

# Thermophile

By Jon Verney

Bachelor of Fine Arts, Massachusetts College of Art and Design, 2010

Thesis submitted in partial fulfillment of the requirements of the degree of Master of Fine Arts

Penny W. Stamps School of Art & Design  
University of Michigan  
Ann Arbor, Michigan

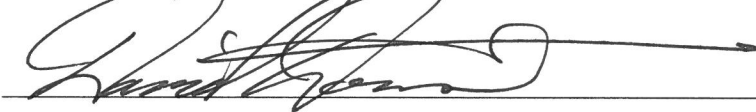
April 18, 2016 Approved by:



James Cogswell, Graduate Committee Chair



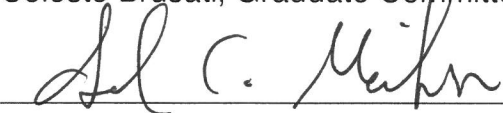
Robert Platt, Graduate Committee Member



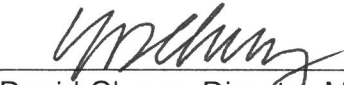
David Doris, Graduate Committee Member



Celeste Brusati, Graduate Committee Member



David Michener, Graduate Committee Member



David Chung, Director MFA Graduate Program



Elona Van Gent, Associate Dean of Academic Programs



Gunalan Nadarajan, Dean, Stamps School of Art and Design

Date Degree Conferred: April 28, 2016

t h e r m o p h i l e



J o n V e r n e y

## **A B S T R A C T**

Tracing the artist's journey across an array of volcanic landscapes in Iceland, Wyoming and southern California, *Thermophile* presents the process and results of using geothermal water and mud to redevelop silver-based photographs. This elemental installation of photography, video, and painting explores the notion of co-creating artwork with the earth, and allowing natural systems equal agency in the process of transformation.

### **keywords:**

Geothermal, Hot Springs, Photography, Analog, Painting, Installation, Video, Thermophiles, Ecology, Hydrothermal, Transcendentalism, Hyperobjects

## ACKNOWLEDGEMENTS

I am deeply indebted to the wisdom and guidance of my thesis chair, Jim Cogswell. Your brilliance, unceasing enthusiasm and belief in my work have been invaluable to my artistic practice and my person.

The members of my committee, Robert Platt, Celeste Brusati, David Chung, David Doris, and David Michener: your support, generosity, guidance and friendship means more to me than I can aptly express in words. I cannot thank you enough for the wellspring of ideas and inspiration you've shared with me. It has been a tremendous honor to work with you. Thank you.

I'd like to thank the Penny W. Stamps School of Art & Design for its generous funding and support, without which I wouldn't have been able to produce this work. This funding allowed me to flex the scope of my creative visions, and travel and work in places more wondrous than I could've possibly imagined. I must thank David Chung, Elona Van Gent and Gunalan Nadarajan for their hard work in making this program the dynamic and positive place it is.

Over my two years here, I've been fortunate to work directly with brilliant faculty members: Rebekah Modrak, Stephanie Rowden, Jennifer Robertson, Jennifer Nelson, Lisa Steichmann, Joanna Millunchick, and Endi Posckovic. Thank you all for your input, support, and for making my graduate career the rich, stimulating experience it's been.

My fellow graduate students: I could not have asked for a brighter, more supportive group of individuals to have worked along side. Your friendship and input on this project means the world.

Lastly, I owe the inspiration for this work to my colleague and friend, Romeo DiLoreto, without whose mentorship and generous spirit this project would never have been realized.

Thank you.

# TABLE OF CONTENTS

ABSTRACT	2
ACKNOWLEDGEMENTS	4
PREFACE	6
CALDERA [introduction]	7
OBSCURA [darkroom preparation]	10
BECOME OCEAN [standing over mantle plumes]	14
QUABBIN [personal background]	18
THE MUTABLE SELF	21
FLUX [paintings as parallel journeys]	24
SOLFATARA [geothermal landscapes as working spaces]	29
SALTON SINK [salton sea diary and self-instruction manual]	40
CLIMATOLOGY OF THE MIND	45
ANALOG [proposition + artistic precedents]	56
ARGUS [mfa exhibition]	70
SEA DRIFT [conclusion]	79
APPENDICES	
A. Environmental limitations to thermal toning	83
B. Photochemistry + geochemistry	85
WORKS CITED	92
LIST OF ILLUSTRATIONS	95

## t h e r m o p h i l e



“I am carried through planetary spaces in the center of this nebulous mass...my body is refined, is sublimated in its turn, and mingles like an imponderable atom with the vapors that are tracing their inflamed orbit in the infinite.”<sup>1</sup>

Jules Verne, *Journey to the Center of the Earth*

---

<sup>1</sup> Verne, Jules. *Journey to the Center of the Earth*. 1864. trans. Willis T. Bradley, 1956. Print. p.181

## P R E F A C E

*Thermophile* is a project that explored the possibilities of using geothermal water from hot springs to chemically alter and redevelop black and white silver gelatin prints. Using the motif of the self portrait, the images consider our perpetual transformation as living beings on earth, both metaphorically and as physical, chemical reality.

Between May 2015 to February 2016, I conducted three research trips to volcanic systems across Iceland, Wyoming and California. For each trip, I carried a set of black and white photos that I printed in a darkroom, and brought them to environments teeming with sulphur-rich hot springs and mud pots. Here in these geothermal fields I carefully immersed my photos into the superheated waters. The photos began to change on contact: iron, sulphur, calcium, aluminum—the atoms of dissolved elements latched into place, bonding to the silver in the photographs' emulsions, fusing and forming new compounds.

This mineral abundance, paired with the springs' acidity and high temperatures, caused each photo to be redeveloped in a unique manner—no two appearing the same. In this way, each photo acts as a paper-thin capsule of the landscape in which it was toned. *Thermophile* is then an exploration of co-authoring artwork with the earth, and allowing non-human entities to determine its visual outcome.

# CALDERA

## [introduction]

8.21.15

In Wyoming, connected to Yellowstone's vast magma chamber, lies a little-noted geothermal field. In this field are myriad small springs, each different from every other. Some are large, frightfully still and deep; some splash and heave in a perpetual gush, depositing bulbous ramparts of sinter. Others quietly well upwards, hosting chromatic colonies of thermophilic bacteria, ruby and alizarin, cadmium, lavender, violet. And everywhere a host of small springs hiss, spit and babble.

Here, I've learned to be aware of my feet. What appears as solid ground might be a mere crust of dried clay and minerals hiding reservoirs of boiling water beneath. Only once have I suddenly plunged a leg into a well of heated mud. On others, I've felt the ground beneath me pulse, upwelling from pressure. Keeling into the mud, sinter-encrusted trees and dead plants dot the field, reminders that this landscape is not fixed or stable.

Stepping carefully through the field, favoring spots where plants grow and avoiding spots where they don't, I walk with eyes cast downward, searching for the right place to start, the right array of minerals and heat. I've come here to work with this place's transformative powers, to let its sulphur-rich waters alter a set of photographs I've brought with me.

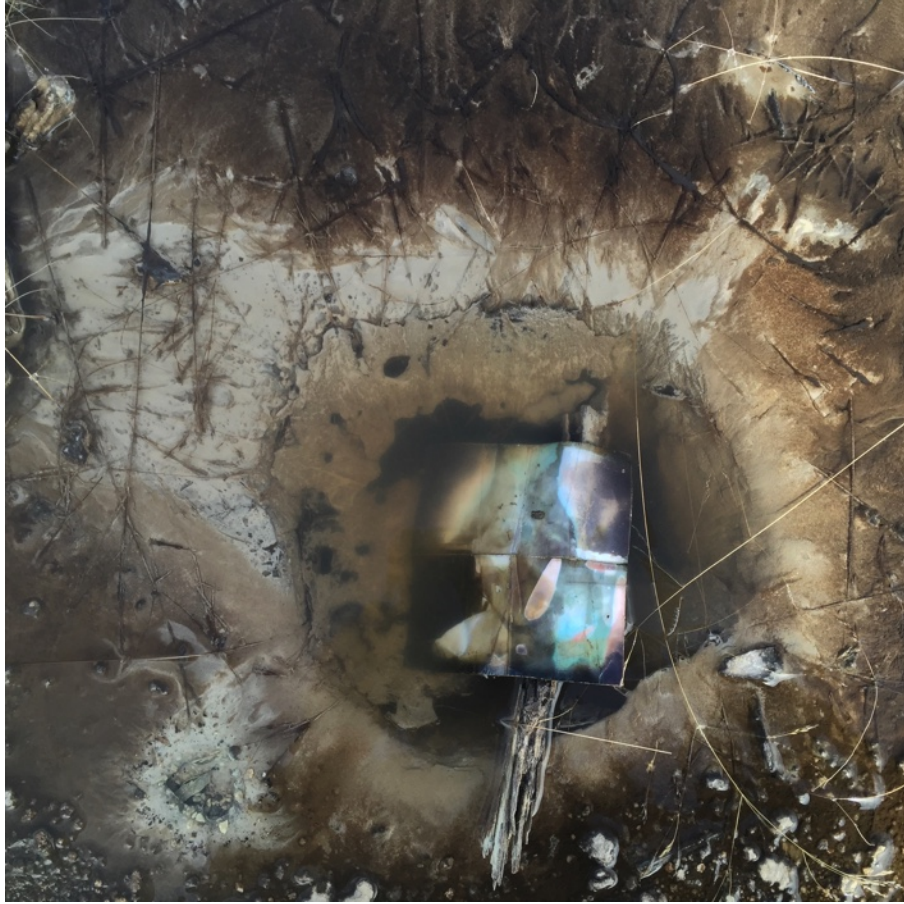


Round a ridge, the right spot reveals itself. Gurgling in a brackish, chocolate-brown seep, a constellation of little springs emits tendrils of steam. Carefully kneeling before them, I reach into my pack, put on protective gloves, and pull forth a battered cardboard box. Inside are hundreds of small pieces of photographic paper, each a four-inch square, each depicting a faintly visible face, my own, eyes closed and expressionless. All the photos hold a version of this image in faded tan tones: some clearly legible, others hardly there.

Selecting a few of these photos, I fold them in half twice, then gingerly place them into the boiling water before me. Each photo hisses and quivers as it enters the springs. I settle back and observe.

After a minute the photos' surfaces start to change: they slowly darken and turn tones of reddish-brown; the face becomes clearer. A crack in the emulsion turns a light cyan. Emerald flecks smatter in the corners. The tiny cauldrons pummel the images.

Soon I pull out the photos one by one and unfold them, laying them on the grass. With my gloves, I smear away the mud-slick surfaces, revealing the imagery beneath. Each portrait is more evident now; the tones and edges describing my face are deeper and sharper. They appear to have been made from the same negative, but each is different from the next: some clearly depict my face in a rich sienna, others obscure it in metallic darkness. This one seems appears marbled with crimson and citron streaks. This one has turned bronze, daubed with opalescence. One however, seems unchanged, and I wonder why. I pluck it from the grass and place it back into another spring, and watch.



Figures 1+2 : Thermally toning a photo in a geothermal seep, Wyoming.

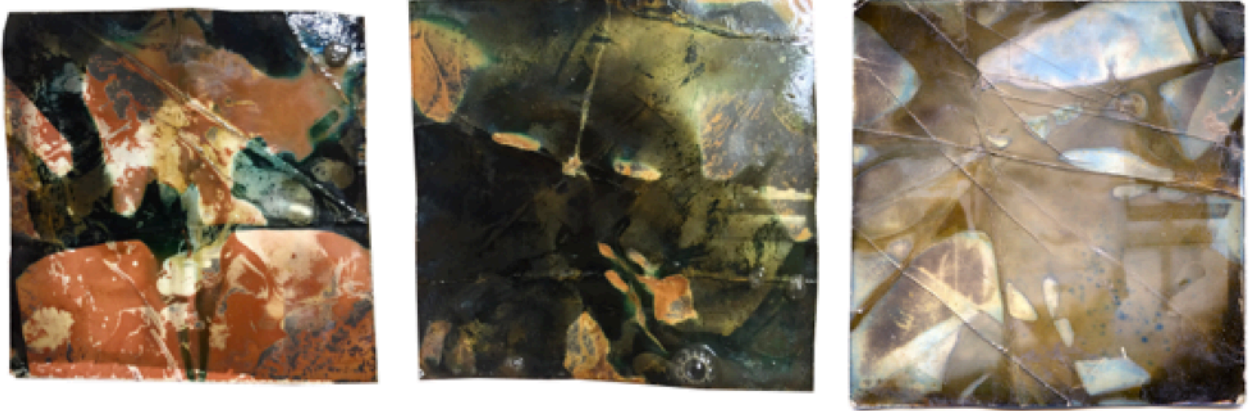


Figure 3. thermal toned silver gelatin photographs from Wyoming. Each approximately 4x4"

## **OBSCURA**

### **[darkroom preparation]**

This moment of interaction between myself and these springs is a result of a long process of systematic preparation. Before I came to this geothermal landscape, all the images were black and white. I made them by the hundreds, printing them in a makeshift darkroom in Michigan. Every night for weeks, I rolled a cart, laden with chemicals, trays, tongs and an enlarger into a bathroom in my studio building. There, bathed in the wine-red darkness of a safelight, I printed the images one by one, revealing each time an identical image of my face in the light-sensitive emulsion. Then I plunged the pile of exposed paper into a tray of developer.

During their development, I sculpted them with chemistry and light. With the photos still wet with developer, I briefly flash on the bathroom's light, causing them to solarize, highlights blossoming into shadows like bruises across skin. A quick bath of citric acid ceases the reaction.

Chance has a role in each photo's gestation, as did I. I left them unfixed in daylight for hours. I folded them into shapes and immersed them in solutions, trapping bubbles of air in their folds. The developer slowly oxidized with time until was it almost opaque as rust. In spite of having been printed from the same six negatives, every photo was different from the next: some over exposed, some under, some clear, some obscured.

After creating a large set of photographs, I set about erasing them. Placing the photos into a bath of potassium ferricyanide—a yellow colored liquid made from dissolved red crystals—the images immediately began to fade. First, highlights brightened into blank white swaths, followed by the mid-tones; the darkest tones corroded away last, leaving behind only a faint visage of the original image.

Through prior darkroom experience, I learned that, on a chemical level, this bleach reverts the silver in the papers' emulsions back into an undeveloped state. The photos aren't obliterated—rather they are in a state of dormancy. While no longer particularly light sensitive, they are now susceptible to development, reforming upon contact with another developer solution. Traditionally, this bleaching process is called “redevelopment toning”, more commonly known as sepia toning. The second step of redevelopment toning requires this bleached image to be placed into a different solution—in the case of sepia toning, a bath of sodium sulphide. Immediately upon contact with this solution, the faded image will reemerge, composed in warm, brown tones. This is due to the sulphur

molecules within the solution latching onto the image's silver and forming the new compound of silver sulphide,  $\text{Ag}_2\text{S}$ . Based on my experience, I had a strong hunch that placing these reverted images in a thermal spring would cause them to redevelop in much the same way.



Figure 4. Detail of a map of Iceland

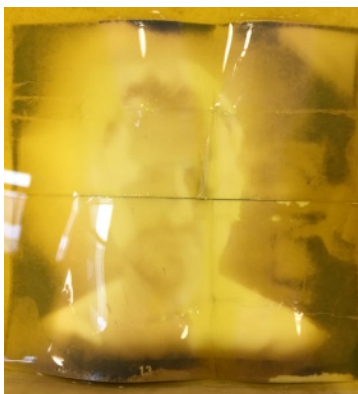


Figure 5. Black and white photograph immersed in potassium ferricyanide

Thermal springs are naturally rich in sulphur, and could function as a second chemical bath. In addition to sulphur, hydrothermal systems contain many other dissolved minerals and elements, often including what the Eastman Kodak Company lists

as the “elements most integral to black and white photography.”<sup>2</sup> With this in mind, I knew that these elements—iron, calcium, sodium, copper—would latch to the silver in the photos’ emulsions and fuse to form new compounds, causing the image to redevelop in unexpected colors.

