Ana Paola Hernandez

Fictions

Architecture In Climate Crisis

Thoughts

Columbia University GSAPP

In Climate Crisis

Project
The Declaration of Independence of the Toxic: Transfusions for an interspecies alliance between pokeweed and people living with viruses

Collaborator
Rocio Crosetto Brizzio

Produced
Summer 2021

Studio
(A)cClimatizing natures or how to intervene with/in them

Professor
Nerea Calvillo

Facts

Project
Enacting Our Environmental Entanglements: A carbon-zero design for a new Interpretative research campus

Produced
Fall 2021

Studio
Innovation at the Columbia Climate School's Lamont Doherty Observatory

Professors
Mark Rakatansky and Jorge Otero-Pailos

Project
Subterranean District One: Living under the environmental threat of extreme heat

Collaborator
Gejin Gloria Zhu

Produced
Sprint 2022

Studio
RISK: Climate, Architecture and Uncertainty

Professor
David Benjamin

Conversations

Fictions

Thoughts

THE DECLARATION OF INDEPENDENCE OF THE TOXIC

Transfusions for an interspecies alliance between pokeweed and people living with viruses

Produced:
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(A)cClimatizing natures
or how to intervene with/in them

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THE DECLARATION OF INDEPENDENCE OF THE TOXIC

Transfusions for an interspecies alliance between pokeweed and people living with viruses

How is nature adapting to climate change? Which species are acclimatizing, migrating or disappearing in these changing conditions?

The studio will explore climate/s as situated weather conditions with their natural, social, political and cultural entanglements; and will explore critical vocabularies around climate change. It will consider Nature (capitalized) a social construct, and explore how each construct informs specific forms of action; as well as the potential of living with/in specific natures (uncapitalized and multiple).

In this context the studio will focus on who and what migrates because of environmental or social climates, and who has the capacity, the favorable climate/s or the chance to acclimatize to changing conditions. We will challenge the notions of native, invasive, endemic or indigenous species; understand the role that climate, culture, politics and society (in the form of power and inequality) play in assigning those categories to different plants and animals; and explore forms of intervention to (a)cclimatize them.

Considering that institutionalized epistemic practices like geology, botany or animal taxonomy, among many others, are all colonial projects, we will explore, hands-on, different forms of knowing, and speculate as a consequence on different forms of intervention. For instance, how would restitution work for an (a) cClimatized species?

The studio claims the need to explore new imaginaries, typologies, technologies and forms of inhabiting that take into consideration global warming, climate change, ecocide, or climate migration.

Dealing with climate and the environment is not only about technological solutions, but requires dealing with the weather, nature and cultural, social and political issues.

Designing with and in natures is a tool to expand our ways of thinking about how the environment and nature are not passive entities, but are constructed and therefore also the realm of architecture

The role of buildings has been to create indoors climates to facilitate or permit habitation. Buildings as comfort generating enclosures. However, what happens when what needs to be protected is outdoors? Biodiversity is collapsing. Some species cannot adapt to such rapid climate changes others get into phenological mismatch. Some migrate to other areas with their former climates, others adapt to the new conditions. There is movement, transformation, predation and new alliances.

We will study plants dynamics form an ecological perspective, to understand their different interrelations with other beings. We will design spatial interventions to facilitate, intensify or avoid some of those interactions to permit a fairer present for all species.

How does climatizing look like outdoors beyond an accumulation of machines? Which species should/can get acclimatized and how can we design environments to support (climatize) the ones which cannot? What counts as invasive, native, adaptive for plants and humans?

In particular, the studio starts in Central Park, one of the most famous man-made nature's of the world. The park was built in the second half of the 19th century as a social and political project. Conceived as a public infrastructure, it was envisioned as an instrument to improve the health of city dwellers and the formation of civil society, and therefore a fundamental tool for the consolidation of democracy. Today its biodiversity is still being explored, and the park is a laboratory for urban species' adaptation to climate change.

The studio will bring together critical thinking, design, research, citizen science, creative and speculative explorations and technical discussions, supported and inspired by guest talks and lived experiences within nature. Time will be shared between the field, research and the studio, spending time outdoors to observe, experience, share and discuss.

The studio will also emphasize a variety of skills and means of representation, including conceptual thinking, personal aesthetics, architecture drawings, collective editing and collaboration. - Nerea

THE DECLARATION OF INDEPENDENCE OF THE “TOXIC”.

Transfusions for an interspecies alliance between Pokeweed and People living with HIV and Covid viruses is a pokeweed Acclimatizer, which brings together two species — Pokeweeds and Humans — to collaborate and help each other through transfusions of their chemical body fluids. Pokeweeds help humans to fight HIV and Covid viruses; and humans help the weed to write its own Declaration of Interdependence in Central Park.

>> SLIDE
(Title of project)

>> SLIDE
(Photograph of Poke on July 16, 2021)
This one here is Poke. She is an American Pokeweed or commonly named as Pokeberry.

>> SLIDE
(GIF map of Pokeweed's expansion in the US)
The American Pokeweed, widely extended in the southern and eastern territory of the US,

>> SLIDE
(Diagram of Pokeweed's nameanculture)
was originally known as Poke, which in the Algonquin Indian language means blood.

Later, in the 20th century, it was cataloged as a weed, by the US Department of Agriculture, defining the plant as an unwanted species.

>> SLIDE
(Abstract GIF of Pokeweek's rapid growth)
Pokeweed is considered invasive because it reproduces "too" fast and spreads "too" easily.

>> SLIDE
(Image of Pokeweed's berries)
It is also disliked because it can be poisonous for some animals since livestock, pets and humans have been intoxicated because of eating the berries.

>> SLIDE
(Diagram of Pokeweed's relationship with other species)
However, despite this negative portrayal, Poke tends to be surrounded by an abundant ecosystem of species that rely on her for both food and pollination, as pokeweed is indeed not harmful or toxic to these birds, insects and small mammals.

>> SLIDE
(Historical timeline with major events)
Poke has made some major appearances in history, especially thanks to her amazing fluids: the chemicals running through her leaves and the colorful liquid contained in her berries.

>> SLIDE
(Title Image "Native American, 13-16th C")
The fluid was used by Native Americans

>> SLIDE
(Image of Native American textiles)
to dye textiles,

>> SLIDE
(Illustration of Native American producing medical substances)
and the leaves for medicinal purposes: as a cardiac stimulant, and to treat epilepsy, anxiety and neurological disorders.

>> SLIDE
(Title Image "Declaration of Independence, 1776")
Paradoxically, Poke also had a prominent role in the American Revolution.

>> SLIDE
(Painting of the signing of the Declaration of Independence)
It is claimed that poke berries' ink was used to write

>> SLIDE
(Title Image "Civil War, 1861-1865")
Later, during the Civil War,

>> SLIDE
(Photographs of letter send by soldiers during the civil war)
soldiers at the war fields used to squeeze poke berries to extract its ink and write letters to their beloved ones.

>> SLIDE
(Title Image "Antiviral, today")
Today, Pokeweed has been discovered to be a potential breakthrough in medical applications.

>> SLIDE
(Scientific report on Pokeweed Antiviral Protein)
Pokeweed's leaves contain a protein called PAP (Pokeweed Antiviral Protein)

>> SLIDE
(Scientific report on Pokeweed Antiviral Protein)
that has shown effectiveness to treat HIV virus.

>> SLIDE
(Scientific report on Pokeweed Antiviral Protein)
Recently, it has also been tested to treat Covid-19 virus.

>> SLIDE
(Diagram of Pokeweed's relationship to historical events, discoveries and uses)
Despite all the key-playing roles of Pokeweed throughout history and in the present, it continues to be cataloged as an unwanted species.

>> SLIDE
(Question Image)
Then, why do we catalog this plant as unwanted?
Who says it is unwanted?
And, unwanted for who?

>> SLIDE
(Zoom-in GIF from space to Central Park, NY)
We found Poke at Central Park through Citizen Science apps.

>> SLIDE
(Map GIF of appearing and disappearing pokeweeds in Central Park)
We noticed that many Pokeweeds that were recently mapped in Central Park were no longer there, thus we believe that the plants were removed from the park when reported.

>> SLIDE
(Image of side road where Poke was found)
Actually, this explains the site where we found Poke, on 86th Central Park Traverse, in the dirty sidewalk of this underground road, where Poke was able to emerge from the cracks.

>> SLIDE
(Image GIF of Poke in its usual habitat)
She has managed to live in the borders, apart from humans, together with litter.

>> SLIDE
(Photograph of Act Up March, late 1980's)
Both Pokeweed, as a weed, and people living with HIV have been forced to live in liminal and relegated spaces.

>> SLIDE
(Photograph of Act Up March, late 1980's)
Viruses and weeds propagate by themselves and out of human control, and as a consequence they have been pulled apart and rejected.

>> SLIDE
(Photograph of Act Up March, late 1980's)
In addition, both Pokeweed and people living with HIV have been stigmatized because of the poisonous or infected fluids circulating in their bodies, turning them into poisonous or "toxic" bodies.

>> SLIDE
(Question Image)
But actually, we question: What is not toxic today? In an era in which air, soil, food, water is polluted, then, aren't we all toxic? Isn't toxicity encompassed within each of us? Among the environments in which we live and within our own bodies?

>> SLIDE
(Triptych Video squeezing pokeberry's liquid)
The Declaration of Independence of "The Toxic" Transfusions for an interspecies alliance between pokeweed and people living with HIV and Covid-19 viruses is a pokeweed acclimatizer, which brings together two species Pokeweeds and Humans - to collaborate and help each other through transfusions of their chemical body fluids. Pokeweeds help humans to fight HIV and Covid viruses; and humans help the weed to write its own Declaration of Interdependence in Central Park.

>> SLIDE
(GIF of pokeweed's intervention)
To do so, two pokeweed fluids are mobilized: the Pokeweed Antiviral Protein and the juice of the poke's berries. The PAP, Pokeweed Antiviral Protein, contained in the leaves will be collected to produce antivirals for HIV and Covid. The Poke's magenta liquid contained in the berries will be squeezed to write the Poke's Declaration of Interdependence.

>> SLIDE
(Aerial image of intervention)
These interspecies interactions happen at the acclimatizers which are:

>> SLIDE
(Aerial image of intervention, highlighting the Toxic Gardens)
the Toxic Gardens,

>> SLIDE
((Aerial image of intervention, highlighting the Soaking Fountain)
the Soaking Fountain

>> SLIDE
(Aerial Image of Intervention, highlighting the Biohacking House)
and the Biohacking House.

>> SLIDE
(Manhattan Map highlighting HIV and LGTBQ historical places)
These spaces take over existing empty infrastructures and open areas in Central Park where people living with HIV and LGTBQ communities have protested and secretly gathered throughout the years.

>> SLIDE -- "TOXIC" GARDENS
(Aerial Image of Intervention, highlighting the Toxic Gardens)
The "Toxic" Gardens are dispersed throughout Central Park in open available areas such as the

>> SLIDE
(Photograph of the Sheep's Meadow, 1970 first gay march)
Sheep's Meadow

>> SLIDE
(Photograph of the Ramble)
The Rambles

>> SLIDE
(Photograph of the Strawberry Fields)
and The Strawberry Field.

>> SLIDE
(GIF of hands collecting pokeweed leaves)
Here is where Poke will grow freely and humans will collect mature leaves during the summer and spring seasons.

>> SLIDE
(Perspective Drawing of the Acclimatizer)
To acclimatize these areas, flexible and mesh-like canopies are hung from nearby trees. The canopies capture the trees' falling leaves creating the necessary shade for Pokeweeds to flourish.

>> SLIDE
(Rendering of the Acclimatizer)
As the canopies collect more and more leaves, these drop down into the canopy's sacs, eventually decaying and enriching the soil around the Pokeweeds' gardens.

>> SLIDE
(Aerial image of intervention, highlighting the Soaking Fountain)
the Soaking Fountain

>> SLIDE
(Photograph of the Bethesda Fountain)
The collected leaves are taken to the existing Bethesda Fountain, below the Angel of the Waters, the sculpture designed by Emma Stebbins in 1873, an active feminist and lesbian, and the first woman to be commissioned a public artwork by the City of New York.

>> SLIDE
(Video of hands washing pokeweed leaves)
This sculpture represents water as a main source for healing the body, and a crucial element in the transfusion of body fluids.
At the Soaking Fountain the leaves will be washed collectively during summer and fall, and then transported on the boats to the Biohacking house.

>> SLIDE
(Aerial Image of Intervention, highlighting the Biohacking House)

>> SLIDE
(Photograph of the Biohacking House)
The Biohacking house will take over the unused rooftop of the existing Loeb Boathouse and its boats.

>> SLIDE
(GIF of hands drying pokeweed leaves)
Here, the leaves are dried and processed to extract the PAP Antiviral Protein.

>> SLIDE
(Perspective drawing of the Biohacking House)
A double mesh is installed over the terrace and

>> SLIDE
(Rendering of the Biohacking House)
big tubes pour air to dry the leaves and prepare them for the antiviral extraction.

>> SLIDE
(Night Aerial Showing the PAP)
If we could X-Ray our intervention, we could see the PAP antiviral protein circulating from the leaves of the plant to the human body.

>> SLIDE
(Scientific news of fluorescent cat)
Participants of this (do it yourself) biohacking process, as well as others who might not be able to participate, will get, in addition to the PAP Antiviral Protein, the GFP, a Green Fluorescent Protein, which is a bio-marker for HIV and Covid.

>> SLIDE
(Image of fluorescent cat)
This protein, which has been already tested as a marker for cats and other animals' immunodeficiency viruses, will glow on Covid or HIV bodies.

>> SLIDE
(Night Aerial Showing the GFP)
The use of GFP is an action for visibility, intended to dilute the stigma placed on people living with viruses, and to blend with fireflies at night.

>> SLIDE
(Quantitative Diagram)
So, how many pokeweeds would this intervention require? Through this proposal, the whole New York City population with HIV could be treated with the antivirals. If the whole area of Central Park was left to the pokeweed, the whole US could.

>> SLIDE
(Aerial Image of Intervention, summer)
Once a year, a toxic-interspecies-celebration takes place.

SLIDE
(>> Aerial Image of Intervention, sept 17)
With the help of humans, Poke will "write" its own Declaration of Interdependence in Central Park.

>> SLIDE
(Aerial image of intervention, sept 17)
This event will unfold as a procession.

>> SLIDE
((Aerial image of intervention, sept 17)
Humans will stop at each of the Toxic Gardens

>> SLIDE
(Night aerial showing the purple liquid)
and squeeze the round and juicy Poke's berries, allowing the fluid to tint the soil and mark the plant's territory. Instead of using citizen science apps to mark Poke's location, Poke will use her own magenta fluid, contained in her berries, to speak for herself.

>> SLIDE
(Central Park Drawing showing Procession)
This is Poke, writing her own Declaration of Interdependence - as she can now move freely in Central Park.

>> SLIDE
(Central Park drawing showing procession)
The procession is conceived as a performative and bodily engaged event that will end at the Bethesda Fountain.

>> SLIDE
(GIF of hands collecting pokeweed berries)
The berries collected throughout the summer

>> SLIDE
(Video of Pokeberries being squeezed)
will be poured into the fountain where humans will crush the berries, as a sort of grape harvesting event, releasing the magenta liquid into the water-bodies of Central Park.

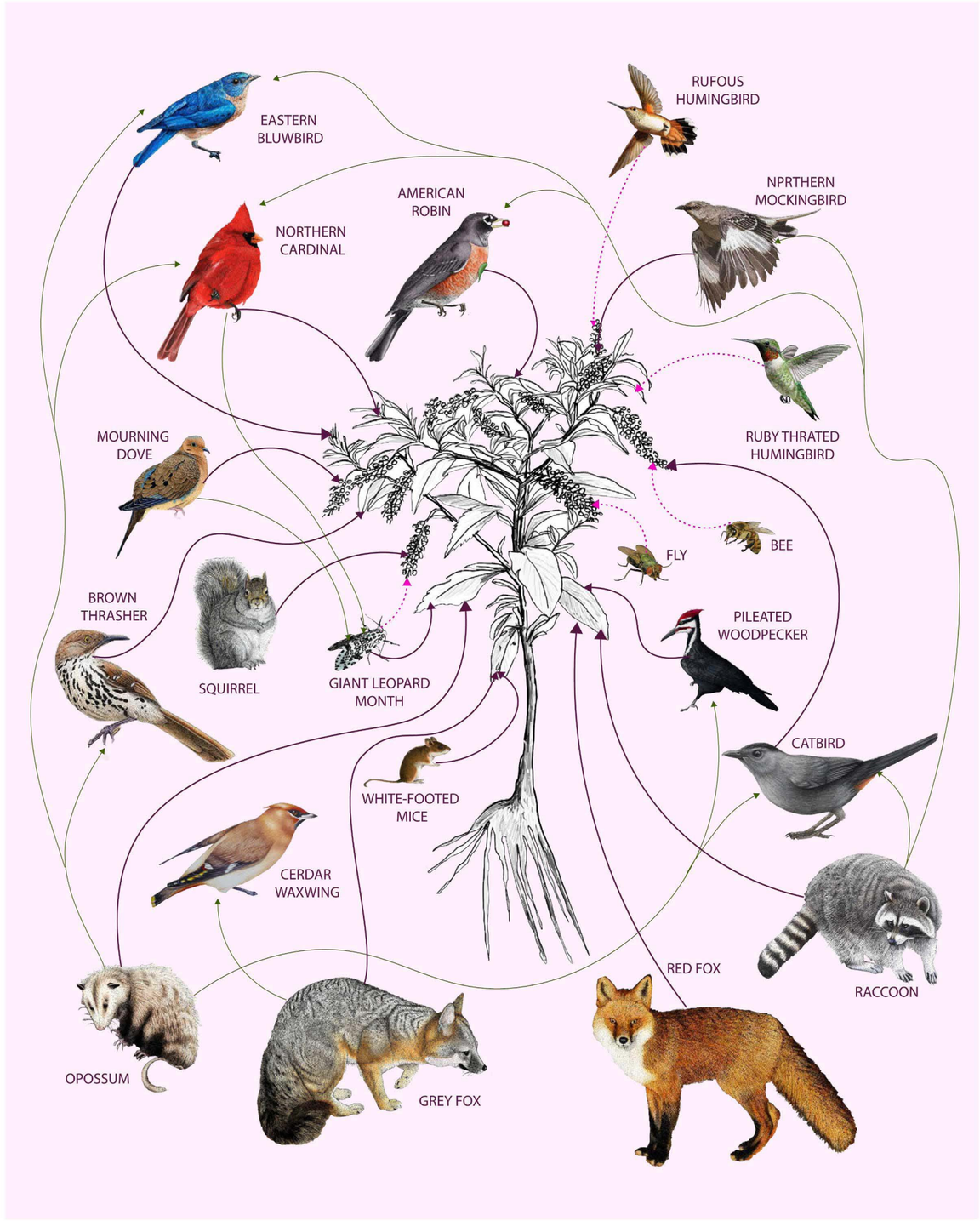
>> SLIDE
(Preformative Photograph)

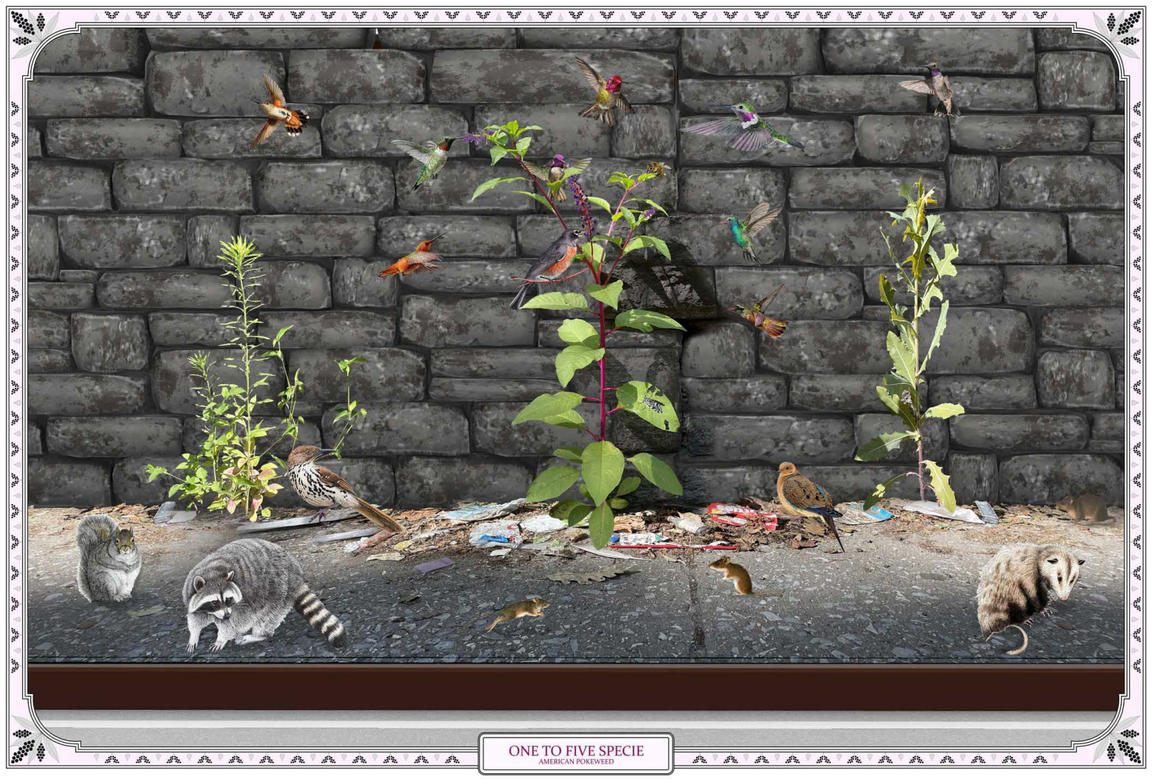
>> Slide
(Bodily Engaged Photograph)

>> (Slide)
(Bethesda Fountain)

>> SLIDE
(Video of purple liquid tinting fountain)
In this collective celebration, "toxicity" and the injustice of its displacement will be collectively acknowledged and celebrated in its multiple forms.

POKE = BLOOD
WEED = ??????

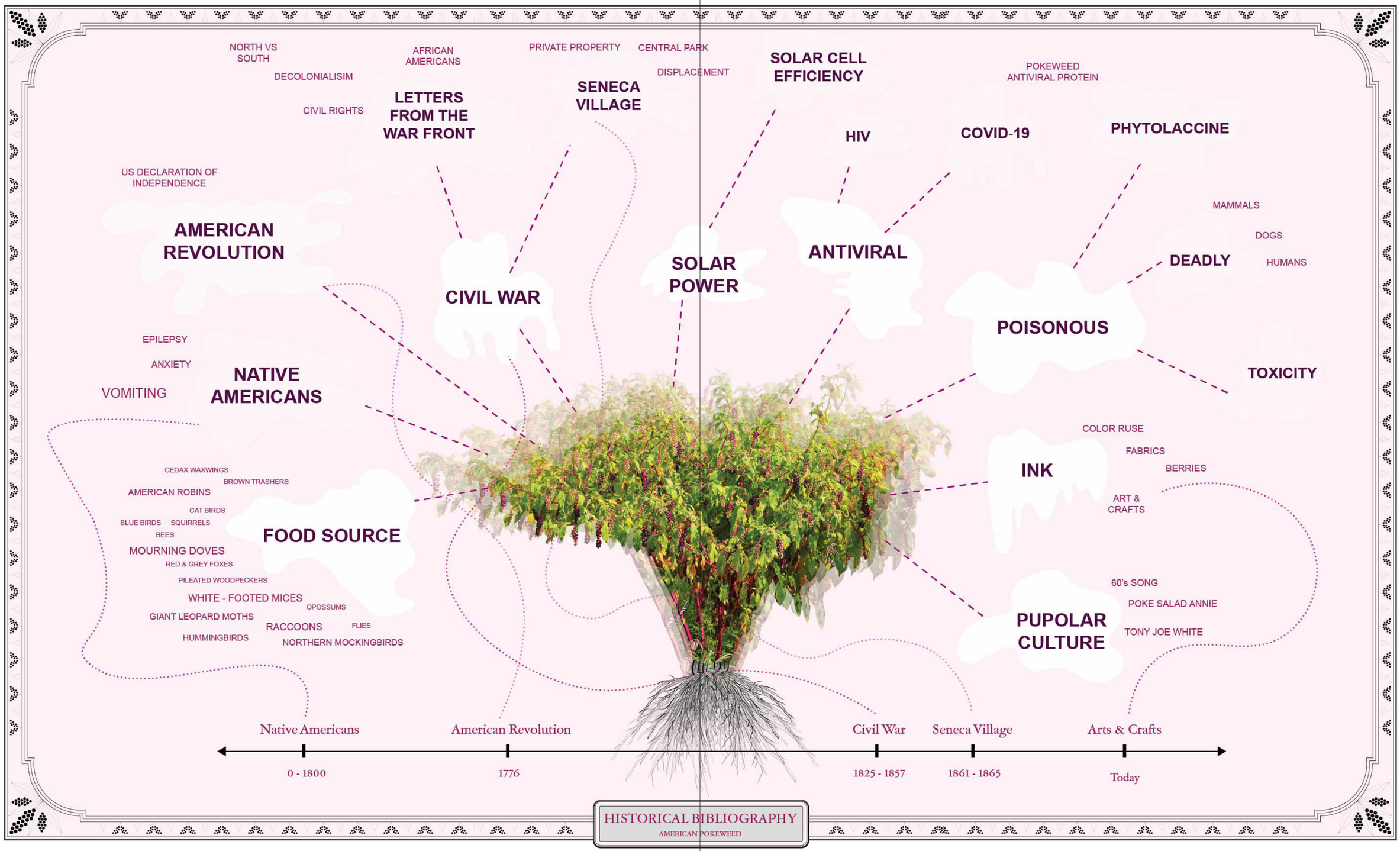




WHY DO WE CATALOGUE THIS PLANT AS UNWANTED?

