# FRAGILITY

2024
Benjamin
Menschel
Fellowship
Exhibition

# RESILIENCE

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# DIRECTOR'S NOTE

Buck Wanner

In the projects completed for this year's Benjamin Menschel Fellowship Exhibition, familiar materials and spaces reveal unexpected depths. Glass becomes a meditation on time, irrigation canals transform into laboratories of renewal, and the basic act of growing food opens onto questions of autonomy and community. Each fellow has followed their curiosity into territory where conventional boundaries—between art and research, personal and political, fragility and resilience—begin to dissolve.

What emerges in these investigations is a particular kind of attention to vulnerability. Whether studying the slow deterioration of materials or mapping the fault lines in our food systems, these projects suggest that true resilience might begin with embracing, rather than resisting, impermanence. The fellows have worked in this fertile territory between breakdown and renewal, finding in it not just subject matter but method.

Their inquiries move across scales with remarkable fluidity. A close study of phosphorous opens onto questions of history and preservation; investigations of local farming practices reveal global patterns of extraction and repair. Yet even as they engage with sweeping environmental and social questions, these projects remain grounded in the intimate work of observation, experimentation, and making.

This speaks to something essential about the Menschel Fellowship Program: its belief that creative practice and critical thinking are not opposite modes but complementary ways of knowing the world. The projects collected here demonstrate how rigorous research can emerge from artistic intuition, and how aesthetic decisions can crystallize years of study.

The conversations between these works—about materiality and time, ecology and justice, decay and regeneration—continue to unfold in these pages. I hope you'll find in them both resonance with your own questions and provocations toward new ones.

# CORROSO

Chiara Leopardi

*It is cheering to think that an object so different from all the others, a form that achieves the maximum strangeness with the maximum of simplicity and regularity and harmony, is rotating in the sky.*

*"If the ancients had been able to see it as I see it now,"Mr. Palomar thinks, "they would have thought they had projected their gaze into the heaven of Plato's ideas, or the immaterial space of the postulates of Euclid; but instead, thanks to some misdirection or other, this sight has been granted to me, who fear it is too beautiful to be true, too gratifying to my imaginary universe to belong to the real world. But perhaps it is this same distrust of our senses that prevents us from feeling comfortable in the universe. Perhaps the first rule I must impose on myself is this: stick to what I see."*

- Calvino, Italo. *Mr. Palomar*. Translated by William Weaver, Harcourt Brace Jovanovich, 1985.

The quest to reconstruct the biographies of objects is fraught with challenges, particularly when the available information is limited. An object's life, much like a narrative, is not confined to a linear trajectory; it is a series of intertwining paths, each influenced by the relationships it forges and the contexts it inhabits. In the landscape of contemporary art, our understanding of objects in time is profoundly enriched by recognizing the agency of materials. This concept implies that materials possess inherent characteristics and behaviors that shape our perceptions, guiding their manipulation and transformation. They become active players in an artistic narrative. *Corroso* (Corroded) is an exploration born from questioning how corrosion can amplify the sensory attributes of glass, revealing tales of decay and rebirth.

For months, *Corroso* existed solely as a notion sketched on paper. Driven by a desire to deteriorate material form rather than prolong its lifespan, as I had learned in object conservation, I searched for the clearest material to facilitate deterioration. I wandered Manhattan, gathering shards of glass from the street, cleaning and scraping them, yet nothing seemed to yield the desired result. Each piece, a fragment of potential, resisted transformation.

It was during this time that I sought out UltraClear Glass (UCG), a marvel of modern innovation, celebrated for its exceptional clarity. Formulated with a higher percentage of silica and lower levels of iron and other coloring agents, UCG promised a transparency that transcended the ordinary. To procure samples, I adopted the persona of an architect, fabricating an ambitious vision of luxury apartments near Cooper Union—a venture that would surely yield millions. For three long summer months, I wove this elaborate ruse.

In his article "Blue Sky Urbanism: The Socio-Territoriality of Ultra-Clear," Andrés Jaque discusses the implications of UltraClear Glass in urban settings, noting that it "has become so pervasive that it is invisible to those who inhabit it." This glass exhibits enhanced light transmittance in the cooler portion of the light spectrum—the blue range between 450 and 550 nanometers—resulting in a perception where "everything seems more blue" when viewed through UltraClear Glass. For those who can afford to gaze through it,

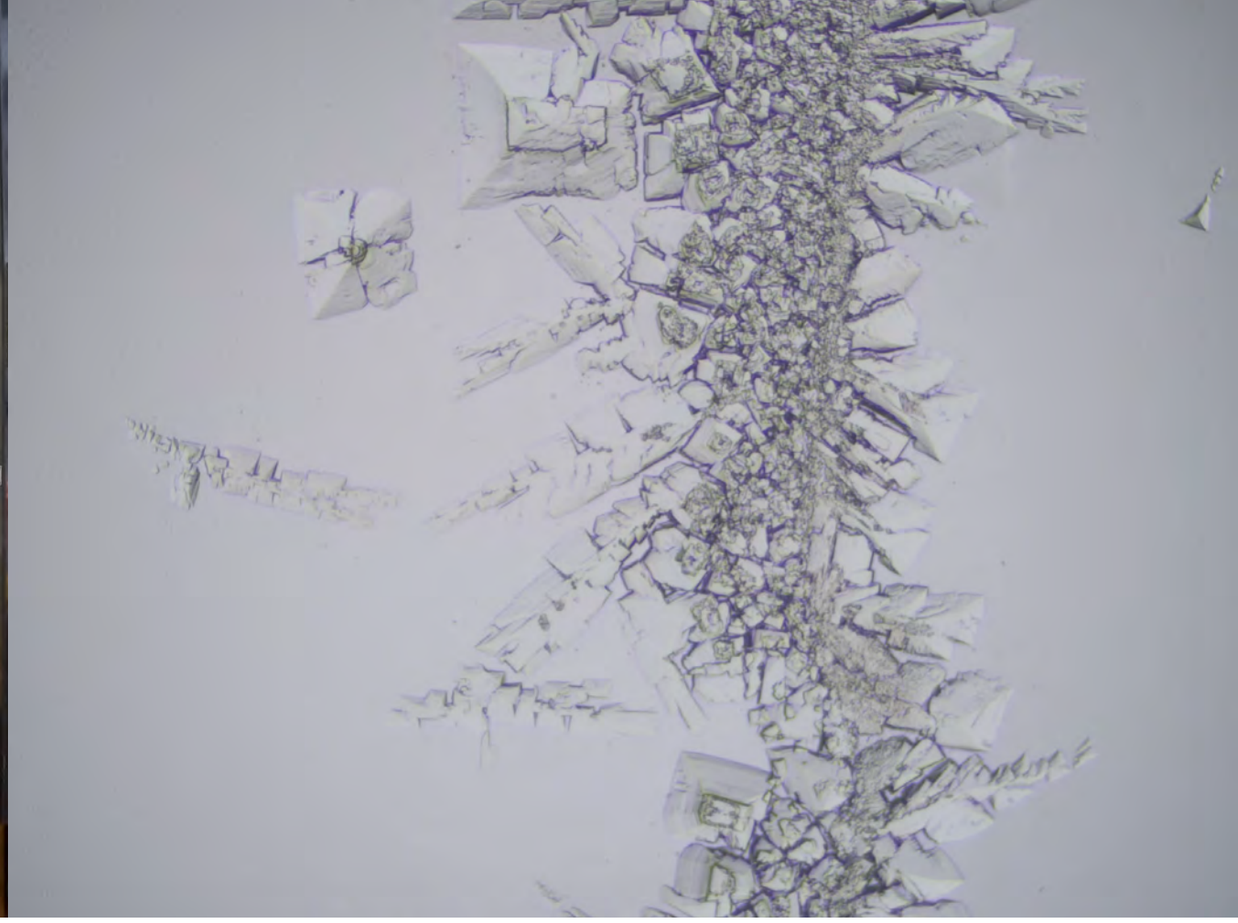



Image captured using a Trinocular Compound Microscope


this glass distorts the true color of the sky, rendering it even bluer. Its influence on visual experiences sparks important conversations about accessibility and environmental factors in urban planning and design.

In the midst of researching the chemical corrosion of glass using Hydrofluoric acid, I encountered Fabiola Barrios, a professor in the chemistry department, one evening on the terrace of Cooper Union. I had shared my aspirations with several professors, but each response echoed a refrain of caution when I mentioned HF. This type of acid is used in various applications, including glass etching. Unlike others, Hydrofluoric acid penetrates the skin and wreaks havoc on deep tissues, with pain often delayed for hours. The specter of limb loss or worse loomed large in their warnings. Nonetheless, I was pointed toward Fabiola. She suggested we used Buffered Oxide Etchant, which provides controlled etching. BOE ensures precision in microfabrication processes and is also essential for creating intricate patterns in integrated circuits. This conversation opened the doors to the lab.