Having bleached the entire series, I washed and dried them, and put them in a box. Then I boarded a plane.



Figure 6. Studio shot, drying recently developed black and white photographs.

---

<sup>2</sup> Eaton, George T. *Photographic Chemistry: In Black-and-white and Color Photography*. New York: Morgan & Morgan, Inc. 1957. Print. p. 29

## BECOME OCEAN<sup>3</sup>

[standing over mantle plumes]

8.21.15

As I crouch above these burbling springs in Wyoming, I marvel at what is boiling the water in which the photographs sit. Staring at the moist earth beneath my shoes, I imagine seeing through the mud, past the stone and bedrock. The world is now celluloid, the opaque stratum of the earth clear as sky. Through this translucent depth I see the hidden channels that feed each of these burbling pools. They sprawl outwards, spiral and conjoin in reservoirs, in turn fed by larger arteries, spreading downwards like the veins of an ancient nervous system. Snowmelt and runoff, seeping for miles, sinking for years, collects and amasses, returning back to the surface.

Beneath this arterial web I would see the heart fueling these hydrothermal systems: a vast chamber of magma, a sea of plasmatic rock, seething and roiling. The chamber is enormous, but it is dwarfed by the volcanic plume of partially melted rock that feeds it. Three hundred miles tall, forty seven times deeper than the Pacific's deepest trench, Yellowstone's mantle plume billows up beneath my feet. And below everything, bright as the Sun, is Earth's molten core; an ocean of ancient radiation, the center of the

---

<sup>3</sup> A reference to composer John Luther Adams's orchestral composition, *Become Ocean* (2014).

gravity that tethers us. Here is the original source for all the hydrothermal phenomena about me; the furnace for the tiny pool at my feet, boiling the water in which my photos sit from four thousand miles away.

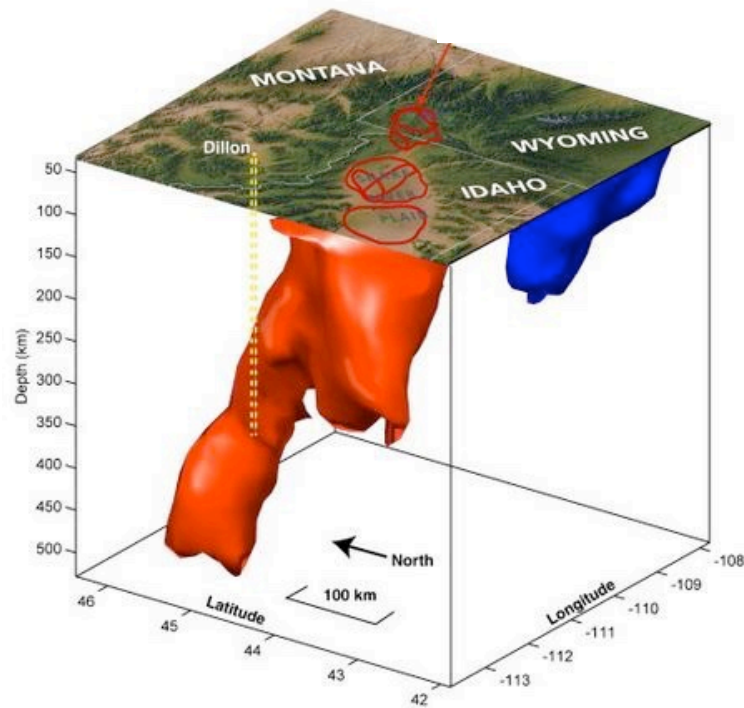


Figure 7. Tomographic model of the volcanic mantle plume beneath Yellowstone (Pierce and Morgan 2009).<sup>4</sup>

Shuddering, I am thankful for the dark opacity of the Earth. I am content kneeling by the tiny springs before me, which bubble in a familiar and reassuring way. I am grateful for this small access.

The knowledge of the source of the spring's heat makes us aware of an unbroken chain of relationships that extends from the spring all the way to the planet's core. The forces powering that heat are what Timothy Morton describes as 'hyperobjects', physical

---

<sup>4</sup> Fritz, William J., and Robert C. Thomas. *Roadside Geology of Yellowstone Country*. Missoula: Mountain Press Publishing Company. 2011. Print. p.60



entities so vast and distributed through space and time that it is “only possible for humans to see [or experience] pieces or aspects of them at any one [moment]”.<sup>5</sup> According to Morton’s definition, the bubbling spring is not merely an entity on its own, but a physical manifestation of the larger entity of the earth itself. In a time of increased environmental awareness and ecological crises, Morton calls for artwork to be made that acts as a collaboration between humans and non-human entities and as a means of making or seeking an attunement between them.<sup>6</sup>

Attunement, or “the channeling of a demonic force” such as the tectonic movements of the planet through an artwork, brings to bear evidence of those movements within the artwork itself.<sup>7</sup> As my photographs bathe in the steaming water, absorbing the dissolved sulphides and metals carried upwards from deep within the planet, I understand that there is another level of meaning to their re-creation: there is an action of tuning, of picking up data, energy, and feedback from a larger system. I am offering these scraps of paper bearing my visage to the Earth and allowing the Earth equal agency in their transformation. One cannot plumb the depths of this enormous entity. However, I am trying to visually attune myself to it.

Sitting in this effervescent field, I know I am perched amidst the end-nodes of an unfathomably deep system, a web of interlocking hyperobjects, each containing and proliferating myriad other objects, all non-human, all acting their own parts. It is a grand

---

<sup>5</sup> Morton, Timothy. “Sublime Objects.” *Speculations II Journal*. 10 (2011): 207-227. Print. p.208

<sup>6</sup> Morton, Timothy. “From modernity to the Anthropocene: ecology and art in the age of asymmetry.” *International Social Science Journal*. 63.207-208 (2014): 39-51. Print. p. 49

<sup>7</sup> *ibid.* p.47

orchestration. An attunement is a recognition of that orchestration, and a channeling of its signal to make it visible, to make it seen.

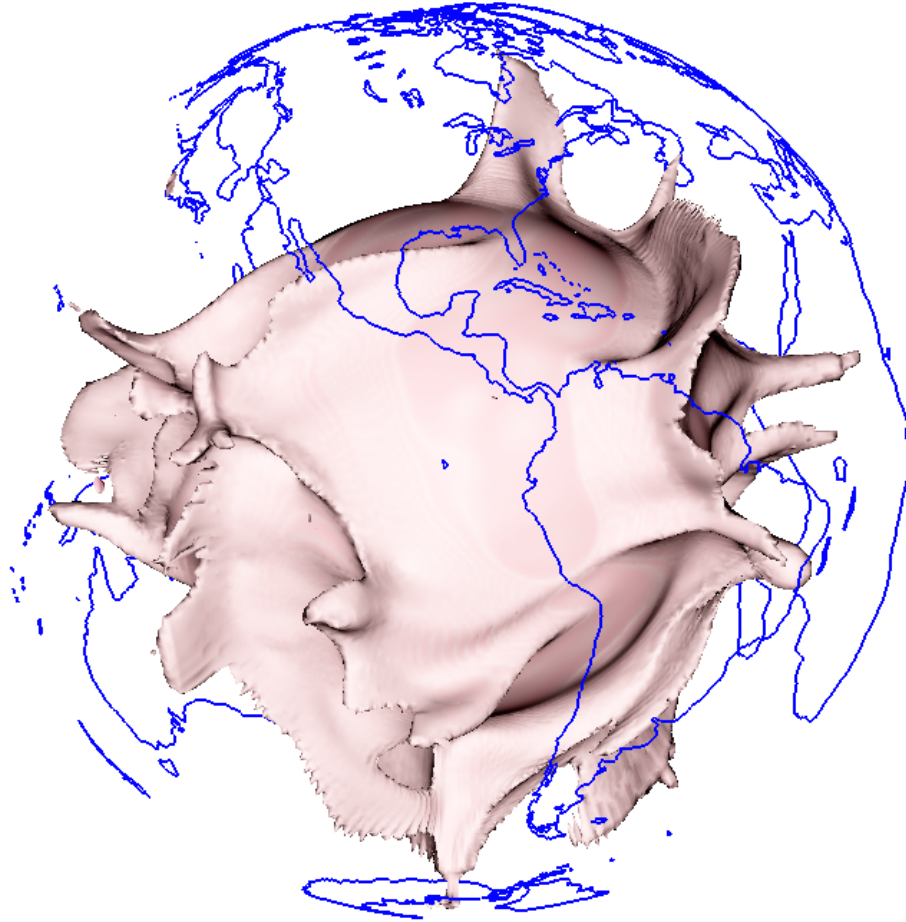


Figure 8. Tomographic model of global isothermal convection in the Earth's mantle.<sup>8</sup>

---

<sup>8</sup> McNamara, Allen. *Mantle Convection Isothermal Surface*. Arizona State University. 15 January 2010. Web. 4 April 2016

## QUABBIN

### [personal background]

My work I've learned has much to do with my upbringing and the world in which I grew up. I was raised in a quiet home situated in the thickly forested woodland of western Massachusetts. My town was small—with a population of nine hundred—and was situated on the rim of the Quabbin Reservoir, the water supply for the city of Boston. The name of the Quabbin is derived from a Nimpuc word which has been translated as “place of many waters”<sup>9</sup>. As a young boy I was fascinated with the many nameless streams and brooks that lulled through the wooded hills all steadily converging towards that massive reservoir at the bottom of the valley. I spent much of my childhood wandering these woods and mapping out these streams, naming waterfalls and eddies, and wondering whence they emerged and where they ended.

I was particularly drawn to the vernal pools that dotted the forest floor; small, ephemeral pools of water that form in depressions and holes from Spring rain and melting snow. In their brief, temporal existence, they hosted entire ecosystems of lifeforms. They

---

<sup>9</sup> Cosgrove, Ben. “Drowned Towns: Preserving the Lost Communities of the Swift River Valley.” *The Harvard Advocate*. The Harvard Advocate Mag. 2009. Web. 14 April 2016.

collected in ditches and gullies and in the ruins of old farmhouses, whose granite stairs descended into murky foreboding depths. Reflecting the world above them, they glistened like mirrors in the ground, containing both the sky and the earth at the same time. Staring downwards into them, I was simultaneously looking into the earth while looking at myself and up to the heavens above.



Figure 9. Vernal pool in New Salem, Massachusetts.

This introspection was no doubt fostered by the world in which I was raised. Brought up in a liberally catholic family that deeply honored the writings of American Transcendentalists like Walt Whitman and Ralph Waldo Emerson, my family also practices Transcendental Meditation—a non-religious, mantra-based practice with Vedic origins. Twice a day, the house would be quiet, family members sitting silent and still, repeating Vedic mantras in their mind. I was brought up to understand that through the effortless repetition of a mantra, of allowing it to slip away in the flow of passing thoughts and then easily retrieving it, one’s mind would naturally sink into deeper, more subtle states of consciousness. Over time, after routinely transcending into this immersive state of being, one begins to carry an awareness of that deeper consciousness with them in their waking, active state.



Figure 10. New Salem, Massachusetts.

## THE MUTABLE SELF



Figure 11. *Thermophile negative no. 13*. Silver-based 120mm negative.

This immersion into the depths of one's being through the repetition of a mantra greatly influenced my decision to use my face as the motif for this work. While the straight-on, deadpan gaze of the portrait may resemble other photographic motifs such as images of death-masks or spirit photography, it is my Transcendentalist background that shines through the most for me. Eyes closed, face forward and expressionless, my self portrait is meant to depict the countenance of a person in meditation, his attention turned inwards.

The sheer number of photographs I created was necessary for the experimental component of this project: in order to gather the greatest range of results, I required a large number of photographs. As an experiment, my face acted as the control, the receptor and armature for the data I would glean from the landscape. However, the

multiplicity of repeated images evokes the mantras repeated in mediation, each one being a similar utterance, yet unique unto itself. When viewed together, the repetition causes the images to undulate and flicker, my face appearing to fade and reappear throughout. Even the act of immersing the photos into the depths of pools, rivers and springs resembles cadences of Transcendental Meditation.



Figure 12. Thermal toning a photo in a hot spring, Iceland.

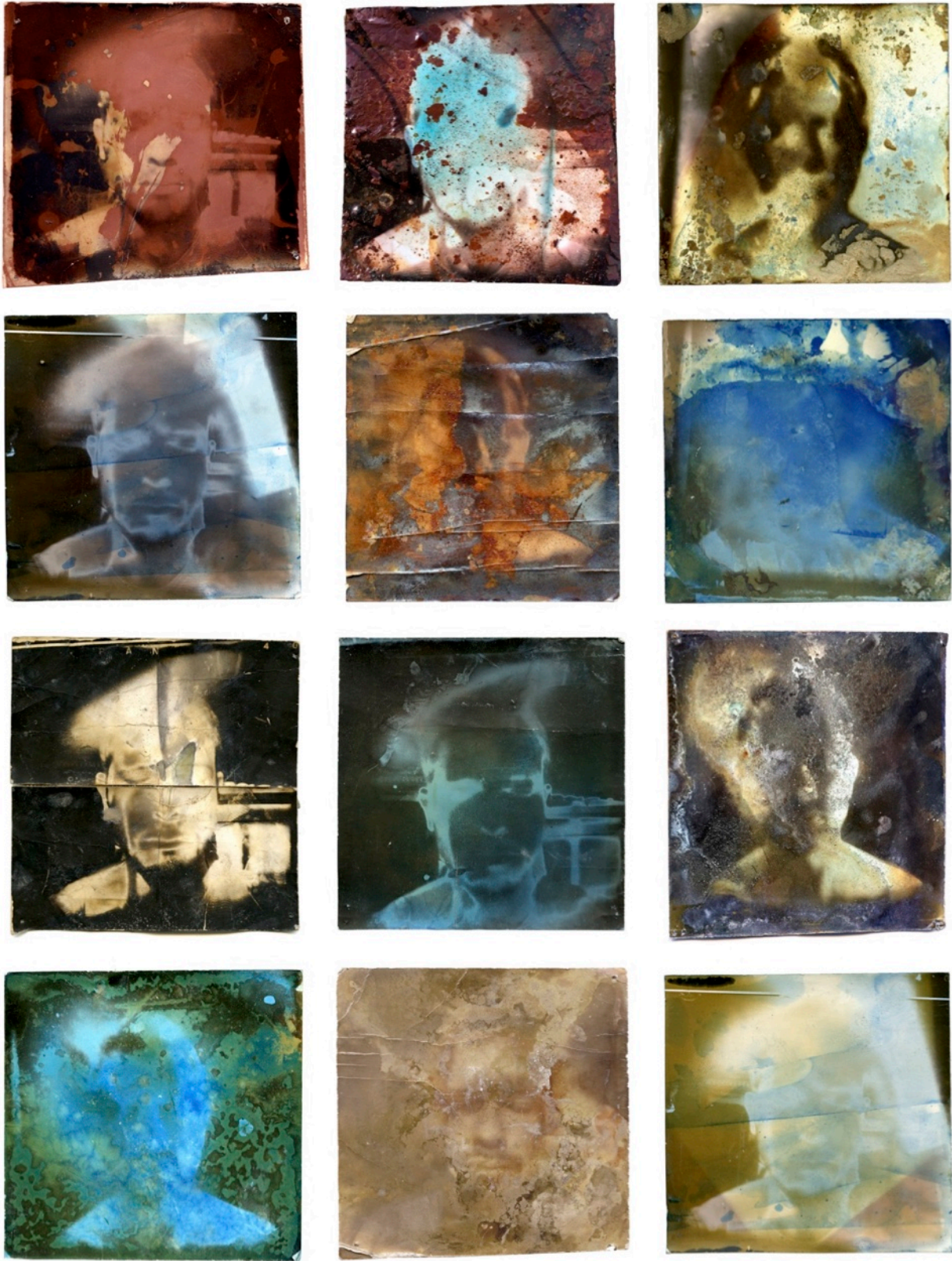


Figure 13. Selection of thermally toned silver gelatin prints from across Iceland, Wyoming and California.



