Unearthing Toxic Histories: Onera Prize for Historic Preservation 2020
Final Report

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October 8th, 2022

Introduction

Through the generous support of the Onera Foundation I was awarded the Onera Prize for Historic Preservation in May 2020. The following report describes the process and the final outcome of the project that I completed in the time since then.

As part of my Onera Prize research, I created an artwork entitled “Curtain for an Uncertain Future.” This work combines twenty-two sheets of transparent silk to form a collage that interprets the ever-present background landscape of nuclear waste storage and disposal. It incorporates salt from the mine of the Waste Isolation Pilot Plant into the silk dying process, using bits of the landscape itself to form the final images.

“Curtain for an Uncertain Future,” artwork created by Sarah Sargent in Summer 2022, supported by the 2020 Onera Prize for Historic Preservation. On the left is the artwork in daylight, and on the right is the artwork illuminated by a UV light and photographed in black and white.

In summer 2022 I traveled to New Mexico to photograph and visit three important historical sites associated with nuclear production. During this site visit I came up with a vision of the final version of this project, which was inspired by my time at the Robert Oppenheimer House. This report details the process by which I turned those film photographs into the final artwork.

I had originally proposed a project based on the use of autoradiography to document nuclear waste in various locales. The intent of this was to make these landscapes visible, and tell stories to help interpret this critical history. However, due to a combination of technical limitations including the length of time required for exposure, difficulty getting permits, and the Covid pandemic, I had to find an alternative methodology. I went through several iterations of this project before settling on the silk dying process that is presented here. In the end I was able to retain the original intent of the project while creating a unique and much more easily replicable process that I plan to continue to develop and refine in the future.

The primary goal of this project was to create a work that would produce a feeling in those who witnessed it, while also documenting the landscape from a technical, preservation-oriented standpoint. I was able to accomplish this by mixing "objective" and "subjective" techniques, in the same manner that a scientific study might employ both qualitative and quantitative methods to arrive at a balanced result. The photographs remain visible enough to be interpreted as a record of the landscape, and the use of salt from WIPP gives the piece an artistic approach that is grounded in the materiality of the landscape itself.

Historical Background

In my travels to New Mexico I visited three important and interconnected sites associated with nuclear history: Los Alamos, White Sands Missile Range, and the Waste Isolation Pilot Plant (WIPP). New Mexico as a state is unique for its associations with nuclear history, and it is home to some of the most significant sites of the Manhattan Project.

Additionally, uranium mined in New Mexico made its way to other sites around the country, and some of that material was eventually brought back to the state to be entombed at the Waste Isolation Pilot Plant. In this way it is a microcosm of the entire nuclear cycle, and has aspects of almost all of the associated issues that we find on a broader scale.

At each site I paid particular attention to the way that nuclear history was interpreted, with the aim of creating my own interpretive artwork at the end of the process. I especially wanted to focus on the relationship between the visible historic sites and the much more invisible landscapes of nuclear waste that they produced.

The first site that I visited in New Mexico as part of my research for this project was Los Alamos. Established in 1943, Los Alamos was a secret city that played a key role in the Manhattan Project's development of nuclear weapons during World War II.[1] Under the leadership of J. Robert Oppenhiemer, scientists were brought from around the country to create the world's first nuclear bomb.[2]

According to the Atomic Heritage Foundation, Los Alamos "is the site the public most associates with the Manhattan Project."[3] This made it a prime case study to explore ways of telling related stories through this project.

Only a few of the original buildings in Los Alamos remain standing and are accessible to the public. One of these is the Oppenheimer House, which is where J. Robert Oppenheimer lived with his wife and children from 1943-1945.[4]

The Oppenheimer House, July 2022. The top photo was taken with an iphone, the lower photo was taken on film.

[1] National Parks Service, "Manhattan Project Science at Los Alamos."
[2] Ibid.
[3] Atomic Heritage Foundation, "Preservation at Los Alamos."
[4] Atomic Heritage Foundation, "Preservation at Los Alamos."

The Oppenheimer House drew me in in part because the museum's docent had encouraged visitors to walk around and look in the windows, but not to go inside (it is currently undergoing the beginning phases of a restoration project). I found the way that it is accessible only from the outside to be a fascinating mirror of the other nuclear-related landscapes I have visited, which are frequently walled off to the public or allowed to be seen but not touched.