In the lab, time became a fluid concept, slipping through our fingers as Fabiola and I delved into conversations. Initially, we adhered to the rigid protocols of the laboratory, timing the acid exposure with the precision of a metronome. However, we began to embrace a more intuitive approach.

A theory emerged regarding the formation of the marks on the glass. In a very thin layer of water mixed with acid, just above the surface of the glass, a compound known as ammonium hexafluorosilicate begins to develop, formed from the interaction of fluoride from the acid and silicon from the glass. This salt crystallizes into well-ordered geometric shapes on the glass surface. As additional fluorides react, certain areas of the surface become obstructed by the crystals, permitting only the surrounding regions to engage in further reactions. Essentially, these crystals function as stencils, leaving behind geometric impressions on the glass. When rinsed with a base and water, the crystals dissolve, erasing the traces of their existence.

*Ultra-clear glass has unique optical properties due to its low iron content, transmitting 91% of light within the visible region of the electromagnetic spectrum. The Buffered Oxide Etchant (BOE, 10:1), containing about 36% ammonium fluoride (NH4F) and 4.6% hydrofluoric acid (HF) etches silicon dioxide (SiO2), the main component of glass, at an approximate rate of 55 nm/min. The silicon atoms at the surface of the glass break their bonds with oxygen to make new bonds with fluorine. The process is thermodynamically favored because the Si–F bonds are stronger compared to Si–O bonds.*

*In the solid state, glass has an amorphous structure while the ammonium hexafluorosilicate (NH4)2[SiF6] formed during etching has a very organized structure. At the surface of the glass, it crystallizes as microscopic cubes, with the [SiF6]– and (NH4)+ ions arranged in a characteristic lattice with a repeating pattern.*

- Fabiola Barrios Landeros

We began to experiment with longer exposure times, sometimes leaving the glass slightly elevated in the dipping tank for hours, even days. This shift unveiled the extraordinary transformations occurring: the crystals, previously visible only under a microscope, began to reveal themselves to the naked eye. Each layer of acid exposure etched unique patterns, a testament to the dynamic nature of the material. Fabiola remarked that “discovering these shapes under the microscope was unexpected and exhilarating. It was the odd observation that an orderly phenomenon took place on a disordered material. Scientists carry out experiments to test a hypothesis, to find evidence through experimental data, to measure phenomena. We are searching for objective answers, often denying ourselves the time to appreciate the subjective beauty in science.” This alternative approach to the lab allowed us to marvel at the spontaneous reactions of materials when left to their own devices.

What, then, are the political reverberations of acknowledging that all things possess a form of vitality? In a radical reimagining of materialism, Jane Bennett unveils a world where matter is not inert but teeming with life, a perspective that goes through the realms of politics, ecology, and the very fabric of our daily existence. She draws upon a rich philosophical lineage, tracing a path from Baruch Spinoza to Gilles Deleuze, and extending to contemporary thinkers like Manuel DeLanda and Brian Massumi. Bennett advocates for an ethical engagement with materials, suggesting that recognizing the vitality of non-human entities can lead us toward more responsible and sustainable practices.

At the heart of this discourse lies an assertion: everything is alive, intricately woven together, and perpetually in a state of becoming. This recognition invites us to reconsider our relationships—not only with the world around us but also with ourselves and one another. It beckons us to see the interconnectedness of all entities, urging us to embrace a more holistic understanding of existence, where the boundaries between the human and non-human blur, and where every thread in life contributes to the unfolding narrative of our shared reality.

As I continued to delve into the relationship between the acid and the glass, I became increasingly attuned to the broader implications of this work. The process of corrosion, rather than diminishing the glass, enhanced its narrative potential, revealing layers of meaning that might otherwise remain obscured. Each etch emerged as a pause to reflect on our interactions with the world, to acknowledge that every choice we make reverberates through a web of existence. In this light, the act of “creation” becomes not merely a personal endeavor but a shared responsibility, a dialogue with the materials that surround us.

In the course of this exploration, I have learned that sometimes the most profound discoveries arise when we allow ourselves to step back and let materials reveal their stories in their own time. In this act of surrender, we create the conditions for a deeper connection to the world around us, recognizing that we are not merely observers but active participants in the narrative of our environment.

Thank you to Fabiola Barrios Landeros, Zachary Poff, Yu-Yun Hsieh, Ernesto Klar, Carlos Irijalba, Buck Wanner, Sarah Nunberg, Corinna Ray, Victoria Velasco, Abhishek Sharma, and Julia Kim.

# LEARNING FROM MANOOMIN: THE ARCHITECTURE OF FOOD SOVEREIGNTY

Aaliyah Torres
Gabriel Riley Howard

The land surrounding the Hudson and East Rivers was originally inhabited by the Lenape, Canarsie, Matinecock, Munsee, Mohican, Wappinger, and Schaghitcoke Nations. Lenape translates to “the people;” they are an Algonquin-speaking, hunter-gather tribe that migrated seasonally, stretching across New York, Connecticut, New Jersey, Pennsylvania, and Delaware. Due to histories of trade, war, forced relocation and displacement, there are only three federally recognized Lenape tribes in the United States. Many Lenape tribes of the Mid-Atlantic and Delaware Basin relocated to New Jersey, Wisconsin, Oklahoma, and Ontario. Many Lenape still reside in Lenapehoking.

The Cooper Union, located in Manhattan’s East Village, has no institutional land acknowledgment. This naturalizes the violence of settler-colonialism and the genocide of Native people. As students at The Cooper Union, we balance Manoomin and decolonial frameworks with the complex histories of settler colonialism in Turtle Island and beyond. These politics, histories, and violence frame our position as academics at The Cooper Union. We see Manoomin as a teacher; the Medicine Wheel expands to teach us beyond our studies in WI. We are asked how we relate to ground. We are asked to place ourselves.

We consider the past year at The Cooper Union, which proved a jarring dissonance of freedom and control. Surveillance cameras flew up over spring break. The end of year show closed to the public. The administration was visibly shaken with fear of political engagement.

We look towards Indigenous, Native American, Latinx, Black, Queer, and Palestinian teachers, writers, caretakers, activists, land-stewards, and water protectors. Palestinian liberation, Black liberation, Queer liberation, and Native American Indian liberation are entangled. We demand that all institutions on stolen land contend with the legacies of settler-colonialism and the ongoing mechanisms of genocide that target Indigenous populations in Turtle Island and Palestine.

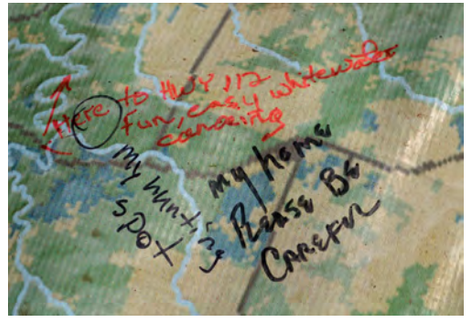
We are indebted to Manoomin, Lake Superior, Bad River Tribe, Red Cliff Band of Lake Superior, Oneida Nation, Northwestern University, University of Minnesota, GLIFWC, Kathy Smith, Mike Wiggins, Jordan Gurneau, Maddy Nyblade, and countless others that contribute

*Gabriel Riley Howard (he/they) is a white settler on Turtle Island (North America) of Irish and German descent. He was born on the unceded Kickapoo, Kaskaskia, Myaamia, Peoria, Wyandot, and Erie tribal land that is presently known as Toledo, OH. Aaliyah Torres (they/them) is a white and Hispanic settler of Irish, Puerto Rican, and Mexican descent born on Peoria, Potawatomi, Myaamia, Očhéthi Šakówi, Hoocąk, Kaskaskia, and Kickapoo tribal land presently known as Chicago, IL. We both reside on the unceded Lenape territory, of Manhatta, Lenapehoking, presently known as Manhattan, New York.*

The mechanical parching of manoomin at the Goslin Rd Property on Bad River Reservation during the August Rice Camp.

Young manoomin stalks grow on the Kakagon Sloughs.






The GLIFWC watershed map serves as an example of decolonial imaging. Labels and names are in Ojibwemowin and Anishinaabeg. The map is full of personal reflections on the land

Lac du Flambeau seen from WI-47 N.

