

A SPECULATIVE PORTFOLIO CREATED UNDER THE INSTRUCTION OF TREE, ROCKS AND ARTHROPODS

YUSHUO DING 2024

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Concrete Jungle

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Forward To the Past

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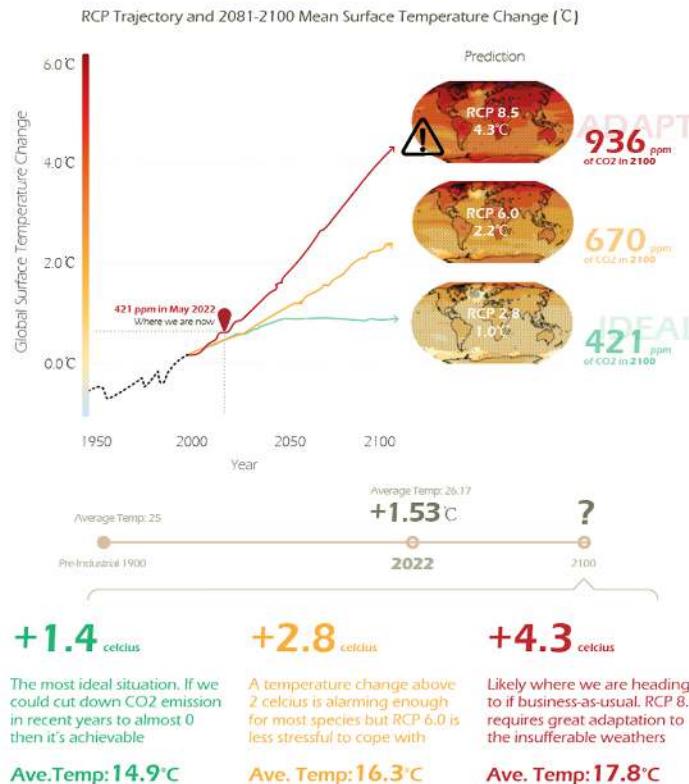
Sleep Tight - A Rehab

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BACKGROUND

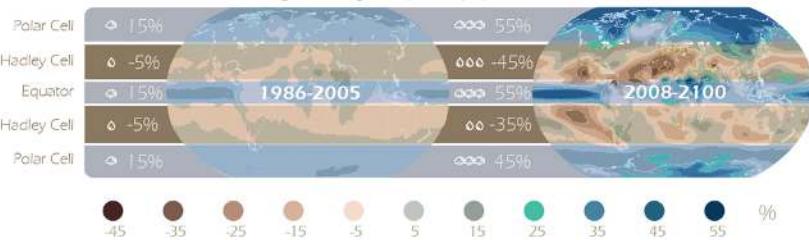
Representative Concentration Pathway (RCP)



PRECIPITATION

Deserts will experience increased aridity, high precipitation regions will face heightened flooding, and the temperature differentials between cold and warm areas will diminish.

1986-2005 & 2008-2100 Change in Average Precipitation (%)



CLIMATE CHANGE'S THREATS ON ANTHROPOGENIC ACTIVITIES



Global decrease of low-latitude fisheries yields with a global trend to catches having smaller fishes



Reduced growth and survival of commercially valuable shellfish and other calcifiers e.g. corals, calcareous red algae



A general decrease on average crop yields and increases in yield variability



Marine and terrestrial biodiversity loss



Urban risks associated with water supply systems



Urban risks associated with energy systems

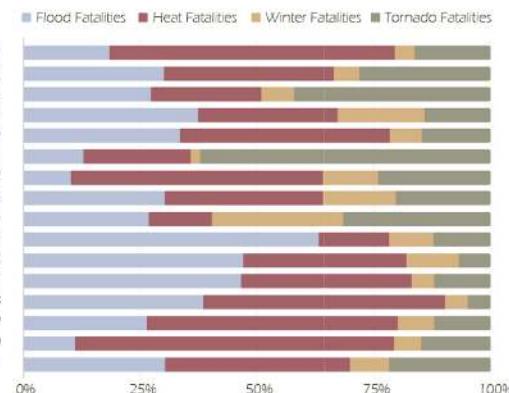


Urban risks associated with housing and displacement



Declining work productivity, increasing mortality from exposure to heat waves. Particularly at risk are agricultural and construction workers, homeless people, children and women who have to walk long hours to collect water (AR5 IPCC)

Fatalities of Four Natural Disasters from 2006 to 2021 in USA



Within these four common type of fatalities, the sum of Heat and Flood mortalities exceeds 65% of the overall fatalities for 13 years out of 16 years

All these data points to POLARIZATION of climate behavior.

URBAN HEAT ISLAND

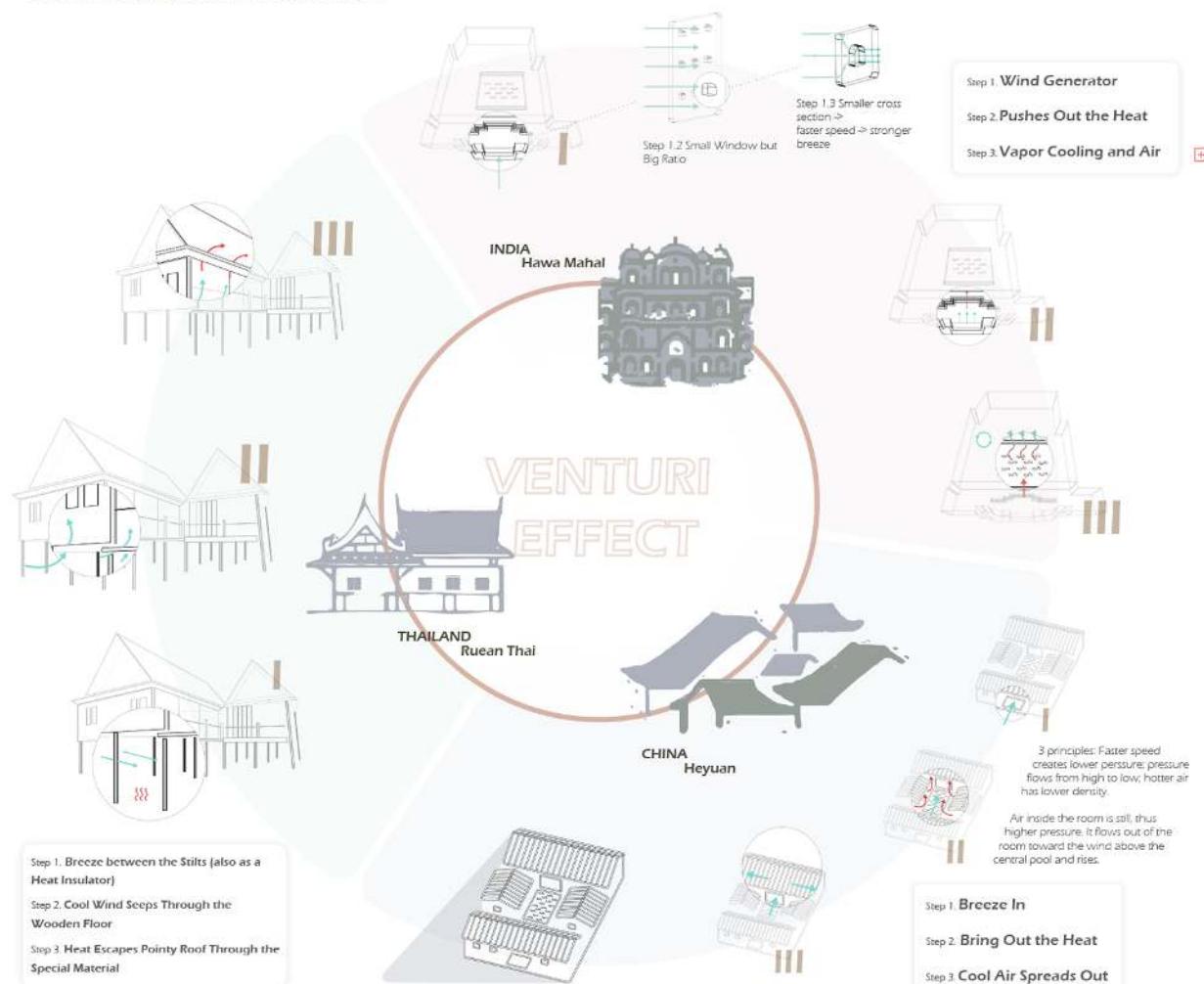
Urban Heat Island is defined as cities being warmer than the surrounding rural areas.



Utilizing regional temperature data from Climate Central and NASA, the map reveals that the Otay Mesa zone near the San Diego-Tijuana border exhibits high aridity and susceptibility to heat.