## FLUX

### [paintings as parallel journeys]

Previously and parallel to formulating this project, I had been making paintings, and have been for years. I identify as a painter. Painting has shaped the mentality that I bring to any creative endeavor. It is what my fascination with alchemy and material and chemistry stems from. Unlike film processing, which I understand as a series of scientific steps and then subsequently dismantle, I don't understand painting. I know I never will, which keeps me at it.

I find the act of painting to be daunting; nothing will happen if I don't do it. It's why I rely on and introduce systems of working that I can get lost within—otherwise I am overwhelmed by my own uncertainty.

My practice oscillates between painting and photography. Cycling from the shrine-like environment of a darkroom to the open-ended space of a painting's plane, the knowledge of each feeds the other. Uncertainty in painting leads me to turn to the systems of the darkroom. Discoveries in the darkroom inspire me to see how they might be applied to a painting.

Wishing to embrace my own uncertainty, I began to introduce naturally transformative systems of dissolution, evaporation and crystallization into my paintings. Building off of the vernal pools of my New England home, I projected photographic



Figure 14. *Heaven has claws; love has teeth*. Oil, Acrylic, alum crystals, salt crystals, copper sulphate, glitter, epoxy resin on canvas. 56x64". 2015.

transparencies of them onto large canvases, tracing their outlines in paint. This binary system of responding to either light or dark values by using singular tones to trace them out on the painting surface was akin to enlarging a photograph in the darkroom. Here, my eyes, hands, and tentative tracing were the developing agent, slowly interpreting the projected image mark by darting mark.

Tipping the canvases on their backs, I poured solutions of dissolved crystal salts onto their surfaces. Under the weight of the liquids, the canvases sagged inwards, forming richly saturated pools atop the traced imagery of the vernal pools.



Figure 15. Video still. Copper sulphate solution being poured onto a painting.

Crystals appear to be about as alien to human life as it gets.<sup>10</sup> Without being alive, they are said to grow. Without wanting anything, they will naturally tend to resolve

---

<sup>10</sup> Charlesworth, JJ. "Signs of Life." *Seizure*. Roger Hiorns. London: Artangel. 2008. Print. p.56

themselves. In doing so, the molecules will accrue together, replicating the same structures and patterns layer by layer. Over the subsequent hours and days as the water evaporated from the pools in my paintings, myriad crystalline forms began to appear, forming richly textured fields comprised of innumerable diamond or cubic lattices. The concentric shapes of the pools formed encrusted haloes across the picture planes, the crystals obscuring and gnawing the painted surfaces below. This dichotomy caused the paintings to feel both literally and pictorially in flux.

To cut the crystals off from the atmosphere, I poured epoxy resin over them. Then, I added additional layers of paint and crystals until the works appeared crystalline themselves. Stratified with embedded layers, they seemed to be in suspended animation; emanations half on the verge of coming into being, half on the brink of falling apart.

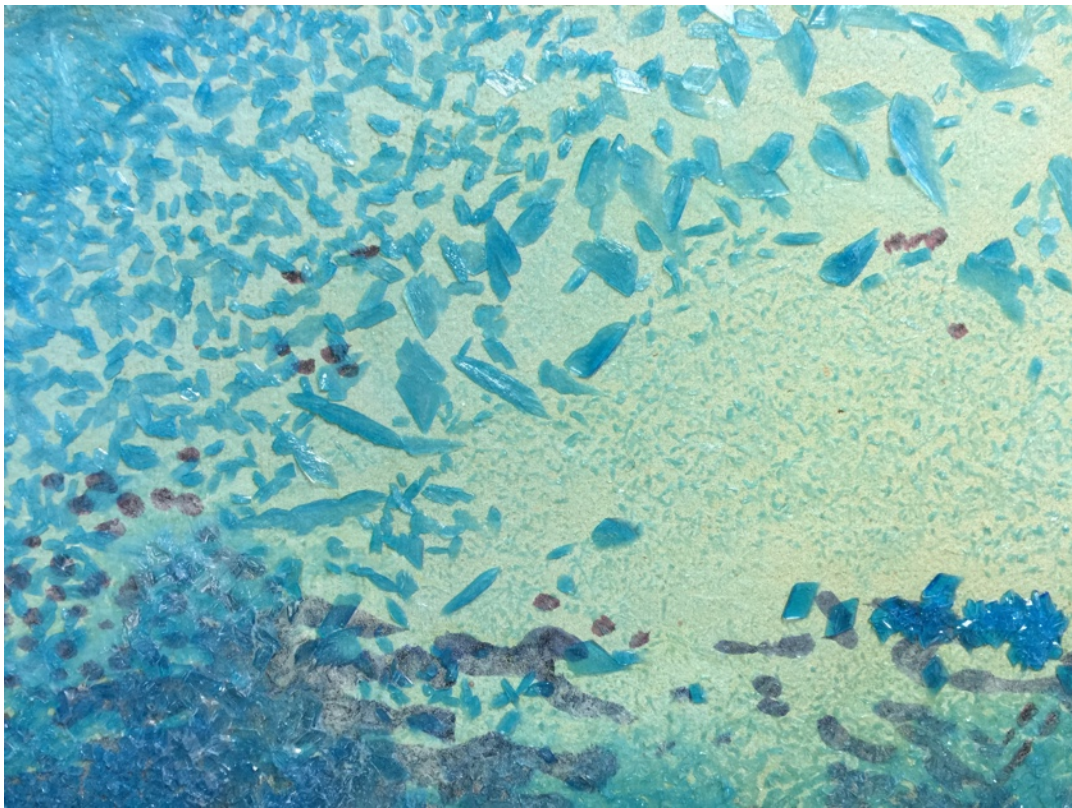


Figure 16. Detail of copper sulphate crystal-structures on a painting's surface.



Figure 17. *Things Fall Apart*. Acrylic, ink, salt crystals, epoxy resin on canvas. 56x64". 2015.

## SOLFATARA

### [geothermal landscapes as working spaces]

Upon arriving at the first geothermal field of my journey, a roiling, otherworldly site in Iceland known as Gunnuhver, I was astonished and delighted to find how closely it resembled the paintings I had been making. Brilliant lemon-yellow sulphur crystals formed about the seething mouths of fumaroles. Delicate floral-like webs of sinter amassed across the coarse ebony of lava rock. Clay beds rich in natural salmon, teal and umber pigments bled into solvents that oozed and belched forth from the ground. The landscape itself resembled paint. As I began to wander through Gunnuhver's prismatic landscape, I felt as if I was crossing a sprawling palette of thick impasto paint.

Early Anglo-European descriptions of encountering such geothermal sites like Gunnuhver were often equated with infernal visions and descents into hell. Recounting his journey into one of Iceland's solfataras, one traveler wrote that: "between the roaring of the caldron, the hissing of the steam jets, the stink of the sulphur, the clouds of vapor, the luridness of the atmosphere, the wildness of the glen, and the heat of the soil increasing tangibly at every inch, I could not help occasionally glancing round to assure myself that his Satanic Majesty was not present."<sup>11</sup>

---

<sup>11</sup> Forbes, Charles Stuart. *Iceland ; Its Volcanoes, Geysers, and Glaciers*. London: John Murray, Ablemarle Street. 1860. Print. p.108



Figure 18. Keystone View Company, *General View of Norris Geyser Basin, Yellowstone*. Stereograph, 1911.

While wondrous and inexplicably beautiful, the geothermal features of Iceland and Yellowstone were not generally regarded as picturesque, the way other sublime destinations like Niagara Falls and Mammoth Cave were. While the “vast and restless power stored just beneath the surface of the earth seemed sublime, it was not a sublimity which raised the heart toward God.”<sup>12</sup> Rather, the blasted and bizarre landscapes often

---

<sup>12</sup> Sears, John F. *Sacred Places; American Tourist Attractions in the Nineteenth Century*. New York: Oxford University Press. 1989. Print. p.182

inspired an awe tinged with fear and revulsion to the travelers who sought them out. One visitor recounted how mud volcanoes that “spat filth to heaven” and “splutter[ed] and [spat] in such a rage about nothing [that] one feels quite inclined to laugh at them.”<sup>13</sup> While one traveler would marvel at the lace-like delicacy of travertine terraces, Rudyard Kipling remarked that a geyser’s mouth looked like a “horrible slippery, slimy funnel.”<sup>14</sup> Thoroughly disturbed by Yellowstone, a certain Lord William Blackmore announced, “I have never seen anything so thoroughly diabolical in my life.”<sup>15</sup>

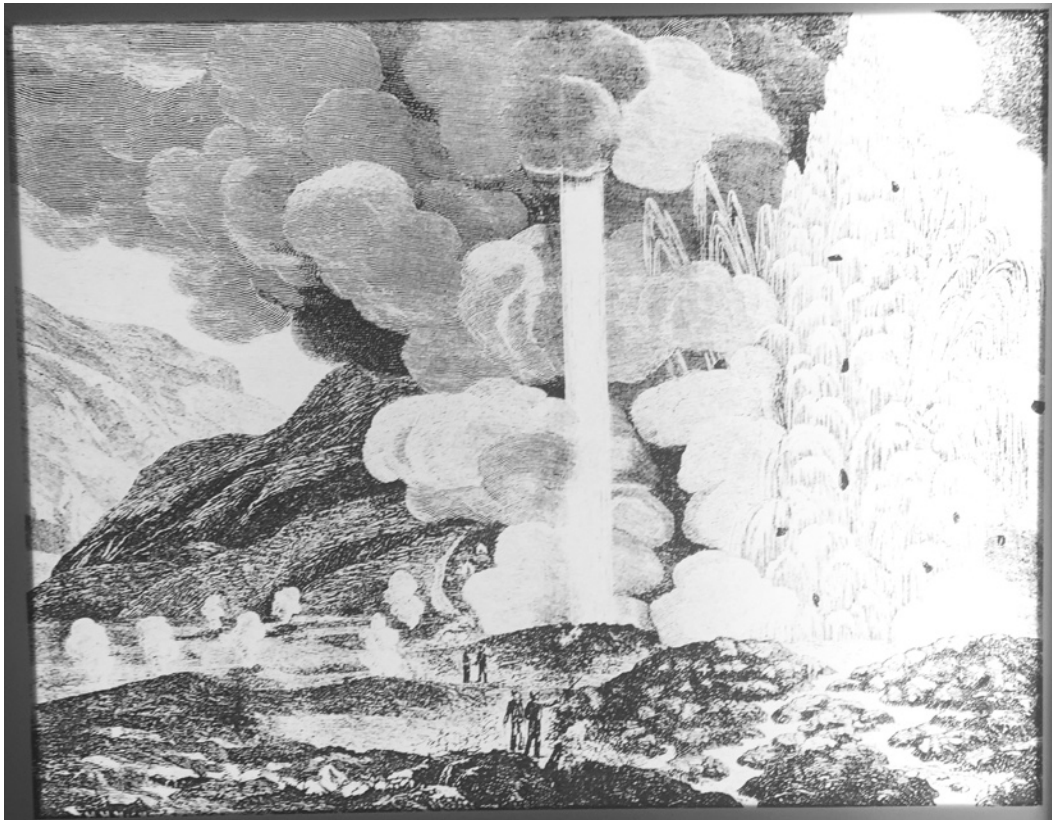


Figure 19. *Geysir and Strokkur erupting*, engraving from *Henderson’s Travels*, 1814.

---

<sup>13</sup>Sears, John F. *Sacred Places; American Tourist Attractions in the Nineteenth Century*. New York: Oxford University Press. 1989. Print. p.169

<sup>14</sup> *ibid.* p.169

<sup>15</sup> Nabokov, Peter. Leondorf, Leonard. *American Indians and Yellowstone National Park: A Documentary Overview*. Wyoming: Yellowstone Center for Resources. 2002. Print. p.218



Such Anglo-Americans projected these infernal associations onto the Native American tribes who lived in the region, propagating the myth that they too were afraid of Yellowstone's geysers, stating that "the Indians pass these places in profound silence and with superstitious dread" and tend to avoid the areas completely.<sup>16</sup> This of course was not true. While many tribes did believe hot springs to be the homes for "spirits who possessed great supernatural powers" which could be enacted for good or ill, they actively lived, hunted and utilized the geysers basin for bathing, cooking and cleaning.<sup>17</sup> Apprehension, caution and fear exhibited in the face of boiling, roaring landscapes is natural and common sense for any sensible people who encounter such forces. The Shoshone considered the hot springs to be sacred places, full of spiritual potency, and having "some kind of good power" for the body.<sup>18</sup> Both creative and destructive, the potency of Yellowstone's waters was felt by the Native American tribes who lived there, who regarded these features with great respect and wonder.

The American environmentalist, John Muir, strove to impart this voluminous sense of wonder in his writings on America's natural landscapes. I recognized in his words my own bewildered excitement at encountering the plethoric features of Gunnuhver. Rather than seeing Yellowstone as a geological circus side-show or an infernal realm of malignant forces, Muir saw in Yellowstone's turbulence cosmic, regenerative "images of heaven and hell, life and death, the end and the renewed beginning of things."<sup>19</sup> In a

---

<sup>16</sup> Nabokov, Peter. Leondorf, Leonard. *American Indians and Yellowstone National Park: A Documentary Overview*. Wyoming: Yellowstone Center for Resources. 2002. Print. p.219

<sup>17</sup> *ibid* p.157

<sup>18</sup> *ibid* p.220

<sup>19</sup> Sears, John F. *Sacred Places; American Tourist Attractions in the Nineteenth Century*. New York: Oxford University Press. 1989. Print. p.171

brilliant passage of his 1901 *Our National Parks*, Muir extolled Yellowstone's geothermal basins, proclaiming that they

“...may be regarded as laboratories and kitchens, in which, amid a thousand retorts and pots, we may see Nature at work as chemist and cook, cunningly compounding an infinite variety of mineral messes; cooking whole mountains; boiling and steaming flinty rocks to smooth paste and mush—yellow, brown, red, pink, lavender, gray, and creamy white—making the most beautiful mud in the world; and distilling the most ethereal essences.”<sup>20</sup>

Muir's description of these geothermal fields as being alchemical laboratories where the landscape churns itself into a state of transformation awakened a similar awareness in me. Concentrated unceasingly, the primordial elements of Earth, Air, Fire, and Water are all present in such places—creating a wellspring of phenomenon seen nowhere else on earth. While it is known that the whole world is in a state of perpetual geological flux, in geothermal hot spots that flux is accentuated and our awareness of it heightened. One can almost feel the landscape before them meld, dissolve and mutate before their eyes.

However, I learned quickly that they are dangerous places. Wandering through Gunnuhver's valley in a daze, I initially traversed only the lava-rock outcroppings that wrapped about the springs' edges. Entranced, I spied a large volcano-shaped crater that

---

<sup>20</sup> Muir, John. *Our National Parks*. Boston: Houghton, Mifflin and Company. 1901. Print. p.44

jutted upwards from a expanse of cracked and fissured red clay. Drawn to the sonorous thudding of splashing liquid within its cauldron, I stepped out from my lava-rock perch and onto the clay.



Figure 20. Geothermal hotspot at Gunnuhver, Iceland.

Stepping lightly as I crept towards it, I heard the aqueous heaving within the crater resound with increasing depth and clarity. I felt its waves slap the sides of its chamber. I felt it seethe and roil. Drawing close enough to glimpse the grey liquid within lash across the volcano's rim, the ground beneath my boots suddenly pulsed upwards.