It was at the Oppenheimer House that I decided to create a curtain that could be used to interpret the story of nuclear waste production and disposal. There was something enthralling about the domesticity of the space, and the way that the obviously aged curtains had been left in the windows, blocking sunlight but also reflecting patterns back onto the glass. I decided to partly replicate that effect with this project. Seeing this helped inspire me to use space in front of the windows as a way of interpreting the history, by incorporating images and hidden stories more directly into the visitor's experience of the architecture.

Window at the Oppenheimer House, July 2022. Note the interpretive black and white photographs tucked behind the glass. (Taken on an iphone camera.)

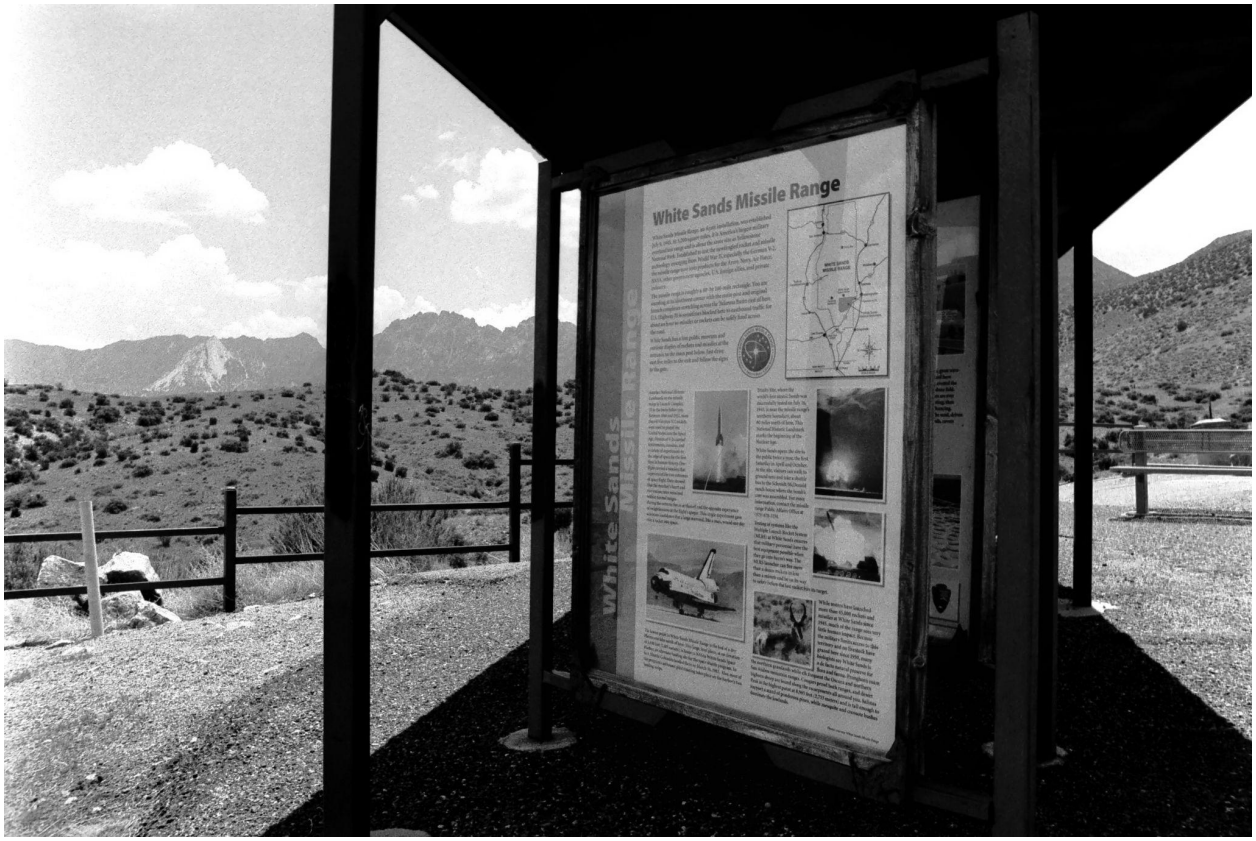
Curtains at the Oppenheimer House, July 2022 (taken with film camera).