CASE STUDY

ADAPTATION OF TRADITIONAL ARCHITECTURE IN THE WARM REGION



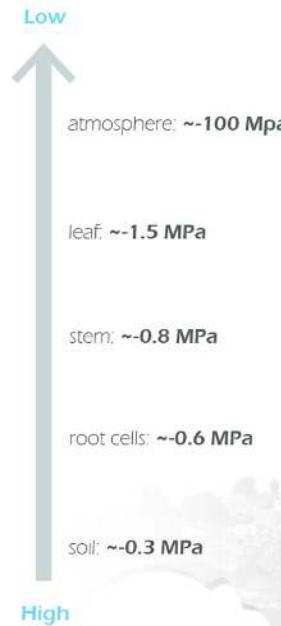
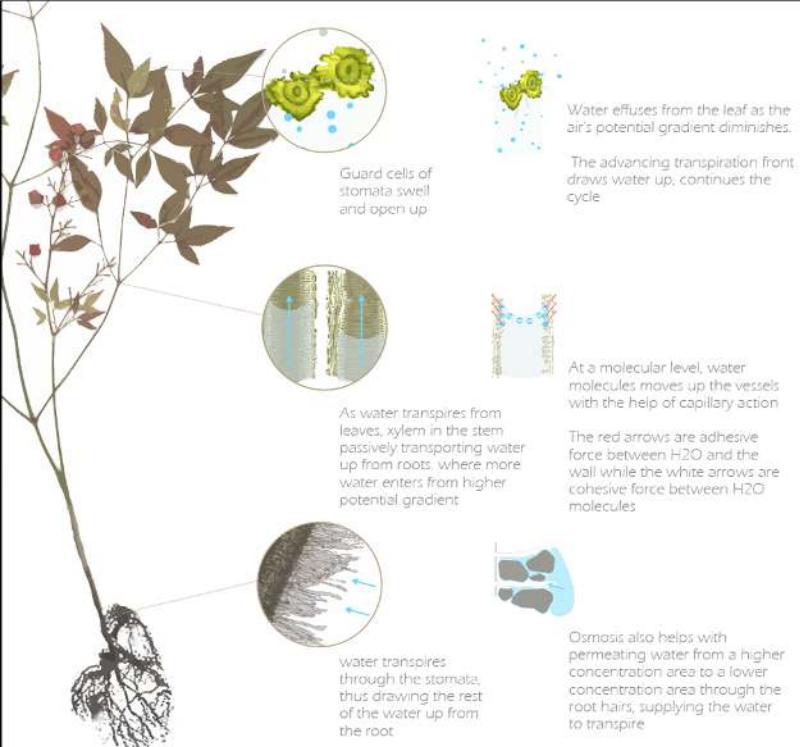
A commonality shared by these traditional buildings is Venturi Effect, where wind speed increases with a narrowing cross-sectional area. Applying this principle to modern architecture can harness wind, cutting air-conditioning energy. Yet, optimal cooling involves vapor and robust air circulation. The project's aim is to reshape the micro-climate nearby. Unlike interior-focused circulation in the case study, this endeavor targets reducing external heat.

Inspired by the vegetation-Urban Heat Island correlation (Portland State Uni), the project aims to counter this by providing shade and promoting evapotranspiration. If successful, it could positively influence the microclimate, mitigating the Urban Heat Island's impact on vulnerable communities. To push the speculative one step further, if successfully design a promising material and appropriate planning, maybe recreational spaces or houses can be built using this system?

If making changes on existing structures is not ideal, can we build around them and manipulate the micro-climate within the vicinity?

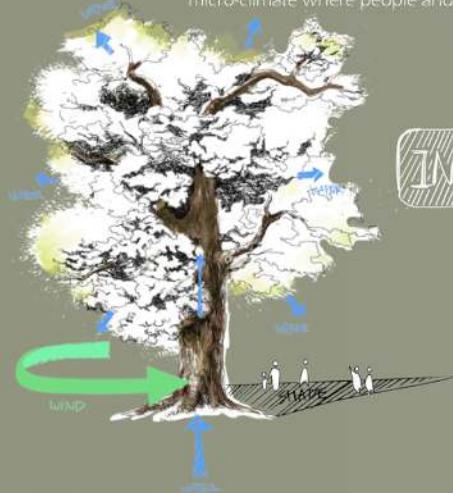
A SPECULATION...

A Strange and Crude Visualization

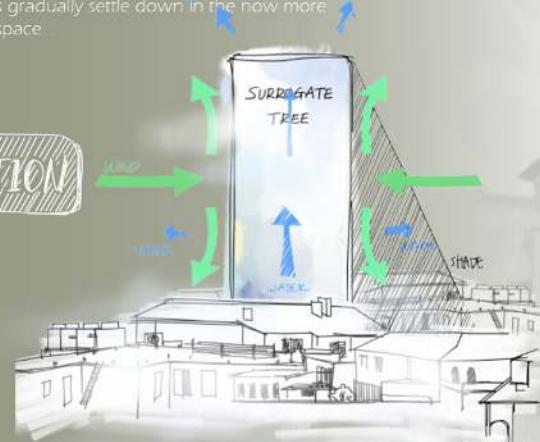


WHAT IF...

Amidst a deserted barren zone, a cluster of gigantic plants start to grow in this inhabitable region. They transpire water and coupled with downdraught effect to disperse the vapors to the surrounding vicinity. The environment shifts into a misty and stable micro-climate where people and other species gradually settle down in the now more welcoming space.



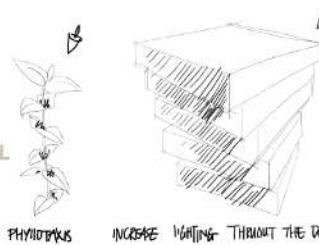
INSPIRATION



MOODBOARD



STRUCTURAL



INCREASE LIGHTING THROUGH THE DAY

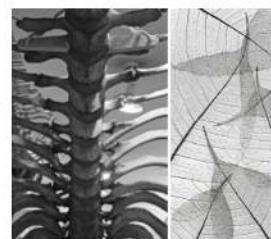
the exterior draws inspiration from the Fibonacci order observed in leaves, a strategic arrangement that plants employ to capture more light for photosynthesis

CONNOTATION



mist softens the contour and blend in with the landscape

FUNCTIONAL



The similarity between the spine & stem

a not-so-direct biomimicry of the veins and spines in both function and aesthetics

similar to a transportation of cerebrospinal fluid in the spine, or passive transportation of water in the leaf veins, the essential function of the tower is to disperse water to every pore of the building then evaporate