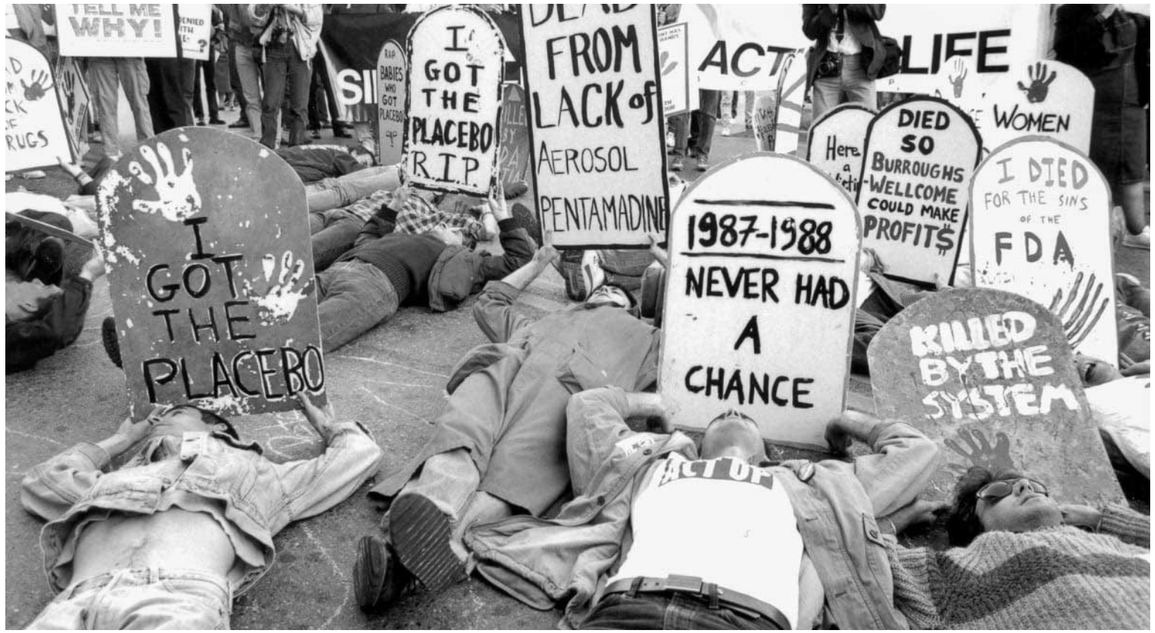
WHO SAYS IT IS UNWANTED?

UNWANTED FOR WHO?



HISTORICAL BIBLIOGRAPHY

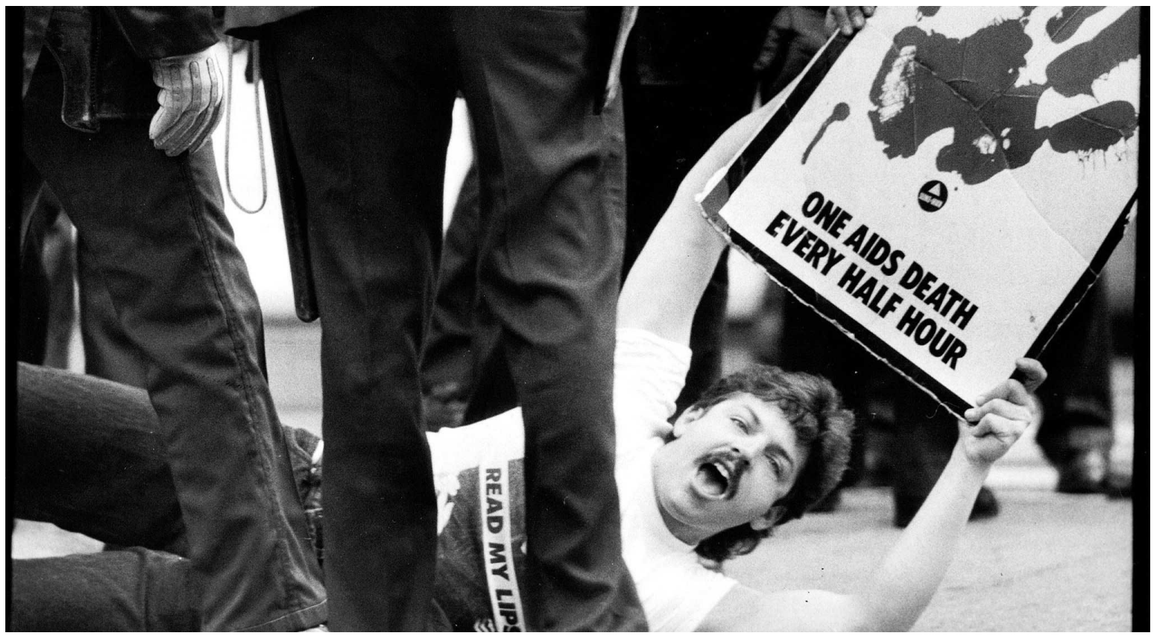
AMERICAN POKEWEED



WHAT IS NOT TOXIC TODAY? AMONG THE ENVIRONMENTS IN WHICH WE LIVE AND WITHIN OUR OWN BODIES?

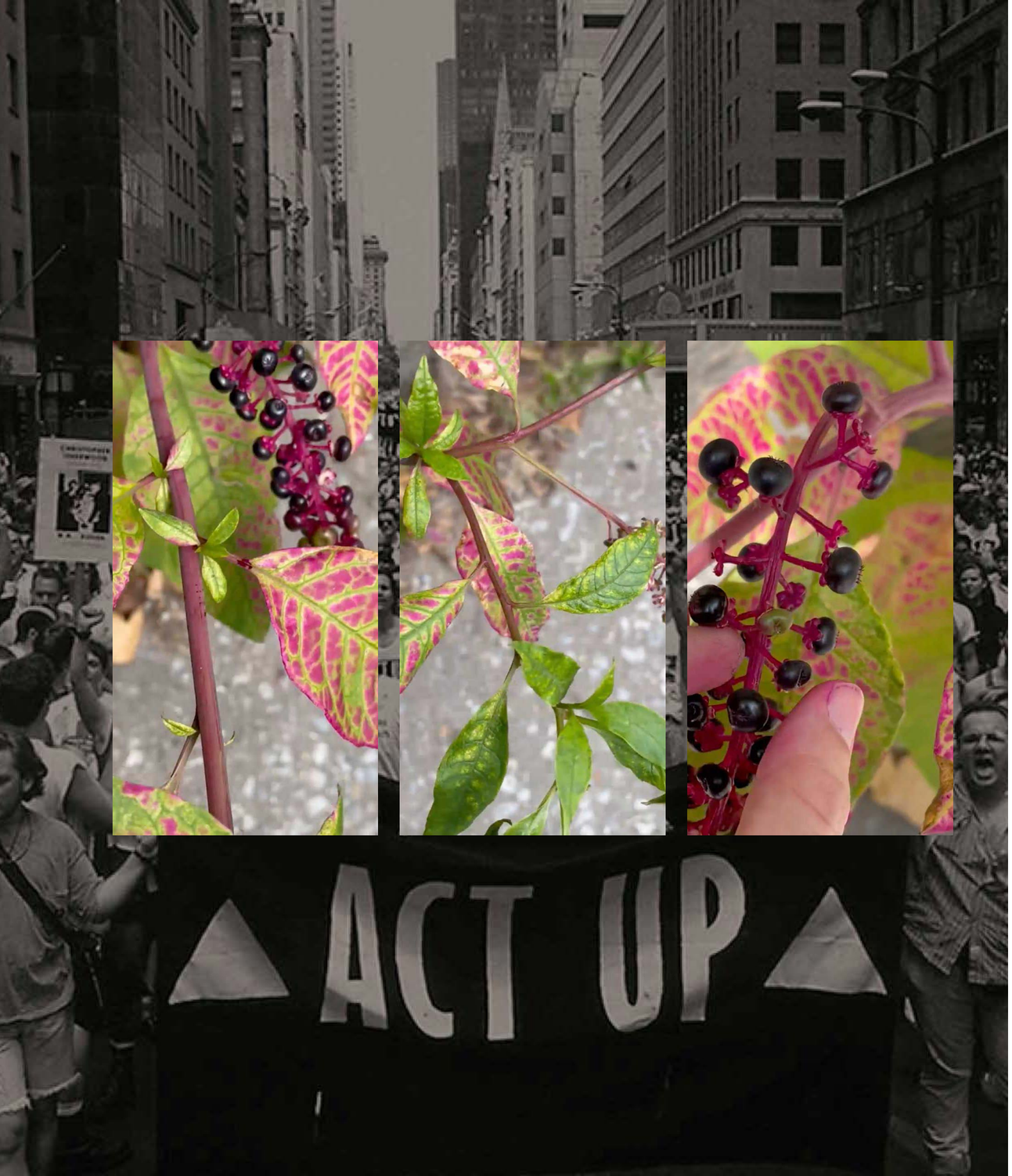
We found Poke at Central Park through Citizen Science apps. We noticed that Pokeweeds that were recently mapped in Central Park were no longer there, thus we believe that the plants were removed from the park when reported.

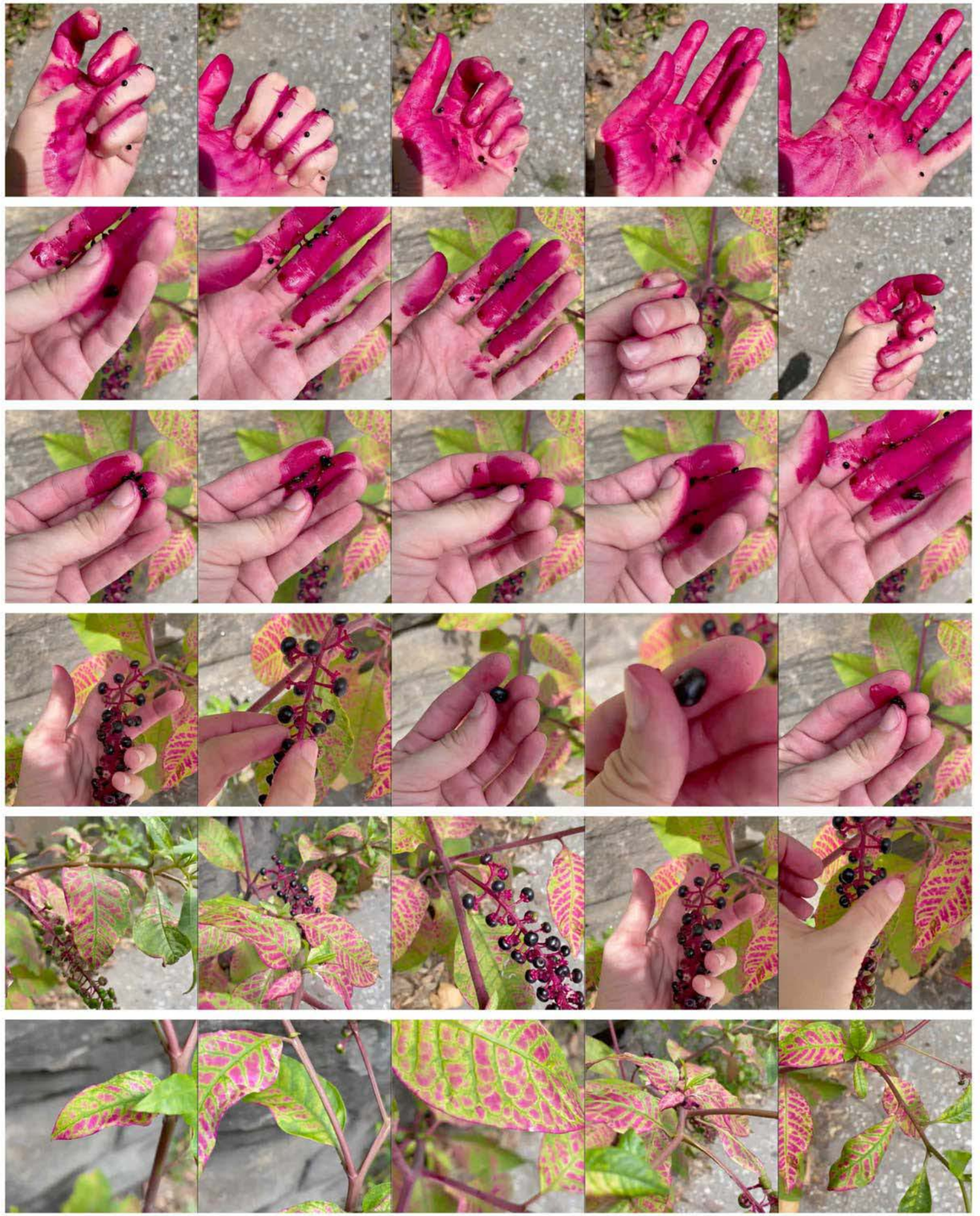
This explains the site where we found Poke, on 86th Central Park Traverse, in the dirty sidewalk of this underground road, where Poke was able to emerge from the cracks. She has managed to live in the borders, apart from humans, together with litter.



ISN'T TOXICITY ENCOMPASSED WITHIN EACH OF US? AREN'T WE ALL TOXIC?

Both Pokeweed, as a weed, and people living with HIV have been forced to live in liminal and relegated spaces. Viruses and weeds propagate by themselves and out of human control, and as a consequence they have been pulled apart and rejected. In addition, both Pokeweed and people living with HIV have been stigmatized because of the poisonous or infected fluids circulating in their bodies, turning them into poisonous or "toxic" bodies.


ACT UP

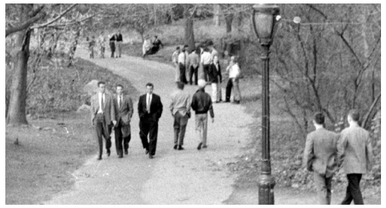


BIOHACKING
HOUSE

SOAKING
FOUNTAIN

“TOXIC”
GARDENS

The Sheep's Meadow.

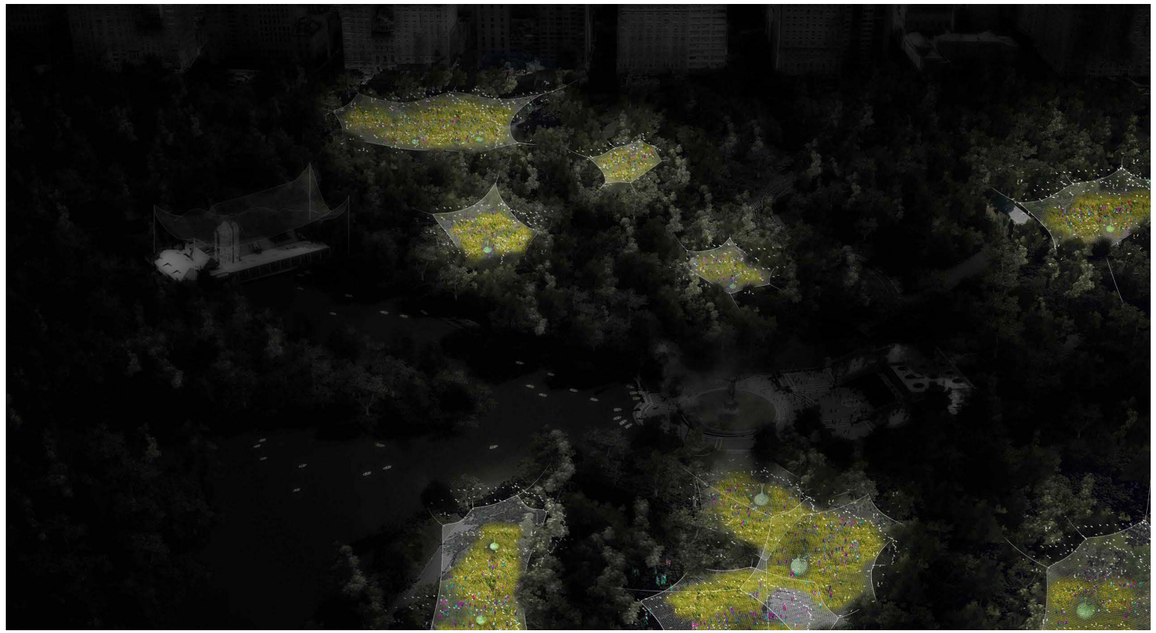


The Ramble.

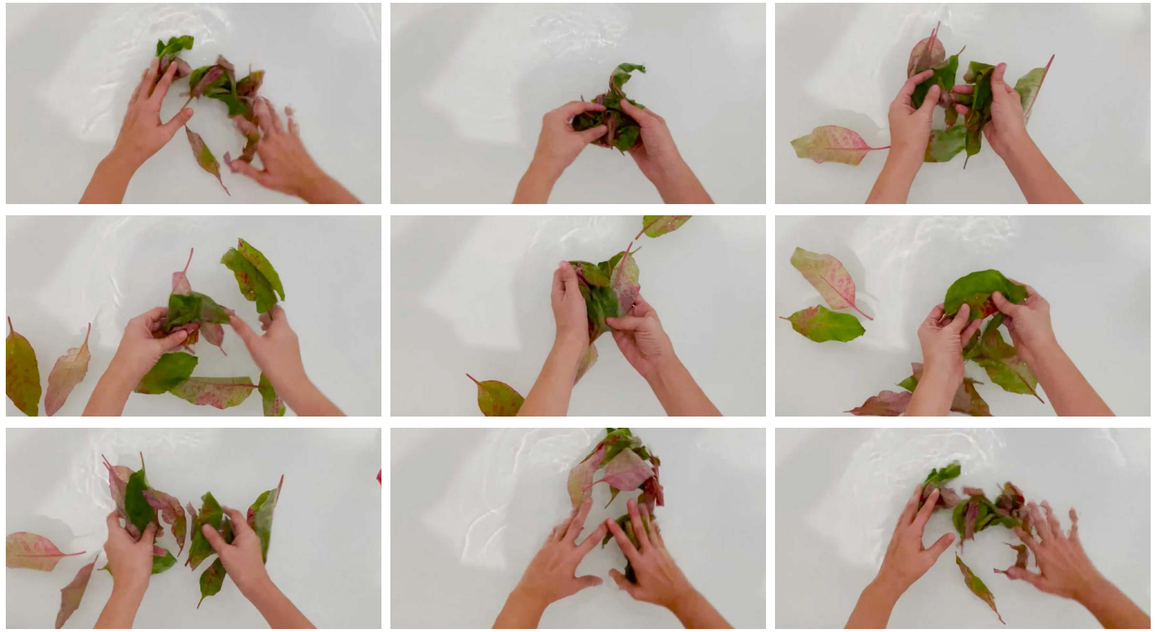
The Strawberry Fields.

The "Toxic" Gardens are dispersed throughout Central Park in open and historically used areas for gathering.

Here is where Poke will grow freely and humans will collect mature leaves during the summer and spring seasons. To acclimatize these areas, flexible and mesh-like canopies are hung from near-by trees. The canopies capture the trees falling leaves creating the necessary shade for Pokeweeds to flourish. As the canopies collect more and more leaves, these drop down into the canopy's sacs, eventually decaying and enriching the soil around the Pokeweeds' gardens.

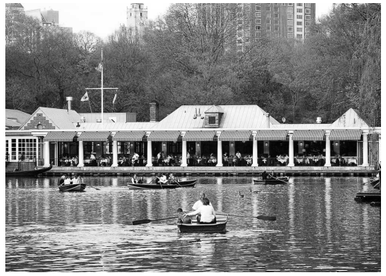


Bethesda Fountain.

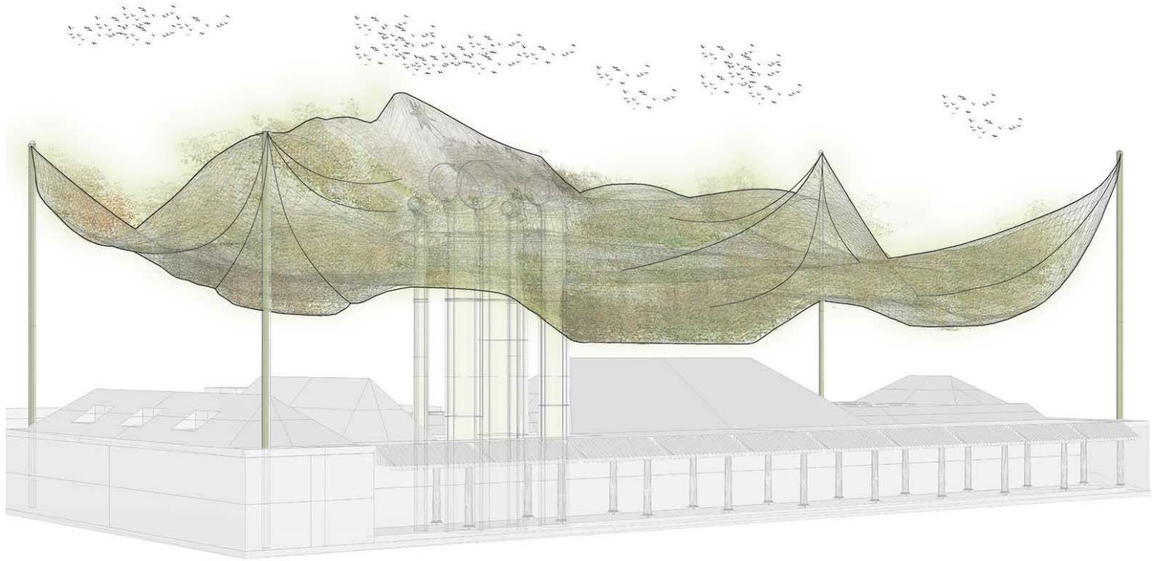


The collected leaves are taken to the “Soaking Fountain” at the existing Bethesda Fountain.

Located below the Angel of waters, the sculpture designed by Emma Stebbins in 1873. Emma was an active feminist and lesbian, and the first woman to be commissioned a public artwork by the City of New York. This sculpture represents water as a main source for healing the body, and a crucial element in the transfusion of body fluids. At the Soaking Fountain the leaves will be washed collectively during summer/fall, and then transported on boats to the Biohacking house.