The Mino Bimaadiziiwin Farm (Return to the Good Life Farm) is located at the Red Cliff Band of Lake Superior Chippewa Reservation. The farm centers tribal sovereignty, with over 35 acres of garden, orchard, wetlands, forests, and open pasture.



to Manoomin's Mino-bimadiziwin, or Manoomin's "Good Life." Thank you for sharing your work with us. We extend gratitude to Professor Benjamin Aranda, Professor Nora Akawi, The Cooper Union SJP and BSU, and our peers in NY and WI that support the work. We pull from the scholarship of Deborah Cohen, Max Liboiron, Angela Davis, Nada Elia, Winona LaDuke, Eve Tuck, K. Wayne Yang, Basil Panek, Maddy Nyblade, Robin Wall Kimmerer, the Kawe Gidaa-naanaagadawendaamin Manoomin "First We Must Consider Manoomin/Psin" tribal-university collective, and many others as guides in our research.

In the practice of decolonization, we position this work as a collaborative project that has no single author. *Learning from Manoomin* is an ongoing practice of documentation, archive, conversation, and accountability. This is a multi-media, group work that seeks to unsettle settler colonialism through writing, drawing, curation, and other re-presentations that center an Indigenous worldview. We jump between scales of time and geography to consider the trans-geographic nature of settler-colonialism. We bring together and arrange pre-existing words, stories, facts, statements, images, and experiences. We re-present and respond to the research of others through writing, drawing, installation, and modeling to investigate the relationships between Manoomin, food sovereignty, architecture, institutional accountability, decolonization, imaging, narrative, craft, archive, and museum.

For the Ojibwe, Manoomin is a central part of their culture, spirituality, health, and history. It is food, plant, life-giver, sustenance; a being which possesses more-than-human qualities. Manoomin is "history and vocation, a living connection to our ancestors and a testament to our cultural resilience" (Sonderegger, 2024).

In 796 AD, the seven prophets arrived to the Anishinaabe Nation, which stretched far across the North-Atlantic coast of Turtle Island, with a prophecy of migration, warning, "if you do not move you will be destroyed" (Benton-Benai, 1985). They warned of a light-skinned race, with a "face of death," and a "face of brotherhood," whose decisions would drastically impact the life of the Anishinaabe people (Ibid). The Anishinaabe migrated east, searching for "the land where food grows upon the waters" (Ibid). When they arrived at Nayanno Nibiimaang Gichigmiin, the Great Lakes Region, they found Manoomin's stalks rising from the water. The wetlands of Lake Superior became the home of the Lake Superior Ojibwe. The Potawatomi and Ottawa settled in other areas of Nayanno Nibiimaang Gichigmiin.

In 1854, the Treaty of Lapointe established US ownership of most Ojibwe land. In return, the US allowed reservations, annual payments, hunting and fishing rights, debt forgiveness, supplies, and educational stipends for the Lake Superior Ojibwe. Following the treaty, the United States government began targeting Ojibwe religion, spirituality, culture, and way of life: children were forced to attend boarding schools, and Ojibwe people were forced to learn English, convert to Christianity, and become individual farmers (Stone, n.d.). Mining and timber companies removed natural habitats; hunting and fishing became nearly impossible. Many tribes were forced to live off government stipends alone.

Foreign to Manoomin, white settlers employed devastating harvesting techniques that damaged Manoomin's stalks. As settlers entered the wild rice trade, industrialized logging, mining, and shipping made traditional rice stewardship almost impossible (Whitney, 2015). Today, fossil fuel infrastructure, urban growth, the introduction of invasive species, and water pollution present additional threats (Ibid).

Cultural preservation, knowledge-keeping, and environmental protection of Manoomin are essential to Ojibwe sovereignty of land, water, and food. An effect of the dispossession and displacement initiated by settler colonialism is the loss of access to traditional food. Unsettled from traditional sources of sustenance, culture, and economic sovereignty, many Indigenous people are forced to live on food stamps, which sustain diets contributing to diabetes, obesity, and hypertension (Elia, 2023).

During our travels, we went from Toledo to Chicago, Oneida Nation, Lac du Flambeau Band of Lake Superior Chippewa Indians, Stockbridge-Munsee Band of Mohican Indians, Bad River Tribe, Red Lake Band of Chippewa Indians, Red Cliff Band of Lake Superior Chippewa, Madeline Island, and Ho-Chunk Nation. Our travels were punctuated by visits to the Oneida Nation Museum, the Arvid E. Miller Memorial Library and Museum, the Lac du Flambeau Government Boarding School Boys Dormitory, the Moka'aangiizisiban Tribal Museum, the Bad River Rice Camp, the Madeline Island Museum, and the Bad River Manoomin Powwow.

We traveled by car, camping on and off reservation. In the evening, we built fires, cooked corn and beans, and discussed the day to come. At the Bad River Rice Camp, we connected with Bad River Tribal elders, met leaders from GLIFWC, whittled rice knockers, and made friends with Bad River children. We were invited to an informal inter-tribal meeting focused on the protection of Manoomin, and we finished our trip at the Bad River Manoomin Powwow. We collected and brought back images, words, discarded objects, books, pamphlets, experiences, craft objects, and relationships.

In this exhibition, we contend with the beauty of visiting a place, of being a stranger, and asking for permission. This privilege is not without its politics; we are researchers and tourists, from "over there," or "elsewhere," asking questions and full of our own biases.

We are faced with the following questions: How might this exhibition serve as an opportunity to engage with questions of institutional complicity in settler colonialism, settler privilege, and violences of Western, Euro-centric worldviews and knowledges? How does the history, sovereignty, and resilience of Manoomin connect to the ongoing Palestinian liberation movement? What would it be like to image, model, and archive in alliance with the Ojibwe people, the Great Lakes, and decolonization? What does a decolonial, Indigenous future look like?

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# PARADOX/ DRAGLINE

Zaid Arshad

*"Polk County. Black men laughing and singing. They go down in the phosphate mines and bring up the wet dust of the bones of pre-historic monsters, to make rich land in far places, so that people can eat. But, all of it is not dust. Huge ribs, twenty feet from belly to backbone. Some old-time sea monster caught in the shallows in that morning when God said, 'Let's make some more dry land. Stay there, great Leviathan! Stay there as a memory and a monument to Time.' Shark-teeth as wide as the hand of a working man. Joints of backbone three feet high, bearing witness to the mighty monster of the deep when the Painted Land rose up and did her first dance with the morning sun. Gazing on these relics, forty thousand years old and more, one visualizes the great surrender to chance and change when these creatures were rocked to sleep and slumber by the birth of land."*

- Zora Neale Hurston, *Dust Tracks on a Road* (1942)

This project is centered around the effects of phosphorus mining, production, and usage across time and particularly in the present. It uses the "Bone Valley" region of Central Florida as a site through which the history of a single element can point to far-reaching connections between government and corporate levels of ecological and societal change—a *contact zone*. Further, it asks how the auto-theoretical and anthropological method can be employed to express the relationships between religion, folklore, colonial and post-colonial exploitation, travel writing, and oral history.

Phosphorus is a waxy, flammable chemical element that is found in several allotropes, primarily as white or red phosphorus. It is found in all of our bodies—in our bones, urine, and feces (all three of these would later be used to produce phosphorus). White phosphorus was accidentally discovered by German alchemist Henning Brand in 1669 while he was experimenting with boiling urine in pursuit of the infamous "Philosopher's Stone" which was said to bear the ability to transform base metals into gold. Phosphorus allotropes and anions today are used in food, medication, camera flashes, pesticides, rat poison, nerve gas, detergents, toothpaste, matchsticks, fireworks, munitions, fertilizer, BP LEDs, electric vehicle batteries, bronze and copper improvements, the production of methamphetamines, and more.

The *phosphorus paradox*, a term popularized by environmental journalist Dan Egan, refers to a twofold concept that encompasses the fact that (1.) although phosphorus is necessary for plant and human life, in excess it causes environmental harm and (2.) that, despite its necessity, phosphorus is mined from non-renewable resources with pending expiration dates. The same chemical substance responsible for sustaining all types of life is also a cruel and devastating agent in harming life.

The Christian theologian St. Augustine reported in the third century AD that a perpetual light came from the sepulchers of early Christians, and contemporary studies suggest that this was due to self-igniting phosphorus rising from decaying cadavers.

In the 1840s, English agricultural scientist John Bennet Lawes began producing "superphosphate," the first artificial fertilizer, from combined rock phosphate (salt phosphorus anion) and sulfuric acid. At the same historical moment, scientists discovered that phosphate ore could be mined from the earth, and the originally Europe-based capitalist ventures began to evolve into colonial extractivist projects. Business owners began testing, surveying, and prospecting land to be used for mining. This operation has not ceased, despite the harm it causes.

The usage of phosphates as plant fertilizers causes significant environmental damage, such as eutrophication (the proliferation of toxic blue-green algal blooms in bodies of water). The water turns to a green, slimy sludge. I collected some of this algae-laden water from different drainage sites and allowed it to ferment, producing a natural ethanol.