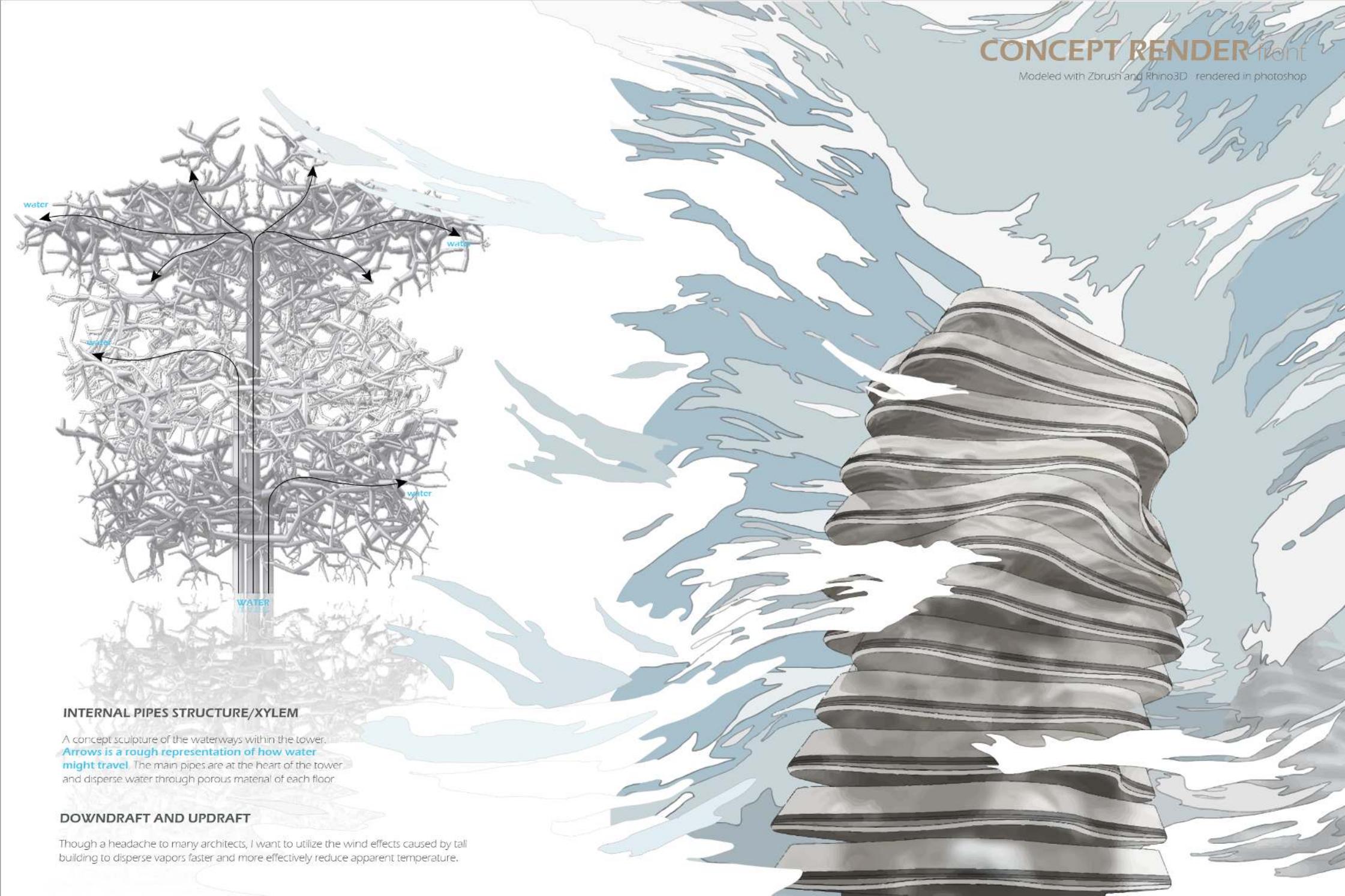
MATERIAL



material is the essence of biomimicry, after the water being pulled up in the central pipes, the porous material disperses the water to each floor and eventually into the air by capillary actions and pressure gradient difference

CONCEPT RENDER front

Modeled with Zbrush and Rhino3D · rendered in photoshop



INTERNAL PIPES STRUCTURE/XYLEM

A concept sculpture of the waterways within the tower.

Arrows is a rough representation of how water

might travel. The main pipes are at the heart of the tower
and disperse water through porous material of each floor

DOWNDRAFT AND UPDRAFT

Though a headache to many architects, I want to utilize the wind effects caused by tall building to disperse vapors faster and more effectively reduce apparent temperature.



Primary Succession
1st Year



Lichen/Pioneer Species
5th Year



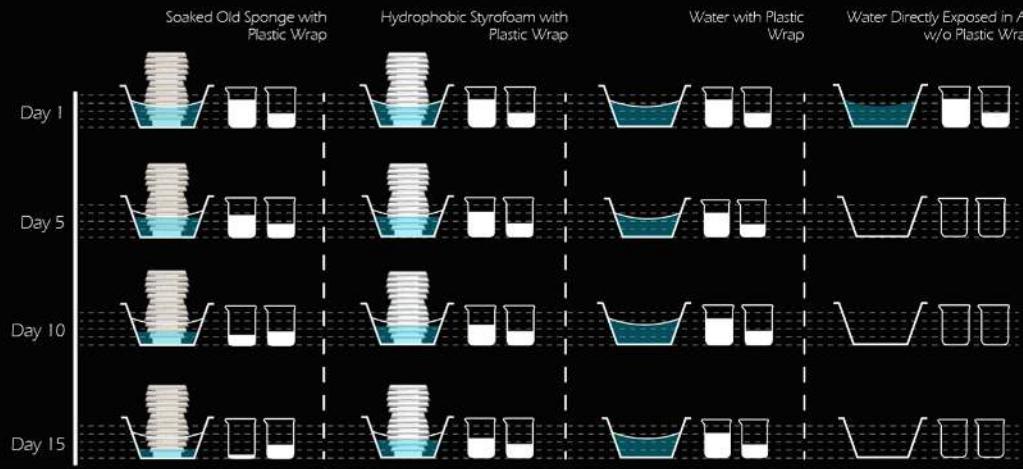
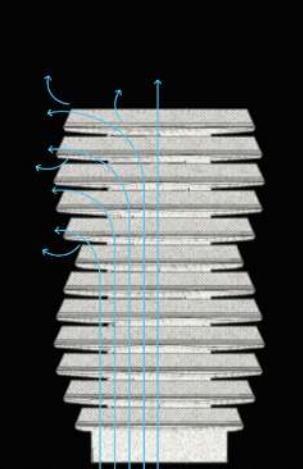
Intermediate Species
10th Year

Time As A Measurement

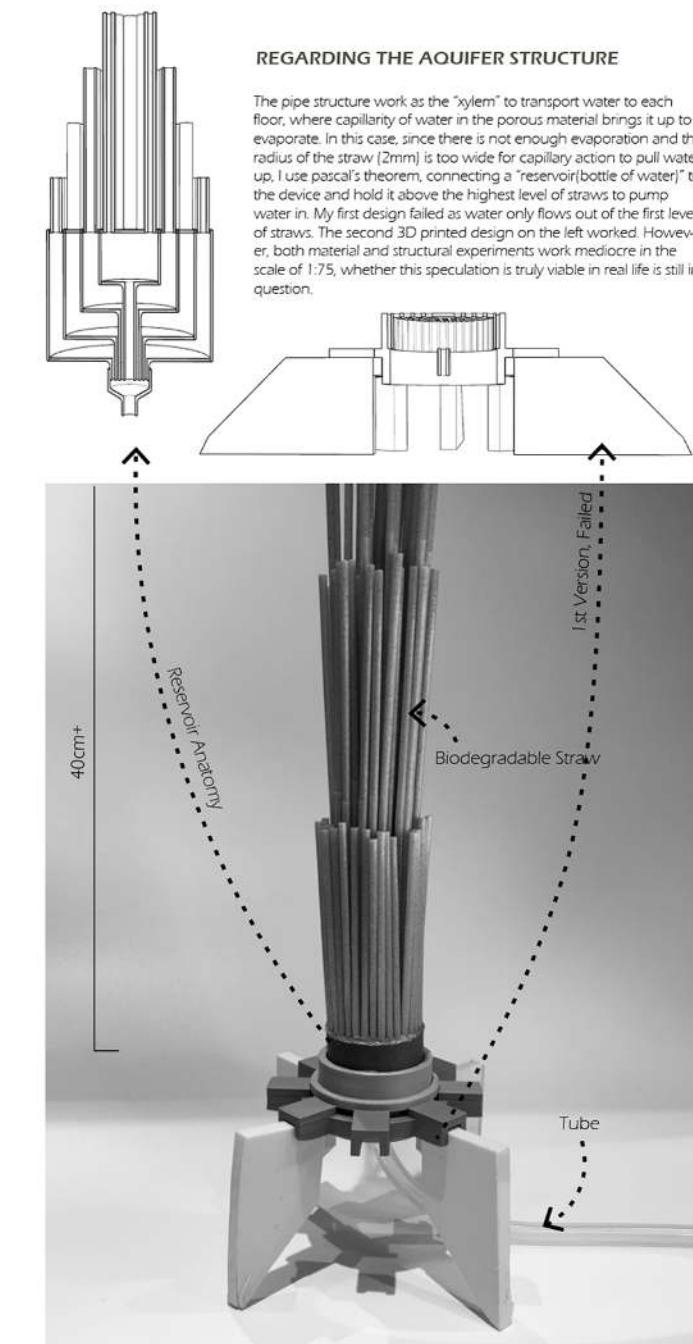
The exterior glass will be replaced by metal grid fence to avoid bird collision and to host native species that can form a symbiotic relationship with the building like Desert Wild Grape, Chaparral Clematis or Virgin's Bower

EXPERIMENT

REGARDING THE MATERIAL

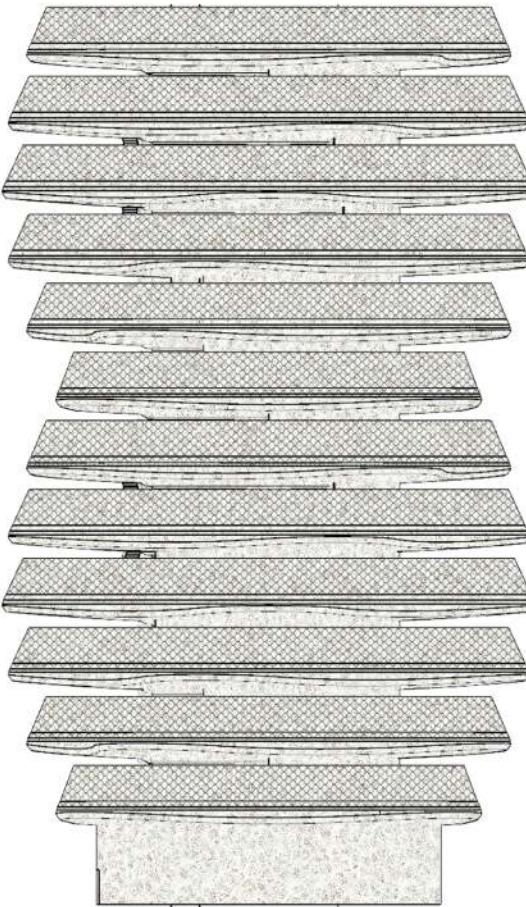


In conclusion, Water in the basin containing old sponge evaporate faster than the one with hydrophobic styrofoam with plastic wrap and the control group, but it's much slower than water evaporates directly under the sun. The result of the experiment isn't ideal and has many flaws such as the plastic wrap in the comparison groups aren't completely sealed off, so presumably the evaporation in both groups would be slower than the current outcome. To achieve the best result requires further exploration of materials with better capillarity.