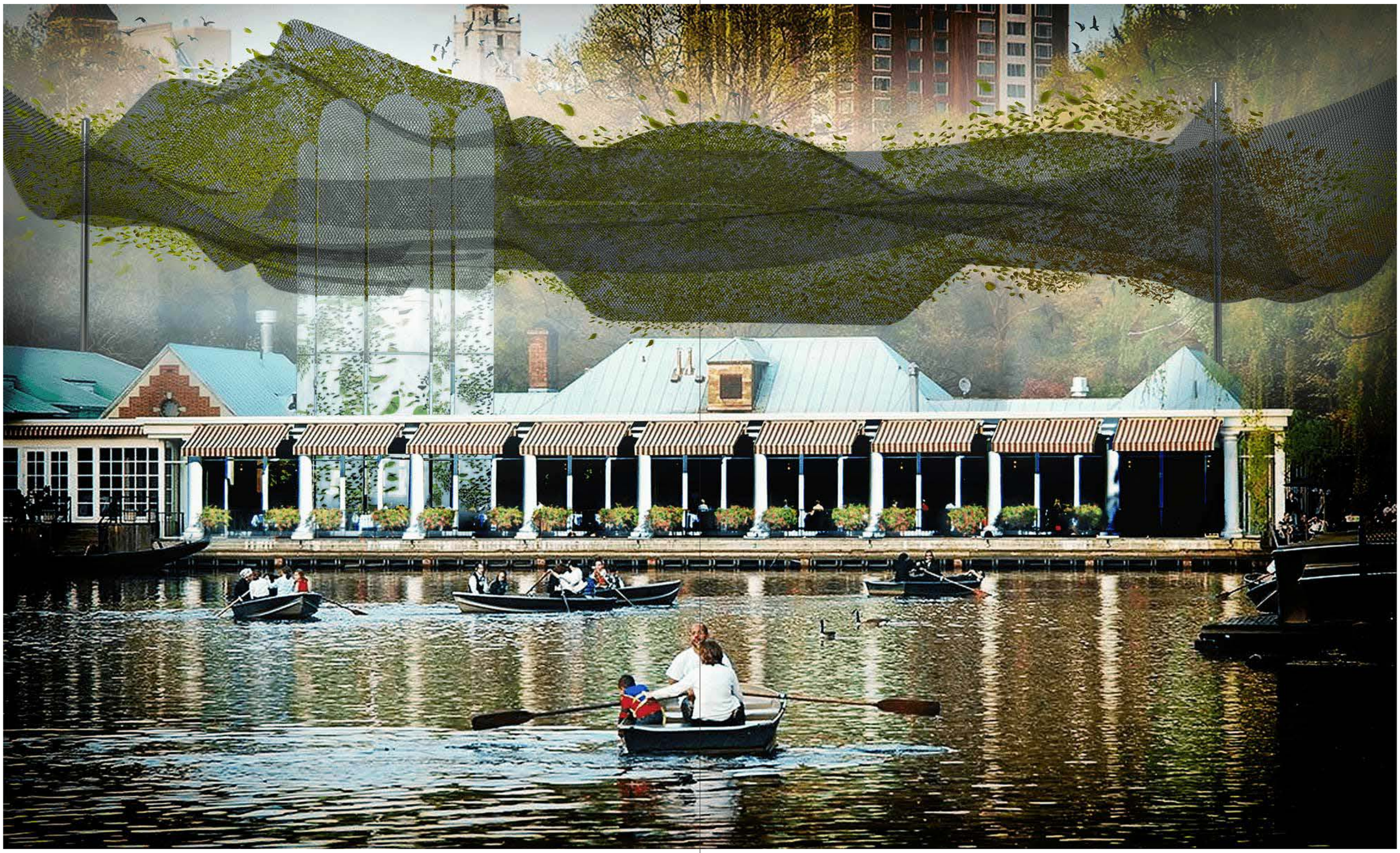
Leob Boathouse.

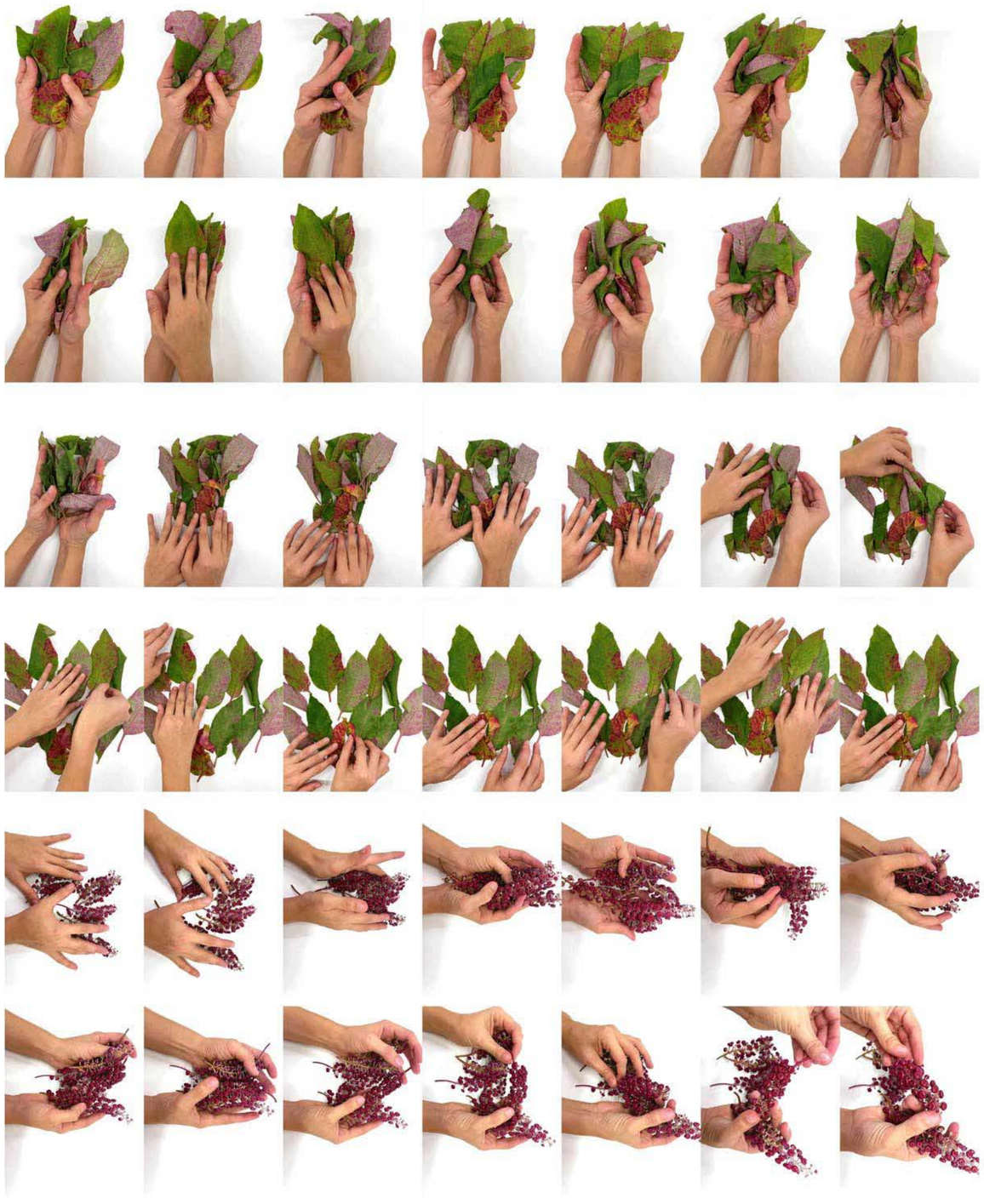


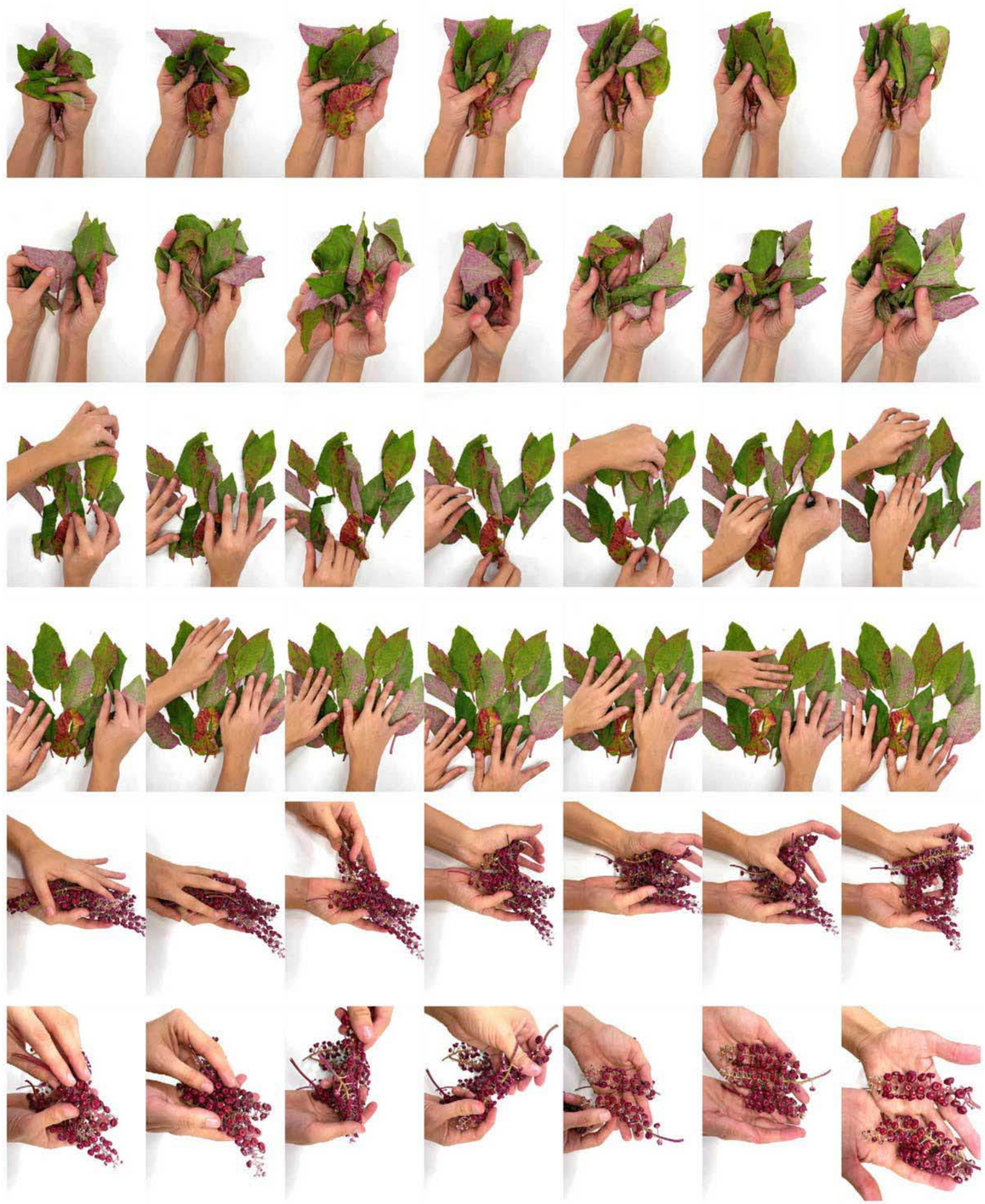
The Biohacking House will take over the unused rooftop of the existing Loeb Boathouse and its boats.

Here, the leaves are dried and processed to extract the PAP Antiviral Protein. A double mesh is installed over the terrace and big tubes pour air to dry the leaves and prepare them for the antiviral extraction.

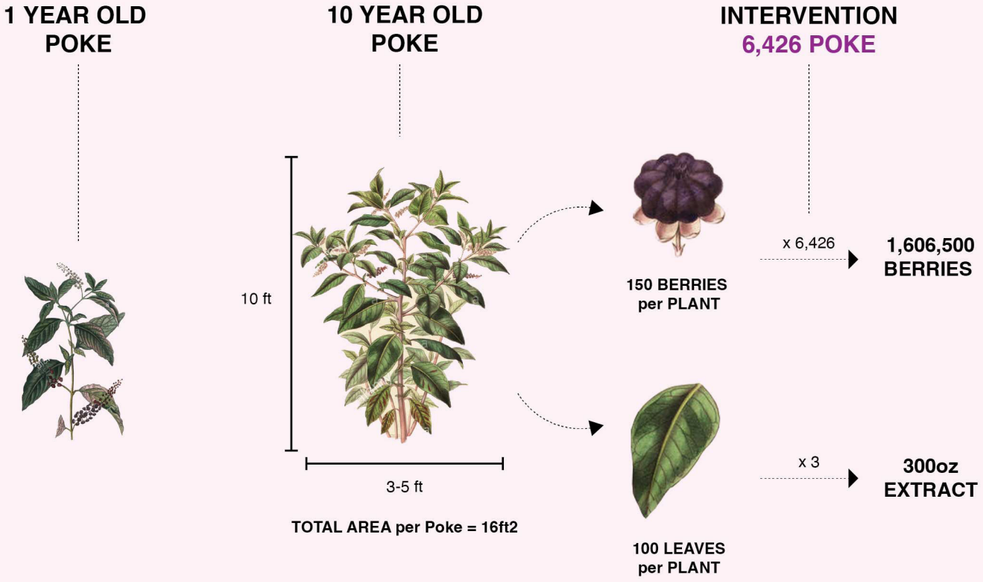
Participants of this (do it yourself) biohacking process, as well as others who might not be able to participate, will get, in addition to the PAP Antiviral Protein, the GFP, a Green Fluorescent Protein, which is a bio-marker for HIV and Covid.







If we could X-Ray our intervention, we could see the PAP antiviral protein circulating from the leaves of the plant to the human body.



RESULTS

BERRIES per cup = 75
TOTAL CUPS of INK = 21,420

Surface Area INKED per CUP = 6.35 ft2

TOTAL INKED SURFACE = 133,875 ft2

1oz EXTRACT = 114 DOSES
DAILY DOSE = 1
DOSE per YEAR = 365

oz of EXTRACT per person/year = 3.2 oz

Cases of HIV in NYC = 128,000

New cases of COVID in NYC per day = 1,300
In one year = 474,500

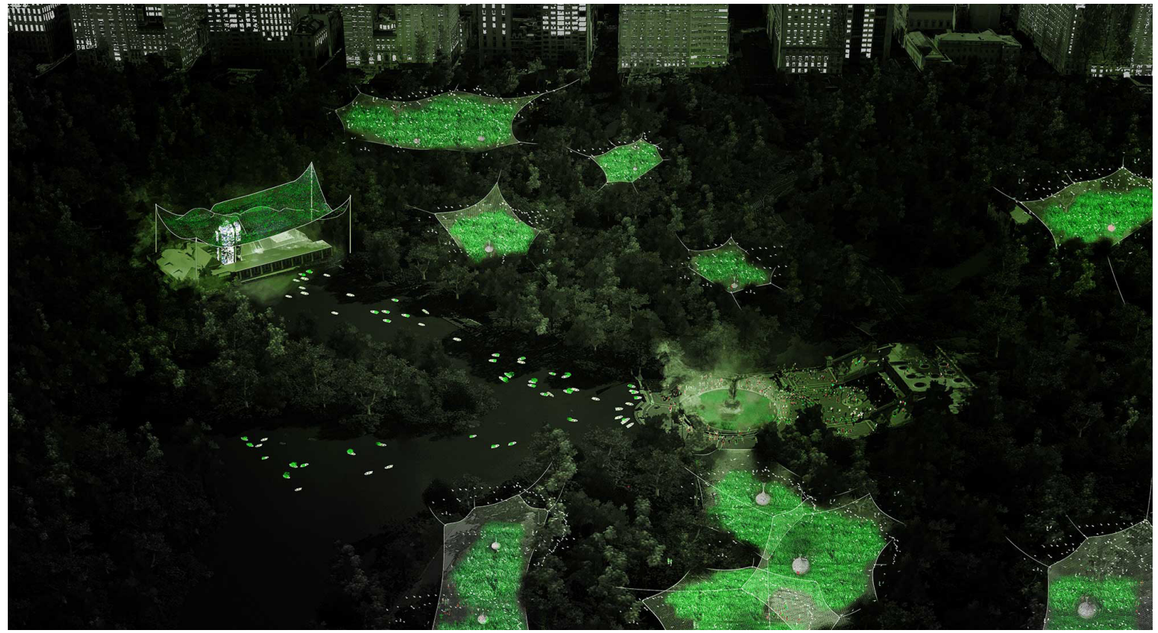
Total of people treated = 602,500

Total oz of EXTRACT needed = 1,928,000 oz
oz per POKE = 300 oz

TOTAL POKES NEEDED = 6,426 POKES

TOTAL AREA PER POKE = 16 ft 1.5 m2
TOTAL POKES = 6,426 PLANTS ..... 6,426 PLANTS
TOTAL AREA HARVESTED = 102,826 ft ..... 9,552 m2 or 0.26% of CP

POEPLE LIVING WITH HIV AND COVID TO BE TREATED PER YEAR
= 602,500 PEOPLE



The use of GFP is an action for visibility, intended to dilute the stigma placed on people living with viruses.

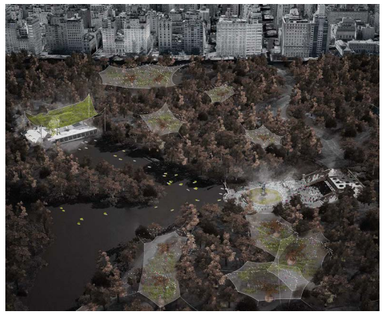
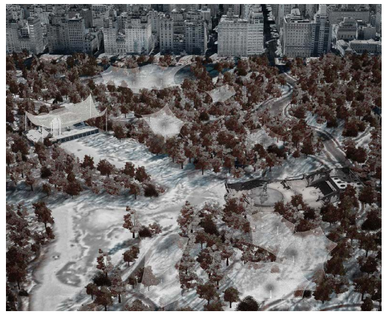
And in the process we can all blend in with fireflies at night. This protein, which has been successfully already tested as a marker for cats and other animals' immunodeficiency viruses, will glow on Covid or HIV bodies.

How many pokeweeds would this intervention require? Through this proposal, the whole New York City population with HIV could be treated with the antivirals. If the whole area of Central Park was left to the pokeweed, the whole US could.

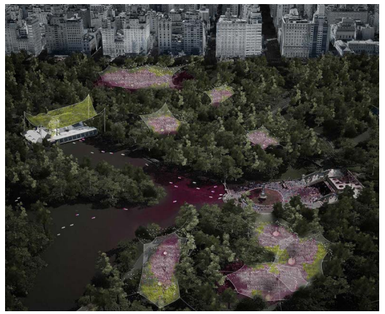
Glow Cat. Medical Research.
A "glow in the dark" kitten viewed under a special blue light.
Fluorescent green marker on felines could help study HIV.

Once a year, a toxic—interspecies celebration takes place. This event will unfold as a procession.

With the help of humans, Poke will ‘write’ its own Declaration of Interdependence. Humans will stop at each of the Toxic Gardens and squeeze the round and juicy Poke’s berries, allowing the fluid to tint the soil and mark the plant’s territory. Instead of using citizen science apps to mark Poke’s location, Poke will use her own magenta fluid, contained in her berries, to speak for herself.

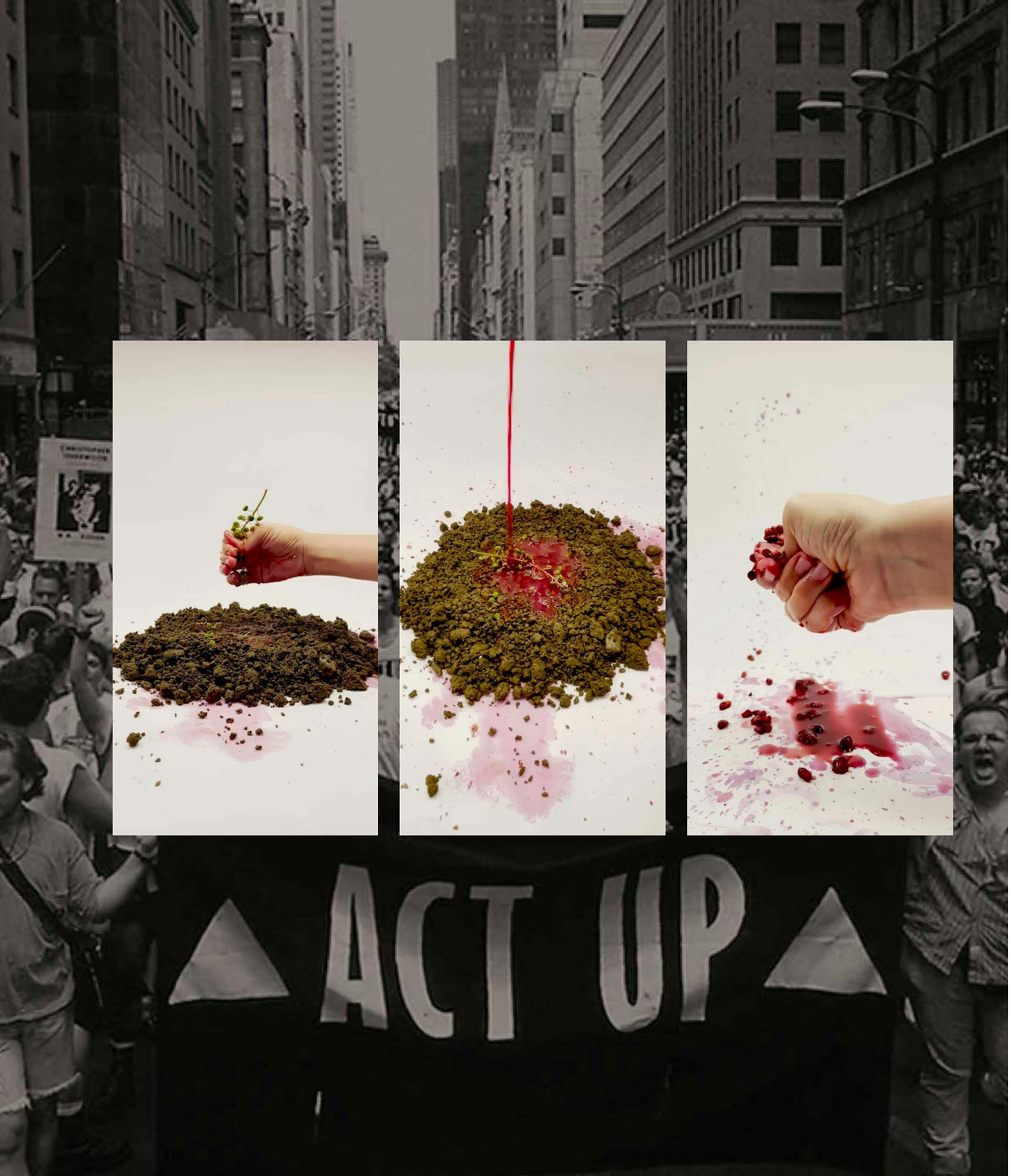



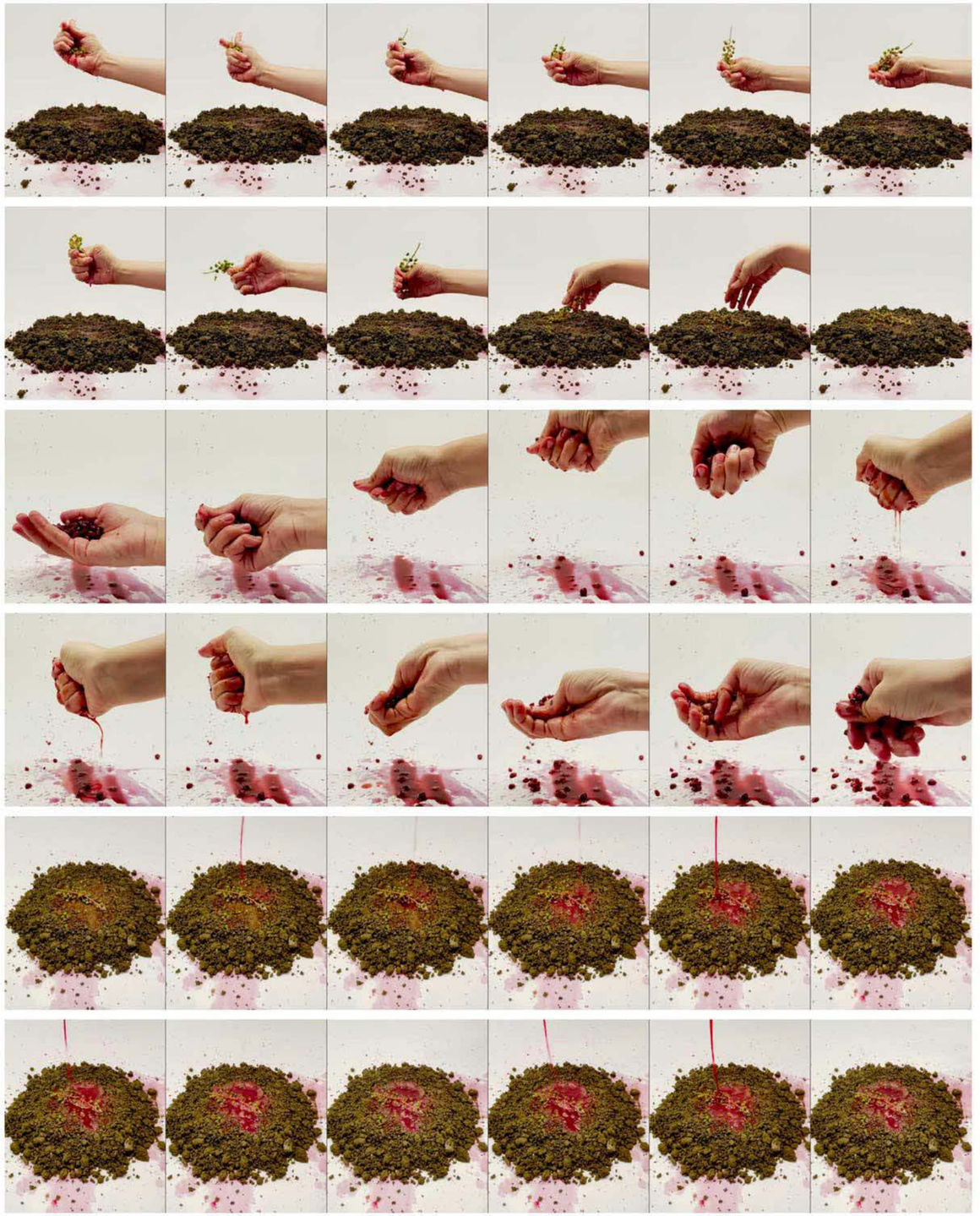




This is Poke, writing her own Declaration of Interdependence, as she can now move freely in Central Park.