From Los Alamos I traveled south to White Sands Missile Range. White Sands is home to the Trinity Site, the place where the first nuclear bomb, which had been created at Los Alamos, was exploded.[5] It is located west of Alamogordo, essentially adjacent to what is now White Sands National Park, and approximately 200 miles away from Los Alamos. The bomb, known as "the Gadget," was detonated at White Sands on July 16, 1945, in the world's first nuclear explosion.[6]

The Trinity Site itself is open only two days a year and exists within what is still a highly militarized landscape. Normally, visitors can stop at a visitor center at the Missile Range. The range is currently off limits to visitors while the visitor center is renovated, but I was able to visit and photograph the surrounding landscape, White Sands National Park, and a roadside interpretive display. (I had previously visited the Trinity Site itself in 2017.) White Sands, Los Alamos, and WIPP are all interconnected, with overlapping histories of nuclear development and waste disposal.

Highway exit to White Sands Missile Range, July 2022 (taken with film camera).

[5] National Parks Service, "Manhattan Project Science at Los Alamos."
[6] Ibid.



Interpretive sign at White Sands Missile Range that explains the story of the Trinity test, July 2022 (taken with film camera).

The final site on my trip was the Waste Isolation Pilot Plant (WIPP). WIPP is the country's only deep geologic nuclear waste repository.[7] It is also the only repository in the United States currently licensed to hold defense-related transuranic (TRU) waste.[8] The site has accepted over 13,000 shipments of nuclear waste from sites around the country since it opened in 1999.[9] Waste from Los Alamos National Laboratory, as well as many other historically significant nuclear sites, is brought to WIPP to be disposed of. An improperly packed waste drum from Los Alamos triggered a fire at WIPP in 2014.[10]

WIPP is located in the desert near Carlsbad, New Mexico. I was able to get a spot on one of the first publicly accessible tours since the start of the covid-19 pandemic. I woke up before dawn to

[7] Lohmann, Patrick, "NM's Nuclear Waste Site Could be Open 'Forever'"
[8] "National Transuranic (TRU) Program."
[9] Lohmann, Patrick, "NM's Nuclear Waste Site Could be Open 'Forever'"
[10] "National Transuranic (TRU) Program."

drive out to the site. Emailed directions gave only vague locations, necessitating my pulling over to the side of the road several times before I found the appropriate turn off. For a place that gets trucks full of nuclear waste every day, it is not very well marked. My directions said only “turn right 10 miles past where the railroad tracks cross the highway” but I drove for miles in the dark, waiting as the tracks slowly turned from parallel to an intersecting path. At the last place anyone not going to WIPP would need to be, I took photographs of the landscape and the site’s entrance. (Photographs in the underground were strictly prohibited and cell phones or cameras could not be taken in.) I also photographed a WIPP nuclear waste transport container that is on display permanently in Carlsbad.

The road to the WIPP site (taken with film camera).

Sunrise at the turnoff to the WIPP site (taken with film camera).

The exterior of WIPP (taken on an iphone camera).

The WIPP site is constructed in a 2,000 foot thick salt bed left behind from the 250 million year old evaporation of the Permian Sea.[11] The disposal area consists of what is essentially a very deep salt mine, with multiple "rooms" carved into the earth 2,150 feet below the surface.[12] Drums of contaminated material are hoisted to what is referred to as "the underground," where they are permanently "emplaced."[13] The plan is that over time the salt will contract and move, filling in around the waste and sealing it forever, or at least as close to forever as can be planned for.[14]

As the WIPP website explains, "Bedded salt is free of fresh flowing water, easily mined, impermeable and geologically stable — an ideal medium for permanently isolating long-lived radioactive wastes from the environment."[15] Salt therefore plays a crucial role in the story of nuclear waste disposal, and it is pieces of this salt that I have utilized and highlighted in the creation of this artwork. I was given permission to collect salt from the floor of the mine while on the tour.

Image of the salt mining process from WIPP website.[16] "WIPP Site." Accessed 10/7/2022. https://wipp.energy.gov/wipp-site.asp.

[11] "WIPP Site."
[12] Lohmann, Patrick, "NM's Nuclear Waste Site Could be Open 'Forever'"
[13] Ibid.
[14] "WIPP Site."
[15] "WIPP Site."
[16] Ibid.