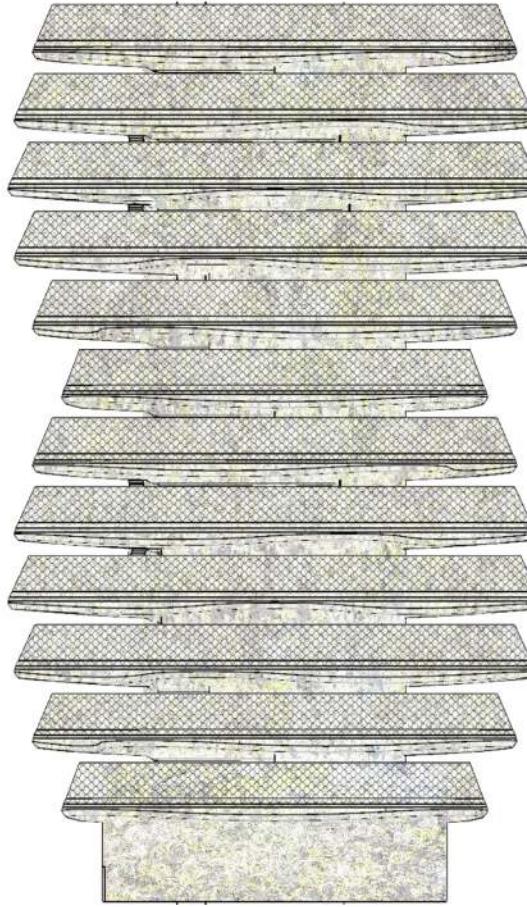
Exterior Model Made of Deport paper



FUTURE STUDY

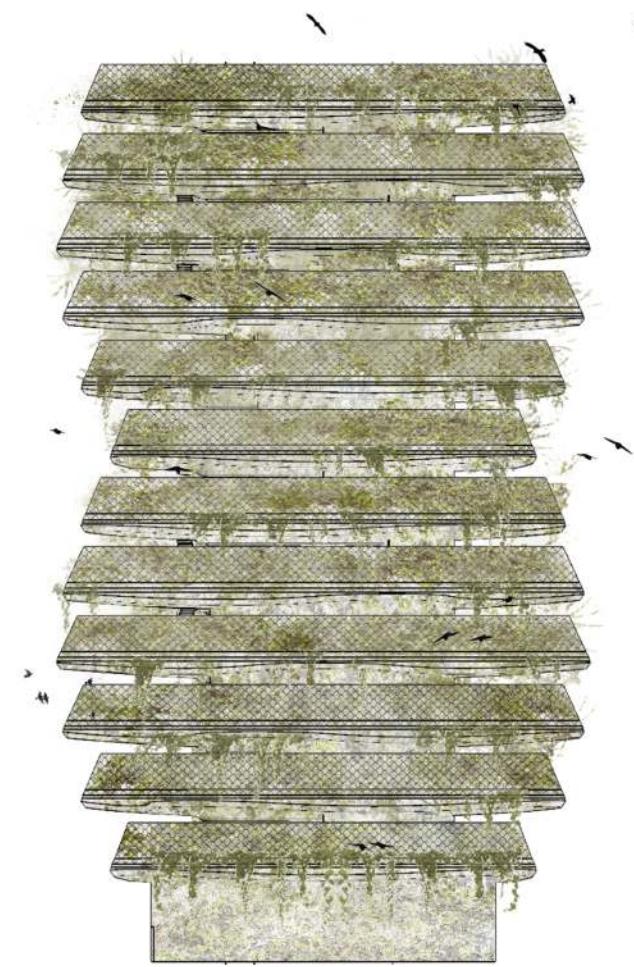
Some unanswered questions:

- How to recycle the evaporated water?
- What's the scale it takes or number of tcres to change the albedo?
- How big should the reservoir be?
- Can it use sea water?
- What's its cost?
- Will it generate profit?
- How difficult is the maintenance?
- What are the side effects of altering microclimate? Will the local regime change?



REFERENCE

- vegetation's influence on surface/apparent temperature <https://www.osti.gov/biblio/10180633>
- Factors of why surface temperature is lower under trees <https://link.springer.com/article/10.1007/s00484-020-02030-8>
- Vulnerable groups susceptible to heat stroke <https://www.sciencedirect.com/science/article/abs/pii/S0169204615001309>
- landscape parameter's impact on surroundings https://www.researchgate.net/publication/289518900_Contribution_of_trees_and_grasslands_to_the_mitigation_of_human_heat_stress_in_a_residential_district_of_Freiburg_Southwest_Germany
- <https://climatechange.chicago.gov/climate-change-science/future-climate-change>
- <https://fia.umd.edu/answer/find-a-time-lapse-map-of-wildfire-growth-in-california/>
- <https://www.weather.gov/hazstat/>
- Mortality by climate data <https://www.epa.gov/climate-indicators/climate-change-indicators-heat-related-deaths>
- Urban heat island <https://cds.climate.copernicus.eu/cdsapp#!/software/app-health-urban-heat-islands-current-climate?tab=app>
- <https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202206>



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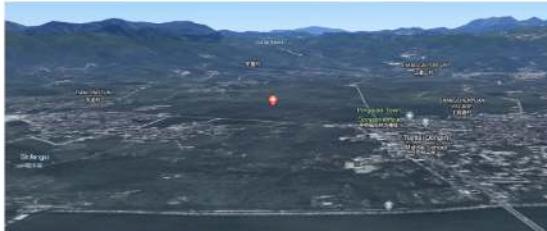
Forward To The Past

INDEPENDENT PROJECT

In the future, perhaps commercialized exoskeletons will aid seniors in leading convenient lives, or perhaps an elixir of eternity will erase the concept of physical "elderly" altogether. Alternatively, individuals may seek refuge from the cyber future, yearning for simplicity in a humble room within a serene community—existing solely for the sake of existence.

INTRODUCTION

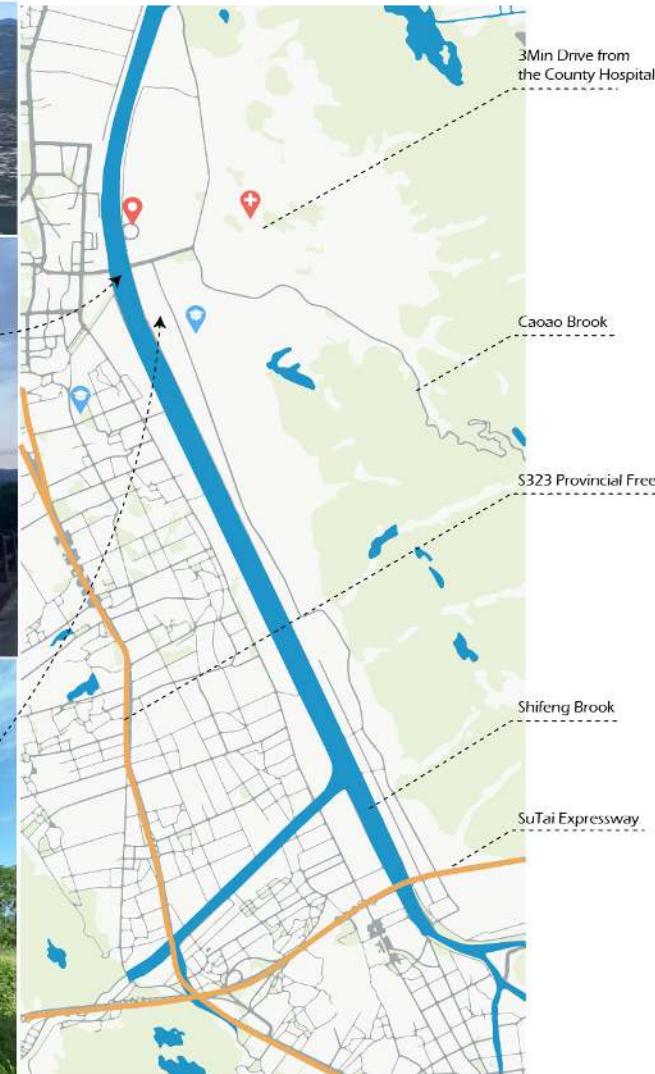
This concept emerged during my stay with my grandmother, recovering from her brain surgery in 2023. Nestled in her hometown - Tiantai in China - renowned for botanical diversity and the convergence of three religions (Daoism, Buddhism, Confucianism), this retirement haven seeks inspiration from the indigenous rock and bamboo dwellings, harmonizing with the local environment. In contrast to successful senior care facilities yet unaffordable for many, this design veers away from commercialization, offering decentralized spaces for residents to relish the serenity of nature and foster intimate connections within the community. This visionary retreat envisions a departure from bustling e-commerce cultures, providing a tranquil haven for my family and future seniors to escape the hurried pace of modern life prevalent in nearby cities like Hangzhou.