The procession is conceived as a performative and bodily engaged event that will end at the Bethesda Fountain. The berries collected throughout the summer will be poured into the fountain where humans will crush the berries, as a sort of grape harvesting event, releasing the magenta liquid into the water-bodies of Central Park. In this collective celebration, “toxicity“ and the injustice of its displacement will be collectively acknowledged and celebrated in its multiple forms.


ACT UP



In this collective celebration, “toxicity” and the injustice of its displacement will be collectively acknowledged and celebrated in its multiple forms.

ENACTING OUR ENVIRONMENTAL ENTANGLEMENTS

A carbon-zero design for a new interpretative research campus

Produced:
Fall 2021

Studio:
Innovation at the Columbia Climate School's
Lamont Doherty Observatory

Professor:
Mark Rakatansky and Jorge Otero-Pailos

ENACTING OUR ENVIRONMENTAL ENTANGLEMENTS

A carbon-zero design for a new interpretative research campus

The Lamont-Doherty Earth Observatory at Columbia University was founded in 1949 to develop “fundamental knowledge about the origin, evolution, and future of the natural world” — new Columbia Climate School. The Climate School was founded in 2020 “to develop and inspire knowledge-based solutions and educate future leaders for just and prosperous societies on a healthy planet.”

In proposing for the Earth Observatory’s 157-acre campus carbon-zero designs for a new interpretative commons-building (as visitor center, exhibition space, and dining hall and lounge for the scientists), what we propose in this studio is an investigation into the ways design can visibly enact our own and its own environmental entanglements.

The fundamental lessons of ecological understanding have been to make evident these entangled interrelations between species and their environment in terms of behavioral, energetic, and informational exchanges. But while recent effort to engage issues of sustainable in architecture have been crucial to bringing greater awareness to the field, but instead of enacting those relational exchanges all too often the resultant designs have privileged a checklist of material and systems as the fundamental features of a building. In regard to energy and information, the term ergon has been used to express a quantity of energy or work necessary in a system, Whereas the term parergon has been used to express both a quantity and a quality of elaboration that seems unnecessary, merely supplemental — and the form of architecture in these designs is considered as supplemental to what is perceived as the primary work being done by energy systems. Rather than as an integrative mean to further develop formally and socially innovative design. In this studio we propose, as has recent critical theory, that what appears to be supplemental in cultural and informational systems is the fundamental framework that establishes and mediates the working of those systems.

This brings up the question of the entangled mediated labor of these architectural and energy systems, the work involved in these behavioral, energetic, and informational exchanges of this “dynamic community of 500 scientists, students, and staff, with nearly 300 PhD-level researchers, and 80-90 graduate students” who are engaged in research dedicated to environmental awareness and justice.

This studio proposes designing environments that spatialize these relational circulations of mediated environmental matter (air, water, waste), energies (structural and thermal loads), and information (among the scientists and with the visiting public). Buildings that visibly perform the interaction between their energy systems, social systems, structural systems, infrastructural systems, and tectonic systems. That engage new and old sustainable technologies, formal techniques, and building materials in designing new environments and re-designing older ones. That investigate the transformational re-cycling of the ecological, formal, material, programmatic, and typological resources of the site, renewing those resources. That reimagine the relations between new and old buildings in their interaction with the landscape, as exchange interfaces of energy and information in a social ecology.

The suffix -novation, as in innovation and renovation, already means to “make new,” to “renew,” so innovation and renovation are just ways to indicate a doubling of this revitalizing engagement. All of which will be enhanced through the collaborative exchanges between the architecture students and the historic preservation students in this joint studio (who will be engaged in assessing the site’s significance and in material research with the aid of GSAPP’s own Preservation Technology Lab).

And most significantly, the work of the studio will be developed in collaboration with the Earth Observatory’s Director, Maureen Raymo, one of the world’s leading climate scientist and oceanographer. Maureen Raymo is the first woman to receive the Wollaston Medal, the Geological Society of London’s highest award (previous recipients of the medal have been Charles Darwin and Louis Agassiz). Most recently in 2020 she was appointed by President Bollinger to be co-founder and co-Dean of the Columbia Climate School.
- Mark and Jorge

Global issues related to the climate crisis and cultures of sustainable living are spatialized in the way the architecture enacts the entanglements of climate — water, energy, food, social life, and waste in this new campus.

>> SLIDE
(Title of project)

>> SLIDE
(Massing diagram of entire square footage)
I started the design by placing the entire 81,760 sf of the requested program onto the site, to take advantage of net passive strategies for mix-humid climates, like that of NY. The mass is sunken to use Earth Berm for heat regulation. And placed Mid hill for wind protection.

>> SLIDE
(Massing diagram breakdown)
Since the volume of mass was out of scale with the surroundings, I split the program into smaller programmatic clusters

>> SLIDE
(Massing diagram shifting clusters)
Alluding to one of Lamont Observatories greatest discoveries, proving the theory of the continual drift. The clusters begin to shift, drift, break apart, and sink into the ground, like the continental drift

>> SLIDE
(Massing diagram granular breakdown)
Creating terraces, courtyards, and an overall massing appropriate for the forest landscape

>> SLIDE
(Massing diagram slanting roofs)
Lastly, the roofs are slanted to capture and direct the rainwater for reuse.

>> SLIDE
(Roof plan indicating program)
The interlocking design connected the different Laboratories, administration offices, Visitor center, and Cafeteria creating an integrated campus.

>> SLIDE
(Aerial render of overall campus)
The result is clusters of rock-like buildings emerging from the ground.

>> SLIDE
(Overall ground floor plan)

>> SLIDE
(Campus ground floor plan, highlighting laboratories and water treatment facility/lounge)
On the southern part of the campus,

>> SLIDE
(Exterior render of laboratories and water treatment facility/lounge)
Three Laboratory buildings surround and have direct access to the Solar Aquatic Systems which also houses a community lounge and study plaza for students and faculty and scientists.

>> SLIDE
(Photograph of first ocean floor map)

Lamont Earth Observatory's most historical achievements center on our oceans. They were the first to map the seafloor, which lead to proving the theory of tectonic plates. Likewise, they were the first to predict El Nino weather events and the ocean's role in triggering climate change.

>> SLIDE
(Interior render of seismology laboratory)
The water flow through the buildings creates the portal for each of the labs, which are open to a central exhibition and casual area for knowledge exchange.

>> SLIDE
(Ground floor plan of water treatment facility and lounge)
The three lab building have access to the central lounge.

>> SLIDE
(Interior render of water treatment facility and lounge)
Integrated with the tanks, are individual desks, team tables, and lounge seats, as well as sharing shelves for students and faculty from different departments to cross paths and knowledge.

>> SLIDE
(Ground floor plan of water treatment facility and lounge, highlighting mechanical systems)
The solar aquatic system is based on naturally occurring ecological processes, similar to how streams and wetlands purify their waters. The ecologically engineered system will be able to filter and treat gray and black water collected from fixtures in all buildings and be pumped back into them to be used for toilet flushing and irrigation.

>> SLIDE
(Ground floor plan of seismology laboratory)

>> SLIDE
(Campus ground floor plan, highlighting core archives, visitor center and children's daycare)
On the far northwest corner, across Monell Hall, the bore archives and visitor and children center integrate with one another.

>> SLIDE
(Exterior render of core archives, visitor center and children's daycare)

>> SLIDE
(Photographs of Lamont Earth Observatory's core archives)
Today, Lamont Earth Observatory continues to study the Earth's future by analyzing its past climate records. They house the world's largest collection of deep-sea and ocean sediment cores, more the 13,000.

>> SLIDE
(Interior render of core archives and rainwater storage)
This Archives will be on the display while also accessible for reach and use.

>> SLIDE
(Interior render of core archives and rainwater storage)
All the new buildings will aim to be entirely water self-sufficient. The potable water in each building will be supplied by the rainfall on its roofs. Through the facade panels integrated system, rainwater is channeled from the roofs to store cisterns. After the rainwater is disinfected within the building, it can be distributed back into the buildings for potable water applications

>> SLIDE
(Exterior render of core archives, visitor center and children's daycare, highlighting rainwater facade system)
To accomplish this, the facade panels consist of a double layer. The interior layer seals and insulates the building, with the exterior layer having tube openings that channel the rainwater to the cisterns below. There are 3 different ways of channeling the water using the same panel module. While each building is unique to its program, they all have the same components required for the project's reclaimed water and rainwater goals.

>> SLIDE
(Ground floor plan of core archives, visitor center and children's daycare)

>> SLIDE
(Campus ground floor plan, highlighting cafeteria and experimental hydroponic center)
On the northwest corner, and gateway building, the cafeteria, and an experimental hydroponic garden.

>> SLIDE
(Exterior render of cafeteria and experimental hydroponic center)

>> SLIDE
(Photograph of food security)
The experimental cafeteria will help Lamont halls continuous mission to battle food

>> SLIDE
(Photograph of water availability)
and water scarcity.

>> SLIDE
(Interior render of experimental kitchen)
Kitchen and display

>> SLIDE
(Interior render of hydroponic greenhouse and eating area)

>> SLIDE
(Interior render of hydroponic growth beds)

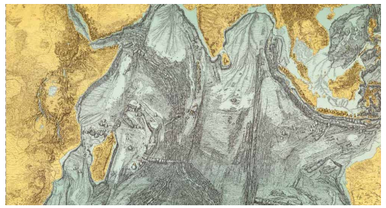
>> SLIDE
(Ground floor plan of cafeteria and experimental hydroponic center)

>> SLIDE
(Aerial render of overall campus)

Lamont Earth Observatory's greatest discovey was proving to the world the theory of the continual drift.

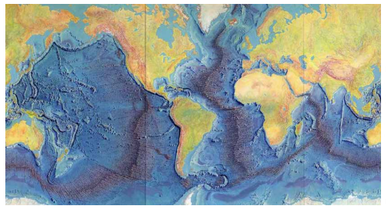
With such inspitation, the design shifts, drifts, breaks apart, and sinks into the ground, like the continental drift. This cluster of buildings create terraces, courtyards, and an overall massing appropriate for the forest landscape.

The result is a series of rock-like buildings that emerge from the ground. Three Laboratory buildings surround and have direct access to the central plaza which houses a community lounge and study areas for students, and faculty.

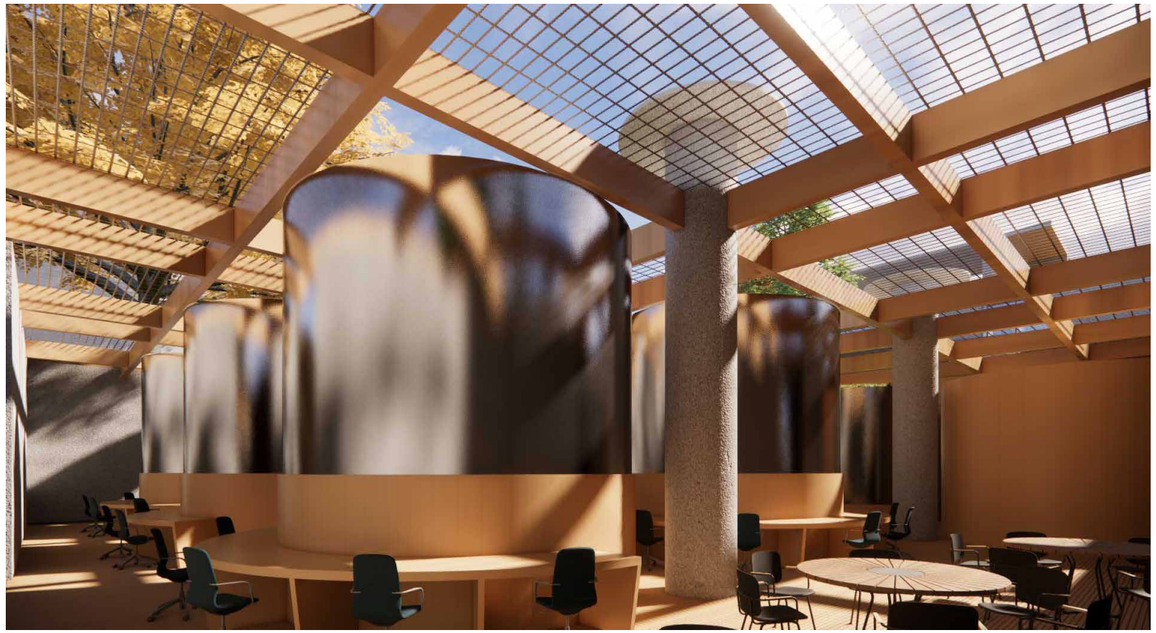


Drawing of the Indian Ocean's floor by Marie Tharp.

Drawing of the Atlantic Ocean's floor by Marie Tharp.



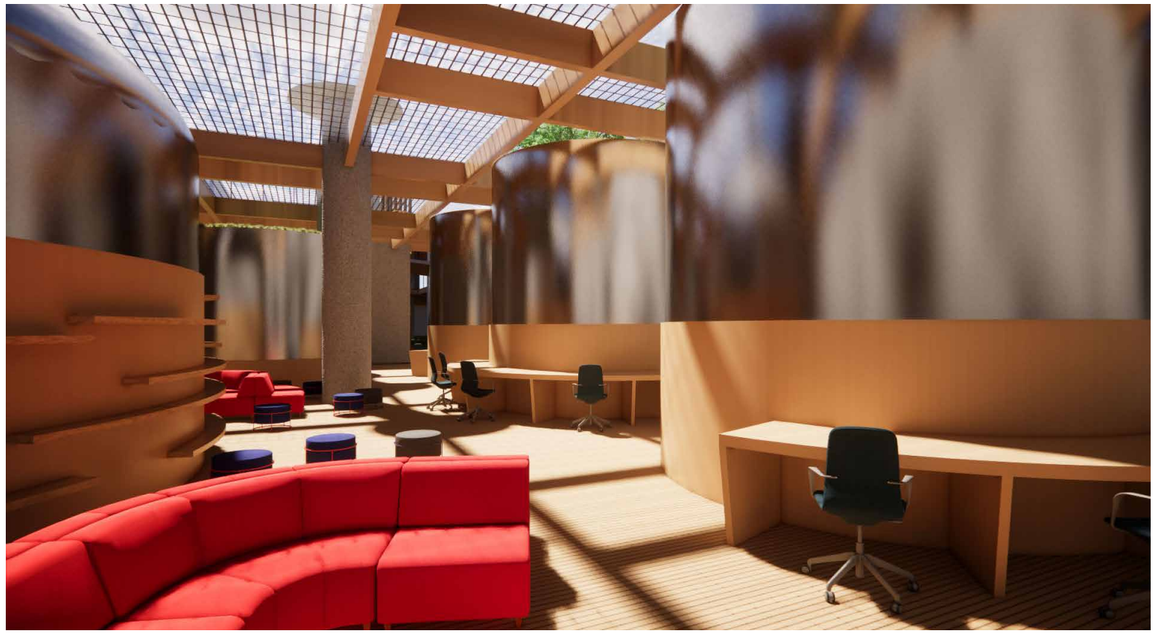
Painting of the Mid-Ocean Ridge based on the profiles of Marie Tharp. 1977.



Likewise, they were the first to predict El Nino weather events and the ocean's role in triggering climate change.

The water flow through each of the buildings directos the entry portal for each of the labs. Each lab building opens up to a central exhibition same and casual area for knowledge exchange.

The solar aquatic system, located in the cental plaza is based on naturally occurring ecological processes. The system filters and treats gray water collected from fixtures in all buildings and pumps it back for toilet flushing and irrigation.



All buildings aim to be entirely water self-sufficient, by collecting rainfall from roofs and redistributing it.

Through the facade panels integrated system, rainwater is channeled from the roofs to store cisterns. After the rainwater is disinfected within the building, it can be distributed back into the buildings for potable water applications.

The facade panels consist of a double layer. The interior layer seals and insulates the building, and the exterior layer has tube-like openings to channel the rainwater to the cisterns below.

Core Archives at Lamont Earth Observatory

Core Archives at Lamont Earth Observatory

Core Archives at Lamont Earth Observatory

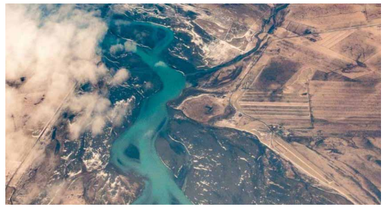
Today, Lamont Earth Observatory continues to study the Earth's future by analyzing its past climate records.

They house the world's largest collection of deep-sea and ocean sediment cores, more the 13,000. These archives will be on display and easily accessible for reach and use. The design aims to juxtapose the historical layers of the earth with the site's own ground layers. As well as create a space where not only scientists can access this impresive records, but visitors and children can learn from them aswell.

The gateway building houses the experimental cafeteria, administrative offices, auditorium and exhibit hall.

Lamonth Earth Observatory's environmental histories and investigations can be engaged as interpretative informational networks throughout the new campus buildings. Through the design, new hybrid programs can be imagined.

Like a cafetorium, where the public can engage in participatory demonstration work of kitchen experiments in new forms of auditorium space.



Water availability.

Food scarcity.

Hydroponic growing beds merge into eating bars. A nursery wall spills down to signal the building's entrance.

This experimental cafetorium will help Lamont Earth Observatory's continuous mission to battle food and water scarcity. Scientists and visitors engage with the growth processes on a daily and casual - integrated way.

Global issues related to our climate crisis and cultures of sustainablility are spatialized locally in the way the architecture enacts the entanglements of climate, energy, food, social life, waste, and water in this new dining hall.

SUBTERRANEAN DISTRICT ONE

Living under the environmental threat of extreme heat

Produced:
Spring 2022

Studio:
RISK: Climate, Architecture and Uncertainty

Professor:
David Benjamin

SUBTERRANEAN DISTRICT ONE

Living under the environmental threat of extreme heat

In the life and death stakes of climate change, the risks of extreme heat and flash flooding are known to exist. They are also intertwined with other risks, and they tend to have disproportionate effects on people who are most vulnerable. The details and the timing may be uncertain, but the direction is clear. According to the Washington Post, "Recent science suggests that today's children will live through three times as many climate disasters as their grandparents."

How can we know about these risks and do nothing? How can we address these risks through narratives and through climate models? How can we translate these risks into action? And what can architecture do? What protection do buildings provide in these scenarios? What role do buildings play in creating these crises? This is the territory of Risk—a design studio about climate change, architecture, and design with uncertainty.

Over the course of the semester, we work with scientists at the Columbia Climate School and learn about modeling and predicting climate disasters. We will also develop tools for telling stories about climate futures. We will explore the architecture of mitigating and adapting to climate change. And we will prototype the buildings and cities of the future.

Over the past few years, the annual reports by the United Nations Intergovernmental Panel on Climate Change (IPCC) have been both familiar and unfamiliar. The reports build on facts we already know about the climate crisis: carbon emissions cause warming, which causes sea level rise and extreme weather and loss of biodiversity, which in turn causes disease and hunger and migration and death. But the reports also reach new conclusions: the world has only a handful of years to halt carbon emissions and avoid the most catastrophic global effects. The warming target of 1.5 degrees Celsius (rather than 2.0 degrees or higher) is required, not optional. The difference of half a degree dramatically improves our odds of preserving any coral reefs, avoiding the collapse of insect life, escaping the trigger of irreversible planetary transformation, and minimizing drought, floods, extreme heat, food shortage, migration, and poverty for hundreds of millions of people. Architecture makes up about 40% of global carbon emissions. So addressing warming requires reducing the carbon in our buildings. At the same time, global population will grow from 7 billion to 10 billion by 2050. This will require the construction of 13,000 buildings every day for the next 30 years. A New York City worth of buildings every month. If architecture is a significant component of the climate crisis now, it will only be more so in the near future.

The risks of climate change include extreme heat and flooding, as well as the risks of compound events. It is clear that flooding and extreme heat will keep occurring. But it is uncertain exactly when. For compound events, it is uncertain exactly what and how. For example, when flooding and a pandemic occur at the same time, the risks become very complex. So how do we model risk? And how do we translate risk models into actionable design strategies?

In order to change the status quo and trigger the massive transformations necessary to address climate change, we need the best science and also the best narratives. We need the stories, images, and designs that will capture the public's imagination. The studio will engage the translation of climate science and models into narratives about climate futures. The use of climate risk models in architecture requires design with uncertainty. Despite recent advances and discoveries, in the near future anyone designing with climate risk may have to do so with only partial understanding and partial mastery of the forces and systems involved.

This architecture studio will explore the role of designers and architects in world building. It will engage the translation of climate science and models into narratives about climate futures. Narratives as speculations about a future that has yet to unfold. Hypothesizing about interconnections, causes, and effects across environments, economies, materials, technologies, and society. It will aim architectural intelligence and representation at a global audience. As journalist Sonia Rao observes, "Fighting back involves accessing the public's emotions." - David

While numerous solar plants have been recently built, Subterranean District One differs from the traditionally single focused ones. By inter-connecting solar technology, agriculture production, and research practices, it embraces a multi-dimensional approach to our climate crisis.

>> SLIDE
(Title of project)

>> SLIDE
(Map of heat temperature in Death Valley)
Average temperatures above 125°F like those in Death Valley may seem unusual, however, according to recent climate data, northern cities will soon experience similar temperatures to southern cities, and many southern cities will reach extremely hot temperatures like those in Death Valley by 2050. Additionally, recent projections from the United Nation predict that while the world population will increase by 50 percent in the next 30 years, current crop yields will decrease by 50 percent due to climate change.

>> SLIDE
(Map of existing solar plants in northern California and western Nevada)
In light of our climate emergency, the US government has cited industry studies that calculate that by vastly increasing the number of solar plants, half a million jobs a year could be created over the next decade. While numerous solar plants have been recently built, Subterranean District One differs from the traditionally uni-dimensional green dots. By interconnecting solar technology, agriculture production, and research practices, it embraces a multi-dimensional approach to our climate crisis.