In Haiti's history, phosphorus remains a major, yet sidelined, importance. Lanavaz (Navassa Island) is a three-square-mile island off Haiti's west coast, which is the site of a 167-year land ownership dispute. The island rocks are covered in guano, a major source of phosphorus. In 1857, American ship captain Peter Duncan claimed "discoverer's rights" to Lanavaz and sold it to his employer who had recently established the Navassa Phosphate Company of Baltimore (NPCB). The NPCB relocated 137 Black prisoners from Baltimore to work as miners on Lanavaz under the supervision of eleven white supervisors. Due to the deplorable conditions under which the men were forced to work, they elected to overthrow their employers and killed five of the eleven supervisors. Resultantly, a number of the miners were sentenced to death but eventually the sentence was changed to life imprisonment. Mining operations were permanently halted on the island in 1898 due to the Spanish-American War, and in 1900 the island was sold at auction by the NPCB to a Baltimore native. Since 1999, Lanavaz has been owned and regulated by the U.S. National Wildlife Refuge System (NWRS) and is no longer approved for visitation.

Phosphate ore was first discovered in Florida in 1883, six years after the Lanavaz mines were shut down. The first mining operations were started by the Arcadia Phosphate Company in 1888 in a phosphate-rich area known as Bone Valley. Land was acquired by the Peace River Phosphate Company through an exploit scheme whereby company officials told landowners that the native palmetto bushes were ripe with tannic acid, and that the company would extract the tannic acid and sell the land back in exchange for a song. With this scam, the Peace River Phosphate Company acquired 27,520 acres (47 square miles) of land.

While the manual labor of the wheelbarrow assembly line method discouraged miners and company owners alike from investments, the invention of the dragline in 1904 expedited the production of phosphates. A dragline is a heavy-duty excavator—a crane with a bucket attached to cable wire. It is primarily used for surface mining purposes. The Ridgewood Southern Phosphate Company, started by Harry L. Pierce in 1919, was the first to use a dragline for P mining in Florida. The dragline has become a well-known symbol of some parts of Central Florida; the Mulberry Phosphate Museum in Polk County houses a retired dragline bucket filled with "real phosphate materials" from the Bone Valley with fossils.

For alchemists, phosphorus' significance was in its perceived ability to capture light, since oxidized white phosphorus glows green.

For early photographers, who occupied a space midway between modern science and alchemical mysticism, the significance of phosphorus recalled the observations of St. Augustine and Henning Brand. Fox Talbot theorized in *Notebook M* that he believed "the cause of insolation or Solar phosphorescence may be that the solar light causes a vibration in the phosphorus which continues long after the exciting cause is withdrawn…."

For pharmacists, the discovery of phosphorus began an experimental business venture whereby sick patients suffering from erectile dysfunction, colic, asthma, fever, tetanus, apoplexy, and gout acted as test subjects for the possible treatment of ailments using phosphates. These tests used circumstantial evidence to justify the implementation of phosphate-laden remedies, despite the possibility of phosphorus poisoning in the instance that the P quantities were too high. Then, in the 18th century, phosphorus was mostly produced from boiling urine and/or burning bones, making it relatively cheap to produce and therefore able to render an increased profit. In contemporary medicine, phosphorus is probably best known as a homeopathic treatment for anxiety, fears,

insomnia (and resulting headaches), dandruff, cough, pneumonia, nose bleeding, gastritis, glaucoma, hoarse voice, and excessive menstrual bleeding—and so much more. In homeopathy, symptoms are not treated in such an aleatory manner; instead, the full circumstance of one's ailment is considered against the range of treatments.

For chemists and engineers, phosphorus allowed for the ability to mass-produce matches, a simple method of starting a flame. It simultaneously posed a health threat to the female factory workers who were in constant contact with the same phosphorus, which caused bone and teeth degradation referred to as "phossy jaw." These women would also use the phosphorus from their factories to poison their husbands and induce abortions, which caused health problems for the mothers as well as the fetuses.

Additionally, the discovery of white phosphorus allowed for the development and construction of bombs and flares. White phosphorus is still used today in artillery and munitions despite its illegality near civilian areas according to human rights law. WP projectiles like the M825A1 used by the U.S. Army in Fallujah, Iraq in November 2004 and by the IDF in Dhayra, Lebanon in October 2023 remain in production and usage all over the world. When WP comes in contact with oxygen, it burns at temperatures upwards of 1,470 degrees Fahrenheit. When an M825A1 shell is fired, it produces a thick WP pentoxide smoke screen that causes temporary or permanent eye, nose, and respiratory tract damage. Additionally, the shell contains 116 felt wedges covered in WP which ignite in the air, raining down and burning through anything and everything until it is deprived of oxygen or burns out completely. The entry of WP into the skin can also cause severe organ damage or failure. Between the first usage of white phosphorus munitions by the U.S. Army in WWI and contemporary usage of the same munitions by Israel and Russia, it has been confirmed that at least seven nations have used illegal WP munitions in 16 wars or conflicts. Countless lives have been lost or drastically changed by this usage of WP.

For about three weeks, I lived between an RV, my grandmother's home, and my aunt's home near active, unincorporated, and defunct phosphate mining sites, making trips to film at and collect earth material from the towns of Riverview, Nichols, and Brewster.

In the film *Will the surveyors envy the dead?* (2024) short clips of moments throughout my time there are collaged and minimally manipulated to draw visual cues between the natural and built environments as well as the persons who inhabit them.

The voice of a narrator is heard in the background, conveying the sentiments of Professor Jaclyn Lopez, Florida Director and Senior Attorney at the Center for Biological Diversity. Professor Lopez established and directs the Jacobs Public Interest Law Clinic for Democracy and the Environment at Stetson's College of Law. She coordinates campaigns in the Southeast and Caribbean, focusing on protecting imperiled species and ecosystems. The description of her 2017 lecture presentation "Florida's Frightening Phosphate Problem" at Stetson University of Law reads: "Florida is home to the world's largest phosphate mine, and receptacle for one billion tons of radioactive phosphogypsum, the hazardous byproduct from turning mined phosphoric ore into fertilizer. And the problem is only growing. The industry now seeks to expand this land-altering practice by 50,000 acres, altering waterways, destroying habitat."

In 2022, Professor Lopez published a legal review entitled "EPA's Opportunity to Reverse the Fertilizer Industry's Environmental Injustices," which "examines the regulatory failures that have given rise to the proliferation of phosphogypsum stacks [i.e. mountains of toxic chemical waste produced by phosphate mining] in vulnerable communities and sensitive environments in the United States," and "argues that EPA has the authority, and with President Joseph Biden's Executive Orders, the mandate to take corrective action to remedy these environmental injustices."

In addition to Professor Lopez, I spoke with La Mesa, California based Pamela Hird Klein, PDHom, who has worked as a classical homeopath for almost 26 years. As she explains, "Homeopathy is a holistic form of medicine based on *Like Cures Like* or *The Law of Similars*. It was developed by the German physician Samuel Hahnemann in the early 1800's." Essentially, the homeopathic thesis states that a substance which is harmful in large amounts can grant cure in small amounts. The