Methods

I traveled to New Mexico to collect research for this project for two weeks in July of 2022. My first stop after picking up my rental car in Santa Fe was a small camera store, where I purchased a vintage mid-1970's film camera and film. I chose to use film instead of a digital camera because I wanted a way of documenting the landscapes that would be more authentic to some of the themes I was exploring. I also wanted to "expose" the images on film to the underground at WIPP at the end of my trip, adding another layer of artistic documentation to the project.

The author in the field at the Oppenheimer House in Los Alamos (left), and the camera and film used to photograph the sites (right).

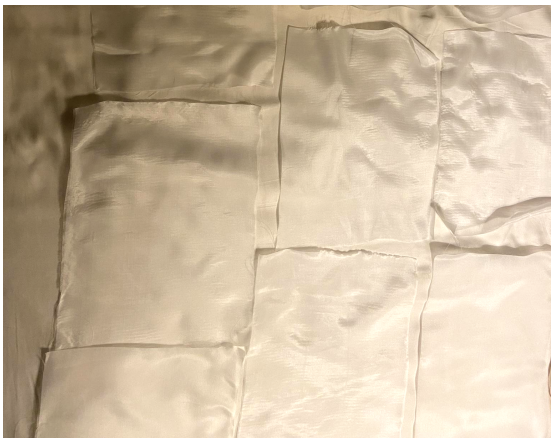
I photographed all three sites extensively as part of the documentation process, to create images that could be incorporated into the final work. I wanted to connect all three sites together, to mimic the ways that their histories overlap. To accomplish this I took photos from Los Alamos and White Sands and brought them with me to WIPP, mirroring the path that nuclear waste from each place would have taken. Once at WIPP I took my rolls of exposed film and placed them in the pockets of hiking pants. There, they traveled down with me 2,150 feet beneath the earth. The film was exposed to any low levels of radiation that were present, potentially creating slight graininess in the final images.

Once home, I developed the rolls of film and scanned the negatives into a JPEG digital format. I took multiple digital exposures of each image to ensure the best possible results. Once the images were scanned, I began the experimentation, testing, and printing process.

A silk sheet is printed with UV reactive ink. The image is only visible in the blue UV light.

In order to create a semi-transparent effect in the final product and to ensure that the WIPP salt would effectively dye the material, I choose to use silk fabric. Silk also lets the background of the structure where the final curtain will be installed show through. I tested the prints on several varying thicknesses and weaves of silk, ranging from 5mm to 12mm thick, before settling on 5mm thick silk Habotai. This best illuminated the images while allowing light to shine through. I chose a background fabric for a curtain in the same material. Each smaller sheet was treated with a backing and sizing to allow it to be printed with an inkjet printer.

To create the first layer of images, silk sheets were first printed with “invisible” ink that can only be seen in blue UV light. I converted an Epson printer to be able to handle the UV ink, tested various settings, and printed a batch of fifteen images. Each has four “colors” of invisible ink: white, cyan, yellow, and magenta. I chose to print the images taken at WIPP in UV ink, so that the history of nuclear waste disposal would be rendered invisible and illuminated after the fact, while still in communication with the images of the other two sites.



The silk sheets after being printed with UV ink, shown under incandescent lighting.

Under normal daylight conditions these photographs appear as blank white sheets of silk. This reflects the invisibility of radiation, and the way that landscapes of disposal are often hidden. In daylight the curtain contains visible scenes from White Sands Missile Range and Los Alamos, but at night time under the illumination of blue light the background images of the Waste Isolation Pilot Plant become visible. In this way the final resting place of waste from these locations is brought to the foreground. The images become blurry and dark, while the hidden photographs glow.

The photographs of White Sands and Los Alamos had a different artistic treatment. One of my main goals with this project was making the materiality of waste disposal visible and tangible, so I knew I wanted to incorporate material taken from the WIPP site into my final design. I chose to use the salt I had collected from WIPP as a dying agent to leave visible marks in the final images, thereby making the hidden reality of nuclear waste's permanence and danger visible in the finished product. Dying silk of this nature with salt is not a new process, but the application of salt from WIPP makes the technique meaningful. Usually specialized silk dyes are painted on, and the silk is stretched taut before salt is applied, but I adapted this technique to use inkjet printed photographs where the ink was reconstituted.

An image of White Sands printed on silk drying after being carefully sprayed with water, with WIPP salt placed on top (left), and the WIPP salt crystals harvested from 2,150 feet underground (right).