>> SLIDE
(Plan view of Subterranean District One)
As a prototype of living in extreme habitats, our project aims to transform current solar farm communities or the lack thereof, by creating a city that harmoniously merges people's daily lives, with good jobs, energy, food, and water production.

>> SLIDE
(Perspective render of Subterranean District One)
Through the synergism between the different flows, not only will the implications and adaptations required to survive in extremely hot conditions be evident, but a hopeful view of how we might live in the future come to life. While utopian, the project rejects the mainstream understanding of the dream city and prompts conversations about today's realities of displacement, extraction, and alienation.

>> SLIDE
(Roof plan of Subterranean District One)
The project centers around an agri-voltaic farm and a climate data center, while integrating common city programs, such as apartments, restaurants, plazas, shops, and retail.

>> SLIDE
(360 Diagram of energy, food, and water production)
As an agri-voltaic farm, the project combines agriculture and solar energy harvesting in mutually beneficial ways. The reduction in direct sunlight exposure beneath the PV panels led to cooler air temperatures during the day and warmer temperatures at night, which allow the crops under the solar arrays to retain more moisture, increasing crop yields and reducing water loss. Additionally, swapping traditional ground gravel for vegetation counters the heat island effect, cooling the heat-sensitive PV panels. This has been proven to increase energy production by 10%.

>> SLIDE
(Interior collage of apartment)
It's 2050, I came to this land of extremes with my mother when I was 5, I'm turning 30 this year. This is the hottest, driest, and lowest place on earth. Fall is ending yet the temperature averages well over 100F. I was pretty much born into this world, so I get by, but history of human suffering in this vast desert appears to have given the valley its aptly name: Death Valley. Before Subterranean District One, people called this rugged and desolate land home for as long as 9,000 years. For centuries, legends of an underground city in Death Valley had been told by indigenous tribes. Today, here I am and it's vividly real.

>> SLIDE
(Sunrise collage showing path to solar farm)
It's 4am, I check the weather forecast, put on my white cotton, long sleeve, hooded shirt, and matching light-weight trousers, grab my sunglasses and head up to the epicenter of the solar farm.

>> SLIDE
(Render of agri-voltaic farm)
The whole city is up, like me half of the city works at the agri-voltaic farm. Like dessert rabbits, we are all crepuscular creatures, active primarily at dawn and dusk. There's a very smart reason for picking these dimly lit in-between hours to be active: we are all avoiding our predators, as humans our predator is the burning sun.

The lack of rain and high temperatures made food and energy production so vulnerable that we had to change our living ways. By co-locating agriculture and solar energy infrastructure, we have created a holistic and integrated approach to food-energy-water harvesting.

>> SLIDE
(Quantitative diagram of energy and food production)
Subterranean District One functions as the experimental laboratory for four large agri-voltaic farms at Zabriskie Point. Each year, our district generates clean energy to power more than 14,000 households, and cultivate crops on four hectares of multi-use land, enough to feed 1,000 people each year.

>> SLIDE
(360 Diagram of integrated systems)
We amply produce energy and food to be a self-sufficient community and be able to export our excess to others who live in less sustainable habitats. We export 90% of our crops to nearby traditional solar plants and send 99% of our energy to the US energy grid for large cities such as Las Vegas to use.

>> SLIDE
(Diagram of energy and food reach)
With rising temperature and variable climate-conditions, we are urgently helping nearby solar plants transition from single-focused production to our multidimensional production method.

>> SLIDE
(Top render of solar farm)
At the center of the complex, more than 10,800 Mirrors and 4,000 PV Panels are mounted above vast polyculture fields of crops. The mirrors focus sunlight onto a boiler positioned at the top of the center tower extending 500 feet into the dry desert air. The reflected sunlight from the mirrors heat water in the boiler making the steam necessary to turn the turbines and generate our electricity.

>> SLIDE
(Collage showing stairs to central lab)
It's 12pm, the whole city has taken refuge inside the desert landscape. I'll go to the main control room. At this time of day, being outside is suicidal. It's too hot to think, too difficult to inhale the hot air, and dangerous to talk.

>> SLIDE
(Exterior render of apartment clusters)
To protect ourselves from the afternoon sun, our buildings are constructed using local stone and soil. Like caves, they are half-buried into the land to maximize thermal insulation and reduce construction materials.

>> SLIDE
(Render of open plaza)
Light-colored, double roofs, with vents and evaporative towers direct wind. Courtyards, balconies, and closely spaced structures function as shading devices.

>> SLIDE
(Render of visitor center)
We've learned from the nearby ghost towns left behind after exploiters scour the valley for metals during the early 1900s to stop devouring earth from its limited resources.

>> SLIDE
(Interior render of climate center)
It's 2pm, I checked the weather forecast again, mostly out of habit, run our food and energy numbers.

Subterranean District One has been the region's primary experimental research lab for food and energy harvesting for several decades now. In the past two years, three new agro-voltaic farms have already been built using our know-how.

To protect our buildings from desert floods, our city's foundations are built with zero carbon concrete. Our solar plants are able to convert concentrated sunlight into heat that exceeds 2700F, the temperature needed to fuse limestone, clay, and other materials together for the clinker in concrete.

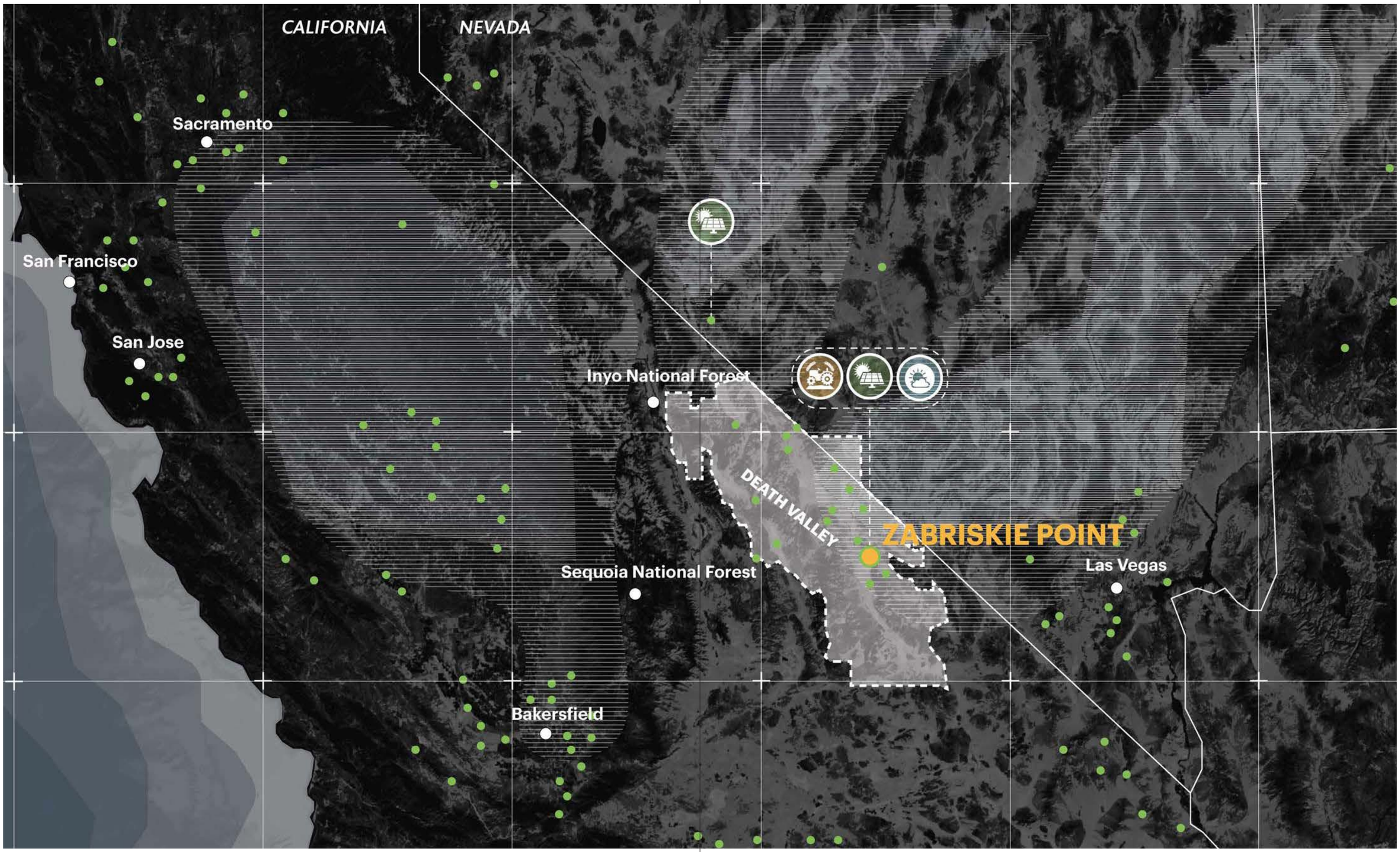
>> SLIDE
(Exterior render showing materials)
Before the development of this technology, the fossil fuels used for producing the clinker in concrete were responsible for 40% of the direct carbon dioxide emitted by concrete. However, by replacing fossil fuels entirely with solar energy, the concrete industry has been forever changed.

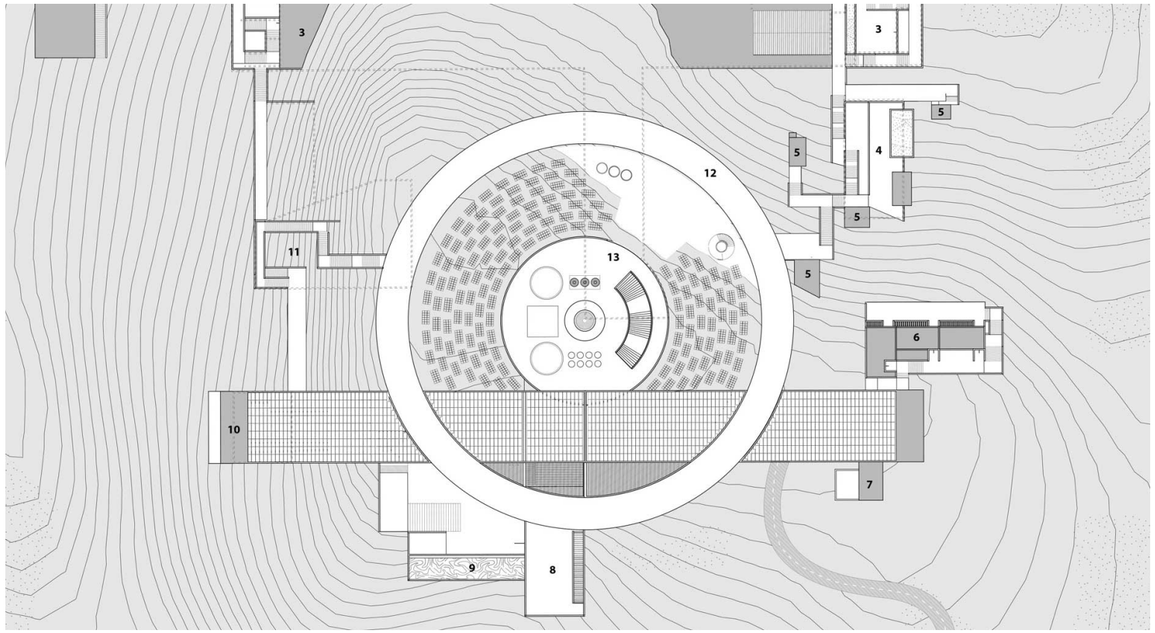
>> SLIDE
(Sunset render of mobile retail event)
It's 6pm, The sun is setting, I can go outside now. It's Thursday, so I head straight up to join everyone in the main plaza. Once a week mobile retail shops from nearby cities come to Subterranean District One with supplies and services. Bakeries, cafes, boutiques, and delicacy shops together with dentistry and cardiologist examination rooms all station along our main circulation tracks. Some come to the open market to buy while others come to sell our produce.

>> SLIDE
(Interior render of climate center)
It's 9pm, I head back to the climate center and check our daily report. It notes, a series of northern cities are catching up with us. Based on today's numbers, 89 cities in the world are preparing to live under a burning sun, as they face food and energy shortages. The report also predicts that in the next 10 years 1,000 communities will go underground just like us.

>> SLIDE
(Physical model photograph)
As a prototype city, the Subterranean District One is not a monumental object but a project with progressive effort

>> SLIDE
(Physical model photograph)
or a "green revolution" in clean energy and farming practices under the environmental pressure of extreme heat.


CALIFORNIA
NEVADA
Sacramento
San Francisco
San Jose
Inyo National Forest
DEATH VALLEY
ZABRISKIE POINT
Las Vegas
Sequoia National Forest
Bakersfield



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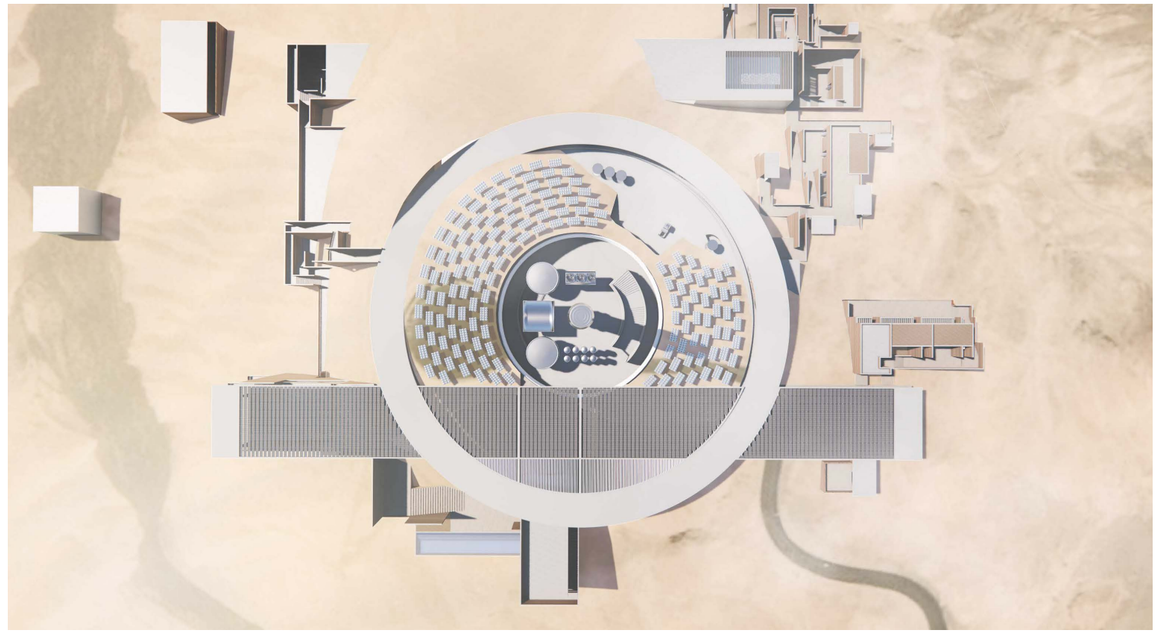
However according to recent climate data, northern cities will soon experience similar temperatures to southern cities, and many southern cities will reach extremely hot temperatures like those in Death Valley by 2050.

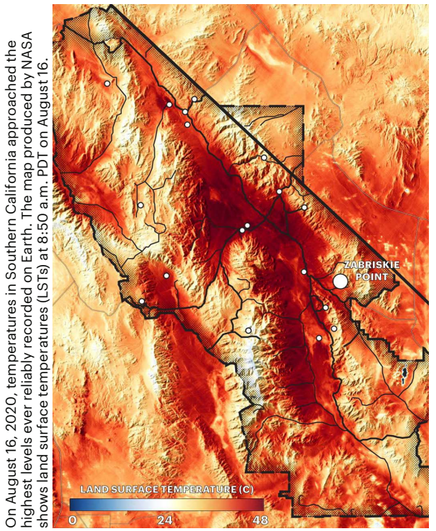
In light of our climate emergency, the US government has cited industry studies which calculate that by vastly increasing the number of solar plants, half a million jobs a year could be created over the next decade.



As a prototype of living in extreme heat, the project transforms current solar farm communities or the lack thereof.

Creating a city that harmoniously merges people's daily lives, with good jobs, energy, food and water. Through the synergism between the different flows, not only will the implications and adaptations required to survive in extreme

be evident, but a hopeful view of how we might live in the future come to life. While utopian, the project rejects the mainstream understanding of the dream city and prompts conversations about today's realities of displacement, extraction, and alienation.



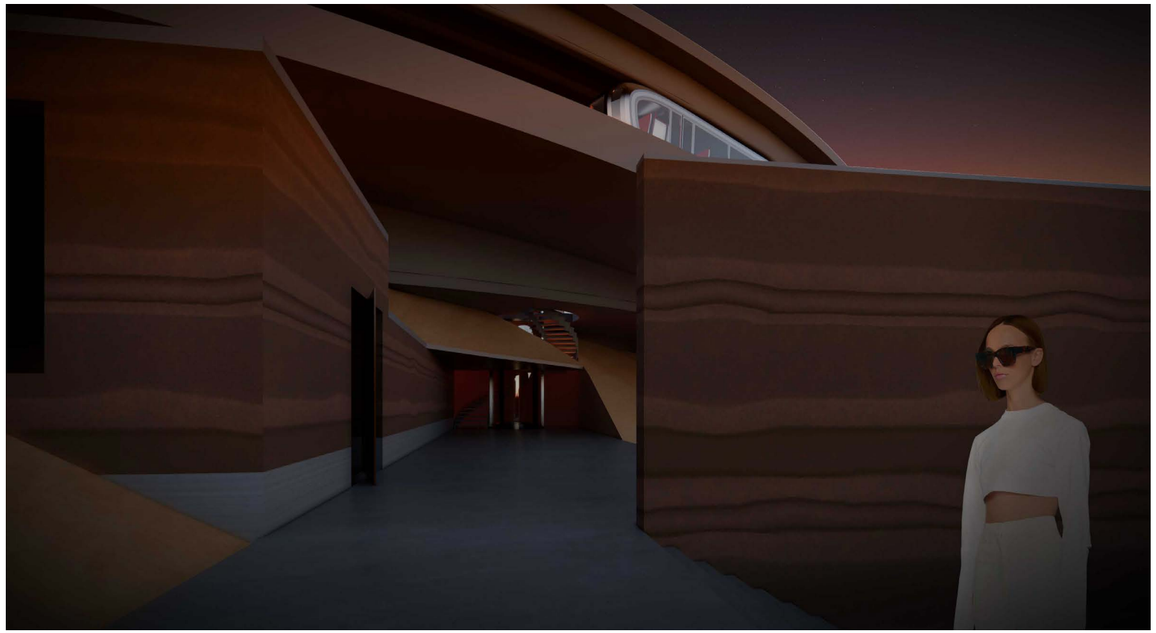
On August 16, 2020, temperatures in Southern California approached the highest levels ever reliably recorded on Earth. The map produced by NASA shows land surface temperatures (LSTs) at 8:50 a.m. PDT on August 16.

It’s 2050, I came to this land of extremes with my mother when I was 5, I’m turning 30 this year.

This is the hottest place on earth. Fall is ending yet the temperature averages well over 100F. I was pretty much born into this world, so I get by, but history of human suffering in this vast desert appears to have given the valley its aptly name: Death Valley. Before us, people called this rugged and desolate land home for as long as 9,000 years. For centuries, legends of an underground city in Death Valley had been told by indigenous tribes. Today, here I am and it’s vividly real.

It’s 4am, I check the weather forecast, put on my white cotton attire and head up to the epicenter of the solar farm.

The whole city is up, like me half of the city works at the agri-voltaic farm. Like dessert rabbits, we are all crepuscular creatures, active primarily at dawn and dusk. There’s a very smart reason for picking these dimly lit in-between hours to be active: we are all avoiding our predators, as humans our predator is the burning sun. The lack of rain and high temperatures made food and energy production so vulnerable that we had to change our living ways.



By co-locating agriculture and solar energy infrastructure, we have created a holistic and integrated approach to food-energy-water harvesting.

ENERGY PRODUCTION

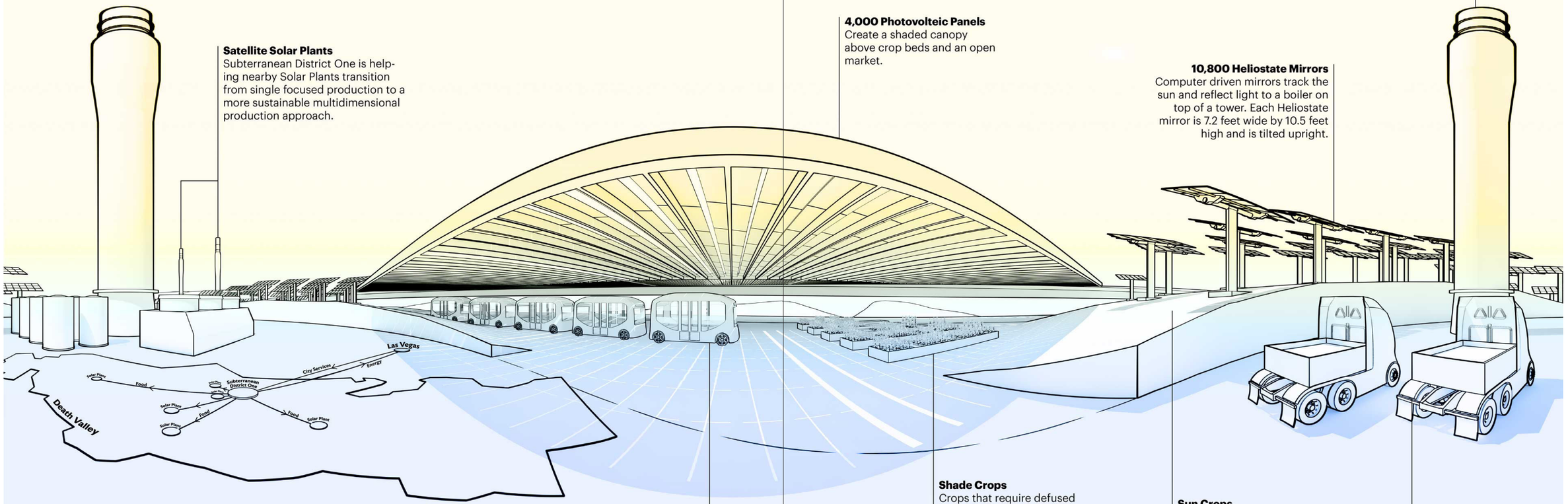
14,000 Household
1% Used by Subterranean District One
99% Exported to surrounding big cities

Satellite Solar Plants
Subterranean District One is helping nearby Solar Plants transition from single focused production to a more sustainable multidimensional production approach.

4,000 Photovolteic Panels
Create a shaded canopy above crop beds and an open market.

Boiler Tower
Concentrated sunlight strikes boiler's pipes, it heats water inside to more than 1,000 degrees, creating steam. Steam is piped to a turbine to generate electricity.

10,800 Heliostate Mirrors
Computer driven mirrors track the sun and reflect light to a boiler on top of a tower. Each Heliostate mirror is 7.2 feet wide by 10.5 feet high and is tilted upright.