With a sharp gasp, I hastened back to the lava-rock shore. My legs trembling, I was filled with the visceral realization that ground surrounding such volatile springs was akin to the surface of a frozen lake; what might appear to be dry, solid earth, could be mere inches of sun-baked clay above reservoirs of boiling, acidic mud. All the hidden tributaries and plumbing that fed these springs and geysers were spread out beneath me, continually pummeling upwards, wearing away the earth above them.



Figure 21. Mud pot, Gunnuhver, Iceland.

After this initial brush with danger, I began to improvise different methods of immersing my photographs in springs too dangerous to approach. While purchasing supplies at an Icelandic grocery store, I bought some dishwashing gloves and a pair of long-handled BBQ tongs. Using the sturdy elastic of a hair-tie, I learned how to firmly clamp a photograph in the tong's grip and safely extend my reach into the boiling mud pots I was fascinated with.

While a great improvement, this only worked for smaller features. One day, having spotted a distant column of *reykja* (the Icelandic word for "smoke" that signifies a thermal feature, and which I poured over my map looking for), I parked my car and hiked out towards the steam. Upon arriving I found not a constellation of springs, but rather one enormous rift in the hillside. Approaching its ledge, I beheld a giant crater sloshing with a turbid, miasmic solution of metallic-looking water. I knew navigating the steep incline to its shores was to invite calamity.

Lying in my camp that night, I rinsed out a plastic peanut butter jar I had and poked holes through it with my pocketknife. Feeding a length of synthetic laundry line through its bottom and out its lid, I brought this simple apparatus back to the mammoth spring. I placed a photo within the jar along with some stones, and sealed the lid. Pulling the line taut, I braced myself and threw the capsule as far as I could into the depths of the spring. Drawing it back and draining the liquid, I found the photo richly toned. The success of this experiment introduced a new method of working into my process. Similar to fishing, I would stand on the shores of larger springs and cast this line and wait, drawing it back periodically to examine the results.



Figure 22. Video still of the artist throwing a jar into a large hot spring near Krýsuvík in Iceland.

Over ten months, I traveled across Iceland, to the Yellowstone Caldera in Wyoming, and to the geothermal shorelines of the Salton Sea in southern California. While I met many interesting people and formed friendships along the way, these journeys were mostly solitary. In Iceland, I slept in a rented car and camped in the countryside. I cooked cans of beans and soup by placing them in the boiling springs while I worked. To avoid tourists, I worked all night in the Arctic summer light. In Wyoming and California I stayed in hotels, returning to my rented rooms at night after having worked all day in the field, becoming caked in mud and reeking of sulphur. I'd return exhausted from my outings and wash my photos in the sink, laying them about my room to dry. In the morning, I would gather them up and write on their backs a number

indicating the order in which I toned them, a name, and the kind of thermal feature they were immersed within.

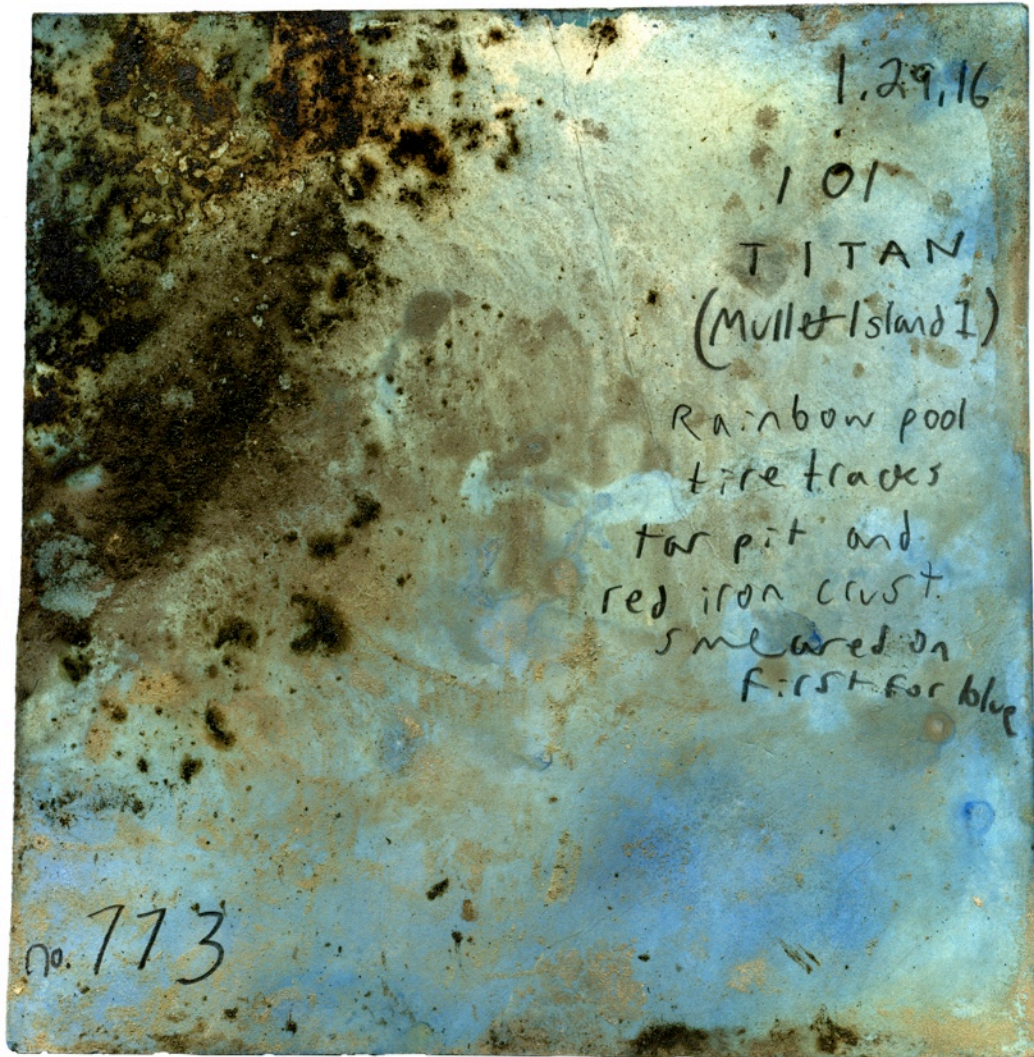


Figure 23. Notes on the back of a photo toned at the Salton Sea, California.



Figure 24. Video stills of various methods of immersing photos in hydrothermal systems.



# SALTON SINK

[salton sea diary + self - instruction manual]

2.18.16

Calipatria, California

## **To obtain blue:**

Scrape the rust off an old structure. Take the flakes of iron oxide and sprinkle them into a plastic jar. Follow that with a scoop of red-stained mud. Flip through the photo-box and choose a photo. Roll it into the jar and seal the lid. Feed plastic line through container's holes and then pull it taut. Stamp the end of the line into the mud then and step upon it. Sturdy oneself.

Survey and look. Stand on the edge of the system, where the ground is sturdy, before the spongy depths, the minerals seeping, the swallowing of feet. Steam gushing from a hundred points, water plashing, heaving, forming craters, pockets, pools and lagoons. Choose a spring that's mostly water but still brackish. One that spouts, one that splashes. Neither too muddy nor too shallow.

Cast the line. Watch how it traces an arc through the air. Earth squishes under weight. With a splash, the jar lands within the spring, and is enveloped in steam. Hydrogen sulphide with ferrous leaching. Wait some seconds, then draw the line back. The jar crosses the terrain, bouncing and

skipping, trotting over the banks. Drain out the hot water, and then dump out the contents.

Lemon photo is now blue. A brilliant blue. Cyan flecked with red, indigo and cobalt. Scrape the mud off and smear it with one's gloves. Hold it up to the sky to match.



Figure 25. Photo thermally toned in iron-rich hot spring at the Salton Sea, California.

**To obtain siena:**

Find a mineral grove with concentric rings. Crystalline sprouting in bulbous groupings. The colors of another planet—Saturn-esque, Jovian, tangerine crusting with white speckled globules. Listen for hissing. Crouch and catch vapors melding the air, hold hand lightly near and feel the heat rising.

Step lightly closer, the softness crunching, feet sinking into prismatic crumble. Step where the dead plants are, on the ossified branches, on the old pipes, along the old roots.

Close enough now to see their mouths, the hissers and seethers, the little volcanic vents that glower and scowl. Their mouths glisten with sulphur needles, each crystal gleams like a rabid tooth.

Wearing gloves, plant photos inside them, one atop each of the vents. The vents will object; they'll curse and hiss. So scoop up some mud and plop it on the papers' backs. Once weighed down, the hissing's muffled. Slowly back off. Make note of the time—scrawl it in a notebook, and then retreat.

In some hours creep back. Pluck papers from the ground. The photos are now brown, deep etruscan honey and amber and gold. Silver stained rainbows, sweating and glistened. Images turned inside out, other spots burnt, blackened and embered.

Pocket the photos, stand to leave, withdraw lightly.

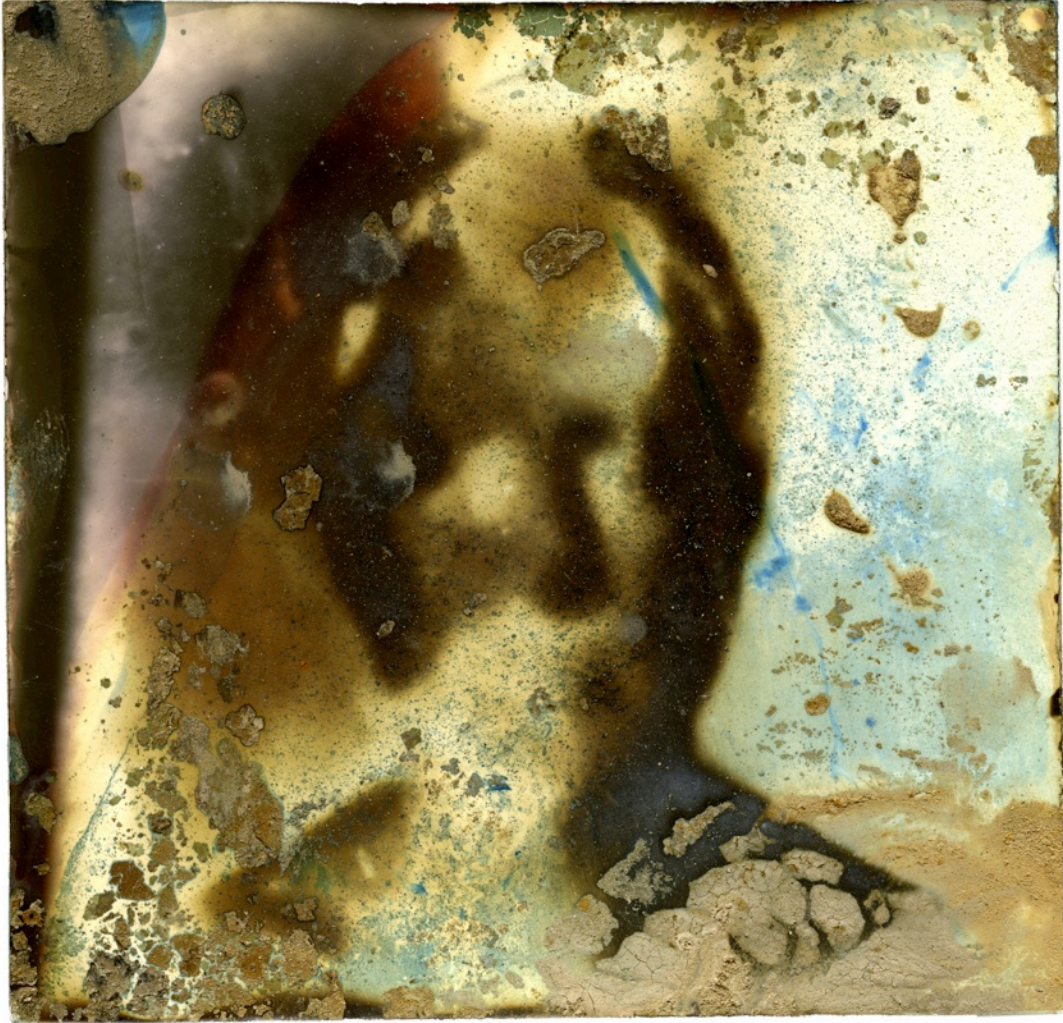


Figure 26. Photo thermally toned in a fumarole at the Salton Sea, California.

**To obtain traction:**

The tires spin and dig themselves deeper. The radiator wheezes. Fervent scraping, feverish digging. Fingers grasp at mud, tearing out clumps and clops and globs. The engine groans, the tires whirl useless in the earthen slather. Pushing and pacing. Kicking and scraping. It all sinks another inch.

A good stone's throw off, hear the hissers hiss. The splashers splashing.

The springs continue their rumbling. They rage in the dusk.

The sun casts reds, violets and velvets. Finally there are nothing but stars overhead. Marshy bugs draw to the winking of lights, and then draw closer to the smell of skin.

Utter prayers. Sigh curses. Photo-boxes spilled, toppled in the trunk. Two tons of metal and plastic slunk in a field, everything perched on the edge.

Phones lose power, the water jugs empty. Conversations flit over airwaves, sections break off, shatter and silence.

Teemer. Spouter. Spasm and roil. The darkness draws them closer. Close eyes and say you're sorry. Close eyes and someday learn.

A signal cracks to life, startles the stupor. On the horizon, headlights bloom, beams casting through bushes, roaming, looking.

Slam the car door and run down the road. The light beams sweep and flash across you. Jog towards them, hands raised and waving, hear the sweet bass of distant men's voices. An engine grows closer. Spirit's now lighter. Spirit's now laughter.

Ropes and chains and hooks and traction. The springs gurgle onwards, uncaring, unfazed.

## CLIMATOLOGY OF THE MIND

Working in the field and physically grappling with the material constraints and conditions of a specific terrain naturally led me to consider the writings of artists who worked in a similar mode. The essays of Robert Smithson, who made monumental earthworks in fringe, remote American landscapes in the 1960's and 70's, were instrumental to my understanding of my own work. At the beginning of his essay, *A Sedimentation of the Mind* (1968), Smithson wrote:

“One’s mind and the earth are in a constant state of erosion. Mental rivers wear away abstract banks, brain waves undermine cliffs of thought, ideas decompose into stones of unknowing, and conceptual crystallizations break apart into deposits of gritty reason.”<sup>21</sup>

This beautiful equating of the ineffable aspects of one’s inner consciousness as being akin to vast natural systems is reminiscent of the writings of American Transcendentalists. The melding between self and nature and the boundlessness invoked by Smithson’s words are to be found just as readily in the work of Walt Whitman. However, the inherent Transcendentalism within this passage is at odds with Smithson’s

---

<sup>21</sup> Smithson, Robert. *Robert Smithson: The Collected Writings*. Ed. Jack Flam. Los Angeles: University of California Press. 1996. Print. p. 100

frank dismissal of any notions of spirituality in art or nature, and his rejection of artists he believes “indulge in spiritual fantasy” and “wishy-washy transcendentalism.”<sup>22</sup>

After touting the desert climates he favors, Smithson writes somewhat pejoratively about those whose inner climatologies are drawn to the “pools and stains of paint”, referring to them as possessing “leaky minds” and “dank brains”, stating that “such wet eyes love to look on melting, dissolving, soaking surfaces that give the illusion at times of tending toward a gaseousness, atomization or fogginess.”<sup>23</sup> Despite Smithson’s underlying snarkiness, these are precisely the kind of qualities I feel attuned to. I sense this dismissal of any attraction to liquidity as being a remnant of an outdated polarization between land art and painting. Indeed, this sentiment is again at odds with the power behind Smithson’s own masterwork, *Spiral Jetty* (1970), which is activated not by its form alone, but by its placement and immersion in the transformational salt-saturated waters of a dead sea.