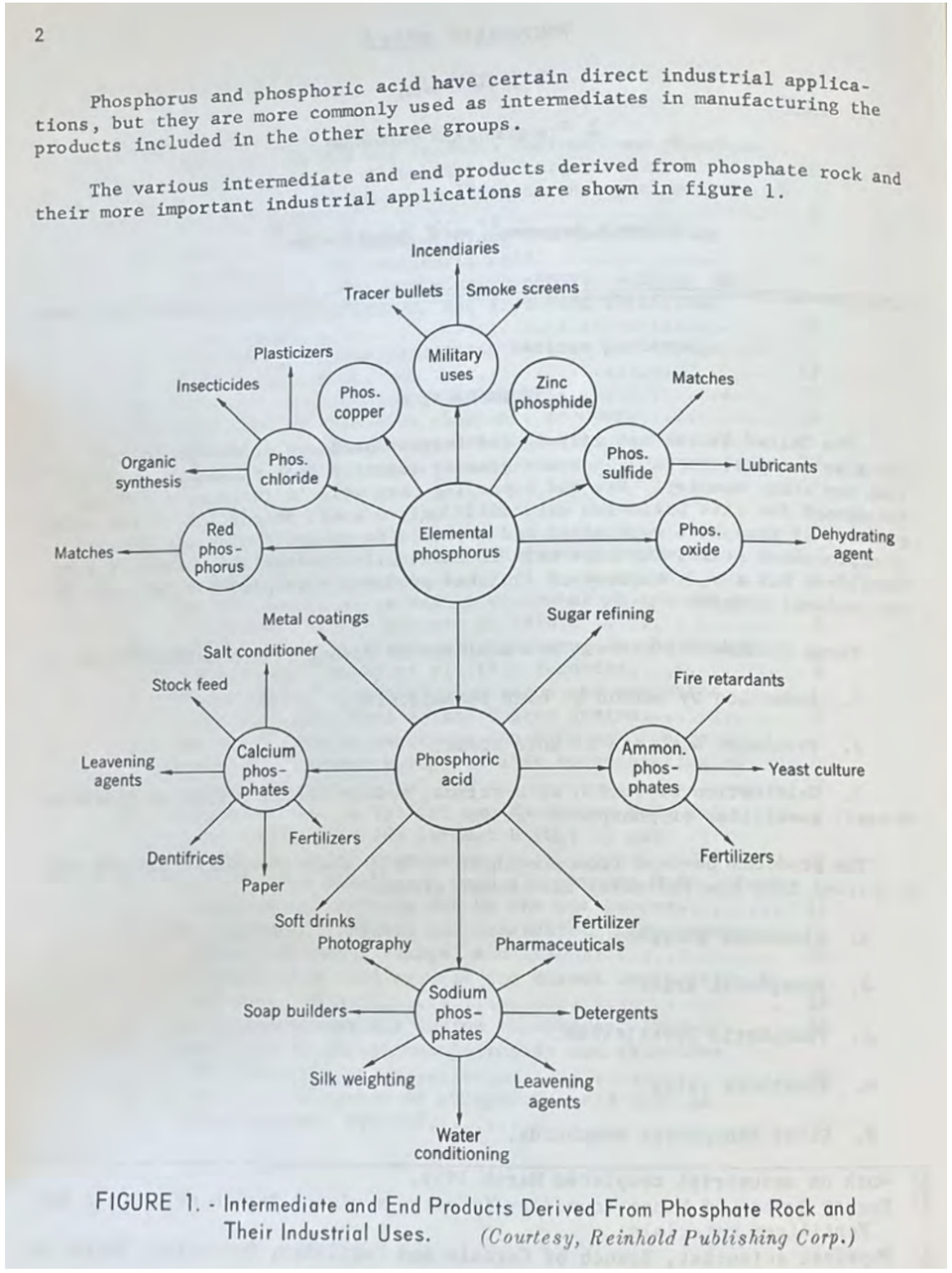


FIGURE 1. - Intermediate and End Products Derived From Phosphate Rock and Their Industrial Uses. *(Courtesy, Reinhold Publishing Corp.)*

William H. Waggaman & E. Robert Ruhlman, USBM IC 7951 Phosphate Rock (In Two Parts) 2. Processing And Utilization.
The National Institute for Occupational Safety and Health (NIOSH), 1960. Published by the United States Department of the Interior.

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homeopathic medicinal system is based on the periodic table, making phosphorus one of the original forms of homeopathic treatment.

Featuring shots of the production sites and facilities of phosphate mining companies, phosphogypsum stacks, urine, other bodies of water, as well as wildlife and landscapes both natural and industrialized against homes of all kinds, *Will the surveyors envy the dead?* makes a slowly evolving picture of a world surrounding this chemical. At the end of the film, material from the extensive collection of phosphate-related documents housed in the University of South Florida Library's Special Collections Department create an index of this multifaceted history.

The film is shot on an iPhone and a digital photo-microscope.

Additionally, my travels are cataloged in an epistolary, diaristic text alongside images. This text is a way of contending with the long, complex history of travel writing. It combines various literary forms to situate Bone Valley as a *contact zone*—a time-space wherein different cultures interact:

*"Autoethnography, transculturation, critique, collaboration, bilingualism, mediation, parody, denunciation, imaginary dialogue, vernacular expression: these are some of the literate arts of the contact zone. Miscomprehension, incomprehension, dead letters, unread masterpieces, absolute heterogeneity of meaning: these are some of the perils of writing in the contact zone."*

- Mary Louise Pratt, *Arts of the Contact Zone* (1990)

The part of Florida I visited has been chopped up into pieces by land surveyors at some point as the first step on the journey to the issues that phosphate mining poses today. This chopping up is the way places have come to be. Land surveying, an indexical process much like—and which often involves—photography, can then be said to then be an *afterlife* in the way that film and photography indeed are. The grid and the measurement are apparatuses, too.

In some ways, the whole project is about an afterlife:

*Bone Valley*, that nickname, refers to the fact that Florida is only so ripe with phosphorus because of all the dinosaurs who once roamed the land, their fossilized remains morphing over time into the material which gives life back to plants.

A paradox, an afterlife.

Thank you to my parents, to my grandparents, my aunts, my uncles, and the rest of my family.

Thank you to Jaclyn Lopez, Pam Klein, Abney Henderson, Julia Arin Cooper, Terry Eagan, Okasha Arshad, Fia Backstrom, Sarah Richter, Coco Klockner, Buck Wanner, Dylan Clark, Leyla Ba, Joey Russo, Lucy Raven, and so many more.



# PLANT DOCTOR
# 植物醫師

Ginger Jingzhe Fan
Evan Chiang
Arthur Lee

Plant Doctor 植物醫師 emerged from our walks through fields of strawberries, betel nuts, chili peppers, and papayas in Taiwan. In those fields, we conversed with farmers, pesticide store owners, university professors, and Plant Doctors, engaging in dialogues that revealed Taiwan's intricate ecosystem and agrarian landscape—a terrain shaped by the coaction of traditional practices and emerging professions. Beyond these conversations, we carefully listened to the biophony sung by bugs, rivers, crops, and mountains. The relentless stampede of industrial machines transforming nature's habitats into sites of extraction often drowns out these sounds. With a tendency to overlook the rhythms of the natural world, humans' trampling silences ecosystems. Intricate soundscapes and biological exchanges amongst the flora and fauna of Taiwan's valleys of paddy fields and subtropical evergreen forests are subjugated to the spritz of pesticides: a destructive industrial invention that abstracts molecular energy flows of life processes into the homogenizing function of capital accumulation: M-C-M'.

Taiwan's agricultural landscape is dominated by monoculture farming, particularly fruit cultivation for specialized markets often driven by tourism. Many of Taiwan's farms are smaller, family-run operations that rely heavily on pesticides to maintain the appearance of perfect, unblemished fruit. This reliance on pesticides, which has persisted for decades, stems from a mindset focused on maximizing yields. Combined with the effects of climate change, it has led to new crop diseases. Farmers often seek quick fixes to ensure seasonal harvests, such as importing new plant species or applying more pesticides, without considering long-term solutions. Currently, the pesticide store acts as the primary social infrastructure for farmers on pesticide use, whose motives are to sell pesticides and provide financial tactics. With Taiwan's agricultural practice defined by a binary relationship between farmer and pesticide vendor, monetary values supersede the cumulative damage pesticides continue to inflict on the land.

Plant Doctors were introduced by The Ministry of Agriculture in Taiwan, in response to the overuse of agrochemicals, offering an ecological alternative to the pesticide-driven status quo, such as replacing pesticides with nature's very own pest repellents. At the heart of their philosophy is a commitment to sustainability, where solutions are thoughtfully tailored to meet the specific needs of each plant and its environment. Unlike quick chemical fixes, plant care requires consistent, patient effort. Professor Hsiao Xun Feng, a pioneer in formalizing plant doctors as a profession, believes this role offers long-term solutions over temporary bandaids.

Pesticide is substituted with methods that can be surprisingly simple, such as tweaking the plant's environmental conditions by adjusting humidity and temperature levels or inviting natural predators to maintain yields. Plant Doctors do more than provide alternatives to pesticides; they assist farmers in reconnecting with the land and understanding its needs. By offering a nurturing touch, they help tend to the soil, seeds, and plants, fostering a deeper relationship with the earth. It is a slower, more thoughtful path forward—one that acknowledges the deep, complex relationships between farmers and their land, and the long-term health of both the crop and environment. A rough but telling analogy could be this: pesticides resemble Western medicine, where the approach is to remove the tumor. Plant Doctors, however,

Papaya and chili pepper farm near Xinpi, Pingtung County, infrared medium format film. The whiteness reveals the amount of infrared light reflected by the sun, suggesting the "level of health" of these plants.