Import City Services
Healthcare, Dental, Retail and Speciality Food services arrive once a week to Subterranean District One. Creating a true city-like community

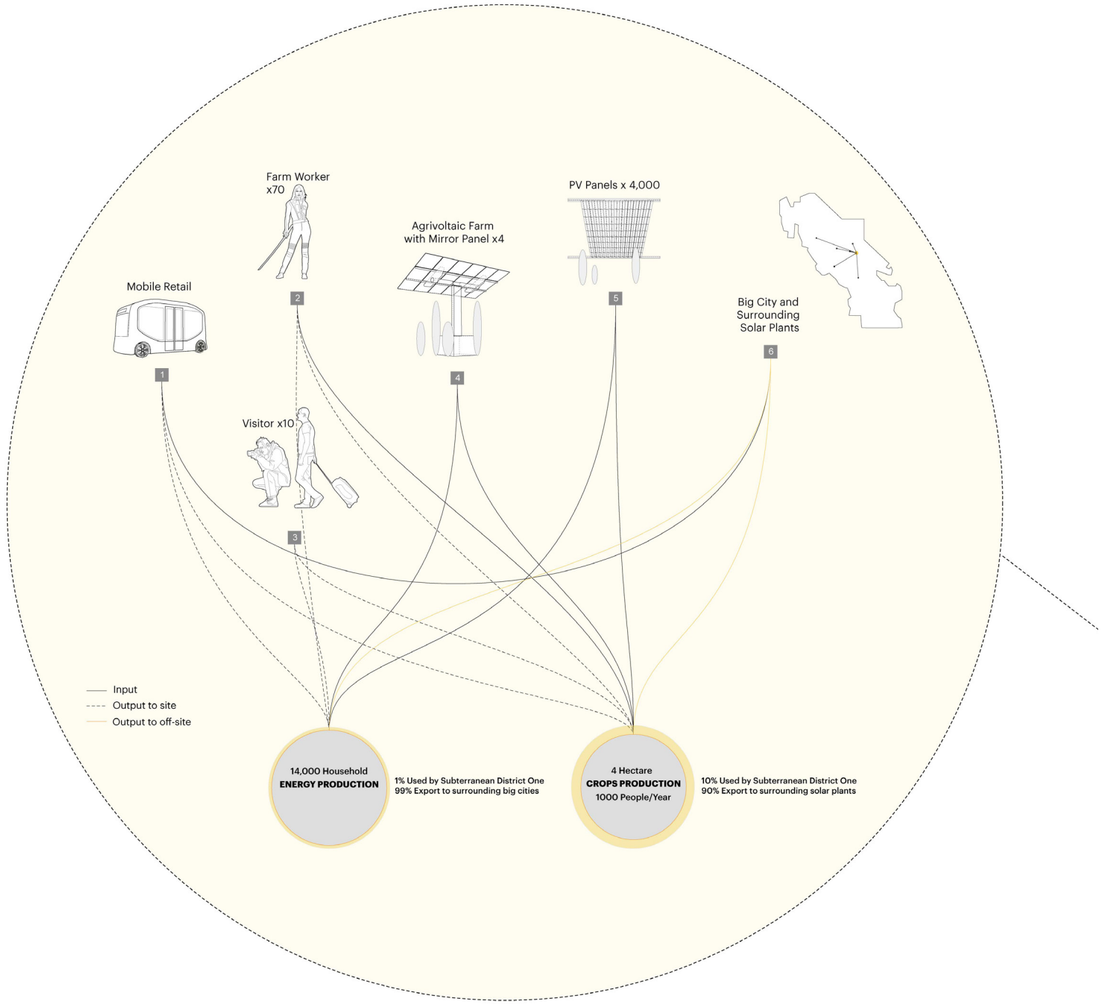
Shade Crops
Crops that require defused sunlight are harvested under translucent PV panels, such as tomatoes and cucumbers.

Sun Crops
Crops that require direct sunlight are harvested under the heliostate mirrors, such as peppers and melons.

Export Crops
Excess crops are exported to nearby solar plants that have not yet adapted to agri-volteic methods

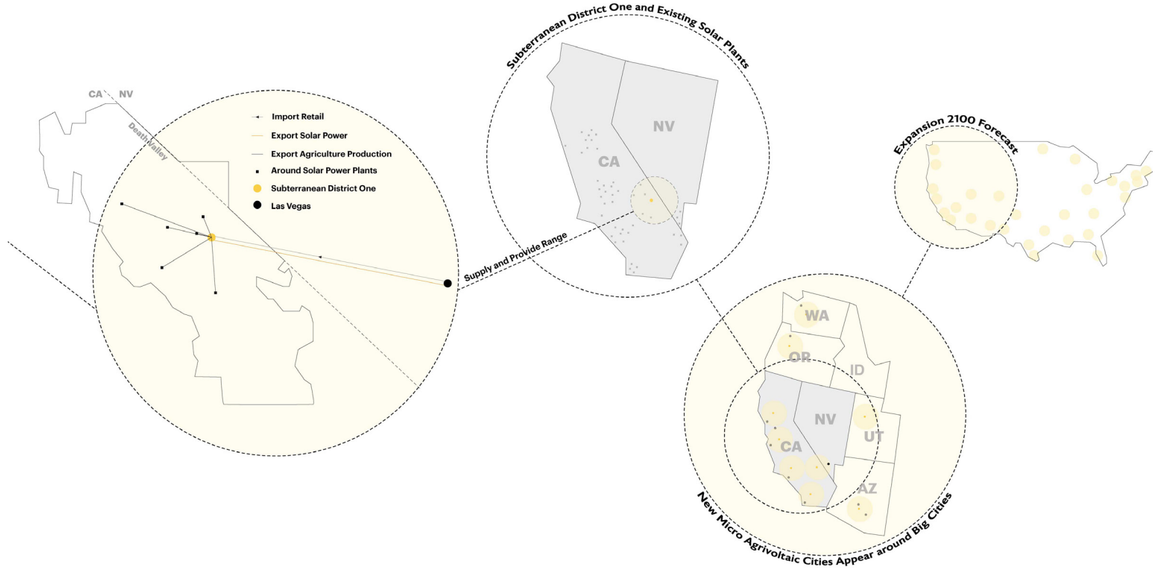
FOOD PRODUCTION

1,000 Humans per year in 4 Hectors
10% Used by Subterranean District One
90% Exported to surrounding Solar Plants



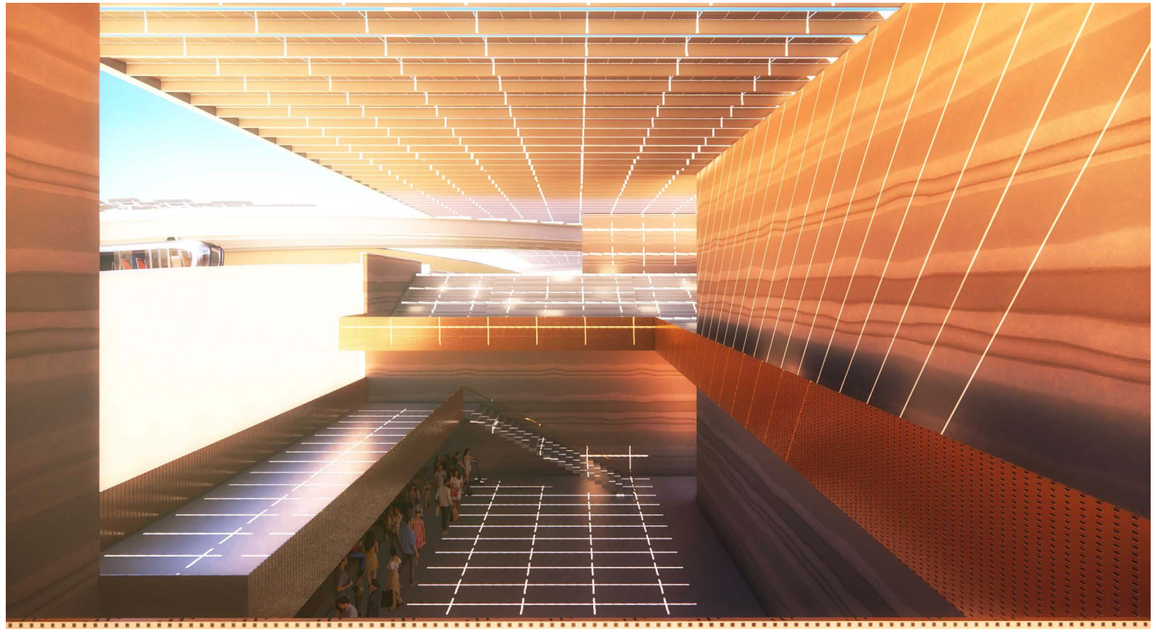
As a prototype city, the Subterranean District One is not a monumental object but a project with progressive efforts

for a "green revolution" in clean energy and farming practices under the environmental pressure of extreme heat. our district generates clean energy to power more than 14,000 households, and cultivate crops on four hectare of of multi-use land, enough to feed 1,000 people each year. We export 90% of our crops to nearby traditional solar plants and send 99% of our energy to the US energy grid for large cities such as Las Vegas to use.



It’s 12pm, the whole city has taken refuge inside the desert landscape. At this time of day, being outside is suicidal.

It’s too hot to think, too difficult to inhale the hot air, and dangerous to talk. I’ll go to the main control room. To protect ourselves from the afternoon sun, our buildings are constructed using local stone and soil. Like caves, they are half buried into the land to maximize thermal insulation and reduce construction materials. Light colored, double roofs, with vents and evaporative towers direct wind. Courtyards, balconies, and closely spaced structures function as shading devices.

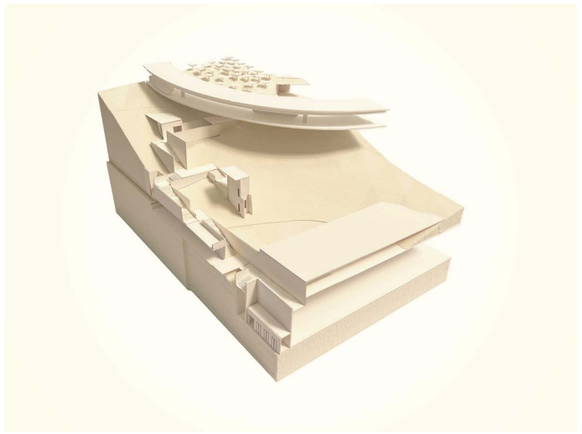


It’s 2pm, I checked the weather forecast again, mostly out of habit and ran our food and energy numbers.

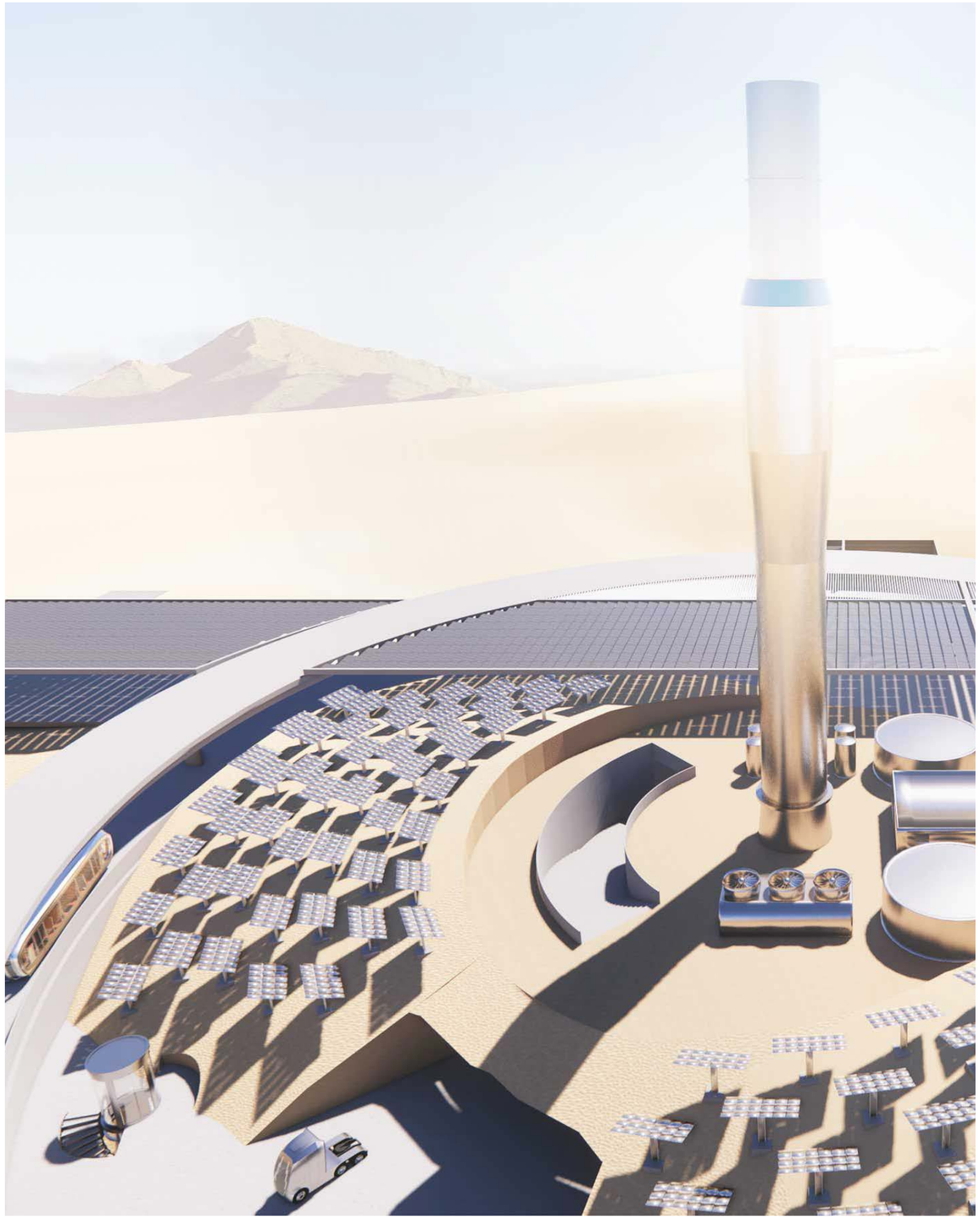
We’ve learned from the nearby ghost towns left behind after exploiters scour the valley for metals during the early 1900’s to stop devouring earth from its limited resources. Subterranean District One has been the region’s primary experimental research lab for food and energy harvesting for several decades now. In the past two years, three new agro-voltaic farms have already been built using our know-how.

To protect our buildings from desert floods, our city's foundations are built with zero carbon concrete.

Our solar plants are able to convert concentrated sunlight into heat that exceeds 2700F, the temperature needed to fuse limestone, clay and other materials together for the clinker in concrete. Before the development of this technology, the fossil fuels used for producing the clinker in concrete were responsible for 40% of the direct carbon dioxide emitted by concrete. However by replacing fossil fuels entirely with solar energy, the concrete industry has been forever changed.



Physical sectional model.



It's 6pm, The sun is setting, I can go outside now. It's Thursday, so I head straight up to join everyone in the main plaza. Once a week mobile retail shops from nearby cities come to Subterranean District One with supplies and services.

It’s 9pm, I head back to the climate center and check our daily report. It notes, a series of northern cities are catching up with us. Based on today’s numbers, 89 cities in the world are preparing to live under a burning sun, as they face food and energy shortages.

Essay
Eclogue For [In]habitability
with Sondra Perry

Produced
Summer 2021

Course
Transscalarities: The Intersectional
Design of Climate

Professor
Andres Jaque

Advisor
Benjamin Weisgall

Facts

Essay
Nature of Contracts
with Michael Osman

Produced
Summer 2021

Course
Arguments

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Andres Jaque

Advisor
Jessica Ngan

Fictions

Essay
Interspecies Environmental Activism
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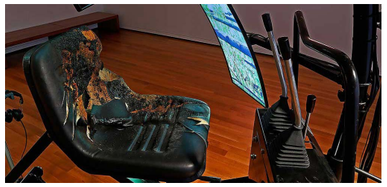


Eclogue For [In]habitability

With Sondra Perry

As an interdisciplinary artist, Sondra Perry works with video, computer-based media, and sculpture to provoke conversations around societal themes of race, identity, and place. Perry distinguishes her work by using technology as her main tool for representation. She experiments with digital spaces as a means to allow the lost thoughts of her characters' identities to manifest themselves. Perry successfully blends different media forms, images, and cultural objects to promote "historical awareness and critique"[2].

In her exhibit, Eclogue For [In]habitability, abstract representations of nature, labor, construction and urban planning, spotlight the relationship between people and place. Headphones attached to an "interstellar backhoe" [5] placed in the center of the exhibit, narrate to visitors the untold story behind the most filmed urban park in the world, Central Park. Before Central Park existed, the land where the park now sits was home to Seneca Village, a neighborhood known for its high percentage of free African American landowners. In 1857, the city of New York, took ownership of their land, displacing its residence and demolishing their homes, schools and churches to construct a gated countryside for urban New Yorkers to dwell in.

An eclogue is a short pastoral poem, a simile to Central Park for some but a far cry for Perry. Eclogue For [In]habitability rejects the mainstream understanding of the pastoral dream, prompting a conversation about today's realities of displacement, extraction, race, and alienation. The idealized portrait of prestige landscapes and the countryside life is re-interpreted with full wall projections of surreal videos of bodily-like fluids superimposed with digital footage of lakes, oceans, and terrains.

Today, landscapes in urban places like Seattle and New York are systematically demolished. Her work manifests itself in these forever changing places, places where political systems encourage gentrification, disregarding the rights of those, human or non-human that already exist there.

Perry describes the backhoe as a living being aware of his role as a terraforming device. Withdrawn from its duties, resting in an art gallery, this backhoe acknowledges what has happened to our planet and what can happen on others. Perry explores the power of eminent domain as a terraforming device. She questions the literal shifting in earths rock and soil in relationship to colonialism. "How does the shifting of the earth and the changing of the South, coincide with the changing and shifting of people—how have they been moved and shifted throughout time" [4].

Eclogue For [In]habitability's grotesque videos create an overall science fiction quality, alluding not only to what our future points to, but to the history our present stands on. At this scale, her work speaks to the implications the colonial power structure and mindset has had on our built environment. Historically, the role of science fiction has been to allow people to imagine new possibilities for the future. It can be argued that we can only build towards our future by first imagining it, even if we sometimes have to image the worse to trigger change.

The exhibit departs from Seneca Village but looks forward to today's conversation about terraforming other planets. Will we colonize other planets as we have earth? Will we know about other species inhabiting these planets before destroying, using, and exploiting them?

Nature of Contracts

With Michael Osman

In the essay, Specifying: The Generality of Clerical Labor, Michael Osman focuses on two practices that altered the architectural profession in the United States at the turn of the 20th century: the professionalization of architecture described by the cognitive separation of design labor and the work of builders and contractors, and the industrialization of the material economy described by the separation between art and craft between architects and builders. The latter occurred by reinforcing the specifications since they present the work of architects as primarily theoretical in nature and thus abstractable and adaptable. The former occurred when the architect's role as a writer of specifications became a "curator of historical styles." Osman ultimately claims that specification documents are central to the work of the architect and an essential tool to achieving meaningful impact.

Michael Osman described the role of specification not only as objects of architecture history but also as objects of politics. In practice, the specifications not only serve as communication devices for architects to instruct everyone else, but they are also "the battlefields" of any construction site. They are constantly evolving and are the means of contestations, power demonstrations, and negotiations. Specifications are where contractors create economic value. Therefore, specifications could also be the space where architects, in turn, create social and cultural impact. Architects are everyday managers that are constantly evaluating what they must compromise for what they value. They must communicate with other agents explaining why a particular item should be executed in a specific way, not only because of personal creativity but because the item is doing many other things and therefore, it must stay.

By acknowledging the potential of the specifications, could we use them to achieve a prototype "code" for setting new values for the profession, either economic, cultural, or material?

Michael Osman sees the space of specification not as full war zones but as "neutral" battlefields, at most. He believes the language used in the specifications matters and if architects regain agency of that language they can use it as a tool for communication, empathy, and collaboration. If specifications are used this way, he believes architects could help build a landscape based on different values than those seen in the last century. However, Michael Osman acknowledges the limitation of the specifications. A lot has changed since the 20th century and architects are no longer the only ones giving instructions. He described architects as mediators between the contractors and project managers, in the middle of a chain of commands and interests where there are a lot more agents trying to extract value from architects. With this recognition, Michael Osman suggests that we might have given too much ideological meaning to the specifications, causing architects to sit too comfortably on the instructions built for a different century and therefore, different set of values. Without a change of philosophy, the architectural practice will not continue being a field where meaningful impact occurs. While Michael Osman has witnessed various academic attempts to reevaluate the profession in the past decade, he cannot say the same for professionals. Very few professionals seem to believe it is time to rewrite the "code" of the AIA and other professional organizations.

What do you think are alternative ways architects can add value, besides creative or service value?

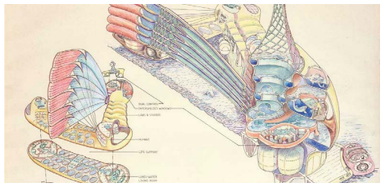
Today, it is commonly understood that architects are creative, and builders are not, and this is how architects produce value. Michael Osman suggests architects can begin to create new forms of value production that allows them to associate themselves with today's politics. This can be achieved by recalibrating inherited ideological paradigm that architects only serve as aesthetic creatives. For example, in uncertain economies, we need to learn how architects can design for increased security; in a world of environmental destruction, we need to understand what the profession can do to associate itself with a sustainable set of values. It is through new associations that Osman believes architects can create alternative ways of adding value besides the implicit aesthetic that architects bring to the table.

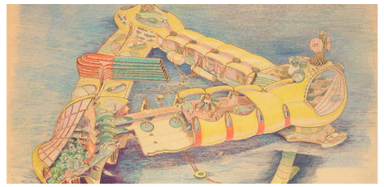
What can we learn by looking into how capitalism has been dealing with the construction of the environment?

The way Michael Osman frames his work allows him to move from the discussion of markets as abstract ideas to marketplaces that are materially constituted. When architects practice capitalism, their work has not only been destructive to the environment but has also defined the limits of what parts of our environment can be sacrificed. Michael Osman separates "autonomous nature" with "natures that have been classified for markets of financial control." Michael Osman explains that when architects define whether something is nature and designate how these areas should be cared for, it is not that one area is sacrificial, and another is not. He believes that all areas require some degree of care, and this characteristic blurs the line between what should be preserved and what can serve as a means of economic extraction. He explains how architectural theory today focuses on showing how the loopholes tend to be bigger than the fence. The boundary-making architects narrate into existence is a minimal and specific narrative, and realities spill far beyond what is narrated.

Do you believe the flow of profits and its increase in value over time as a product of investment has pushed builders and contractors to be part of capitalist construction?

Michael Osman agrees capitalism drove builders and the dominance of the building industry in the United States. However, while this is visually evident, it is also journalistically evident. He argues that to elevate this idea to scholarly rigor, one must acknowledge that the architect also plays an important role in a capitalist-built environment. He questions that if profit is not the driver, is it status? How do architects manage the burden of having been absorbed into a process of capitalization and of increasing profitability? Even though architects have increasingly participated in capitalist construction, they also have the capacity to showcase cultural value. Through design, architects can push a socially responsible agenda while still participating in the reality of today's capitalist market.





Interspecies Environmental Activism

With Ant Farm

In 1968, Chip Lord and Doug Michel launched Ant Farm as an avant-garde architectural collective. Self-described as “super radical activist environmentalists,” [8] Ant Farm emerged when human-caused pollution was becoming more evident, and people were beginning to demand change in climate policies. During the 1960s, massive demonstrations took place across the United States [2]. People had seen the Santa Barbara oil spill’s devastating impacts and the bald eagles’ rapid decline due to air chemicals. In 1968, NASA had released the first images of Earth taken from space [10]. The beautiful blue marble contrasted so clearly from the unfavorable state of Earth that on April 22, 1970, 20 million people rallied across the United States to protest environmental disasters, marking the establishment of Earth Day.

The energy of activists was so focused on radically transforming society that the following years’ environmentalists witnessed a legislative high point. The first Earth Day was unprecedented; the Environmental Protection Agency (1970) was established, and the Clean Air Act (1970), the Clean Water Act (1972), and the Endangered Species Act (1973) were all enacted [2]. While the event has since expanded to more than 190 countries, its attitude has shifted. By the 1990s, Earth Day had become more of a show, where the latest green goods are advertised, and children plant trees and collect litter. Fifty years later, have we become accustomed and vein to seeing the beautiful blue marble that once intensified public awareness of environmental disasters?

Art Farm’s most well-known work, Media Burn, Clean Air Pod, and Cadillac Ranch were based on staging performances to provoke cultural introspection and expose the links between environmental deterioration and mass industry and consumerism. However, their unbuilt research project Dolphin Embassy is perhaps their most radical and transcendent. The Dolphin Embassy foreshadowed today’s critical need for interspecies alliances to respond to our climate crisis. The project moves away from activism that simply “stages issues” to create awareness to one that “hacks the system” to propagate real-time change.