I took these photos when passing by the site



I took these photos when passing by the site



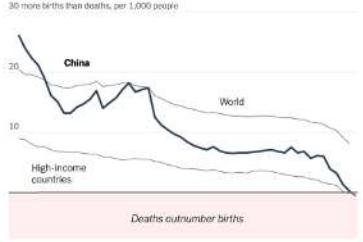
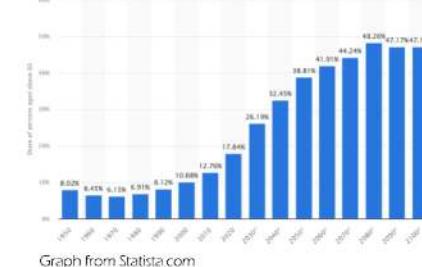
RESEARCH

Who composes the future senior community?

Cultural stereotypes often depict the elderly as either adorable sages or stoic cynics, oversimplifying the rich diversity within each generation. We often overlook the fact that we become them in fifty years, highlighting the need to embrace the unique personalities that exist across all age groups.

Need help Ex-care taker
Peaceful Wise
Grandparents Passive Burden
Sexless Patient
Caring Affable
Dependent Sacrificial
Have Children Conventional
Disabled Well Respected
Abstinent

stereotype word cloud



It is a trend evident in both data and cultural environment that unveils a shifting priority away from childbirth. There will be a growing population of seniors without offsprings. They might be more prone to spare their retirement lives on self-fulfillment and awareness and connection with their friends or pets.

What Elderly(80+) Thinks of Nursing Homes

My Grandma	Grandpa	Their Friend 1	Their Friend 2	Their Friend 3	My Mother	My Father	Random	Their Friend 1	Their Friend 2
Only the abandoned ones go there. It's like the prison for old people	I'd rather die	My friend unfortunately was sent there. They were mistreated.	My neighbor died there during covid. Horrible place.	If your kids send you to a nursing home, you have done something wrong in your past	I'd go	I prefer to stay with my family	I'll go only if my children hate me	I'd like to stay there if the nursing homes are built like resorts in the future	Sounds like a nice place to hang out with friends. I'm tired of babysitting forever

Who are the design's residents? A survey collected from various groups



CASE STUDY

THE GARDENS CARE HOME/
MARGE ARKITEKTER, SWEDEN

The Gardens Care Home in Örebro, Sweden sets in a field nexts to natural reserves, 11 minutes drive from the downtown. It's near to parks, schools, shopping malls and the Orebro central station.

Each residential unit, either sheltered housing or apartment, provides individual kitchen and bathroom to ensure privacy, independence and sense of belong.

The easily and equally accessible center of The Gardens are shared spaces such as courtyards or multipurposes rooms, which take up 3/5 of the architecture. The designers encourage residents to spend more time socializing and interacting with the environment.



CONGREGATING INWARD



Hedgatan 55, 703 74 Lundby Hundrastgård
Örebro, Sweden



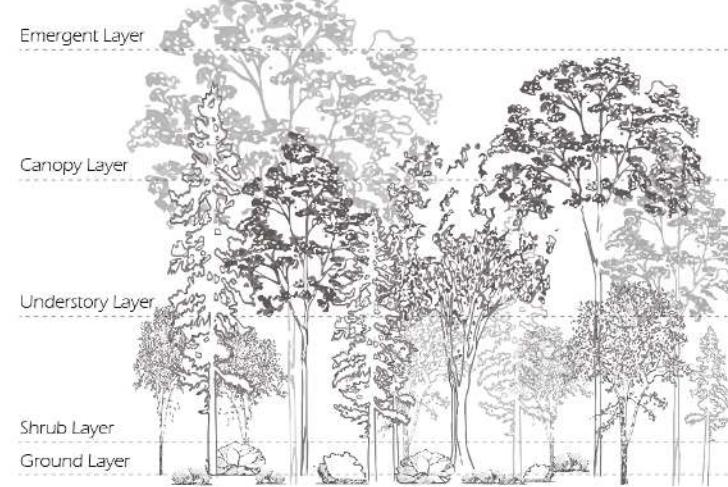
SHAPE AND FORM

Some weathered village houses, constructed in the 50s with local raw materials and bamboo, face challenges such as poor lighting and uneven ground (see photos below). On the other hand, Taizhou boasts a rich historical heritage from the Sui, Tang, and Song dynasties (AD 581-1279). Given the predominantly cloudy and humid climate with distinct seasons, optimizing natural lighting while maintaining comfortable temperatures is paramount. Inspired by the layered adaptation of vegetation to varying light intensities, I envisioned the lower layers with increased leaf surface area capturing light, and the canopy leaves being thinner and smaller. Applying this concept to the design, the single-story building features larger windows for direct light, while the two-story structure relies more on scattered lighting.



Forest Stratification

Emergent Layer



Ma Yuan: Dancing and Singing (detail) 1160-1125



Li Cheng: A Solitary Temple Amid Clearing Peaks (detail) 960AD-1127



Local historic heritage (Pavilion)



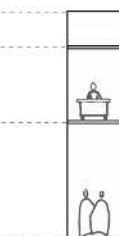
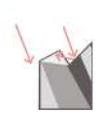
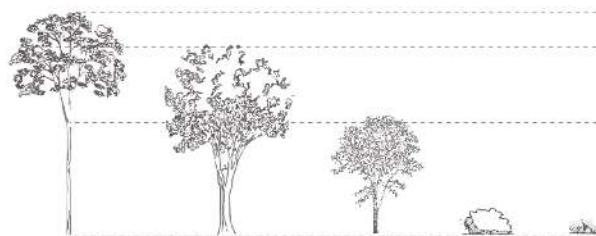
Local historic heritage (Gazebo)

Canopy Layer

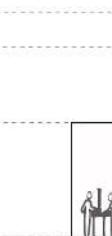
Understory Layer

Shrub Layer

Ground Layer



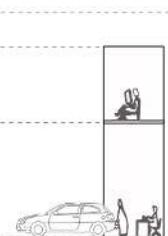
2.5 Stories
Garden/Multifunction Room
with Better Lighting