「植物醫師」這個调研项目，是在我們在穿梭於台灣的草莓園、檳榔園、辣椒園和木瓜園時逐渐成形的。在這片土地上，我們與農民、農藥行老闆、大學教授和植物醫師展開一段段深入的對話，逐漸揭開台灣豐富的生態系統和農業景觀的面紗——這是一片由傳統智慧與新興專業交織演化的園地。

在與人的對話之外，我們更細心聆聽著大地的聲音：蟲鳴此起彼落，溪水潺潺而流，作物在風中搖曳，群山吐露天機。然而，工業機器不歇的轟鳴，將自然棲息地化為採收場所，漸漸淹沒了這些大地的細語。人類往往無暇顧及自然界的韻律，匆忙的步伐使得生態系統的聲音漸趨寂靜。在台灣山谷間的稻田和亞熱帶常綠林中，動植物之間微妙的聲景和生物對話，正被農藥的薄霧所籠罩：這項工業產物將生命過程中奧妙的能量循環，化約為冷冰冰的資本積累公式：M-C-M'。

台灣的農業風景以單一作物為主調，尤其是為迎合觀光市場而精心栽培的水果。這片土地上的農場多為小型家庭經營，農民們為了讓水果呈現無瑕的外表，長年依賴著農藥的庇護。這種依賴已延續數十寒暑，根植於追求最大產量的執念中。當這樣的思維遇上氣候變遷的挑戰，新型的病蟲害便接踵而至。面對收成的壓力，農民往往選擇快捷之道：或是引進新品種，或是增加農藥使用量，卻鮮少有機會思考更長遠的解方。

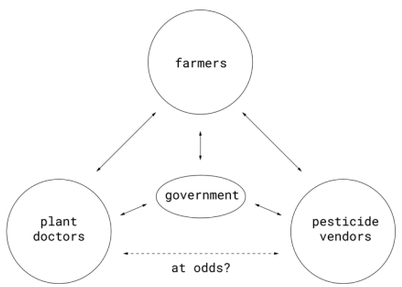


Diagram depicting the triadic relationship between Taiwanese farmers, pesticide vendors, and plant doctors.

Plant Doctor Parkson Chen (陳泊菘) offering advice to a local chili pepper farmer in Pingtung. A month before our visit, many farms in Southern Taiwan were hit by a hurricane.

A farmer kicking the Ganoderma off the base of the betel nut tree with her foot in Pingtung.

The owner of a pest-free strawberry farm in Taoyuan (上日有機莓園) shows his box of bees in the center of his greenhouse to maintain a non-toxic environment for the strawberries.

are like traditional Chinese medicine practitioners, who focus on preventing the tumor from reoccurring, and treating the body as a whole. They examine the land as an interconnected system, conditioning it for long-term health. This contrasts sharply with the short-term, reactive nature of conventional farming, offering a more environmentally conscious path toward cultivation.

After many conversations, we discovered that while many in Taiwan's agricultural community have heard of Plant Doctors, skepticism about their methods remain, particularly among older generations of farmers. For years, farmers have turned to pesticide vendors for advice on improving yields. In every town, pesticide stores line the streets, stocked with agrochemicals sold by licensed vendors. A consensus of trust towards pesticide dependency has been long built through generations of use, lasting partnerships between farmers and pesticide vendors, and government agencies endorsing their safety from yearly regulations. The pesticide-reliant farm works only with stable yields in mind, neglecting unseen and unlistened ecological complexities.  Plant Doctors challenge this narrative, and address the quiet, less visible, but far-reaching consequences of pesticide dependence, including disruptions to local ecosystems and the gradual erosion of soil health.

Throughout our travels, we've used LiDAR, a technology that creates detailed digital reconstructions of an observed space by emitting laser pulses that measure its distance and direction to the camera. Pesticide stores and storage facilities were documented through LiDAR, and on-screen these spaces are precisely represented as dense vibrant clusters of dots, seemingly resembling the structure of molecules. However, while the camera can meticulously detect and measure depth, light, and color it operates on a scale too large compared to the subtle molecular exchanges happening within our ecosystems. Consider the dozens of bees from a hive buzzing between hundreds of budding fruits, the thousands of saplings, trees, and bushes in a subtropical forest, or the millions of dust particles and water droplets drifting from air to leaf to soil. The ecosystem is a constantly multiplying series of relations happening simultaneously that forms an intricate dance of diseases spreading while healing other disorders. For instance, aerosol deposition in the Amazon, where astonishingly, a small, dried-out lake bed in Chad, known as Bodélé, has been quietly fertilizing the Amazon rainforest for years. Saharan dust, carried thousands of kilometers over the Atlantic, nourishes this verdant garden without fanfare. Ecosystems concurrently work on a granular, molecular scale that is invisible to the eye and through material exchanges, shifting beyond geological borders.

In Pingtung (屏東), Plant Doctors work across vast open fields of betel nuts and chili peppers, immersing themselves in the land's soil and ecosystem to collaborate with nature rather than fight against it with pesticides. We had the privilege of spending a day with Chen (陳泊菘), a Plant Doctor at the National Pingtung University of Science and Technology, shadowing him in the fields and the plant hospital as he worked with farmers to analyze disease cases. In the plant hospital, Chen showed us a piece of banana leaf carefully trimmed and preserved in an unusually large plastic container. His expertise and passion were infectious, drawing us into a game of "spot the difference" as we matched the diseased banana leaf before us against an imagined pristine version. In the field, we watched as he removed Ganoderma boninense, a parasitic fungus, from the base of betel nut trees. Initially, the sight of him kicking the fungus off the roots shocked us, as its appearance closely resembled lingzhi mushrooms, prized in traditional medicine for their value. We soon understood the urgency of this act was to halt the spread of brown rot and necrosis. Eschewing pesticides, Chen relied on meticulous inspection, precise diagnosis, and intervention, drawing on decades of intimate knowledge of the land to safeguard its native plants.

One particular organic farm in Taoyuan (上日有機莓園) operates within an enclosed greenhouse, with a beehouse at its center and large fans at the periphery, creating a controlled climate ecosystem. The bees feed off the strawberry buds, subtly sweetening the fruit while pollinating it. Occasionally, other insects, like grasshoppers, are introduced to prey on the pests that would otherwise consume more than their fair share of crops. Both farms in Taoyuan and Pingtuan model that farmers can coexist with the insects, even sharing a bite with those that prey on the farm's main pests. With local expertise, the Plant Doctor knows when to intervene and advocates for working through the absence of pesticides, allowing nature to move, breathe, and metabolize at its own pace.





在這樣的生態中，農藥行儼然成為農民的諮詢中心，然而其建議往往難以擺脫商業考量的束縛。當台灣的農業實踐被簡化為農民與農藥商的雙向關係時，眼前的利潤自然而然地掩蓋了農藥對土地無聲無息卻日積月累的傷害。

為了回應農業化學品的過度使用，台灣農業部引入了植物醫師的角色，開創了一條不同於農藥主導的生態之路，例如運用大自然本身的智慧來驅趕害蟲。這群醫者的理念核心，是對永續發展的執著追求，他們為每株植物及其生存環境量身打造解決方案。不同於化學藥劑的速效，植物照護需要持續而細膩的耐心。蕭旭峰教授作為植物醫師這個專業的開創者，深信這個角色能為農業帶來長遠的治療，而非僅是短暫的止痛。

農藥可以逐漸被一些出人意料的簡單方法所取代：譬如調整環境的溫度與濕度，或是邀請天敵前來助陣，維持自然的產量平衡。植物醫師不僅提供替代農藥的方案，更幫助農民重新認識土地、傾聽它的需求。透過細心的照料，他們滋養著土壤、種子與植物，編織出與大地更深刻的連結。這是一條緩慢而深思熟慮的道路——一條認可農民與土地之間千絲萬縷的關係，重視作物與環境長期健康的道路。這讓人想起一個貼切的比喻：若說農藥像西醫，採取切除腫瘤的手段；那麼植物醫師則像中醫，注重預防腫瘤復發，將身體視為一個完整的生命系統。他們觀察土地如同觀察一個活的有機體，為其長期健康進行調理。這與傳統農業短視、被動的特性形成鮮明對比，開創出一條更具永續性的耕作之路。

經過無數次的交談，我們發現儘管台灣農業界對植物醫師並不陌生，但對其方法仍存有疑慮，尤其是較為年長的農民。多年以來，農民習慣向農藥商尋求提高產量的智慧。在城鎮街道上，農藥行櫛比鱗次，持照的商販販售著各式農業化學品。對農藥的信賴已深深植根於世代的使用經驗、農民與農藥商的長期情誼，以及政府機構年度法規的背書中。以農藥為重的農場往往只著眼於穩定的收成，忽視了那些無形卻真實存在的生態網絡。植物醫師挑戰這樣的敘事，正視農藥依賴那些無聲無息卻影響深遠的後果，包括對在地生態系統的擾動和土壤活力的漸次流失。