The Dolphin Embassy was designed as a research facility where scientists could study communication with dolphins and as a “prototype model community” [9] where humans and dolphins could live and govern equally. The architecture served as the diplomatic court for utmost cohabitation, while technology allowed for interspecies communication [9]. As Doug Michels explained in the Journal of the Dolphin Embassy in 1978, “The meeting of two civilizations is a process demanding measures of supreme diplomacy. The Dolphin Embassy’s communications is a manifestation of this trans-species diplomacy.” [1]

Our cities and towns have been primarily built anthropologically, centered around human needs and desires. Our human civilization is so dependent on built infrastructures that we continue to colonize land home to wildlife. The Dolphin Embassy encouraged the general public to consider a different interspecies dynamic besides the commonly understood model of humans as the superior specie [6].

When the Dolphin Embassy was envisioned in the 1970s, there was no significant scientific evidence that the atmosphere was being changed and would produce catastrophic climate disasters; yet, as described by Environmental activists of the time, faith was enough to spark the movement [3]. Today, scientific evidence in both numbers and events is plentiful. However, architecture seems to operate in a vacuum, detached from ecosystems and geology. Highways and skyscrapers should not divide animal migration routes, mining of heavy metals should not contaminate the surrounding waters, and wood harvesting should not strip countless species from their homes. By acknowledging how architecture operates with other species and including them as equal stakeholders, we can design for an eco-centric interspecies future.

Catalogue
Chasing White:
Evidence and Effects of Melting Glaciers

Produced
Spring 2022

Seminar
Graphic Design and Typography

Professor
Yoonjai Choi

Facts

Catalogue
Obsessing Green:
Lawns as Chemically Dependent Ecosystem

Produced
Fall 2021

Seminar
Archives of Toxicity

Professor
Mark Wasiuta

Catalogue
Redlining Blue:
A Policy and Energy Issue

Produced
Spring 2022

Seminar
Housing After Scarcity:
Policy, Energy, Settlement

Professor
Michael Bell

Conversations

Fictions

Thoughts

Physical booklets.

1 Chasing White

When there's fresh snow on the ground, have you ever noticed that things tend to get a bit brighter? That's because snow and ice have a reflective property called albedo. They reflect 70% of the sun's energy back out into space, drastically reducing the amount of heat absorbed by our planet. Pretty cool right? But with less ice and snow, less energy can be reflected back to space, meaning it is absorbed as heat, warming the planet.

#1

2

It is, I promise, worse than you think. If your anxiety about global warming is dominated by fears of sea-level rise, you are barely scratching the surface of what terrors are possible, even within the lifetime of a teenager today. And yet the swelling seas — and the cities they will drown — have so dominated the picture of global warming, and so overwhelmed our capacity for climate panic, that they have occluded our perception of other threats, many much closer at hand. Rising oceans are bad, in fact very bad; but fleeing the coastline will not be enough.

In fact, wildfires, droughts, floods, hurricanes, and other extreme natural disasters are all connected to what's happening to our snow and ice.

Even when we train our eyes on climate change, we are unable to comprehend its scope. This past winter, a string of days 60 and 70 degrees warmer than normal baked the North Pole, melting the permafrost that encased Norway's Svalbard seed vault — a global food bank nicknamed "Doomsday," designed to ensure that our agriculture survives any catastrophe, and which appeared to have been flooded by climate change less than ten years after being built.

The Doomsday vault is fine, for now. The structure has been secured and the seeds are safe. But treating the episode as a parable of impending flooding missed the more important news. Until recently, permafrost was not a major concern of climate scientists, because, as the name suggests, it was soil that stayed permanently frozen, forever.

3

Portraits of Vanishing Glaciers
Icebergs that originated in the vast expanse of the Vatnajokull have been constantly in decay and melting in the tidal lagoon.

4

But Arctic permafrost contains 1.8 trillion tons of carbon, more than twice as much as is currently suspended in the Earth's atmosphere. When it thaws and is released, that carbon may evaporate as methane, which is 34 times as powerful a green house gas warming blanket as carbon dioxide when judged on the timescale of a century; when judged on the timescale of two decades, it is 86 times as powerful. In other words, we have, trapped in Arctic permafrost, twice as much carbon as is currently wrecking the atmosphere of the planet, all of it scheduled to be released at a date that keeps getting moved up, partially in the form of a gas that multiplies its warming power 86 times over.

5

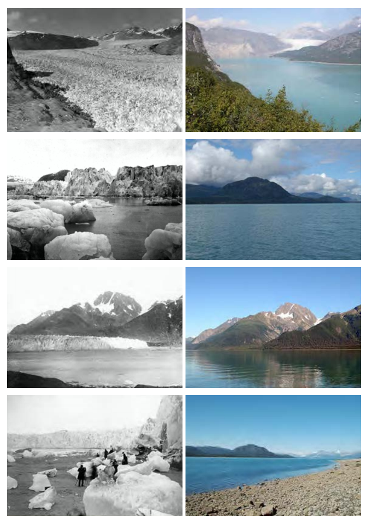
Releasing CO2 and Methane.

Permafrost is the permanently frozen land that covers approximately 9 million square miles of the Arctic. Permafrost hold twice the amount of carbon sitting in known oil reserves. In warmer months, the surface thaws. This "active layer" releases carbon dioxide, methane and nitrous oxide as the organic material breaks down. Since 1975 CO2 entering the atmosphere from North slope of Alaska has increased by 73%.

Banff National Park in Alberta, Canada
Methane gas bubbles trapped underneath Vermillion Lake. Formed from decaying material at the bottom of the lake bed, these bubbles rise up becoming trapped under the frozen lake surface.

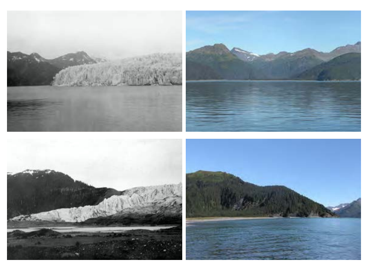
Kanjia Bogg in Alaska, USA
Melting permafrost frees up water and nutrients that spur the growth of methane-producing bacteria and methane-transporting plants.

Maybe you know that already — there are alarming stories in the news every day, like those, last month, that seemed to suggest satellite data showed the globe warming since 1998 more than twice as fast as scientists had thought (in fact, the underlying story was considerably less alarming than the headlines).



1882 – 1941 2003 – 2005

Muir Glacier

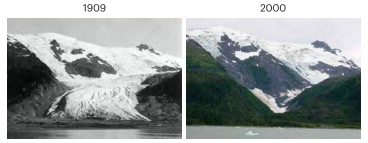


1909 2004

McCarty Glacier

Toboggan Glacier

1909 2000



Increasing Ocean Acidity.

Glaciers have white surfaces that reflect the sun's rays. When ice melts and glaciers retreat they expose the dark surface of the oceans. Ice and snow have a reflective albedo effect, but what about open water? Lighter colors reflect light and darker colors absorb it, so when the sun's rays meet the ocean, instead of bouncing back into space, the energy is absorbed by the water as heat. When the temperature rises, water chemistry changes due to a series of heat fueled reactions that lower the pH, making it more acidic than normal. According to scientists, the ocean has absorbed 93% of excess heat from greenhouse gases since the 1970s. We have been lossing about 400 billion tons of glacier ice per year since 1994.

1906 2004

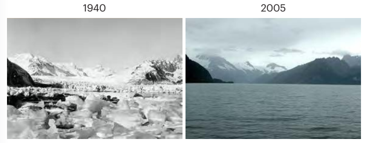
Carrol Glacier

1917 2005

Pedersen Glacier

Northwestern Glacier

1940 2005



Holgate Glacier

1909 2004

Or the news from Antarctica this past May, when a crack in an ice shelf grew 11 miles in six days, then kept going; the break now has just three miles to go — by the time you read this, it may already have met the open water, where it will drop into the sea one of the biggest icebergs ever, a process known poetically as "calving."

Rift in Larsen C measures about 100 meters wide and about half a kilometer deep.

Rising Sea Levels.

Sea level rise is a complicated issue with lots of factors at play, but we're focusing on its role with climate change and ice. As glaciers and icebergs melt, fresh water flows into the oceans. One might think that since ice is less dense than water, causing it to float, that the water it displaces is equal to the volume of the water it releases; but that's not the case. Fresh water is less dense than salt water; so in its liquid state it takes up more space which is why melted glaciers raise sea levels. Note that the surface of the ocean isn't flat, so different coasts will experience different levels of water rise.

Amery Ice Shelf Deposits of Ice

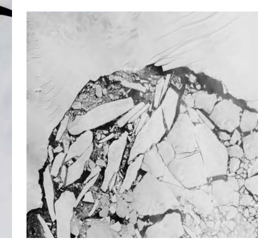
The Advanced Land Imager on NASA's Earth Observing-1 (EO-1) satellite captured this natural-color image on January 27, 2012. It shows a portion of the Amery Ice Shelf, where three giant cracks, or rifts, meet. The largest rift runs in the same direction as the ice flow, and widens toward the edge of the ice shelf (image center). Smaller rifts extend toward the east and west. Although comprising just a tiny portion of the Antarctic coastline, this ice shelf drains roughly 16 percent of the East Antarctic Ice Sheet.

King Baudouin Ice Shelf Chips Off

While large icebergs calve regularly from fast-flowing ice shelves in West Antarctica, the coast of cooler, drier East Antarctica tends to be less active. That made it a mild surprise when a 70-square-kilometer chunk of ice broke off from the King Baudouin Ice Shelf in January 2015. The last time that part of King Baudouin calved such a large iceberg was in the 1960s. A growing rift near the edge of the glacier was visible to satellites for several weeks before the ice finally broke loose. The Operational Land Imager (OLI) on Landsat 8 acquired this image on Jan. 24, 2015.

Wilkins Ice Shelf Continues to Break

An ice shelf is a thick plate of ice attached to a coastline on one side and floating over the ocean on the other side. Many ice shelves fringe Antarctica, including the Wilkins Ice Shelf on the Antarctic Peninsula, which underwent a series of breakup events in 1998, 2008, and 2009.



Larsen Ice Shelf Breaks Away

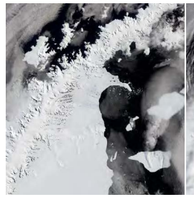
A large floating ice mass on the eastern side of the Antarctic Peninsula, has shattered and separated from the continent. This particular image was taken on March 5, 2002. The shattered ice formed a plume of thousands of icebergs adrift in the Weddell Sea. A total of about 3,250 square kilometers of shelf area disintegrated in a 35-day period beginning on January 31, 2002. Over the last five years, the shelf has lost a total of 5,700 square kilometers and is now about 40 percent the size of its previous minimum stable extent.

Ice shelves are thick plates of ice, fed by glaciers, that float on the ocean around much of Antarctica. The Larsen B shelf was about 220 meters thick. Based on studies of ice flow and sediment thickness beneath the ice shelf, scientists believe that it existed for at least 400 years prior to this event and likely existed since the end of the last major glaciation 12,000 years ago.

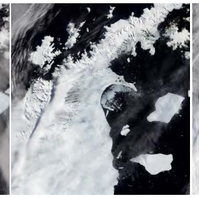
For reference, the area lost in this most recent event dwarfs Rhode Island (2,717 square kilometers) in size. In terms of volume, the amount of ice released in this short time is 720 billion tons–enough ice for about 12 trillion 10-kilogram bags.

This is the largest single event in a series of retreats by ice shelves along the peninsula over the last 30 years. The retreats are attributed to a strong climate warming in the region. The rate of warming is approximately 0.5 degrees Celsius per decade, and the trend has been present since at least the late 1940s. Overall in the peninsula, the extent of seven ice shelves has declined by a total of about 13,500 square kilometers since 1974.

Jan 31, 2002

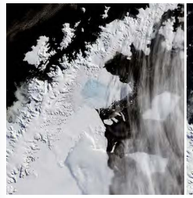


Feb 17, 2002



Feb 23, 2002

Mar 5, 2002



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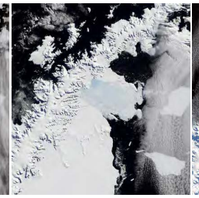
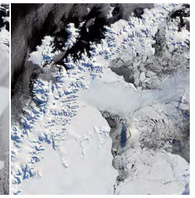
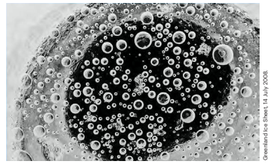


Apr 13, 2002



Rock, in the right spot, is a record of planetary history, eras as long as millions of years flattened by the forces of geological time into strata with amplitudes of just inches, or just an inch, or even less. Ice works that way, too, as a climate ledger, but it is also frozen history, some of which can be reanimated when unfrozen. There are now, trapped in Arctic ice, diseases that have not circulated in the air for millions of years — in some cases, since before humans were around to encounter them. Which means our immune systems would have no idea how to fight back when those prehistoric plagues emerge from the ice.

The Arctic also stores terrifying bugs from more recent times. In Alaska, already, researchers have discovered remnants of the 1918 flu that infected as many as 500 million and killed as many as 100 million — about 5 percent of the world's population and almost six times as many as had died in the world war for which the pandemic served as a kind of gruesome capstone. As the BBC reported in May, scientists suspect smallpox and the bubonic plague are trapped in Siberian ice, too — an abridged history of devastating human sickness, now left out like egg salad in the Arctic sun.

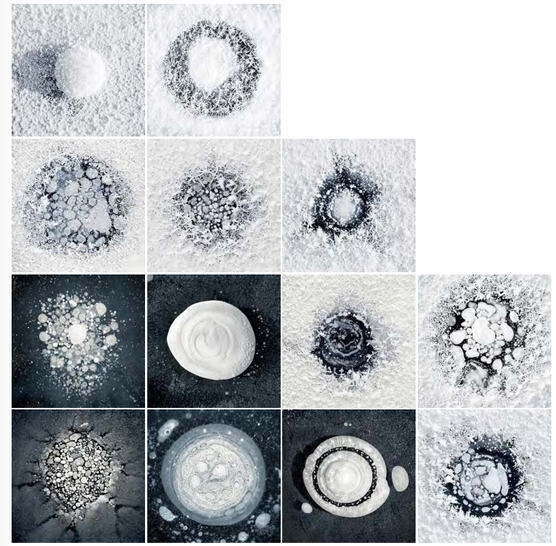


Greenland Ice Sheet, 14 July 2006.

Releasing Ancient Diseases.

This series depicts ice formations on ponds, lacks and river in Alaska. Many of these are frozen bubbles of methane or CO2 trapped under ice. The formation in the photos are about 10-30 inches. Scientific research predicts bubbles of ancient air, trapped in ice, possibly 15,000 years old, could be released as the ice sheet melts.

Ice Formations Made From Trapped CO2 and Methane



14

Humans have affected so much of the planet's white surfaces, we face a future without any precedent. Some of the men who first identified a changing climate (and given the generation, those who became famous were men) are still alive; a few are even still working. Wally Broecker is 84 years old and drives to work at Columbia University's Lamont-Doherty Earth Observatory across the Hudson every day from the Upper West Side. Like most of those who first identified a changing climate and raised the alarm, he believes that no amount of emissions reduction alone can meaningfully help avoid disaster. Instead, he puts his various forms of "geoengineering," the catchall name for a variety of moon-shot technologies far-fetched enough that many climate scientists prefer to regard them as dreams, or nightmares, from science fiction. He is especially focused on what's called the aerosol approach — dispersing so much sulfur dioxide into the atmosphere that when it converts to sulfuric acid, it will cloud a fifth of the horizon and reflect back 2 percent of the sun's rays, buying the planet at least a little wiggle room, heat-wise.

White snow to white skies.

15

Geoenenering Our Skies White

The plan to cool the planet by spraying tiny sunlight-reflecting particles high into the air would turn the sky from blue to white, bleaching the sky. High-flying planes would release small particles into the stratosphere to reflect incoming rays. One estimate says this could reduce global temperature by 1.5C.

Concept image of plane releasing sunlight-reflecting particles.

16

Text adapted from:

The Uninhabitable Earth by David Wallace-Wells

Under a White Sky, The Nature of the Future by Elizabeth Kolbert

Image compiled from:

Portraits of Vanishing Glaciers by James Balog

Ice Formations by Ryota Kajita

Global Ice Viewer by NASA

The Earth Observatory by NASA

Kulusuk Isfjord, Greenland, 24 August 2008

Physical booklets.

1

Obsessing Green

America has an extreme relationship with lawns. Since the 1950s, “The Lawn” has been defined as the emerald-green land surrounding homes. More peculiarly, a ”good” lawn has been universally understood as that composed of a single variety of grass with no invasive weeds, kept bright green, and mowed at an even height of 1.5 inches with clean-cut edges.

To have a better grasp of this obsession, it is worth noting the extent to which American homeowners have collectively invested in lawns. Today, Americans maintain over 32 million acres of lawns surrounding over 58 million homes. To maintain these extensive carpets of green, Americans collectively spend around $60 billion a year. These impressive figures are the consequence of decades of increasing dedication to engineering, growing, and caring for these monotone patches of greenery.

#2

2

The notion of cultivating a lawn at the entrance of private residences dates as far back as the late 15th century in the castles of French and English nobility. By the late 18th century, lawns were successfully introduced to America, however, they were only affordable to the super-rich, since mowing and caring for the grass had to be done by hand or glazing animals. Nonetheless, thanks to the invention of mowing machinery and chemical agents during the war years, lawns tricked down from the estates of the ultra-wealthy to the front yards of the middle class. By the 1950s, in the rapidly expanding suburbs of America, millions of families surrounded their homes with carpets of green. Homeowners displayed their lawns to neighbors and drivers by proudly weeding, watering, fertilizing, and mowing these small-scale replicas of the castle lawns that had inspired and captivated the country's attention centuries ago.

Greg Stimac, Oak Lawn, Illinois, 2005.

3

An American Obsession

In 2014, a man from Upland, California was sentenced to six months in jail or a $4,000 fine for refusing to water his lawn. In 2016, a woman from Cohakia, Illinois was taken to jail for refusing to mow her lawn, and in 2018, a man from Dundin, Florida was fined $30,000 for letting his grass grow "wild". While these cases seem extreme, they are common throughout the United States and allude to Americans' strange relationship with their lawns. Why do they care so much about these bland grasses? What does this strange fascination reveal about our own psychology?

Aerial view of suburbs in Bay City, Texas.

4

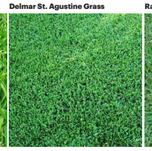
Enforced by its history, a well-kept lawn has become tied to values of success, status, and comfort. However, recent studies have suggested these ties and Americans love for lawns may contain elements that are both evolutionary and psychological, not only consequential of passed down traditions. For the past 15 years, John Falk has been investigating human preference for grassed environments. In his paper, Evolutionary Influence on Human Landscape Preference, Falk surveyed a segment of the US population from various age groups to determine their landscape preferences. Individuals, including children overwhelmingly preferred short grass and scattered trees. Additionally, Falk presented images of five different ecosystems to people living in Nigeria's rainforest belt: rain forests, deciduous forests, coniferous forests, savannas, and deserts. Participants consistently choose savanna sceneries as the most preferable area to settle. The findings support Falk's theory that people have an underlying inclination to prefer savanna-like environments, which are then modified by individuals' own cultural and social experiences. Multiple psychologists agree with Falk, claiming that because humans originated in Africa's grassy, tree-scattered savannas, we have an innate affinity for open landscape such as lawns. Through this concept of genetic memory, it is reasonable to believe the uninterrupted openness of lawns gives people a sense of comfort, safety, and control. The general open landscape lawns provide may be traced down to our ancestors, however, the peculiarly rigid modern day American grass aesthetic can be boiled down to the color green and its physiological effects.

5

Creeping Bent Grass

Perennial Rye Grass

Delmar St. Agustine Grass



Raleigh St. Agustine Grass

Centipede Grass

Soysia Grass

Tifway Bermuda Grass

Creeping Red Fescue

Green is Calmness.

In color psychology, colors with longer wavelengths are regarded as "arousing or warm" and colors with shorter wavelengths are considered "calming or cold". Biologically, our eyes need to adjust to perceive longer wavelength colors, however, they do not need to adapt to see cold hues such as green, triggering a sense of calmness. Our relaxing association with green is further "hard-wired" in our brains because of evolution; early humans associated green in nature with comfortable and calming places, places where water, food, and shelter could be found.

In view of green's strong link to nature, people unconsciously perceive greener lawns with greater health, even if the color is artificially enhanced with numerous chemicals. Grass is quite plain compared to other plants, yet it is through lawns that American's experience their most frequent exposures to and encounters with nature. Green lawns, nonetheless, seem like a net positive to many, since exposure to nature is hard to come across in developed cities. However, our meticulous exploitation of this chemically dependent "natural" element must be judged through its whole life cycle and not for its esthetically green appearance.

Homeowner coloring his lawn green.

Chemically Dependent.

As people associate green lawns with nature and its environmental benefits, they overuse chemical pesticides and fertilizers, scarce water supplies, and gasoline-intensive mowers. According to a study on lawn care habits, households in the San Francisco area where one or more members were part of an environmental group, chemical use for lawn maintenance was 1.7 times higher. The same study found that homeowners in the Phoenix area, a region where maintaining lawns requires virtually continuous water, commonly associate "clean-cut, green lawns" with environmental benefits, including heat reduction, and improved air quality. However, a report on Environmental Science and Technology published by the American Chemical Society, reported that 1 hour spent mowing one's grass emits the same amount of air pollution into the air as a 100-mile car drive. When remembering the quantity of lawn covering, it is easy to understand how lawn maintenance may be a big source of regional water scarcity and air pollution.

Mother Nature Gets No Credit in Advertisement

After World War II, American homeowners acquired a wide range of new chemical products to help them combat Mother Nature. Lawns perfection became such an artificial environment that it could not live up to suburban standards without chemical fertilizers, pesticides and herbicides.

Rachel Carson's book Silent Spring published in 1962 most famously described American's widespread denial of ecological links. She argued that the American society had embraced life with chemicals without understanding the balance of nature and that natural cycles were deteriorating as they fought to reverse everything that chemical pesticides, herbicides, and fertilizers were striving to accomplish, resulting in large-scale imbalances. Despite environmentalists' awareness, chemical pesticides and pest control agents are so accessible that their overuse in domestic applications continues to be rampant. The Environmental Protection Agency (EPA) estimates that American homeowners use up to 10 times more chemical pesticides per acre to maintain their lawns than farmers use for their crops. Chemical pesticides, herbicides, and fertilizers are the main source of deteriorating water quality in most damaged watersheds as these chemicals wash off lawns and contaminate water sources.

Water Thirsty.

Native to the temperate moist climate of England, lawn grass cannot naturally thrive in America's harsh and diverse climates. Therefore, many of the grasses that flourish in America have been engineered to be water thirsty. Additionally, building codes across the United States render low-tech rainwater harvesting for irrigation unlawful or unjustifiably complicated. As a result, practically all water used for irrigation is potable water, which means we are not only using the short supply of water to maintain grass green, but it is also water that has passed through energy-intensive purification systems.

Typical Suburbia Neighborhood in Palm Springs, California

Many parts of the United States are facing water scarcity problems, yet lawn irrigation continues to account for more than half of all water consumption in many residential areas.

Middle Class American Home

Watering deeply and infrequently is far more effective than watering lightly multiple times a week and should therefore not be understood as an afternoon leisure activity.

Green is success.

While some people find green to be a calming hue, others find it to be motivating. According to one study, individuals with a strong desire for success favored the color green over red, which was preferred by those with a "low need for success." Participants also identified terms associated with success with the color green and words associated with failure with the color red. This association is seen culturally at work as well, green is frequently linked with economic security, for example, money is green and the relative health and attractiveness of one's front yard, most visibly judged by its color, is a measure of one's life success.

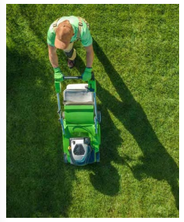
Manicuring lawns give people the illusion of control and order, creating a sense of personal achievement. This suggests lawns operate as psychological buffers. Lawns like berms around castles work as physiological buffers, serving as barriers between our homes and the chaos of reality outside. This illusion of success extends beyond one's own fulfillment to that of others. In a survey from 2013, respondents stated most strongly that having a nice lawn reflected well on them and greener grass helped to convince others that they are doing well. This phenomenon is worrisome, as a study made in Tualatin, Oregon, correlated people's exposure to social pressure's regarding their lawn aesthetics with those most likely to over-water and over-fertilize their lawns. Participants typically mentioned fear of neighbor criticism and approval as reasons for their obsessive lawn care habits.