These contradictions and parallels between Smithson and Transcendentalism are highlighted by the critic Gregory Volk, who writes of Smithson’s ambitions to work outdoors directly with the earth as being in effect, an updating “of a centrally Emersonian call to venture outside in the largest sense: to shed psychological and cultural restrictions, and seek an original engagement with nature.”<sup>24</sup> Writing in his famous essay, *Nature* (1836), Emerson recounts that while “crossing a bare common, in snow puddles, at

---

<sup>22</sup> Smithson, Robert. “Fredrick Law Olmsted and the Dialectical Landscape.” *The Sublime*. Ed. Simon Morley. Cambridge: The MIT Press, 2010. Print. p.116

<sup>23</sup> Smithson, Robert. *Robert Smithson: The Collected Writings*. Ed. Jack Flam. Los Angeles: University of California Press. 1996. Print. p.109

<sup>24</sup> Volk, Gregory. “Transparent Eyeball: Toward a Contemporary Sublime.” *Badlands: New Horizons in Landscape*. Ed. Denise Markonish. North Adams: Mass MoCA. 2008. 177-184. Print. p.180



Figure 27-28. Robert Smithson, *Spiral Jetty*. 1970



twilight, under a clouded sky, without having in my thoughts any occurrence of special good fortune, I have enjoyed a perfect exhilaration. I am glad to the brink of fear.”<sup>25</sup> Continuing, he writes: “Standing on the bare ground—my head bathed by the blithe air and uplifted into infinite space—all mean egotism vanishes. I become a transparent eyeball; I am nothing, I see all; the currents of the Universal Being circulate through me; I am part or parcel of God.”<sup>26</sup>

It is this ecstatic, expansive moment of Emerson’s that Volk relates to Smithson’s work. Smithson’s emphasis on shedding humanistic ideals and embracing and lending primacy to natural forces in his work is an approach that “intersects with Transcendentalism’s desire to cross borders, whether psychological or cultural, [that] separate oneself from the world.”<sup>27</sup> As a means of blurring the separation between disparate geographic locations, Smithson made what he referred to as *Non-sites*, a series of small-scale “indoor earth works” that would be composed of geological materials scooped from the fringe places he explored: panes of slate from quarries, mineral rubble from construction sites, and shards of mica from abandoned mines. In a poignant insight, Volk relates the sudden expansion of “becoming a transparent eyeball” to the way Smithson refers to these works. In an interview about his *Non-sites*, Smithson states “there’s a central focus point which is the non-site; the site is the unfocused fringe where your mind loses its boundaries and a sense of the oceanic pervades.”<sup>28</sup> The possibility

---

<sup>25</sup> Emerson, Ralph Waldo. *Nature and Selected Essays*. London: Penguin Books. 1982. Print. p.38

<sup>26</sup> *ibid.* p.39

<sup>27</sup> Volk, Gregory. “Transparent Eyeball: Toward a Contemporary Sublime.” *Badlands: New Horizons in Landscape*. Ed. Denise Markonish. North Adams: Mass MoCA. 2008. 177-184. Print. p.180

<sup>28</sup> *ibid.* p.180

for an artwork or landscape to inspire within the viewer an awareness of an unbounded universe is at core a Transcendentalist belief, though not unique to it.

My thermal toned photographs act as containers similar to Smithson's *Non-sites*. Because their emulsions have absorbed the dissolved elements within the thermal waters where they were placed and are thus reconstituted, they then bear the molecular attributes of those sites. They function as paper-thin capsules of a landscape. If we consider each spring to be an individual entity, each with its own rhythms, compositions, and energies, each photograph then embodies aspects of that spring's "thermocline". The two become fused.

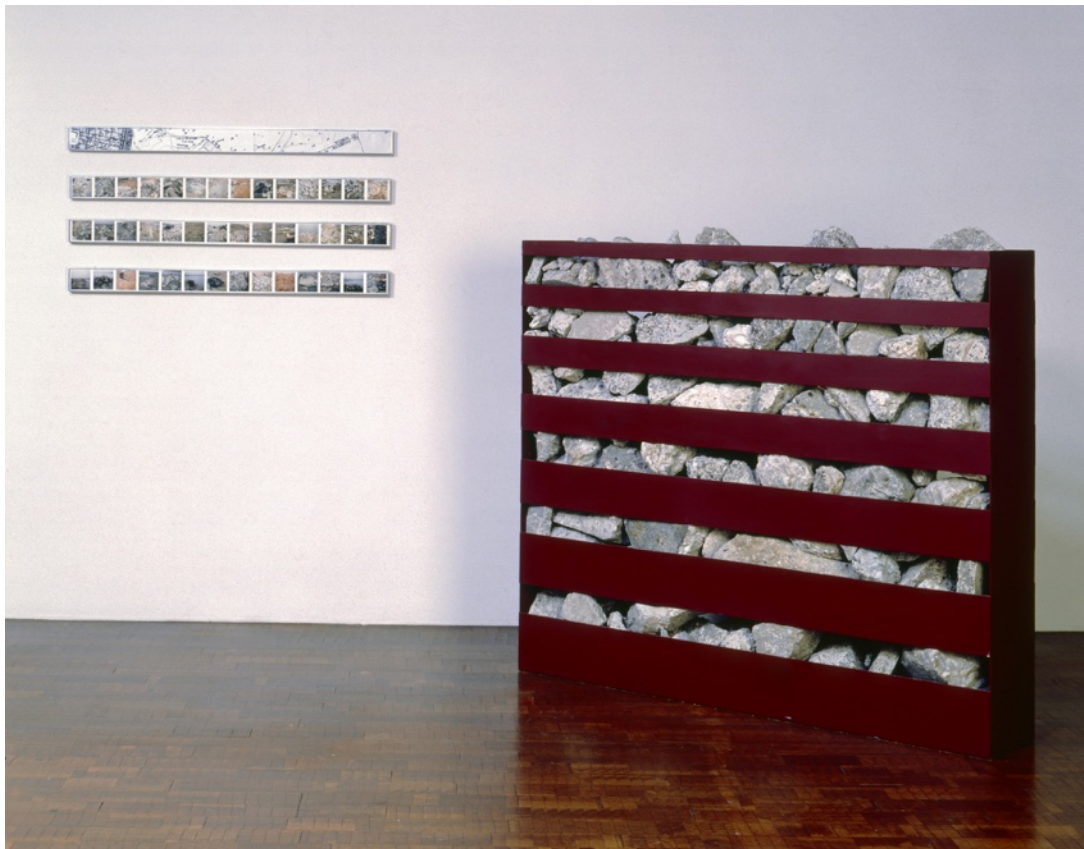


Figure 29. Robert Smithson, *Non-site: Line of Wreckage (Bayonne, NJ)*. 1968. Painted aluminum container with broken concrete, framed map, and three photo panels.



Figure 30. Peter Doig, *What Does Your Soul Look Like?* Oil on canvas, 78 x 108". 1996

Recalling the temperate vernal pools that transfixed my younger self, it is significant that this project centers on meditations of similar pools of a thermal nature. Just as Walden Pond became a small ocean to Thoreau, these swelling bodies of water became vast upon contemplation, each containing an entire cosmos. While working, I

spent many hours staring into these waters, a state recalling a painting by Peter Doig, titled: *What Does Your Soul Look Like?* (1996). Painted in lushly saturated citric yellows and coppers, we see the boots of a figure standing over a pool of water or ice, the person's shrouded reflection blending with the trees behind. The reflected world of the pool swirls with a constellation of forms and shapes that undulate, blend and swim about.



Figure 31. Peter Doig, *Blotter*. Oil on canvas, 78 x 98". 1993.

This introspective gaze, paired with the question the title poses, suggests a similar melding between one's self and landscape as Smithson's *Sedimentation of the Mind*.

Another work by Doig, *Blotter* (1993), presents us with a similar encounter between a figure and an aqueous natural setting. Poised atop a frozen pond, a young boy stares down at his own reflection as it undulates in the shimmering, rippling waves he makes in the water. The motifs present in this work call to mind early Northern Romantic notions of the artist as an introspective traveler, as someone who looks outside of themselves to seek an encounter with a larger natural force. Such sublime encounters in Romantic paintings are often situated in awesome, fringe landscapes, where the seismic, overwhelming immensity of nature can be felt.

Caspar David Friedrich's *Monk by the Sea* (1808-1810) presents just such an encounter. Devoid of the figuration associated with maritime genre painting, Friedrich's painting was received as being disturbingly empty for the period. The image consists of a lone figure standing dwarfed before an immense and brooding sky looming over a vast expanse of water. Art historian Robert Rosenblum writes that is a picture that is "daringly empty, devoid of objects, devoid of the narrative incident...[and] devoid of everything but the lonely confrontation of a single figure".<sup>29</sup> Rosenblum goes on to assert that this painting "corresponds to an experience familiar to [a] spectator in the modern world, an experience in which the individual is pitted against, or confronted by the

---

<sup>29</sup> Rosenblum, Robert. *Modern Painting and the Northern Romantic Tradition*. New York: Icon. 1977. p.13



Figure 32. Caspar David Friedrich, *Monk by the Sea*. Oil on canvas, 43x68". 1808-1810.

overwhelming, incomprehensible immensity of the universe, as if the mysteries of religion had left the rituals of church and synagogue and had been relocated in the natural world".<sup>30</sup> By this reading, Friedrich's picture has an emancipative quality; his desire to imbue an experience of divinity in the secular landscape marks a major breach with the Christian Church's dominance over all matters divine via traditional iconography. This can also be seen as a precursor to the Emersonian call to seek spirituality in nature and within one's self.

It is the work of Walt Whitman that bears the closest resonance to the spirit with which I made this project. Upon reading Emerson, Whitman famously stated: "I was

---

<sup>30</sup> Rosenblum, Robert. *Modern Painting and the Northern Romantic Tradition*. New York: Icon. 1977. p.14

simmering, simmering, simmering; Emerson brought me to a boil."<sup>31</sup> Within the pages of his great poetic work, *Leaves of Grass* (1891), one can feel that ecstatic energy brimming over in Whitman's words. The sweeping, unifying embrace of his poems attempts to encompass everything about him, adulating every aspect of his world in order to bring the reader to a similar euphoric state. Opening with an invitation, the work memorably begins with:

"I celebrate myself, and sing myself,  
And what I assume you shall assume,  
For every atom belonging to me as good belongs to you."<sup>32</sup>

Whitman's emphasis on atoms emphasizes the unifying fundamental makeup we share with the world: "my tongue, every atom of my blood, form'd from this soil, this air."<sup>33</sup> This cosmic elasticity imparts a fluid sense of identity where the boundaries between one's self and the world beyond begin to blur. Throughout *Leaves of Grass*, Whitman's sense of boundlessness allows his being to dissolve and meld into the world:

"I depart as air...  
I effuse my flesh in eddies and drift it in lacy jags.  
I bequeath myself to the dirt to grow from the grass I love,  
If you want me again look for me under your bootsoles."<sup>34</sup>

---

<sup>31</sup> Volk, Gregory. "Transparent Eyeball: Toward a Contemporary Sublime." *Badlands: New Horizons in Landscape*. Ed. Denise Markonish. North Adams: Mass MoCA. 2008. 177-184. Print. p. 181

<sup>32</sup> Whitman, Walt. *Leaves of Grass; Authoritative Texts, Prefaces, Whitman on his Art, Criticism*. Ed. Sculley Bradley, Harold W. Blodgett. New York: W.W. Norton & Company. 1965. Print. p. 28

<sup>33</sup> Whitman, Walt. *Leaves of Grass; The First (1855) Edition*. New York: Penguin Books. 2005. Print. 98

<sup>34</sup> *ibid.* p.96

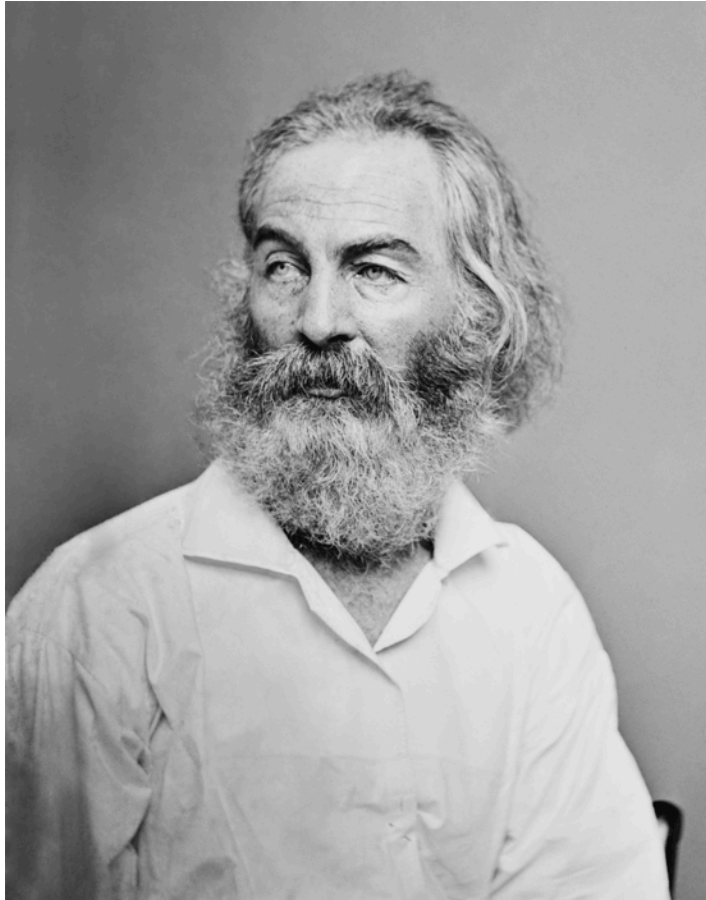


Figure 33. Mathew Brady, *Portrait of Walt Whitman*. Circa 1860



## ANALOG

### [proposition + artistic precedents]

My childhood effectively spanned our society's transition into the digital age. As one of the last members of the analog generation, I was raised listening to dust crackles in the grooves of my parents' records and carefully crafting music cassette tapes that would wear down from overplaying. At the same time, I was learning to type and to navigate computers. Slowly our records and tapes were replaced by CD's, which in turn were replaced by digital files, which now all exist in virtual space. I'm not sure what is more amazing—to have stored music in the form of magnetic dust on a spool of tape, or to be able to look up any song I can imagine instantaneously, regardless of where I am.

On an industrial, social and commercial level, photographic technology embodies this transition. The recent bankruptcy and closure of companies like Polaroid and Kodak underscore this shift, as their demise threatens the very existence of the medium of film. Rather than lament film's obsolescence, I believe that the primacy of digital photography alleviates film from its previous obligation to document, faithfully record, store, and share visual information. Film photography is now freed up to do what only *it* can do. This transition echoes the profound effect the advent of photography had on Western painting when it was invented in the 1820's.<sup>35</sup> Alleviated from its longtime role of being the main visual means for creating a life-like representation of the world, painting was freed to be

---

<sup>35</sup> "Niépce and the Invention of Photography." *Maison Nicéphor Niepce*. Photo-museum.org. Web. 21 April 2016

expressive of the qualities inherent within and emergent from its material nature. In this way, I see analog photography and painting to be indelibly related: they are physical, plastic mediums that allow for expression arising from an infinitude of chemical reactions.

As a proposition, this project is a dissection of analog emulsion's elemental guts, pushing its limits, and utilizing its reactive qualities in a unique manner. While a camera's lens can be thought of as an artificial eye, photographic emulsion can be thought of as artificial skin. A thin, absorbent membrane stretched over the body of the paper, emulsion is porous, sensitive to humidity and temperature, darkening with exposure to light and reactive to its environment. It cracks and scars under duress, it has a chemical memory, and, ultimately and finally, it decays with time.