To form the daylight visible layer, I printed additional 5mm silk sheets with a second inkjet printer using traditional ink, then immediately wet them with a pressurized water mister. I carefully placed salt collected from the mine at WIPP over the damp images. The salt absorbed moisture from the ink as it dried, leaving patterns and colors in the original photographs. The images are still visible, but augmented by the reality of nuclear waste disposal evidenced in the voids left by the WIPP salt. Portions of the salt were crushed in a mortar and pestle, but several pieces in each image were left whole, to ensure that the shape of the salt as it was found imprinted in the ink as well.

The silk was then left to dry, and the salt was removed with a mink-hair paint brush so as to not damage the fragile material. Each silk sheet was carefully removed from the printer backing paper, and attached to a silk sheet of the same thickness and weight of material. In this way the curtain becomes a cohesive whole, with subtle transitions of materials, while still maintaining an otherworldly quality.

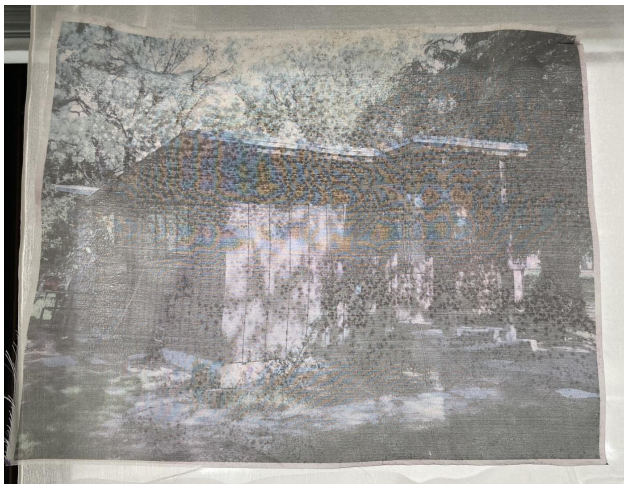
The same image as above, after the salt was brushed away and the silk fabric was removed from its lining.

An image of a roadside display at White Sands drying after being covered with WIPP salt.

The Final Product

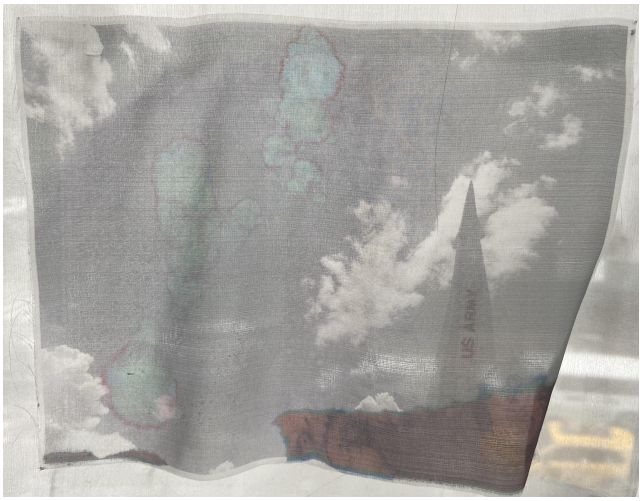
The final product that emerged is a silk curtain measuring 33” x 84”. On it are twenty-two silk panels. Nine of these panels were dyed using WIPP salt and traditional ink. An additional twelve panels are printed with UV ink and set inside the WIPP panels. The traditional ink panels include scenes from Los Alamos and White Sands Missile Range. The UV ink panels include scenes from the Waste Isolation Pilot Plant and its surrounding landscape.

Visible images, dyed with ink and WIPP salt:

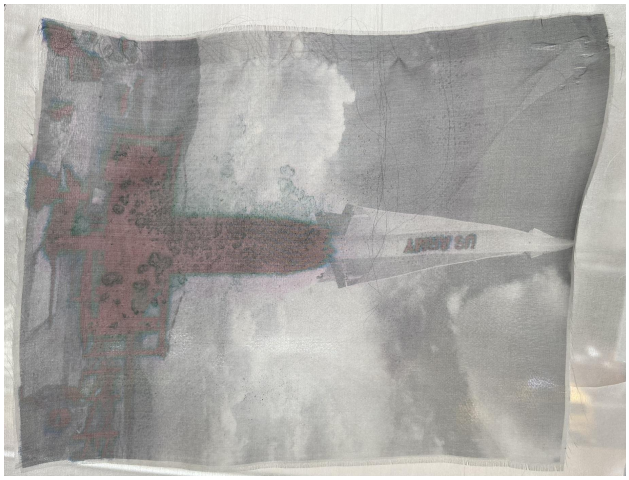


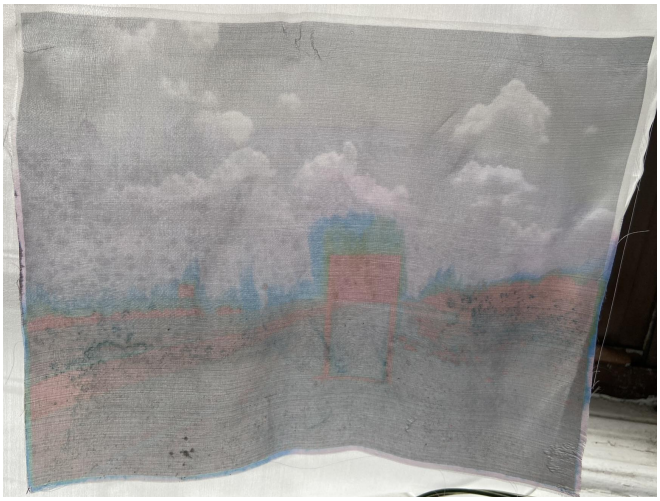
Top three panels, from left to right as seen on curtain: The north facade of the Oppenheimer house, a roadside interpretive sign that explains the Trinity test at White Sands, and a building at Los Alamos that displays a historic black and white photograph.





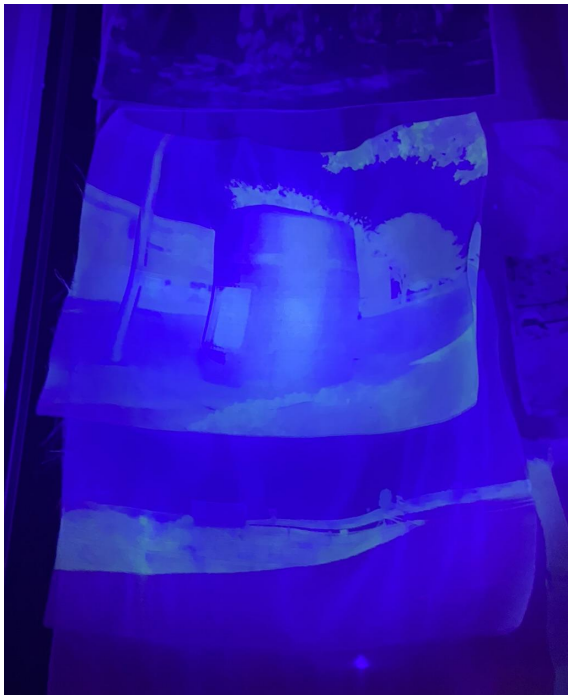
Middle three panels, from left to right: A view out over White Sands Missile Range, a row of widows at the Oppenheimer house in Los Alamos, and a missile with “US Army” emblazoned on it at White Sands.