1 Stories
Staff Office/Common area



1 Stories
Physical Therapy/
Workshop



2 Stories
Residence/Multipurpose
space/Garage

Light Intensity On a Winter Sunny Day

Irradiance

200 W·m⁻²

~90 W·m⁻²

0 W·m⁻²

6W·m⁻²

9W·m⁻²

12W·m⁻²

3W·m⁻²

6W·m⁻²

9W·m⁻²

12W·m⁻²

15W·m⁻²

18W·m⁻²

21W·m⁻²

24W·m⁻²

27W·m⁻²

30W·m⁻²

33W·m⁻²

36W·m⁻²

39W·m⁻²

42W·m⁻²

45W·m⁻²

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66W·m⁻²

69W·m⁻²

72W·m⁻²

75W·m⁻²

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516W·m⁻²

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525W·m⁻²

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531W·m⁻²

534W·m⁻²

537W·m⁻²

540W·m⁻²

543W·m⁻²

546W·m⁻²

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561W·m⁻²

564W·m⁻²

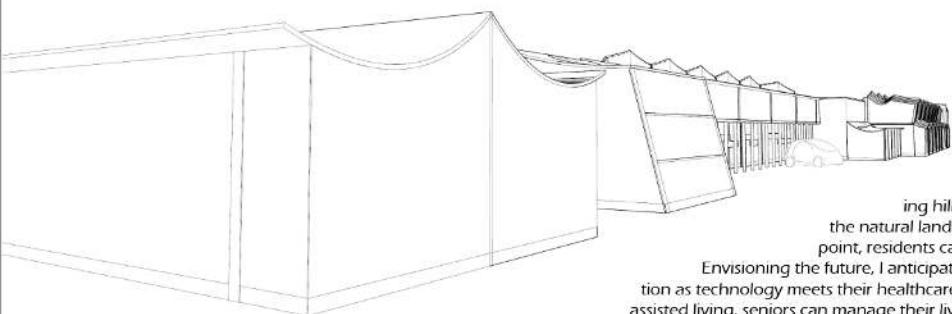
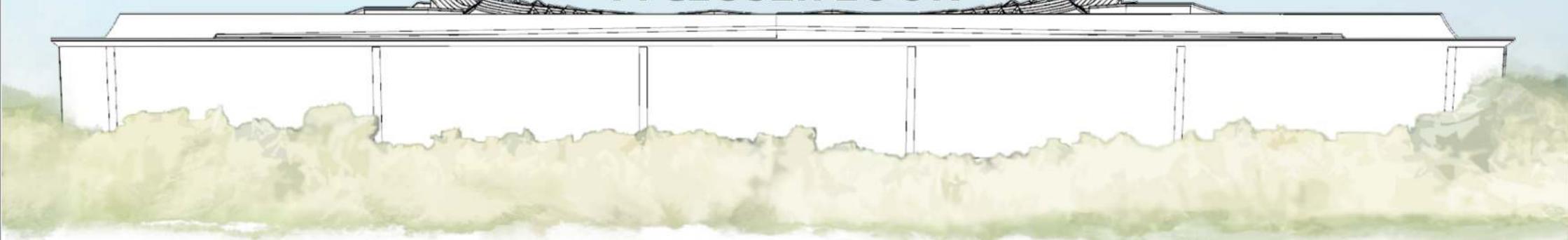
567W·m⁻²

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573W·m⁻²

576W·m⁻²

A CLOSER LOOK



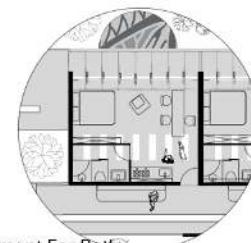
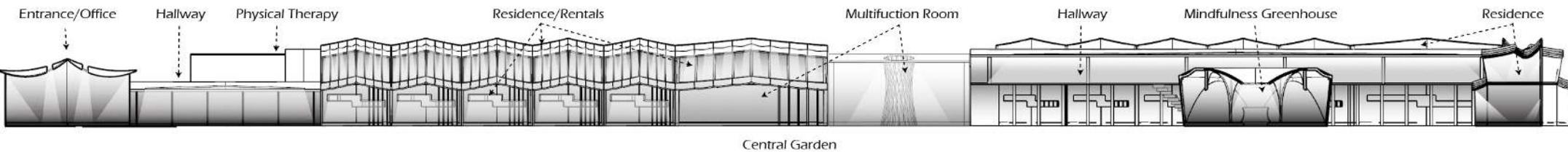
Looking from the front entrance, the contour of the roof ridges seamlessly merge with the surrounding hills. Offering a panoramic 270-degree view of the natural landscape and central garden from any vantage point, residents can immerse themselves in the scenic beauty.

Envisioning the future, I anticipate local seniors prioritizing intimate socialization as technology meets their healthcare needs. With advancements in nursing and assisted living, seniors can manage their lives more independently, enjoying increased freedom. The building comprises four structural modules, catering to essential daily activities.

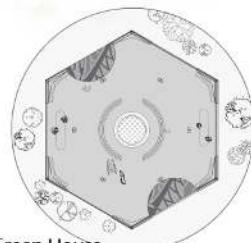
Underneath the residential building, parking spaces ensure convenient access. While the community forms a connected space around the garden, each of the seven living units features two exits directly linking to parking areas. I believe that a sense of belonging and control stems from freedom. Residents should feel liberated to choose between quiet solitary living or engaging in group activities. The Northern section is more compact than the south, with two main common areas on both ends, providing dwellers enough room to socialize and interact. 7 units in the west wing is also open to travelers to book. The Southern section is spaced out and mostly consist of residential and multifunction units. At the center is a green-house for mindfulness.

Both sections leave space in the central garden for resident to grow their own plants, hoping it'd enhance their sense of purpose, influence and accomplishment.

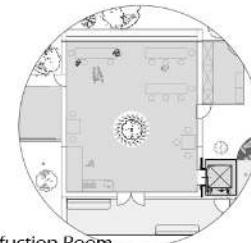
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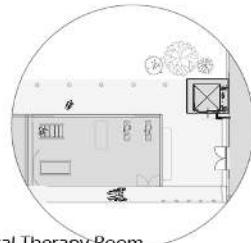
Apartment For Both Residents and Staffs



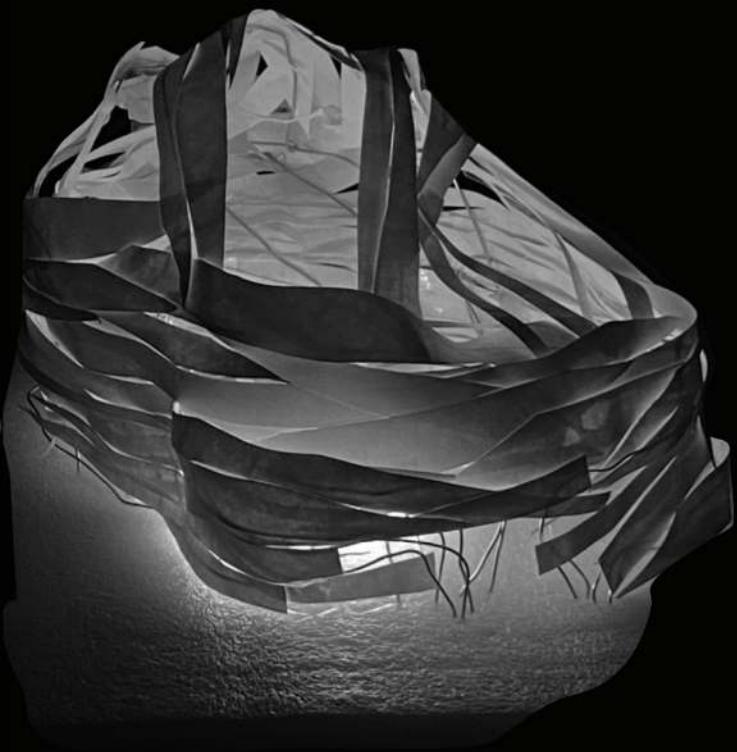
Green House



Multifunction Room



Physical Therapy Room



3

SLEEP TIGHT - A REHAB

INDEPENDENT PROJECT

“ A fun act of question to rethink the meaning of Human-centric design:
Is it about indulging humans' desires or
navigating humans' needs for long-term benefits? ”
— YUSHUO DING



BACKGROUND

I AM MY CLIENT



My summer break left my sleep scandal I spent the rest of the month in borderline insomnia. I started searching for a product to correct my behavior.



EXISTING PRODUCTS

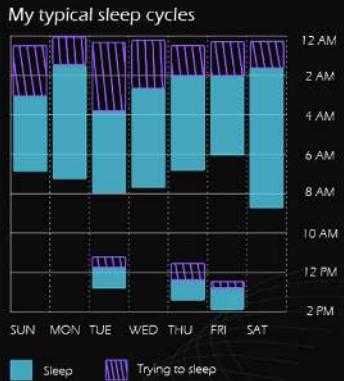
Are mostly APPS



Is there a product that can **ACTIVELY** initiating users' behavior instead of **PAS-SIVELY** waiting to be used?

RESEARCH

PSYCHOLOGY



On average, my daily sleep time is **5.36h**. However, I waste **2.64h** trying to sleep.



Toxin accumulates in brain while we are awake and sleep plays a major role in cleansing them. Space in brain increases 60% during sleep for cerebrospinal fluid to flow through to remove the toxin

Basal Forebrain
Release of **ADENOSINE** promotes sleep and wakefulness. Caffeine blocks the actions of adenosine

Suprachiasmatic Nucleus (SCN)
Receive information about **LIGHT** exposure and control your **BEHAVIORAL RHYTHM**

Pineal Gland
Receives signals from the SCN and **increases** hormone **MELATONIN**, which helps put you to sleep once the lights go down

SOME FACTORS AFFECTING SLEEP

- Light
- Food/Drugs
- Stress
- Sleep schedule
- Physical pain

FACTORS AFFECTING MY SLEEP

- Light
- Food/Drugs
- Stress
- Sleep schedule
- Physical pain

HOW DOES THE BRAIN WORK?

WHAT IS MISSING HERE?

CONDITIONED AROUSAL BEHAVIOR

- 3 of the 5 factors hardly ever bother me.
- Stress level is sometimes difficult to control.
- Sleep schedule's existing assist come from APPs, which DOES NOT WORK for me.

SO... my PAIN POINT is



THEORETICALLY...