This project is not about fetishizing or justifying the use of film in our digital age. In fact I relied heavily on digital means in order to conduct this work. All of the video footage I shot in the field was produced on my cellphone, and the research for many of the thermal sites I sought out was compiled on the internet, and located with GPS technology. Nonetheless, I believe this project highlights what a film photograph can do, and everything that a digital one cannot, and seeks to do so by examining film photography as a physical material.

My research has not revealed any other documented practice of redeveloping film photographs in thermal springs, a process I refer to for myself as "thermal toning." In regards to processing film outside in nature, there are some intriguing precedents that relate to my practice.

Social practice artist, Laura Bon, has organized a multifaceted community of creative outputs based in an ex-industrial site on the Owens Dry Lake, California, a region once teeming with the silver mining industry. Engaged in an exhaustive interrogation of



Figure 34. Laura Bon and the Metabolic studio developing film in an alkaline lakebed.

the landscape's history, material index and cultural significance, Bon has been exploring the impact silver mining played on the local economy as well the history of photography. With a team of chemists and fellow artists, she is engaged in using the naturally occurring "chemicals in the alkali [lakebed] to fix and develop photographs taken with a truck converted into a huge camera obscura".<sup>36</sup>

---

<sup>36</sup> "Laura Bon & the Metabolic Studio." *Sculpture Magazine*. 34.7 (2015): 44-47. Print. p.44

A similar investigation of a landscape's material index through its waterways is the beautiful series *Lakes & Reservoirs* (2008- 2011) by photographer Matthew Brandt. Brandt's innate curiosity has led him to experiment with augmenting traditional photographic processes with eclectic ingredients as diverse as Viagra, fingernails, peanut butter, gunpowder, tar, and Kool-aid. *Lakes & Reservoirs* represents an exquisitely far reaching inquiry into the materiality of his medium and his subject matter.

*Lakes & Reservoirs* is a series of chromogenic prints of large bodies of water across the United States. Brandt shot the photos of the lakes he visited and collected gallons of water from each lake he photographed. He then laid the finished prints into trays of water from the lake or reservoir the imagery depicts. After a prolonged immersion in these waters, the integrity of the photographs' emulsions begins to break down, leading to a steady, gentle dismantling of the imagery. As chromogenic prints are constituted by three layers of cyan, magenta and yellow emulsions, their subsequent decay results in prismatic, astral abstractions that erupt, sever and dissolve the landscapes they contain.

Brandt speaks to this process by stating: "each picture relies on a self-generated energy that is grounded in a friction between the lake or reservoir's light and material index".<sup>37</sup> This process then serves not only as an attempt to conjoin the subject's visual representation with its physical makeup, but also as a disincorporation of the color film process—an industry deep in decline. With the collapse of Polaroid and Kodak, color film processing may even cease to exist in our lifetimes. Brandt addresses the tentative uncertainty that pervades his work stating that chance operations represent "an attempt to

---

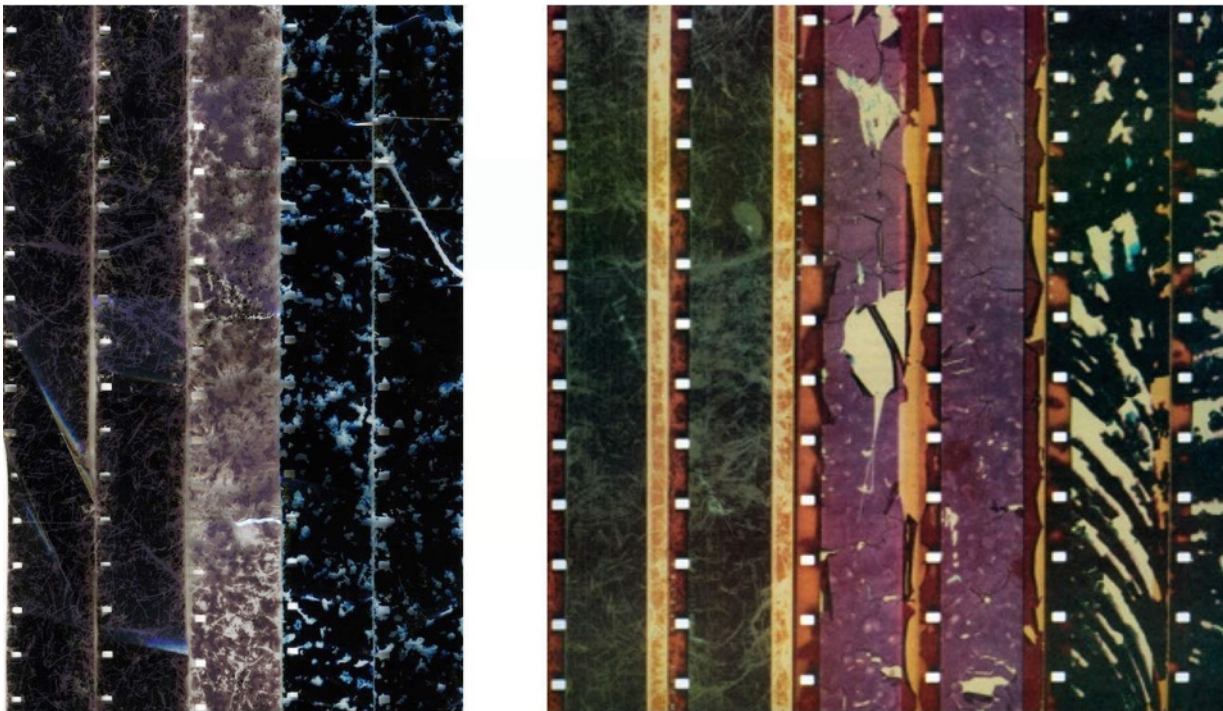
<sup>37</sup> Brandt, Matthew. *Lakes & Reservoirs*. Bologna: Damiani. 2014. p.148



Figures 35-36. Mathew Brandt, *Lakes & Reservoirs*. C-Prints, 72x105". 2008-2011.

try and tap into the oblivion of forgotten wet processes, that of our lakes and reservoirs and the Chromogenic printing technology. Both are wet and with uncertain arid destinies.”<sup>38</sup>

In another reinterpretation of the “wet processes” behind analog film production, filmmaker David Gatten made a series of 16mm films entitled: *What the Water Said* (1997). As an experiment, Gatten placed unexposed 16mm film stock into commercial crab traps and submerged them in the ocean off South Carolina. Upon retrieving the film days later, he found it pocked with myriad abrasions, stains, scratches and markings, which seemed to dance in a frenetic undulation when played it through a projector. To Gatten it “seemed clear that the material and the apparatus *were* responding to



Figures. 37-38. David Gatten, film strips from *What the Water Said*. B&W 16mm film. 1997.

---

<sup>38</sup> Brandt, Matthew. *Lakes & Reservoirs*. Bologna: Damiani. 2014. Print. p.148

differences in the world, and that there was some sort of correlation between what happened in the ocean and what happened on the film.”<sup>39</sup> The film’s physical deterioration was evidence of what the ocean scrawled across it.

Timothy Morton relates this kind of artistic practice to a “channeling” of a larger force through a medium that can transmit and translate it. He gives an example of a composer who records the sounds outside his New York apartment for a year, and then speeds the recording up until the sounds of the city traffic begin “to sound like the tinkling of tiny insects. As the sound accelerates, a slow, periodic hum begins to become audible. The listener is now hearing the standing wave caused by pressure changes in the air over the Atlantic Ocean...A gigantic entity has been channeled into a sound recording audible to humans.”<sup>40</sup> The respective mediums of Gatten’s 16mm film, Brandt’s chromogenic prints, or my thermally toned photos can all be said to function as channelers of the energies and rhythms of the enormous, natural forces they come in contact with. Indeed, Morton classifies this art as being “a matter of contact with an alien presence, and a subsequent work of radical translation.”<sup>41</sup>

Despite the commonality of these experimental works, relating to my work the most perhaps is the research of Dr. Thomas D. Brock. Dr. Brock’s book, *Thermophilic Microorganisms and Life at High Temperatures* (1968) presents the research he conducted in Yellowstone National Park, where he collected and analyzed samples of thermophilic bacteria in the park’s hydrothermal springs. Prior to his findings, it was

---

<sup>39</sup> MacDonald, Scott. *Adventures of Perception: Cinema as Exploration*. Los Angeles: University of California Press. 2009. Print. p. 306

<sup>40</sup> Morton, Timothy. “From Modernity to the Anthropocene: ecology and art in the age of asymmetry.” *International Social Science Journal*. 63.207-208 (2014): 39-51. Print. p.48

<sup>41</sup> Morton, Timothy. “Sublime Objects.” *Speculations II Journal*. 10 (2011): 207-227. Print. p.221

believed that many of the hottest, most acidic springs in the Yellowstone Caldera were inhospitable to life. In order to locate life's true limits in such extreme environments, Dr. Brock and his team created a system in which they immersed glass plates several feet down in the springs, and then retrieved them at systematic intervals over the following days and weeks.



Figures 39-40. *Left:* The artist working in Iceland, 2015. *Right:* Dr. Thomas Brock in Yellowstone, 1977.

Upon the retrieval of these plates and looking at them under a microscope, Brock discovered that without exception, every single plate was colonized with thermophilic bacteria “and in over half the pools the bacteria so densely covered the slides as to form a film visible to the naked eye.”<sup>42</sup> The glass plates he collected were in a way “toned” by the springs themselves. Their introduction into the hydrothermal waters caused them to

---

<sup>42</sup> Brock, Thomas D. *Thermophilic Microorganisms and Life at High Temperatures*. New York: Springer Verlag. 1978. Print. p.46



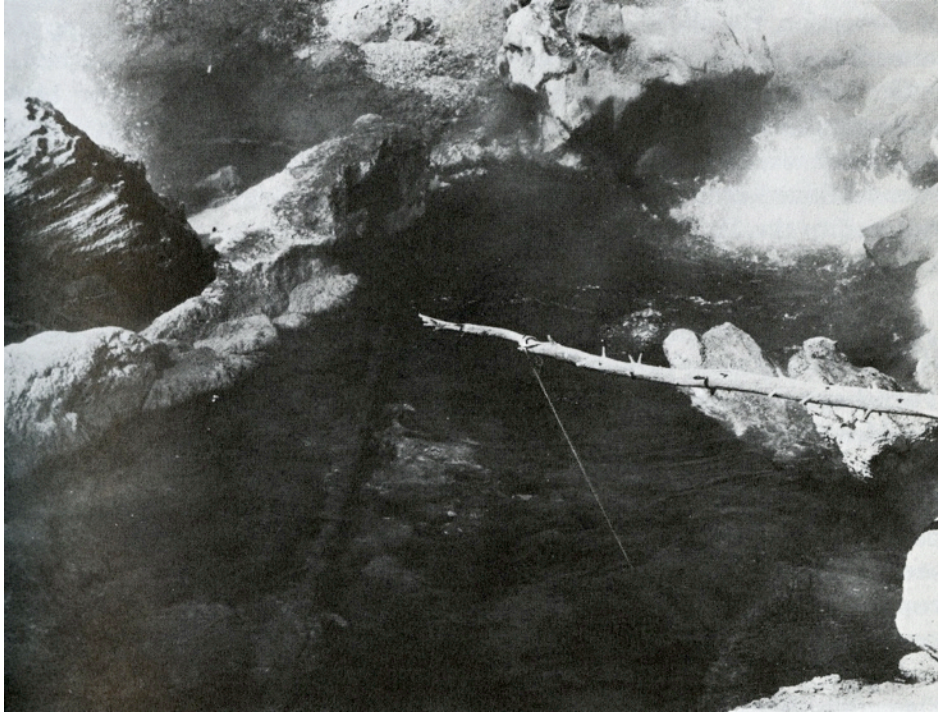
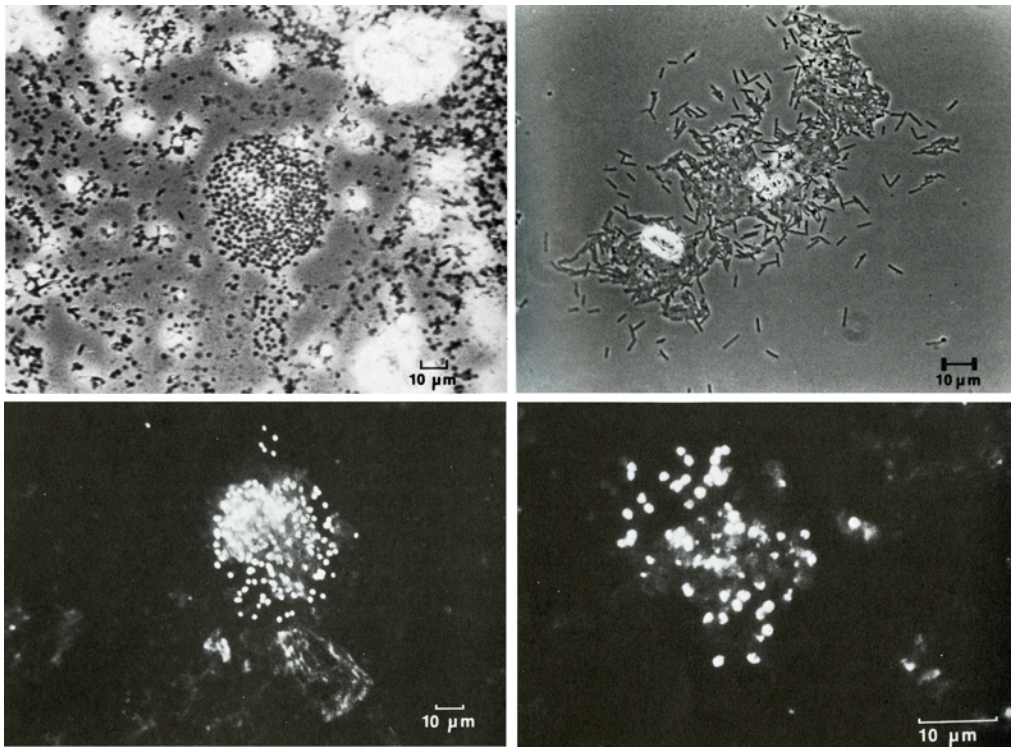


Figure 41. Dr. Brock, method of immersing glass slides in a hydrothermal system



Figures 42-46. Dr. Brock, glass slides of thermophilic bacteria. 1977-78.

be incorporated into the dynamic ecosystem of the springs, and briefly *become part of* them.



Figures 47-48. *Right:* Horseshoe souvenir encrusted with silica, 1897. *Left:* Roman curse tablet, lead. 1st Century, CE. Found during archeological excavation at the Sacred Spring, Bath, England.

This recalls early touristic practices in Yellowstone in which travelers would place “pine cones, ferns, acorns, pieces of wood, shoes, hats, tumblers, knives, forks, scissors, horseshoes, bottles, and picture frames in the hot springs. When they removed them a day or two later, they were encrusted with a hard white deposit of silica.”<sup>43</sup> While the inclination to place objects within the transformative baths of thermal springs seems almost universal, not all rituals called for the objects’ retrieval. An excavation of the Roman baths dedicated to the goddess Sulis Minera in Bath, England in the early 1980’s led to the discovery of the Bath Curse Tablets. After having diverted the waters of the Sacred Spring to assist in the excavation, archeologists discovered 130 tablets in the

---

<sup>43</sup>Sears, John F. *Sacred Places; American Tourist Attractions in the Nineteenth Century*. New York: Oxford University Press. 1989. Print. p.171

spring's mouth, each a thin, flexible piece of lead with writings scrawled across them.<sup>44</sup>

With the exception of a few, most of the writings were requests for vengeance from Minerva to exact fierce, violent punishments upon individuals who had wronged the authors. Once these vicious curses were written, the tablets would be cast into the irretrievable parts of the spring, inducting them into an otherworldly realm, a place beyond human reach.