在我們的考察歷程中，我們使用了LiDAR這項新穎的技術，它能透過發射雷射脈衝來丈量空間，重現觀察場域的精確輪廓。當我們用LiDAR記錄農藥行和倉儲設施時，這些空間在螢幕上化作密集而絢麗的光點，彷彿呈現出分子的結構。然而，儘管這台精密儀器能準確捕捉深度、光線和色彩，它所觀測的尺度仍遠大於生態系統中那些微妙的分子交互作用。想像蜂巢中數十隻蜜蜂在數百朵盛開的果實間翩翩起舞，數千株幼苗、喬木和灌木在亞熱帶森林中共生共長，或是數以百萬計的塵土顆粒和水珠從天際飄落，經過葉面，最終回歸土壤。生態系統是一首不斷變奏的交響樂，由無數關係在同一時空中演奏，編織出複雜的生命之舞。疾病的擴散與痊癒相互交織，就如同在亞馬遜的奇妙現象：查德一處名為Bodélé的乾涸湖床，年復一年默默將養分輸送至遙遠的亞馬遜雨林。撒哈拉的沙塵越過浩瀚的大西洋，無聲地滋養著這片蒼翠。生態系統在微觀的層面上運作，通過物質的流動，打破地理的界限而不斷演化。

在屏東的廣袤田野上，植物醫師穿梭於檳榔園和辣椒園之間，深入土地的脈絡，與自然合作而非對抗。我們有幸與國立屏東科技大學的陳泊菘植物醫師共度春光，在田間和植物醫院中跟隨他為農民診察病例。在植物醫院裡，陳醫師向我們展示了一片被細心保存在特大容器中的香蕉葉。他的專業素養和熱忱感染了在場的每個人，引領我們進入一場別開生面的「尋找差異」遊戲，將眼前染病的香蕉葉與理想中的健康樣態進行比對。在田間，我們目睹他去除檳榔樹根部的Ganoderma boninense真菌。當看到他用腳輕踢樹根上的菌體時，我們初時感到詫異，因為它的外表與中藥珍品靈芝極為相似。但我們很快理解到這個舉動的急迫性——為了阻止褐腐病和壞疽的蔓延。陳醫師捨棄農藥，而是依靠細心的觀察、準確的診斷和及時的處置，運用對這片土地數十年的深刻體認來守護其原生植物。


Storefront (新興農藥種子行，謝綿農藥種子行) adjacent to a corner block in Hsinchu City. These are the last two remaining stores in the downtown area, currently running in their third family generation.

Vista from a LiDar scan of a pesticide storefront in Hsinchu City.

Parkson Chen (陳泊菘) extracting a sample from a banana leaf to be viewed under the microscope. A new disease had just been discovered from visiting a local farmer in Pingtung.

Microscopic view of a new viral strain on a banana leaf observed in the Pingtung University Plant Medicine Teaching Hospital (屏東科技大學植物醫學教學醫院).

Field recording of the ambiance sound in Mr. Hsu's (許鄒錦隆) farm in the mountains of Wanli (萬里區) in northern Taipei, a chicken walked up to the zoom recorder.

Pesticides enter this world quietly, delivered in subtle mists from backstrapped canisters, yet their impact is clear and violent. They strip the rhythm of native insects that allow nature to thrive, but when the spraying stops, the music returns: birds chirp, bees hum, beetles buzz. It's a symphony of life that Plant Doctors defend, recognizing that a farm isn't an isolated patch of land solely operable by profit-driven motivations, but a part of a larger ecosystem that flourishes when we share it with its original inhabitants. Without a symbiotic relationship between humans and the ecosystem, the land's soil will be exhausted, and rivers will dry, leaving the flora and fauna to die of malabsorption.  The vast subtropical forests and the delicate microcosms within a greenhouse are ecosystems that are constantly in flux and governed by relationships that we cannot always see or hear yet persist. The rapid pace of modern agriculture, driven by cognitive capitalism, pushes against the slow rhythms of nature, creating a disconnect between the two. Necessary efforts to combat and reconnect this detachment are addressed by the modest collective of Plant Doctors across Taiwan, each specializing in the distinct ecosystems of their respective regions. By silencing the pesticide spritz, we allow the degrowth of extractive accumulation and the ecosystem to function on its terms, restoring molecular energy flows of life processes. In this absence of hostile industrial inventions, we pause and listen. The surrounding soundscape is rich and intricate, teeming with life in ways we may have long forgotten. This quietude serves as a reminder that the world is alive in ways we cannot always measure but can undoubtedly feel—depending on how we choose to listen.

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Yen-Po Lin (Assistant Professor, Department of Plant Medicine, National Chiayi University)

Parkson Chen (Plant Doctor, Department of Plant Medicine, National Pingtung University)

*Practitioners and Experts in the Field*

Oasis Yang (Plant Doctor, Miaoli County)

Ming-Yen Li (Yi Xin Agrochemical Store)

Weicheng Li (Xin-Xing Pesticide & Seed)

Hsu Tsou Chin-Lung

*Organizations and Centers*

Xinpu Township Farmers' Association Agrochemical and Materials Center

*Farms*

Sanlunche Strawberry Farm

Shangri Organic Berry Farm

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在桃園，一座饒富特色的有機農場（上日有機莓園）以溫室為家，中央設有蜂房，四周環繞著大型風扇，營造出一個可控的氣候生態系統。蜜蜂在草莓花蕾間忙碌穿梭，不經意間為果實增添甜美，同時完成授粉的神聖使命。農場偶爾也會引入其他昆蟲，如蚱蜢，來制衡那些可能過度取食作物的害蟲。桃園和屏東的農場都展現了人與昆蟲和諧共處的可能，甚至能與那些捕食主要害蟲的天敵和平共享一方天地。植物醫師憑藉其專業素養，懂得何時該介入，主張在無農藥的環境下耕作，讓自然依循自身的節奏運轉、呼吸和新陳代謝。

農藥悄然潛入這片土地，從背負式容器中吐露細密的霧氣，卻在無形中帶來明顯而強烈的衝擊。它剝奪了原生昆蟲的生命韻律，這些韻律本應讓自然欣欣向榮。然而，當噴灑停止，生命的樂章便重現：鳥兒的鳴囀，蜜蜂的嗡鳴，甲蟲的低吟。這是植物醫師守護的生命交響曲，他們深知農場不該只是一塊被利潤驅動的孤島，而是一個更廣大生態系統的有機組成，只有與原住民和諧共處才能蓬勃發展。若失去了人類與生態系統的共生關係，土壤將失去活力，河流將乾涸，動植物將因營養匱乏而凋零。從廣闊的亞熱帶森林到溫室內的精巧天地，都是不斷流變的生態系統，受著我們往往察覺不到卻始終存在的自然法則所治理。現代農業快速的節奏，在認知資本主義的推動下，與自然緩慢的韻律產生齟齬，在兩者間造就了一道鴻溝。為了彌合這道裂痕，台灣各地的植物醫師以其謙遜的姿態共同努力，每位醫者都專精於自己區域特有的生態系統。當農藥的噴灑歸於寂靜，我們便能讓掠奪式的積累退潮，讓生態系統依循自然的規律運轉，恢復生命過程中奧妙的能量流動。在沒有這些具侵略性的工業產物的時刻，我們停下腳步，細心聆聽。周遭的聲景豐富而層疊，以我們或許早已遺忘的方式充滿生機。這份寂靜提醒著我們，這個世界以一種我們不總能量化但確實能深刻感受的方式活著——這一切，都取決於我們如何選擇傾聽。

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李偉誠（新興農業種子行）

許鄒錦隆

機構與中心

新埔鎮農會農藥資材中心

農場

三輪車草莓園

上日有機莓園

誠摯感謝Evan Chiang的家人，感謝他們的溫暖和慷慨的招待，也感謝Ninad Pandit教授在指導我們的項目中提供的寶貴建議。

# DESERT OF ABSURDITIES

Katherine Sazhin
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What started out as a research project centered around capturing the natural landscape of the vast Arizona desert did not continue as such. Last May, we traveled as a group on a weeklong road trip to the Mojave, Sonoran, and Colorado deserts, three major desert regions located in the American Southwest. Prior to traveling, we envisioned the desert as how we'd seen in documentaries and movies: a barren landscape, too hot and dry for plants and animals to survive in. Instead, we witnessed the resilience of humans and non-humans, overcoming the initial harsh conditions of the desert through biological adaptation as well as terraforming the land to suit their lifestyle.

For those accustomed to fertile soil and seasonal rain, the existence of vast, thriving cities in the American Southwest is a perplexing phenomenon. How can bustling urban centers rise from barren landscapes seemingly devoid of essential resources—like trees without roots?

Intrigued by the question of how these cities sustain themselves, we explored satellite sites around three major desert hubs—Phoenix, Las Vegas, and Palm Springs. Our goal was to trace the origins of their essential resources: water, energy, and food.