Rings a bell right before feeding the dog as a habit
⇒ The dog **associates** bell-ring with meal
⇒ Salivates whenever the bell rings even if no meal is present

VS.



Only lay in bed whenever is falling asleep
⇒ **Associates** bedroom only with sleep
⇒ Feel sleepy when in bed at any time

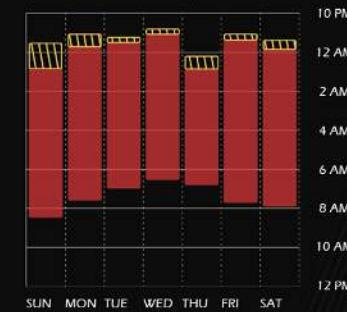
EXPERIMENT



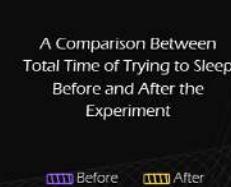
To avoid the urge of lying in bed, I locked up my bedroom and gave the key to my sister by 8AM

She only gave the key back at 10:30PM so my bed has been out of sight between 8AM to 10:30PM.

2nd Week After the Experiment



My Daily Average sleep is **7 hours 12 min**, and I spend about **38 mins** trying to sleep



- **MORE EASILY FALLING ASLEEP**
- **REGULATED CIRCADIAN RHYTHM**
- **SIGNIFICANTLY LESS INSOMNIA**

IN CONCLUSION

– METHOD WORKS

PRODUCT

The experiment successfully confirmed my hypothesis that if I associate the visual of bed only to sleep then I fall asleep fast. Thus, what I need is to keep the bed away from sight in daytime.

However, not everyone has a sibling to keep the key away or a separate room for beds.

I need a physical product that actively influences user's behavior.

REVIEWS OF EXISTING PRODUCTS

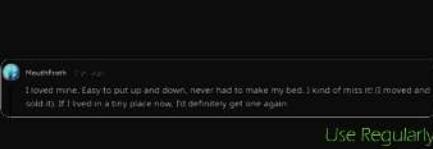
Wall Bed/Murphy bed



Sleeper Couch



Hammock



Futon



IF MAKING THE BED DISAPPEAR IS A SERVICE



7AM
Wake You Up



7:10 AM
Pack your mattress



7:20 AM
No bed to sleep on



9PM
Return your mattress



9:10 PM
Install mattress



9:20 PM
Sleep tight in bed

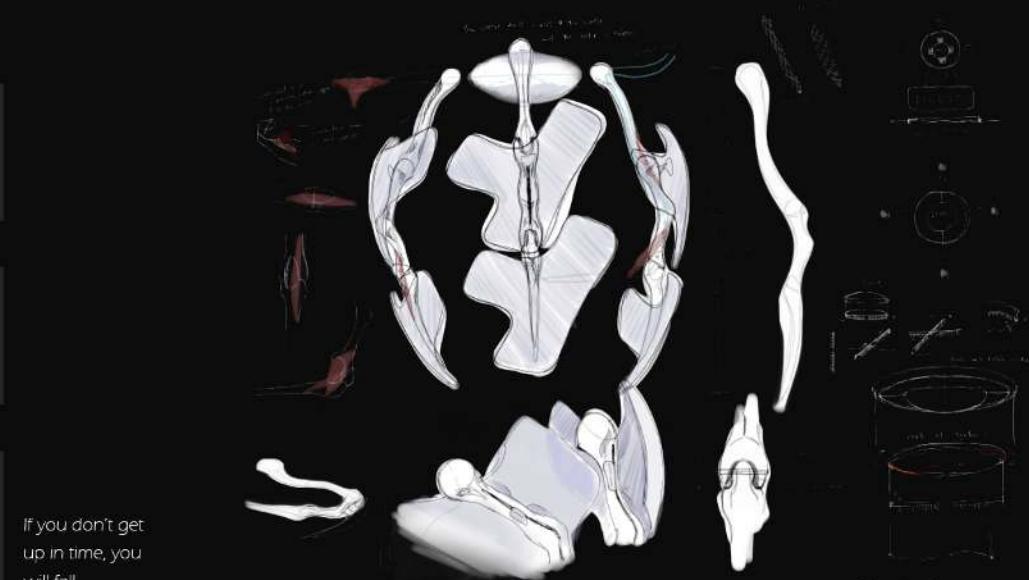
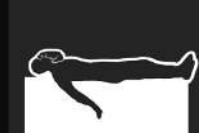
BED? NO BED.

Unfortunately the plan fails easily at step 1 if the user is unwilling to get up and open the door...

FEATURES OF THE NEW PRODUCT

- This product DOES NOT require EXTERNAL interference to perform
- The appearance and disappearance of the bed is NOT UP TO THE USER. If the user cannot get up or lay down within the time frame they set up before (unable to change in a seven-day cycle), they have to sleep on the floor
- Unlike existing products, this design purpose is to SHAPE AN EFFICIENT and CONSISTENT SLEEP PATTERN and making life healthier IN THE LONG TERM, instead of a short term convinience

User Manual



Sketch Procreate

RETHINK DISAPPEAR:



TIME: BIRTH & DEATH



VISUALLY



All lives have a beginning and an end.
Everyday, a newly woven bed is given birth at 10PM.
This bed is dismantled at 7AM.

Concept Sketch
Procreate



PHYSICALLY?

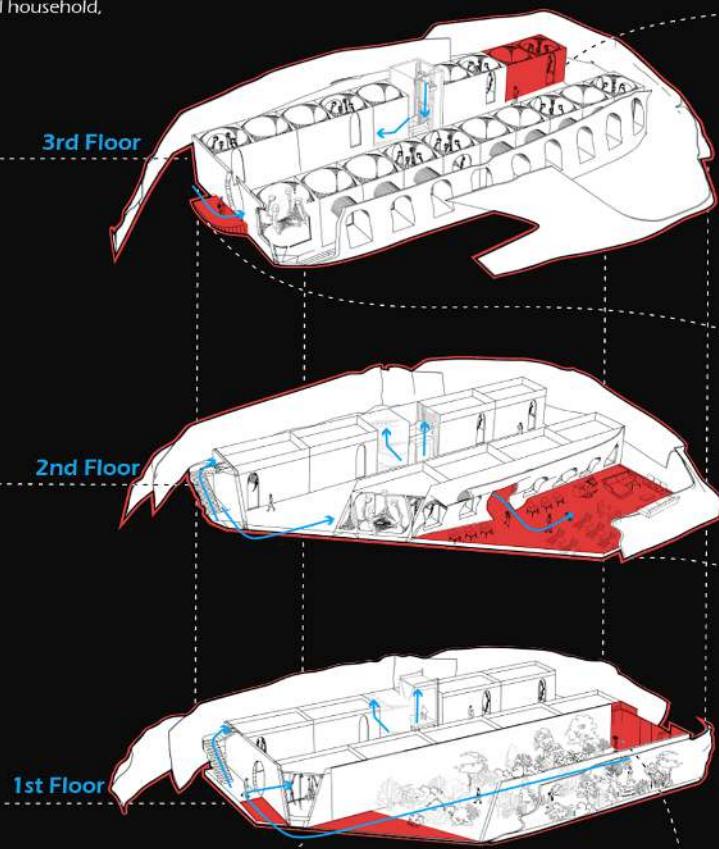
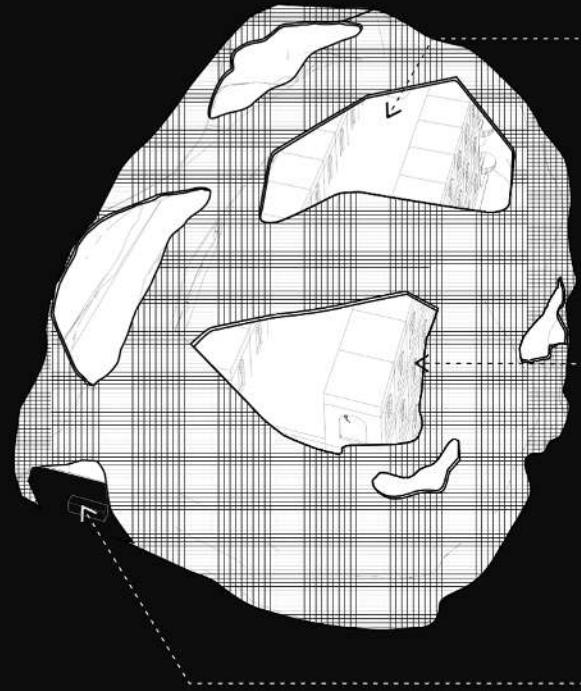
MOVABLE CLAY MODEL OF THE ARMS

Arms are the main support of the woven bed



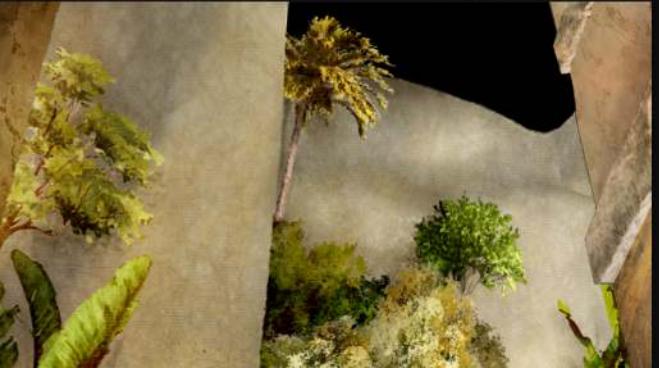
LAYOUT & RENDER

Given that the installation of the device may not be suitable in a typical household, a dedicated building is designed to serve as a sleep therapy center.