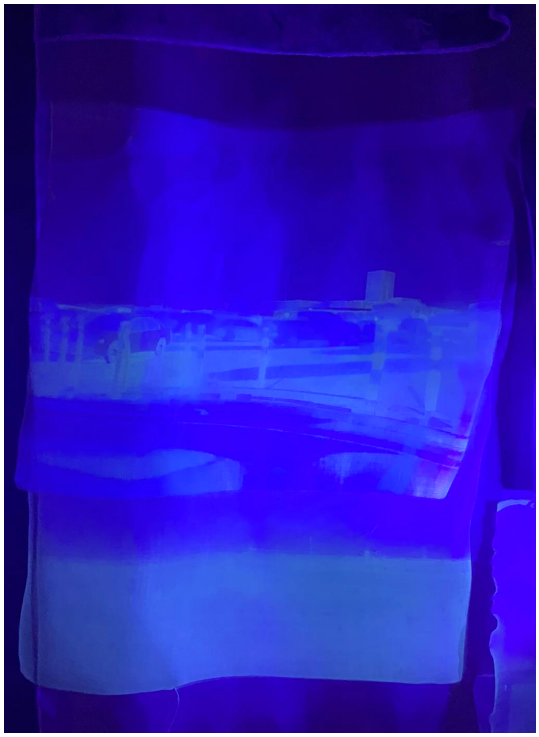


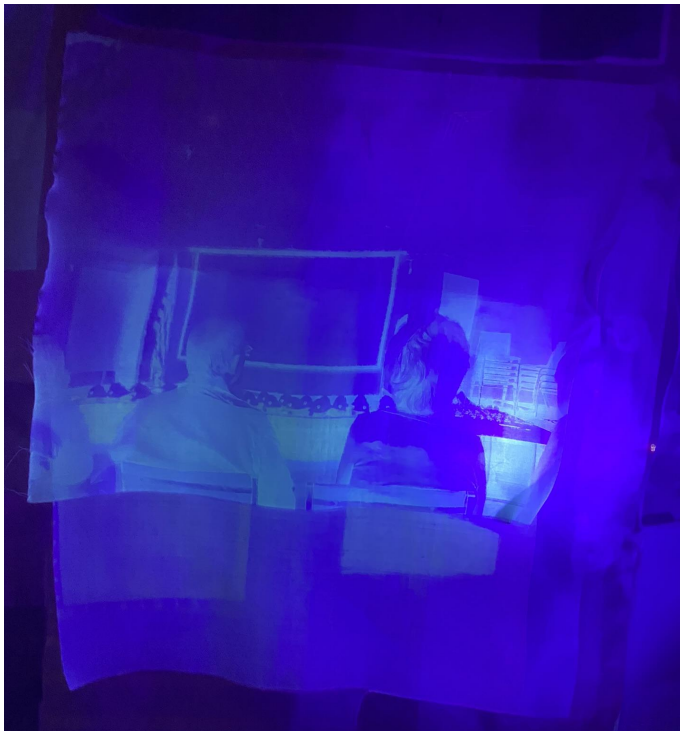
Bottom three panels, from left to right: A highway sign on the way to White Sands with the distance to Alamogordo, the same roadside “US Army” missile from a different angle, and the warning sign at the entrance to White Sands, with landscape in the background.

Invisible images, dyed with UV ink



Top row, layered top to bottom and viewed left to right: Nuclear waste shipping container displayed in Carlsbad, NM and the driveway to WIPP; Porthole in the nuclear waste shipping container in Carlsbad and the landscape at the turnoff to WIPP; and the warning label on the exterior and interior contents of the shipping container, as seen through the porthole.





Bottom row, layered top to bottom and viewed left to right: The exterior of WIPP and the landscape at the highway turnoff to the site; WIPP safety briefing and portholes at the nuclear waste container in Carlsbad; WIPP as seen through the car window and sunrise on the highway on the way to WIPP.

The intent for this work is for it to eventually be exhibited at the Oppenheimer House or a similar location with significant nuclear history. The piece is intended to be approachable and interactive. Viewers can see the visible layers of silk, and then choose what else to illuminate with a UV flashlight or moveable floodlight. They will see the previously invisible landscape of nuclear contamination and waste disposal suddenly glow in the dark. It would be especially impactful to have the piece installed where it could be viewed from the exterior, with a UV light illuminating it at nighttime.

The silk curtain is also simple and straightforward to install and display. Its size means that it adds to the viewer's experience of the architecture where it is placed. It becomes part of the room, with the view outside the window behind showing through the thin silk, and the window frame naturally framing the artwork. It encourages viewers to stop and contemplate the history of the site, and to examine how the histories of these disparate locations directly overlap. It also aims to bring the history of nuclear waste disposal quite literally to light, to ensure that it is effectively interpreted.

Overall, this project brought together significant background research, over 1400 miles of on the ground travel, and creative approaches to preservation to produce an art object that both documents and interprets important histories of nuclear production. It pioneered a technique that I plan to continue to develop in the future with other sites and stories. Dying silk with salt from a nuclear waste disposal site allows the finished product to reflect deeper histories that might not be shown by a simple photograph. This process incorporates the landscape into the product itself, and brings it into a space it would not otherwise reach. In this way it unearths the toxic history of nuclear production and allows it to be made visible. I am especially grateful to the Onera Foundation for the opportunity to pursue this project, and I plan to continue to utilize this technique to create other artwork that can be used to help interpret these important and often forgotten histories in the future.

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