Brock's slides function differently in their "channeling" capacity: having entered an alien world that is virtually unknowable to us, they then return to our realm containing the residue of their journey and a means of *seeing* the primordial life forms that thrive in that space.

My project, *Thermophile*, is named after these microorganisms. Literally meaning "heat-lover" in Latin, they fit under the larger classification of "extremophiles"—resilient, unbelievably tenacious organisms. Whether within the DNA-shredding radiation of nuclear waste, under the deepest pressures and most acidic places on Earth, or found in either boiling or frozen environments, each species of extremophiles have evolved to thrive in cripplingly hostile conditions. Dr. Brock's research proved they can live at a temperature of 95.5°C.<sup>45</sup> Since then, thermophilic bacterial colonies have been found thriving in hydrothermal systems at temperatures as high as 121°C.

Of course, an extreme environment is relative to different organisms. Conditions guaranteed to destroy us are the comfortable habitats for thermophiles. As I worked

---

<sup>44</sup> "Bath's Messages to the Goddess Given Globally Recognized Status." *Romanbaths.co.uk*. Romanbaths.co.uk. 24 June 2014. Web. 14 April 2016.

<sup>45</sup>Sears, John F. *Sacred Places; American Tourist Attractions in the Nineteenth Century*. New York: Oxford University Press. 1989. Print. p.46



Figure 49. Thermophilic bacterial mat, Mammoth Springs, Yellowstone National Park.

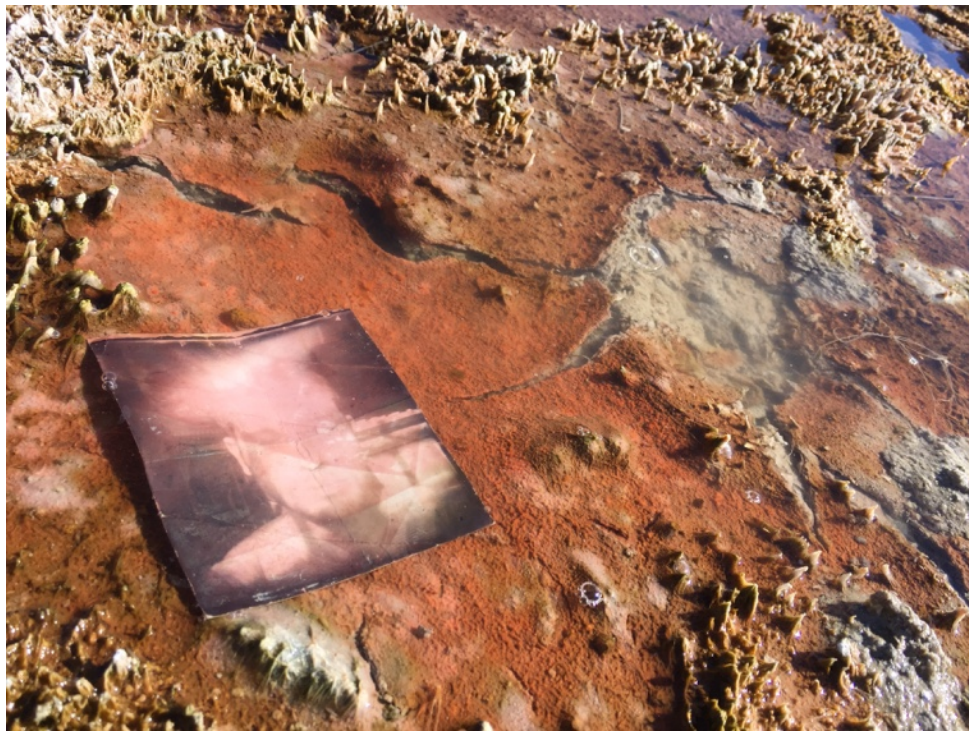


Figure 50. Toning in a thermophile-rich hot spring, Montana.

alongside and within the tumultuous worlds that are their normal habitat, I couldn't help but feel moved by their existence. I feel a dim kinship between our species, a recognition of our common tenacity and ability to adapt and persevere in volatile conditions. Looking closer, one can see the origins of life on Earth in these volcanic pools. In our planet's violent infancy, the first organisms to grow in the noxious, poisonous environment of the Earth must have been able to thrive in such a context. Indeed, they are the kind of organisms we anticipate discovering on other planets and moons in our solar system, whether in the hydrocarbon lakes of Titan, the volcanoes of Io, or within the icy oceanic depths of irradiated Europa.

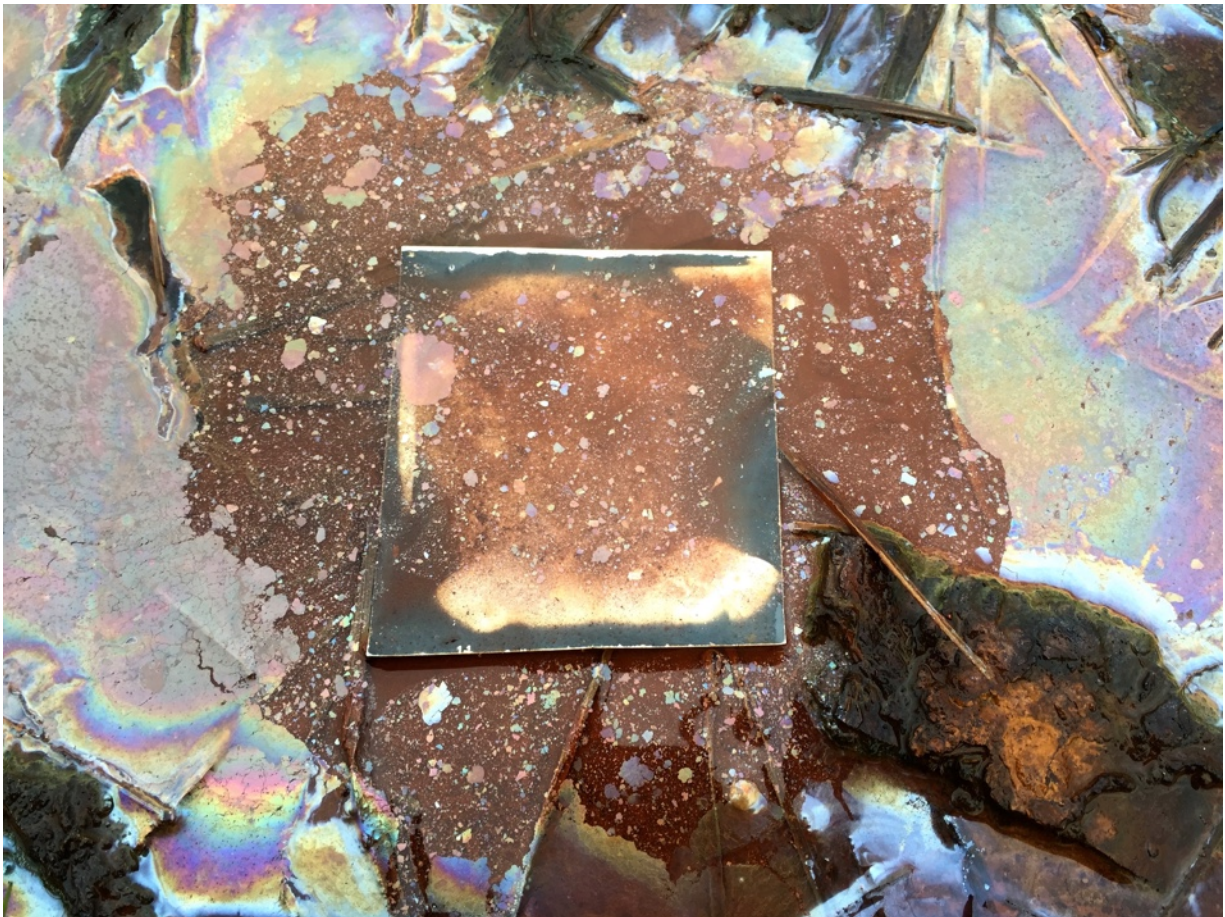


Figure 51. Thermal toning in a hot spring, Seltún, Iceland.

In this way, thermophiles are our ancestors. They represent the tenacity of life, its ability to adapt to the harshest of conditions, to thrive in the face of extreme adversity. In them I sense some hidden hope for life as a natural force; no matter the calamity that threatens to extinguish it, life on this planet will find a means of persisting in spite of it.

*Thermophile* is then about communing with these species, the environments they thrive within, and the earthly forces that generate all of it. The photos act as interlopers in those worlds and are in turn reconstituted by them.



Figure 52. Thermal toning in a hot spring, Seltún, Iceland.

# ARGUS

[mfa exhibition]

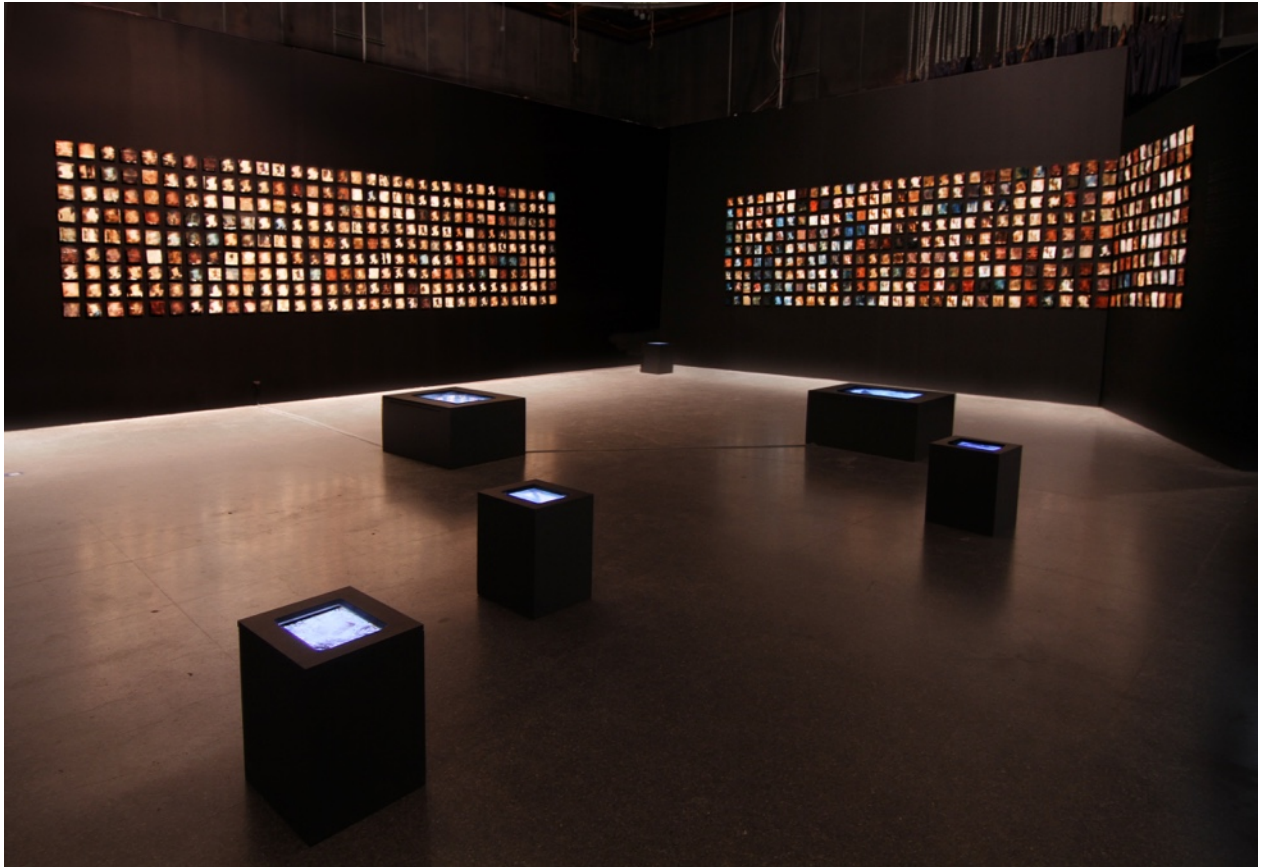


Figure 53. *Thermophile*, exhibition view at Argus II, 2016.

**Argus II Building.** 400 4th St. Ann Arbor, MI.

Once the site of the Argus Camera Company, this building used to be part of a factory that produced analog cameras. Later renovated into two TV studios sometime in the 1970's, this location has a long history in producing and working with optics, film production and visual transmission.

*Thermophile* was installed in one of these TV studios. To create a cinematic and introspective experience for the viewer, I painted the space a matte black and spot-lit the

works using the studio's theatrical lighting. Lit against the dark background, the works in the show seemed to glow and emanate forward, accentuating their physicality.

The name and historical nature of the Argus II Building bears a poetic resonance to my work. Named after the Greek mythological creature with a thousand eyes, the Argus Camera Company no doubt was referring to their production of thousands of lenses. Camera lenses can be thought of as artificial eyes "that see" in many directions at once. It is interesting to note that within the confines of this building, long after the closure of the Argus Camera Company, my installation features 1,068 film photographs of a human face.



Figure 54. View of digital video.



***Title panel.*** Vinyl, LED screen, MDF case, white graphite. Video with sound, looping 1.35 minutes.

Marking the entrance and title of the exhibition, this wall presented the viewer with a list of names, coordinates, dates, and types of thermal systems—data representing the itinerary and travels to the three volcanic areas I visited. Handwritten directly onto the wall, the notational quality was meant to evoke associations of field journals, travel diaries, and scientific notations. This information and its presentation were drawn from actual pages in the sketchbooks I brought with me in the field, containing coordinates and directions to the far flung, remote sites I sought out.

GPS coordinates also suggest an invisible grid, a manmade system of longitudinal and latitudinal lines meant to map the world in a global way. They suggest an exactitude and geographic specificity. Additionally, they speak to a kind of mapping that transcends the relatively temporal boundaries of nations, states, and territories, referring only to the spherical shape of the Earth.

To the left of the coordinates was a digital monitor encased in a black frame. The footage looping on this screen was of the first instance I experimented with loading photos in a jar and casting them into a large hot spring. Witnessing the purposeful and enigmatic activity of the lone figure poised above what appears to be a sea of vapor, the viewer is introduced to the kind environment and process that informed the creation of the works in the show. Additionally, it is the only traditionally framed view of a landscape in the exhibition. Horizons, skylines, and wide-angle views are absent from the rest of the imagery, but implied in their disposition.



Figure 55. Exhibition view of *Thermophile*, 309/1,068 thermal toned silver gelatin prints.

***Thermophile.*** 1,068 thermal toned silver gelatin prints. Each approximately 4x4”

Wrapping about the walls of the space, the results of these toning expeditions were arranged together in panoptic grids according to the region in which they were toned. Viewing them as a whole, one could identify the “geochemical palette” of the landscape, as the colors in the photos were evidence of the kind of minerals and elements present in the hydrothermal systems of the region. Viewing them closer, one can see the variety of different results, as well as recognize that they are essentially the same images repeated throughout, each one different from the next.



Figure 56. Exhibition view.

**Field.** LED digital monitors, video, sound, MDF.

Encased in black boxes, a series of six digital monitors were arranged across the floor of the gallery. Each monitor played looped footage of the process of the toning of my photographs onsite in various thermal systems. The videos' audios played softly, emitting field recordings of bubbling, splashing, and gurgling features that washed together, creating an atmospheric environment that filled the space. Having these videos low to the ground, and arranged across floor the space simulated the immersive experience of walking through a geothermal field, and encouraged the kind of body language and introspective posture one naturally assumes when encountering and examining such features.



Figure 57. *Field*, detail.