Renderings of Selected Areas
Rhino3D & Photoshop

1F Corridor



1F Reception



3F Sleeproom



3F Stairway



2F Lounge



EXTERIOR

The interior will grow vegetation like a green house. Nevertheless, having a large surface of glasses with vegetation inside will severely increase bird-building collision.

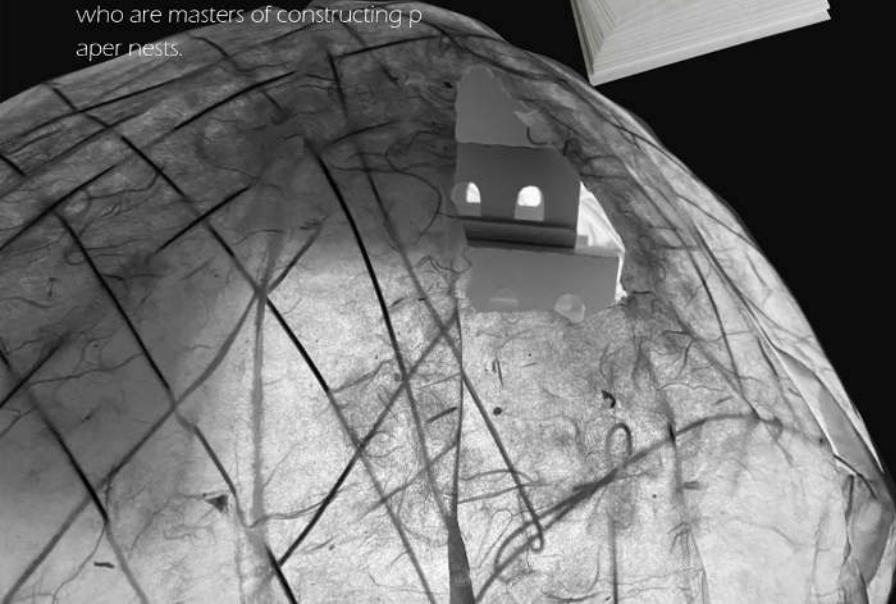


I've seen exquisite ancient handmade lantern so I tried out the traditional method of rice paper paste as the images shown here.

The effect was great but the only problem is the durability due to its thinness.

Dupont paper's texture is also ideal for the exterior, especially during the night when the building is lit-up inside while remaining sturdy.

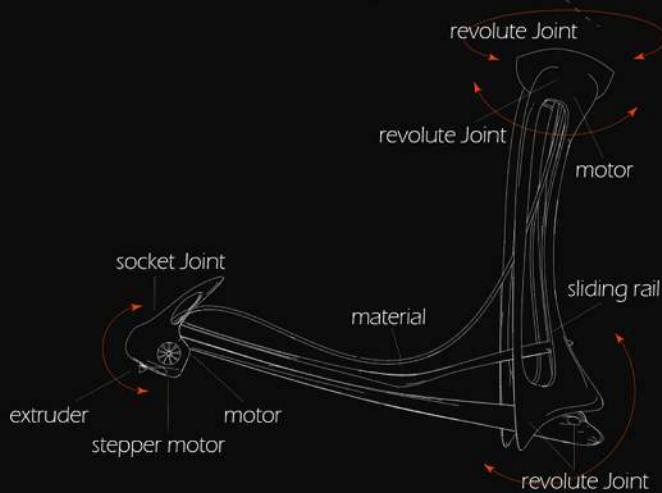
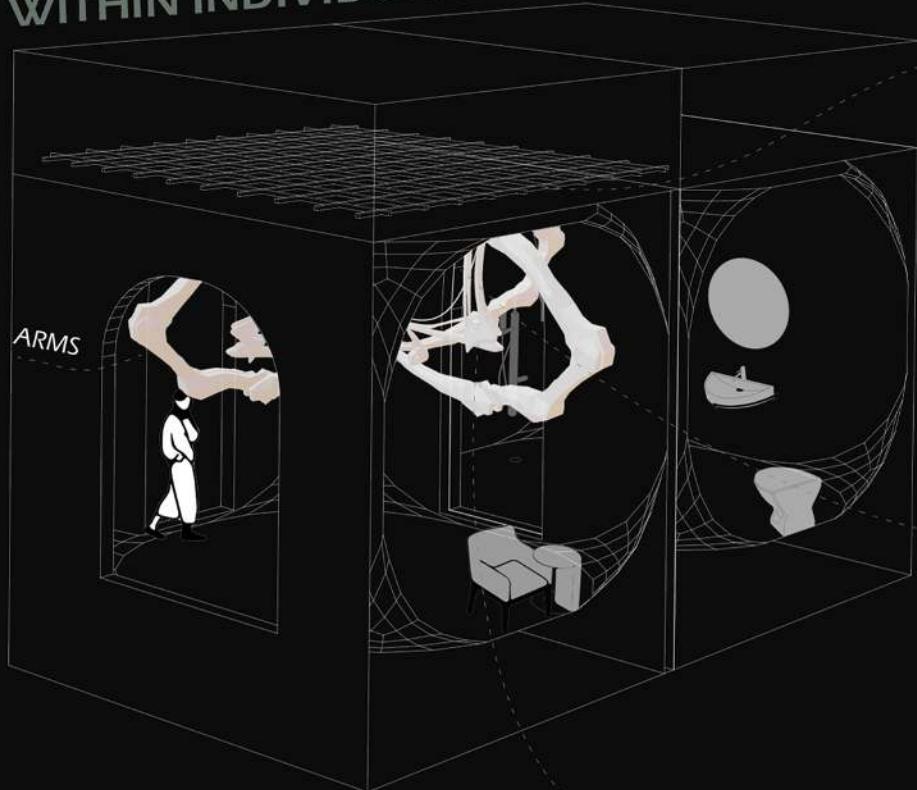
The simple structure of interior is composed of the same sleeping units. These two features remind me of **wasps**, who are masters of constructing paper nests.



The models below are crafted with rice paper. The one featured on the cover image is constructed using Dupont paper.



WITHIN INDIVIDUAL UNIT



Printer

To minimize the weight on the ceiling and to match the bionic style of the four arms, the printer is composed of **flexible yet resilient** and **hollowed-out** skeleton for support. The printing head is shaped like a hook to collect used threads and recycle them in the heater.

Rack

I use a hidden rack in the ceiling to **withstand heavy weight**. In addition to the weight of a person, the structure should be durable to hold a material container, two printer arms and four supportive arms, each with motors on some movable joints.



Heater

The heater hangs on the ceiling and contains heating coils. It **collects** and **reuse** the material by decreasing the thermoplastic's viscosity and transport it to the printer.

MATERIAL

Thermoplastic stands out as the most suitable material among existing options. Hot melt adhesive is the initial consideration, releasing minimal, rarely toxic fumes, crystallizing quickly at room temperature. While it has a high melting point, around 100 degrees Celsius, it exhibits weldable viscosity at 80 degrees Celsius. It adheres well to support arms upon crystallization and can be reheated and reused several times below 200 degrees Celsius. However, its elasticity is a significant drawback.

Alternative ingredients, such as polyol + diisocyanates + short-chain diols, can solidify and form strings at room temperature, but they release slight amounts of methylene diphenyl diisocyanate vapors when heated. Another option is bio-based propylene succinate, with a melting point just above 45 degrees Celsius, but information about its crystallization speed and reusability is not readily available.

REFERENCE

propylene succinate <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2663674/>

Commercialization of glycol + polysuccinate <https://pubs.acs.org/doi/10.1021/acsomega.9b03663>

TPU's melting point <https://www.matweb.com/search/data-sheet.aspx?matguid=1932586b674346e2a9d5cb4c7462dd33&n=1&ckck=1>

Conditioning Psychology <https://www.britannica.com/science/conditioning>

Brain anatomy <https://www.med.harvard.edu/aanlib/home.html>



Yushuo Ding
THANKS FOR VIEWING