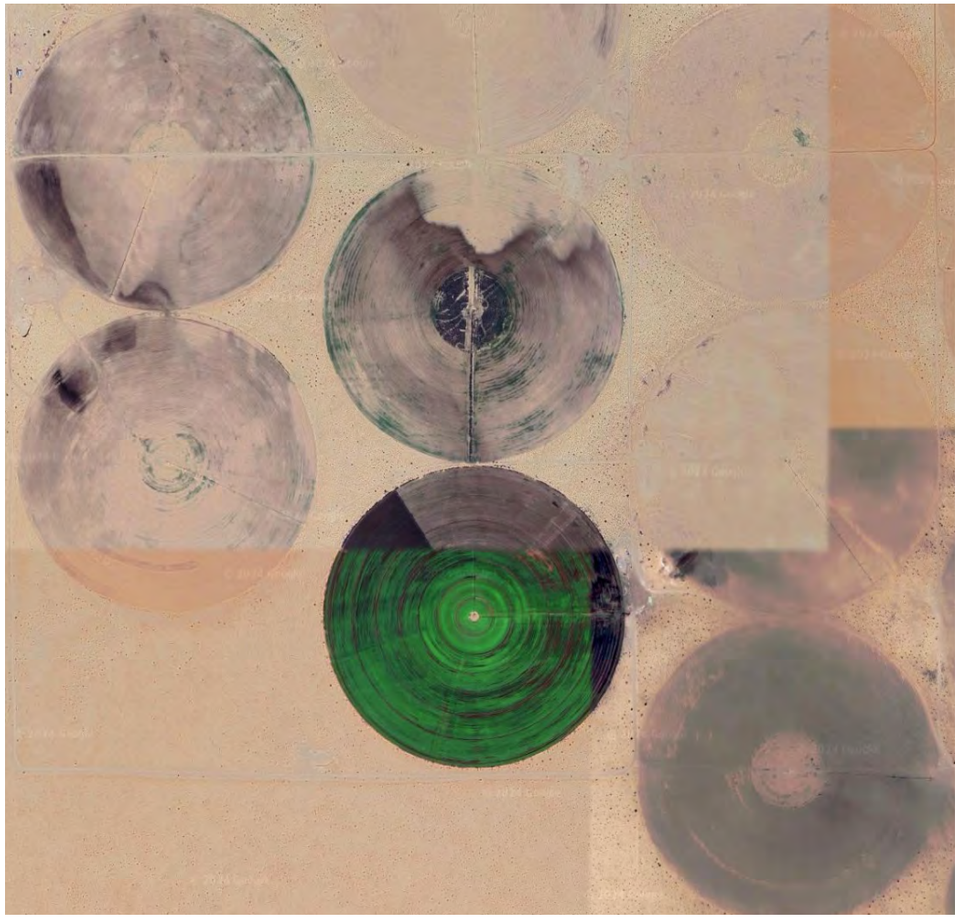
A vital source of water that sustains this region is the Colorado River. Flowing downstream from the Rocky Mountains, it is an artery that has supported human habitation in this arid land for thousands of years. Indigenous tribes, such as the Hohokam, were among the first to harness its waters for survival. They dug elaborate irrigation canals, diverting the river water to agricultural fields, allowing them to sustain communities in an otherwise uninhabitable environment.

Modern desert cities continue to rely on the Colorado River in much the same way. In fact, The ancient irrigation canals engineered by the Hohokam provided the foundation for Phoenix's current aqueduct system. However, unlike the small indigenous settlements of the past, today's desert cities are vast and densely populated. Phoenix, for example, is the 11th largest city by land area and the 5th largest population in the United States. The waterways of current Arizona deliver water to millions of its residents across hundreds of miles.

While the desert offers vast expanses of land, it provides little in terms of natural resources. To bridge this gap, desert cities have developed massive infrastructure systems to transport necessities across great distances. The perceived emptiness of the desert has also led to the rise of large-scale production sites that operate far beyond city limits. Facilities like the Ivanpah Solar Farm and extensive crop circle formations exemplify what we call "superimposed production"—using vacant lands and imported resources to generate food and energy at an enormous scale, far surpassing the city's necessity with surplus being exported to distant states.

Our project documents these findings, cataloging the strange infrastructures that sustain Phoenix, Palm Springs, and Las Vegas. In doing so, we reveal a fascinating paradox: these cities, built in one of the harshest environments on Earth, exist not despite their surroundings but because of the ingenuity and large-scale interventions that transform scarcity into something life-sustaining. The desert, what we once perceived as a barren wasteland, is surprisingly one of the most productive places.

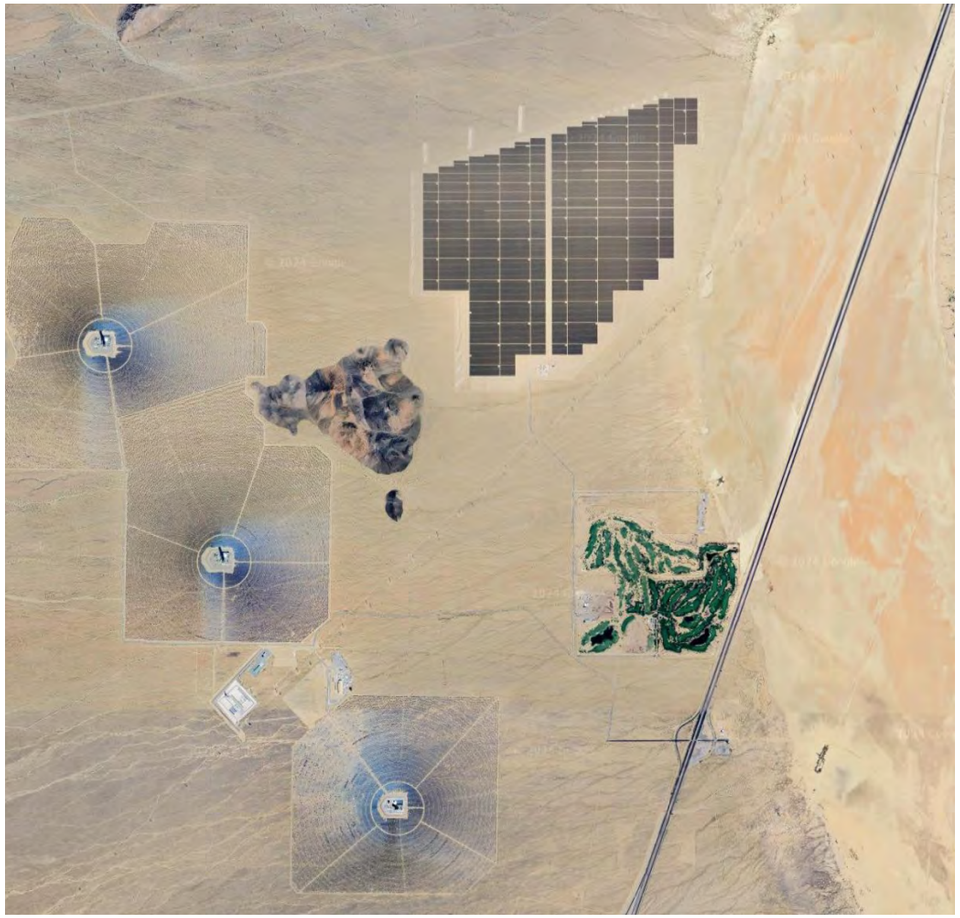
Yuma Desert, part of the Sonoran Desert



Satellite image of crop circle farms



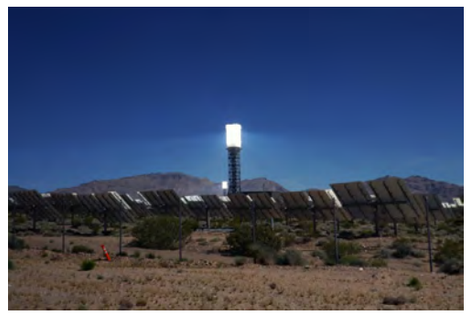




Satellite image of Ivanpah Solar Plant & surrounding context, the road stitches the disjointed context together

Hoover Dam, discolored rocks indicate the depleting water level

View of an industrial farm from the highway growing nonnative plants.



Ivanpah Solar Plant, mirrors reflect light to panels to generate energy

View of San Gorgonio Pass Wind Farm that is located in Coachella Valley, one of the windiest places in the US

Mountainous terrain of the Mojave Desert

# PROGRAM NOTE

The Benjamin Menschel Fellowship Program to support creative inquiry was endowed by a grant given to The Cooper Union by the Horace W. Goldsmith Foundation to support work in the fields of art, architecture, design, and engineering. This generous grant was intended to provide funding to exceptional students who propose scholarly, independent projects that will in some way provide a culmination to their educational endeavors at The Cooper Union. It is the hope of the Goldsmith Foundation that students designated as Menschel Fellows will be encouraged by their awards to complete bodies of artwork, develop scientific protocols, or otherwise further their intellectual investigations in a manner that will provide inspiration and illumination to the community as a whole.





Design by Julia Kim A’25

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