Machine Manicured.

According to the Outdoor Power Equipment Institute, which represents lawn care machinery manufacturers, Americans use an estimated 38 million lawnmowers to groom their lawns. By the 1950's the riding mower had become widely available and affordable and was marketed to men and boys as labor-saving and fun.

Lawnmowers

Most are powered by high-polluting two-cycle engines, where one hour of mowing a lawn generates the same amount of pollution as driving 100 miles.



Grass Clippings

Today, there is a severe landfill problem on a national scale. Existing landfills are filling up, and new sites are becoming increasingly difficult to obtain. Every year, we create 160 million tons of municipal solid trash, the majority of which is dumped into landfills.

Landfills

Yard waste is the second-largest component, with grass clippings from mowing lawns accounting for 75% of this waste.

Green is safety.

Furthermore, colors have been shown to affect not just our emotions, but also our memory. In one research study, volunteers were given a list of emotionally charged terms printed in different colors and asked to memorize specific terms. The results showed that participants were more likely to recall pleasant phrases printed in green. This prompted the researchers to believe that green had more positive emotional connections. When it comes to recalling information, the color green may offer us an optimistic bias. This is further emphasized by cultures' everyday use of red and green, where red is frequently linked with danger (stoplight), and green is used in situation of safety (a green light).

The American suburban sprawl that surged during the postwar era coupled with Cold War paranoia increased the emphasis of child surveillance, and the fenced-in, treeless lawn was perfect as it allowed parents to maintain a constant, attentive eye on their children. However, while trying to protect their children by providing green carpets for play, they unknowingly pour dangerous chemical pesticides to upkeep it. The lawn industry is largely to blame since they have actively advertised America's lawn aesthetic with valued ideals of family, community, and safety. "They teach us that, with the help of petrochemicals and technology, we can bend nature to our will." Front yards, in this sense, represent an isolated order among the chaos of the natural world. "Homeowners fence off entropy, imposing totalitarian power over a few square feet of land."

Father and children enjoy their front lawn.

1960's Family Playing Cricket On Their Front Lawn

1950's Kids Enjoying Their Front Yard Store Set

14

Consumers assume lawn care pesticides are safe because they are sold in stores that also sell food and taken for granted in all landscape and gardening magazines and websites. Lured by the promise of bright colored green grass with minimum effort, they surround their homes with toxic chemical. The public not only remains uniform of the potential health threats posed by these chemicals but are at the same time subjected to deceiving packaging designed by a poorly regulated industry. In 1990 the US government conducted a series of hearings on lawn care chemical regulations and discovered that 31 out of 34 major lawn care pesticides had never been fully assessed for their long-term health and environmental effects. A report conducted by the Toxic Action Center on TruGreen, the largest provider of lawn care services in the United States, uncovered that more then 40% of the chemicals in their consumer product line contained ingredients banned in other countries.

American's often obsessive relationship with lawns can be linked to an innate and cultural love for the color green. Although it might seem like an unproblematic preference, the efforts of maintaining green lawns are significant to the environment and to people's health.

Pesticide Technician.

15

Deadly Toxic.

Many of the pesticides commonly used today have been identified by the Environmental Protection Agency as possible or probable carcinogens. Yet, studies show that 50% of people using pesticides do not read warning labels on packaging. It is then not surprising to learn that children living in homes where pesticides are used are 6.5 times more likely to develop acute lymphoblastic leukemia than those living where pesticides were not used. Or that "50 percent of the 2 million poisoning incidents each year involve children younger than six years old, and 90 percent of these incidents occur in their home".

Chem-lawn Warning Sign

The widespread use of chemical lawn care produces and fears of pollution have made some Americans rethink the front lawn aesthetic.

16

Research from:

Redesigning the American Lawn: A Search for Environmental Harmony by Herbert Bormann

Green With Envy: Psychological and Social Predictors of Lawn Fertilizer by Amanda Carrico

The American Obsession with Lawns by Krystal D'Costa

The Environment: Opposing Viewpoints by Laura K Egendorf

Color and Psychological Functioning by Elliot AJ

Evolutionary Influence on Human Landscape Preference by Falk and John Balling

The Lawn: A History of an American Obsession by Jenkins Virginia Scott

The Effects of Color on the Moods of College Students by Kurt S and Osueke K

Pesticides: A Toxic Time Bomb in Our Midst by Marvin Levine

When green is positive and red is negative: Aging and the Influence of Color on Emotional Memories by Mammarella, N, Domenico, A. Palumbo, R, and Fairfield, B.

Green Consumerism: An A-to-Z Guide by Mansvelt, Juliana, and Paul Robbins.

Lawn People: How Grasses, Weeds, and Chemicals Make Us Who We Are by Paul Robbins

Blue-Washing the Green Halo: How Colors Color Ethical Judgments by Sundar, Aparna, and James J. Kellaris

The American Lawn by Georges Teyssot

Why Your Lawn Is so Important to Your Mental Health by Sare-Coastal Turf

Rancho Mirage, Palm Springs, CA.

Physical booklets.

1 Redlining Blue

We are living in an economy where private banks, the federal government, the Federal Reserve, and everybody else is laser-focused on climate change and the risk it poses to assets, more specifically to property and its valuation.

Hurricane Katrina was the first time I witnessed climate migration. I didn't quite understand what was happening. I just saw new-channels broadcasting people fleeing their homes, fleeing for their lives. Ever since, extreme rainfalls, hurricanes, and heat waves are causing chronic disasters in parts of the US, making some neighborhoods uninhabitable. It doesn't matter whether you are terribly optimistic about the future of the United States when it comes to climate adaptation; it will undoubtedly generate a series of questions we will have to collectively undertake in the next decade.

#3

2

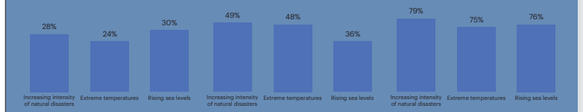
Being a survivor of an extreme climate disaster almost seems like the easy part. No one wakes up in the morning and says, 'I'm going to move because of climate change.' Being a refugee, that's a little more difficult. On the one hand, some people have been forced to start over; they have lost their house and everything they owned and knew. On the other end, there are people who have wealth and are passively thinking about where they want to build a place for their home and can afford to acknowledge that climate change is part of that equation.

1 in 5 Americans already believe climate change is impacting their home values. 49% of Americans who plan to move in the next year say natural disasters were a factor. 30% of Americans are hesitant to buy homes in areas with climate risk. However, is climate migration helping the "right" people? Are people better off after they move? Sadly, the shift of capital to lower-risk geographies with superior amenities, such as potable water and resilient electricity, makes this preferred place less affordable. Consequently, statistics already indicate people are moving more and more into undesirable neighborhoods as they realize insurance and risk transfer plans can only go so far. In 2017, it was reported that 20% of people fleeing a flood moved to another floodplain, and 98% of people moved to an area with a higher poverty rate.

3

30% of People Wouldn't Move Somewhere With Rising Sea Levels Even If More Affordable

Share of respondents who chose "There is no price at which I would consider it" to "I would consider moving if it were --% more affordable"



49% of Americans Who Plan to Move In the Next Year Say Natural Disasters Were a Factor

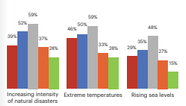
Share of respondents who answered yes to "Have any of these risks played a role in your decision to move in the next year?"

Three-Quarters of Americans Are Hesitant to Buy Homes In Areas With Climate Risk

Share of respondents who indicated they would be hesitant to buy a home in areas with the presence of these risks.

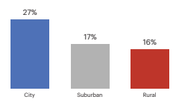
Younger Americans Are More Likely to Factor Climate Change Into Moving Decisions

Share of respondents, by age, who answered yes to "Have any of these played a role in your decision to move in the next year?



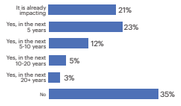
City Dwellers Are Most Likely to Say Home Values In Their Areas Are Being Impacted By Climate Change

Share of respondents who believe home values are already being hurt by these risks



1 in 5 Americans Believe Climate Change Is Already Impacting Home Values

"Will the increasing frequency of natural disasters, extreme temperatures or rising sea levels impacting home values in your area? If so, when?



4

Climate change has, of course, always been a factor in real estate, but never quite this front and center. There will always be people who want to live by the water, who want to live up in the woods. The question is, how much of a cost premium will that become? And at what point would you no longer afford to live where you want to live? The rich will adapt; they're already in the process of adaptation. Those who have the resources and the capability are making their homes climate resistant. But if every house around you is destroyed, and you're the only one left standing, how valuable really is that house if there's no community?

Not surprisingly, banks and investors are beginning to draw lines of risk, a practice known as blue lining. They're starting to think about where to invest and where to disinvest more formally. Part of the challenge is how real that science is. And what will be the implications and impacts for communities inside and outside of the lines? We have already witnessed this practice. The 1968 Fair Housing Act and the 1977 Community Reinvestment Act were passed to stop the practice of withholding financial services to potential customers who resided in neighborhoods classified as 'hazardous' to investment based on race and national origin. However, many of these people are still living the consequences. What will happen to the redlined communities that are still being impacted and are now going to be further impacted by this blue lining? When are we going to hold the banks accountable for this? Or will changing the whole system be a more realistic outcome to tackle this injustice? Will we be able to change the system through moral reasoning -- destroying the environment or displacing the poor is "wrong," or will it change itself as it's forced to collapse?

5

Climate Migration.

Climate migrants—are people displaced by the far-reaching effects of climate change. They include homeowners wading through the process for buyouts of flood-prone homes, families evacuating during climate-exacerbated disasters, and the families moving en masse from places experiencing environmental and economic changes. In 2018, 16.1 million people globally were displaced because of weather-related disasters. More than 1.2 million of those displaced were Americans.

Hurricane Katrina, Aug. 30, 2005

Water spills over a levee along the Inner Harbor Navigational Canal in the aftermath of Hurricane Katrina, Aug. 30, 2005 in New Orleans. In Louisiana flooding surge to 10 to 20 feet and inundated New Orleans, causing 1,200 deaths and catastrophic damage of over $75 billion. Similarly, in Mississippi storm surge flooding of 25 to 28 feet above normal breached the levees and inundated parts of the state.

Hurricane Ike, Sept. 15, 2008

A road collapsed following Hurricane Ike, Sept. 15, 2008, in Galveston, Texas. The storm produced tropical-storm-force winds extending 275 miles and made landfall as a Category 2 hurricane in Texas and then continued to wreak havoc all the way to Canada. In Texas, Louisiana and Arkansas, 20 people died and 34 were declared missing. In Ohio, the storm was directly or indirectly responsible for another 28 deaths.

Hurricane Sandy, Oct. 31, 2012

Homes in the Rockaway neighborhood were damaged during Hurricane Sandy, Oct. 31, 2012, in the Queens borough of New York. The tropical cyclone merged with another system creating an extra-tropical cyclone, thus dubbed "Super storm Sandy" with intense winds stretching over 900 miles, creating a wave of 32.5 feet in New York Harbor. The storm was responsible for 72 deaths and $65 billion in damage.

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Evidently, since the mid-1970, the cost of structures has steadily increased in different cities throughout the United States. However, home and land values have heavily fluctuated since the mid-2000s. This has resulted from scarcity, supply, and demand within a given housing market. However, if the cost of structures naturally increases with time, why are we not placing our home's value" on its "structure" value"? Furthermore, as we move away from passive energy balancing to personal energy storage, couldn't the Embodied energy of buildings become a personal asset?

The United States' energy infrastructure is starting to change. It is being transformed by an increasing adaptation to electric power. Electric cars, HVAC units, stoves, domestic photovoltaics, and stationary storage batteries are changing the future of cities and urban developments. As renewable energy technology advances and becomes abundant, could we create a new economy for housing? Within this new economy, the infrastructure cost of houses and land, which people usually need to put down, would be offset by the energy and occupancy cash flow generated by the 'home' itself. Will public and private property rights and secured lending systems adapt to hybrid forms of ownership as houses become consumer machines? Could energy then become a form of passive income?

Enphase Energy Inc. Solar and Storage Company

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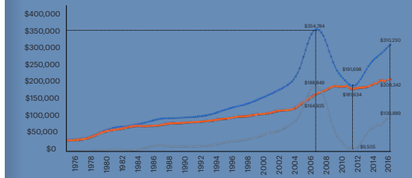
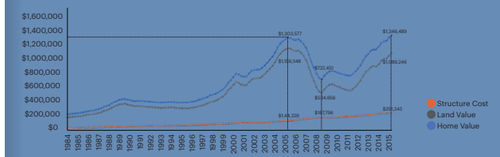
Home Value, Structure Cost and Land Value in Arizona, AZ



Home Value, Structure Cost and Land Value in San Francisco, CA



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Research from:

Housing, Real Estate and Climate Change by Jesse M. Keenan

Housing After Scarcity: Policy, Energy, Settlement Seminar by Michael Bell

Why housing is so expensive in the United States? CNBC Interview with Jesse M. Keenan

Surveys from:

Redfin Surveys

Single family home still standing after Hurricane Dorian Bahamas, 2019, Getty Images

Facts

Project
How to re-frame a solar farm society?

Software
Rhino + Momento 360

Produced
Spring 2022

Seminar
Footprint: Carbon and Design

Professor
David Benjamin

Project
How to code a solar responsive facade?

Collaborator:
Vasco Li

Software:
Revit + Grasshopper + RhinoInside

Produced
Fall 2021

Seminar
Rethinking BIM

Professor
Mark Green

Fictions

Conversations

Thoughts

ENERGY FOOD WATER

The agri-voltaic farm combines agriculture and solar energy harvesting in a mutually beneficial way. Co-located agriculture and solar infrastructure maximizes crop yields, minimize water use, and produce resilient, renewable energy.

The reduction in direct sunlight exposure beneath the solar panels leds to cooler air temperatures during the day and warmer temperatures at night, which allow the crops under the solar arrays to retain more moisture, increasing crop yields and reducing water loss.

Traditional Agriculture and Solar

1 Hectare of solar +
1 Hectare of crops

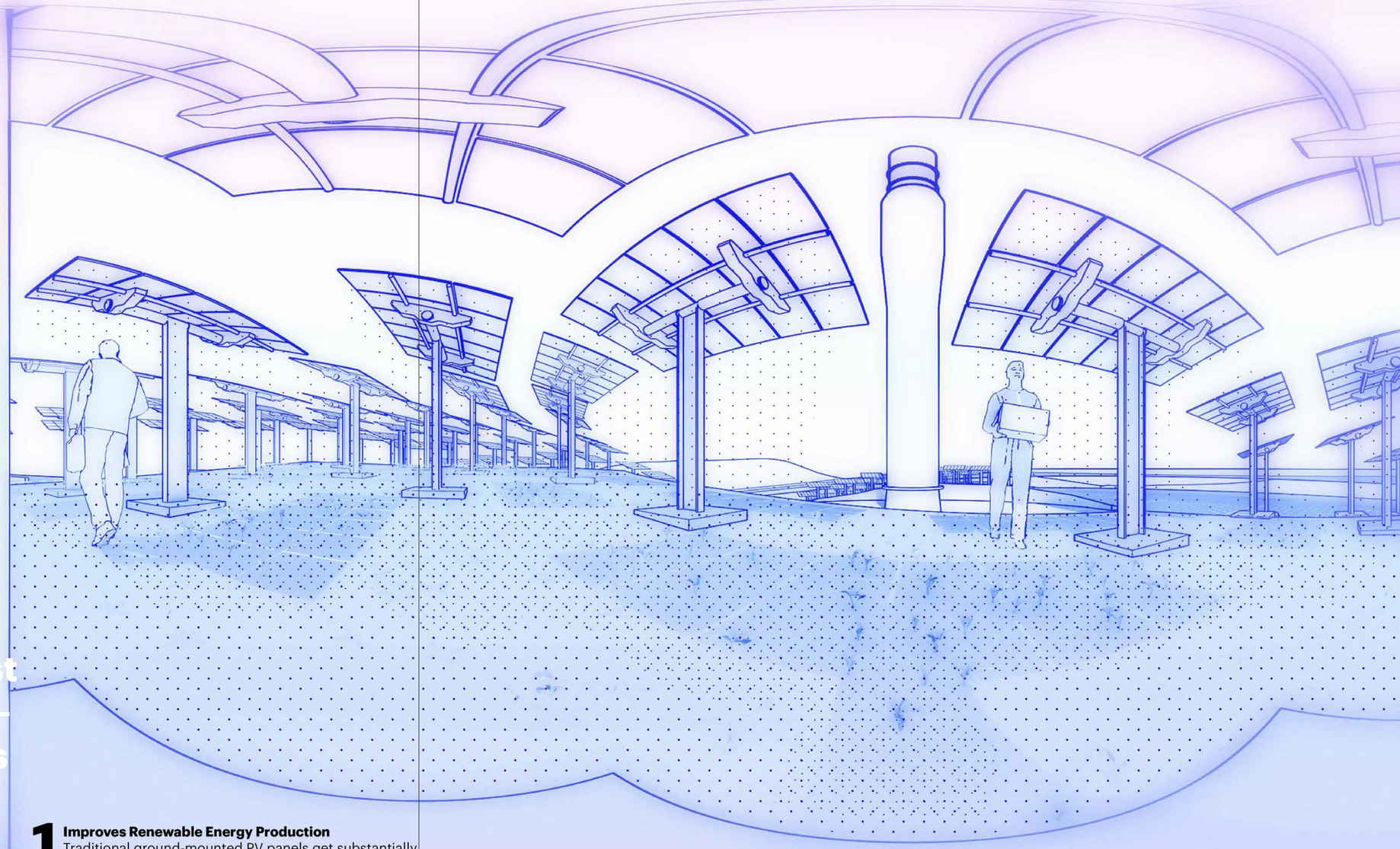
100% Energy
100% Crop

New Agrivoltaic

1 Hectare of crops under Mirror +
1 Hectare of crops under PV panel

160% Energy
160% Crop

Carbon footprint is the most famous—and most urgent—impact of buildings, but it is interconnected with other footprints such as energy, water, labor, food and biodiversity. Each footprint links individual design decisions to global consequences.



1 Improves Renewable Energy Production
Traditional ground-mounted PV panels get substantially warmer during the day due to the heat island effect. This is particularly problematic due to PV panels sensitivities to temperature increases. Swapping gravel for vegetation counters this heat feedback loop.

The PV panels and Mirrors proved to be cooler during daytime hours compared to the traditional panel array by approximately 9°C and produced 10% more electricity.

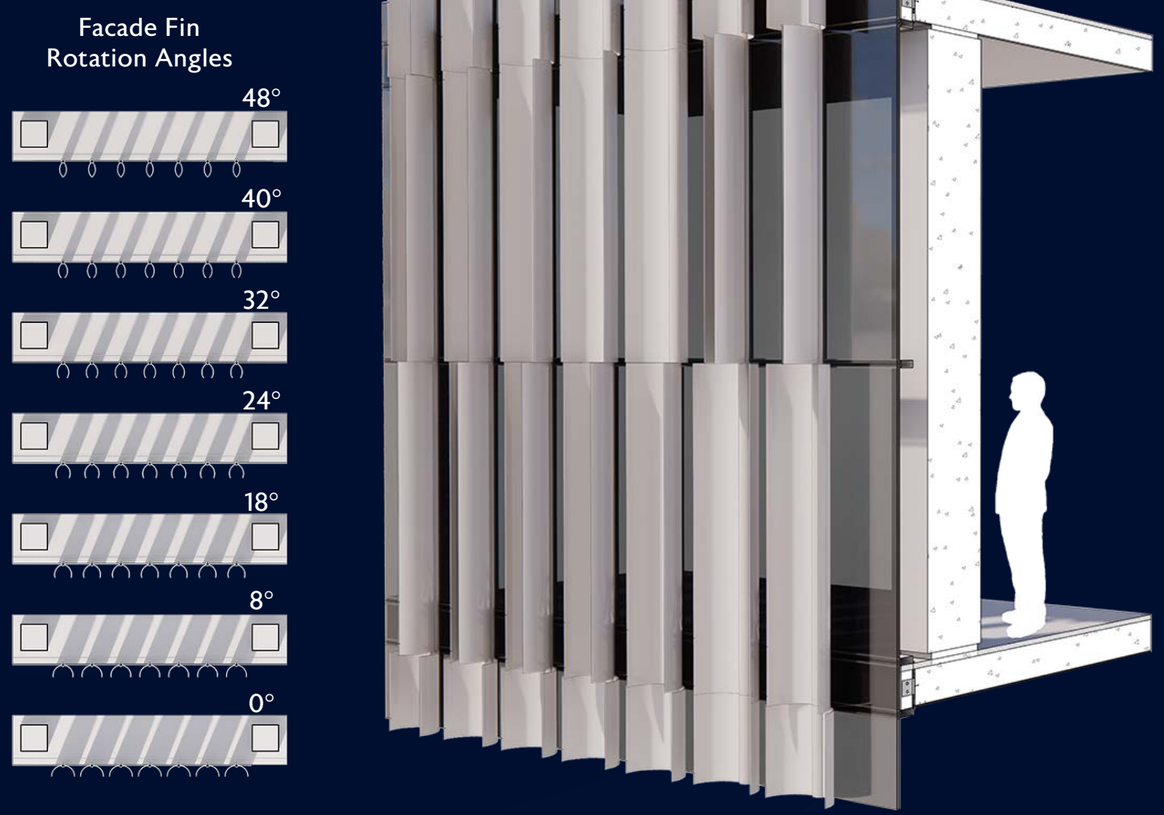
2 Increases Food Production and Efficiency
Consistant and greater moisture in the soil and air creates an ideal environment for greater crop yields.

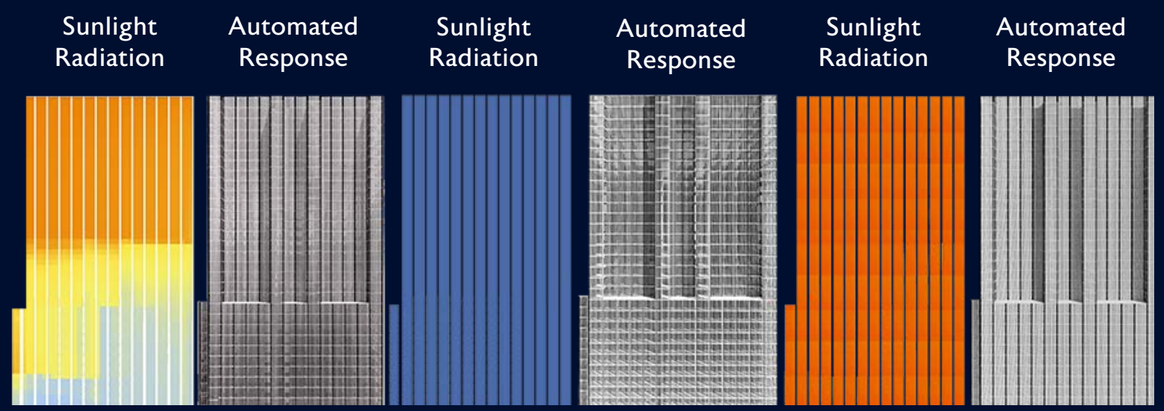
Pepper production was three times greater. Water-use efficiency for the jalapeño was 157% greater. Cherry Tomato total fruit production doubled and the water-use efficiency was 65% greater compared to traditions farming.

3 Substantial Water Savings
Pants have a limit to how much sun they can actually use. It's called the light saturation point. Once reached, any light beyond that point does not increase photosynthesis or help the plant grow, it only increases the plant's water demand. It simply makes the plant sweat, which in turn makes it more thirsty.

When irrigating every two days, soil moisture remained approximately 15% greater and 5% greater when irrigating daily.

Codeing an Adaptive Solar Facade





Data driven methodologies can intensify creative iterations and validate design solutions.

Due to the high energy consumption in cities like New York, the project aims to design a shading system able to be retrofitted onto an existing office building's façade. The proposed Adaptive Solar Facade is a modular, highly integrated, and dynamic building facade. The energetic behavior as well as the architectural expression of the facade can be controlled with high spatio-temporal resolution through individually responsive fins.


Facts
Conversations