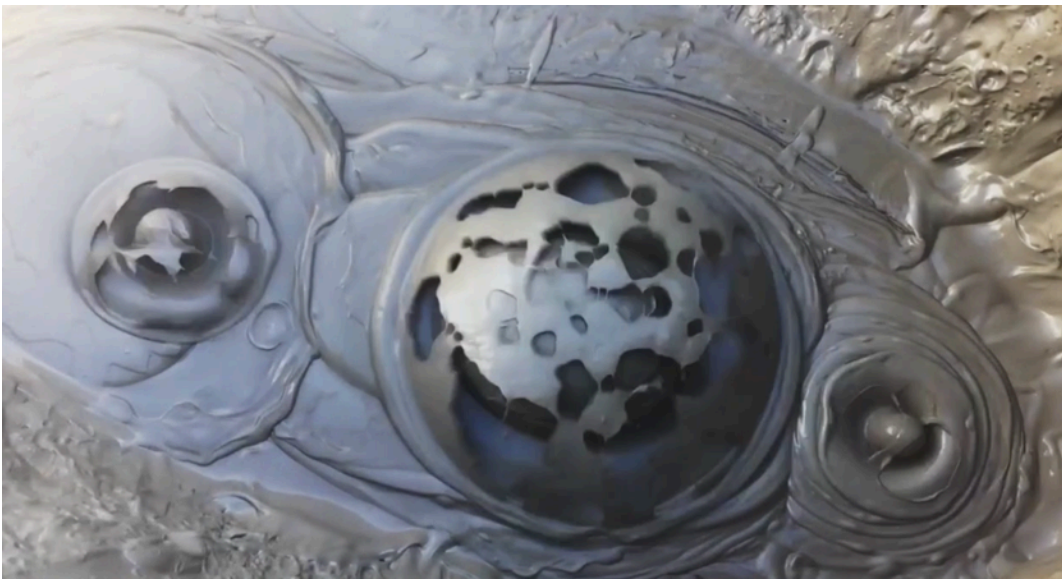


Figure 58. Video still of *Field*.

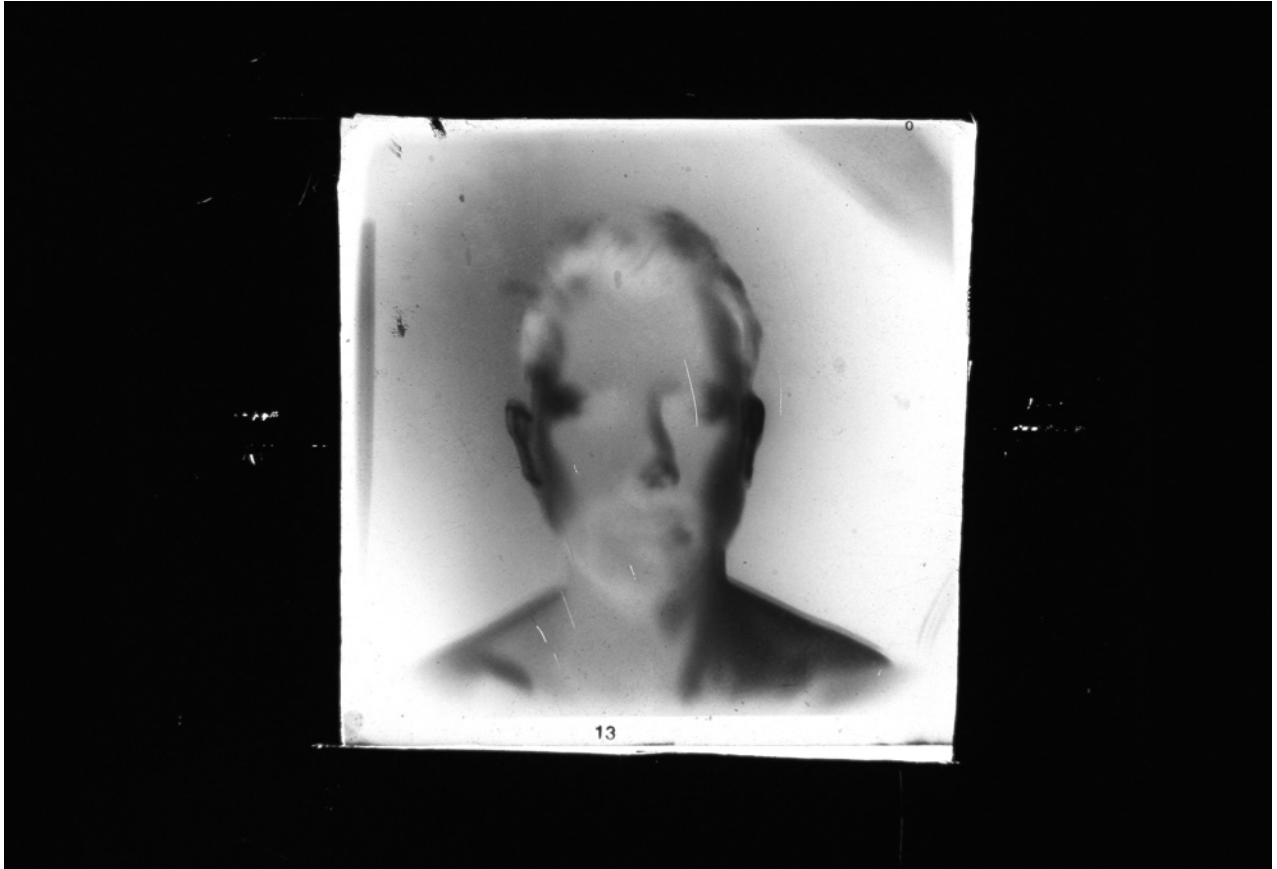
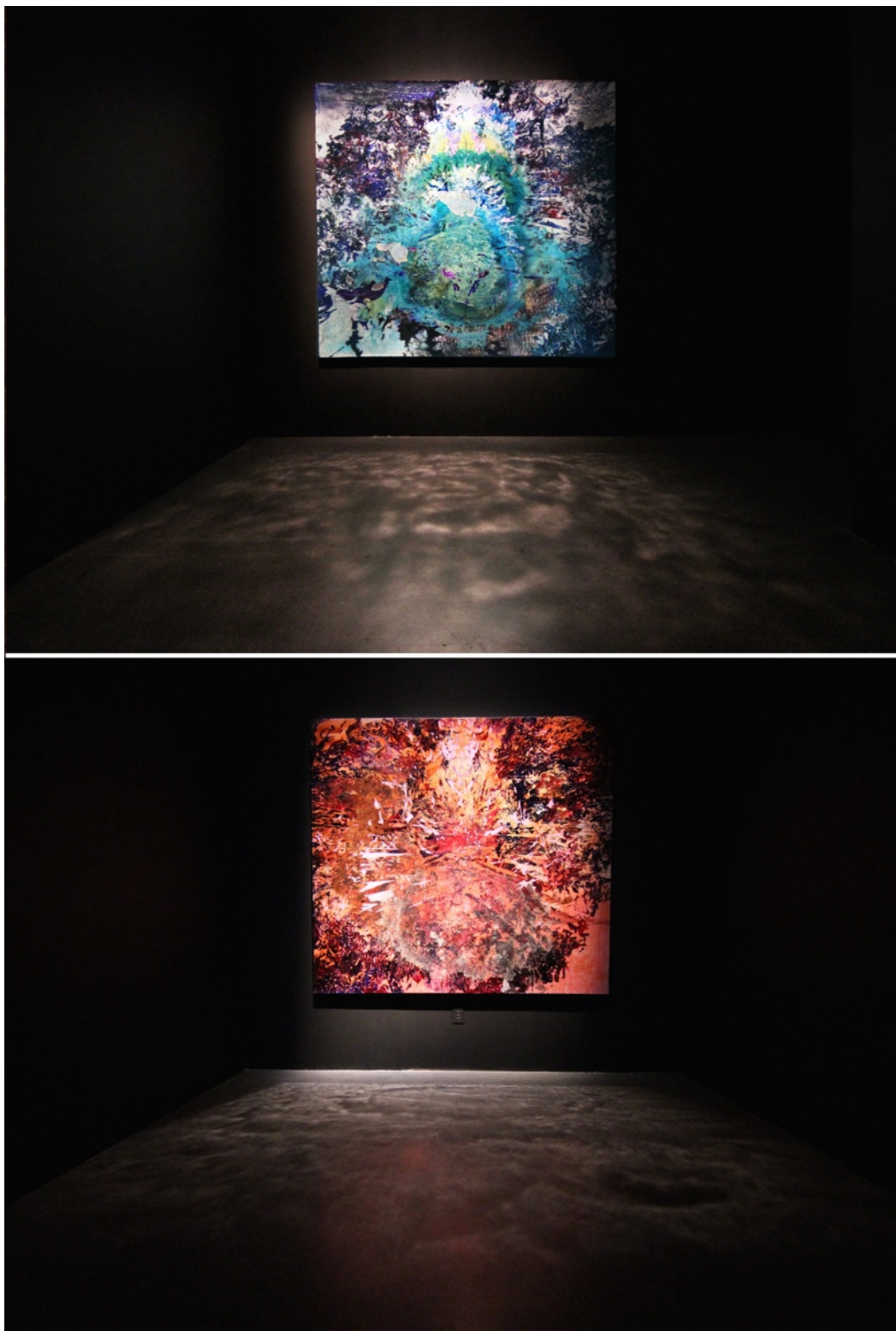


Figure 59. *Thermophile negative no.13.*

***Thermophile negative no. 13.*** Silver gelatin negative, ortho litho film, light-box, MDF.

Backlit and glowing, the negative from which the majority of the photos featured in the exhibit were derived from, was presented at the show's entrance. As the reproducible matrix for much of the work in the show, its presence accentuates the variety and diversity of its permutations, suggesting a possible infinite array of results.



Figures 60-61. Top: *Wellspring*, installation view. Bottom: *Developer*, installation view.



Figure 62. *Wellspring*, detail.

***Wellspring.***

Oil, acrylic, copper sulphate crystals, salt crystals, epoxy resin on canvas. 64x70”

***Developer.***

Oil, acrylic, sulphur, salt, iron-oxide, D-76 photo developer, epoxy resin on canvas. 64x70”

Alkaline and acidic, cold and hot, *Wellspring* and *Developer* were meant to embody the eruptive and tumultuous essences of extreme hydrothermal systems. Created using projected imagery, dissolved minerals and crystalline structures encased in resin, these two paintings emoted the plethora of elemental textures found at geothermal sites.

Situated across from one another in vestibule-like spaces, *Wellspring* and *Developer* acted as the poles at either end of the chromatic spectrum of tones I obtained from my thermal toning: blue at one end, red on the other. Arrayed between them, a grid of photos toned in Iceland embodied this color shift, presenting a range of rich, prussian blues that slowly transitioned into sienas, reds, and umbers.

## SEA DRIFT

### [conclusion]

“...all we do our whole lives is go from one little piece of Holy Ground to the next.”<sup>46</sup>

J.D. Salinger, *Raise High the Roof Beam, Carpenters & Seymour: An Introduction*

When working in the field, I felt deeply satisfied in my efforts. Returning to my camp or room, dirty and fatigued, I was reminded of how French laborers describe such bittersweet weariness as “their trades [having] entered into them.”<sup>47</sup> I found working with the earth in this manner to be similar to gardening, to tilling, planting and harvesting. Despite being caked in sulphuric mud, my legs aching, my beard itching from having sweated into a respirator for hours, I’d wash my photos my photos in a stream, and marvel at how they’ve changed. Setting them on my dashboard to dry, far away from having to present them to my peers, from having to justify my actions, to bolster their worth, I felt a joy, a confidence in myself.

This method of generating artwork afforded me a way of using uncertainty to my advantage: by allowing the infinite combinations of temperature variations, acidity levels, and geochemistry to determine the way my photo redeveloped, my involvement was relegated to deciding where and when I should initiate and cease the development.

---

<sup>46</sup> Salinger, J.D. *Raise High the Roof Beam, Carpenters & Seymour: An Introduction*. New York: Little, Brown and Company. 1963. Print.

<sup>47</sup> Tuan, Yi-Fu. *Topophilia*. New York: Columbia University Press. 1972. Print. p.96



Cybernetician Stafford Beer describes this process of generating art out of a chaotic system as: “instead of trying to specify [the system] in full detail, you specify it only somewhat. You then ride on the dynamics of the system in the direction you want to go....the ‘dynamics of the system’ is its interaction with the environmental, physiological, and cultural climate surrounding its performance.”<sup>48</sup>

Riding the dynamics of these hydrothermal systems filled me with some inner fortitude. As a person often wracked with self-doubt, this process afforded me a means of taking my uncertainties and placing them into the realm of something that *is* certain in its perpetual outpouring.

I am eager to continue my exploration of using the reactive qualities of light-sensitive emulsion as a means of collecting information from the environment, as well as expanding upon the burgeoning use of video in my work. As I move forward, painting will no doubt be the foundation from which these other modes of exploration extend from. The potential for co-authoring artwork with dynamic natural systems seems infinite.

My experience of contemplating these perpetually upwelling waters recalls Whitman’s poem about listening to the sound of the ocean’s waves as they gnaw away the shore on which he stands. Every wave is different, the flow unending, each extinguishing itself with a hiss upon the sand. My photos speak to these metamorphic utterances, and to the ultimate transformation of the self as we know it—the dissolution of our being upon death. Standing on the threshold of this oceanic system, listening to its inexhaustible noise brought on by the Earth’s movements, Whitman recognizes his own mortality, and the sounds of every life form to have ever lived and died. And in that

---

<sup>48</sup> Eno, Brian. “Generating and Organizing Variety in the Arts.” *Studio Intl.*, Nov-Dec. 1976: 270-83. Print. p.5

recognition he finds an affirmation for life; that he is not separate from this system, but a part of it. Just as the ocean's constancy reminds Whitman of our inevitable dissolution, he sees in its waters the wellspring from which all life emerges, its eternal hissing a cosmic lullaby, the flux of perpetual, celestial movement.

"Hissing melodious, neither like the bird nor like my arous'd child's

heart,

But edging near as privately for me rustling at my feet,

Creeping thence steadily up to my ears and laving me softly all

over,

Death, death, death, death, death, death.

Which I do not forget,

But fuse the song of my dusky demon and brother...

...With the thousand responsive songs at random,

My own songs awaked from that hour,

And with them the key, the word up from the waves,

The word of the sweetest song and all songs,

That strong and delicious word which, creeping to my feet,

(Or like some old crone rocking the cradle, swathed in sweet

garments bending aside,)

The sea whisper'd me."<sup>49</sup>

---

<sup>49</sup> Whitman, Walt. *Leaves of Grass; Authoritative Texts, Prefaces, Whitman on his Art, Criticism*. Ed. Sculley Bradley, Harold W. Blodgett. New York: W.W. Norton & Company. 1965. p.253



Figure 63. Seltún, Iceland.

# APPENDICES

## APPENDIX A

### [environmental limitations of thermal toning]

During the execution of this project I sought to work with the nameless springs, the ephemeral and the auxiliary ones, the ones that exist as ancillary offshoots of larger, more massive geothermal sites. I pilgrimaged to famous geysers like Strokkur in Iceland or treasured hot springs like Grand Prismatic in Yellowstone to experience and draw inspiration from them. Though I traveled great distances to witness them, I never sought to incorporate them into this project.

#### **Silver-halide emulsions:**

The photographic paper I used for the entirety of this project was Ilford Warmtone Matte Fiber paper. While Ilford does not publicly list detailed information about this product, a paper of equivalent quality lists its silver content as being 1.5g per square meter.<sup>50</sup> This means that each of my four-inch square photographs contain approximately .01g of silver particles each.\*

Silver loss during film processing generally occurs in the darkroom during the *development and fixing* stages, which is made evident by the process of silver reclamation—where chemical companies will buy or collect used photographic fixer in

---

<sup>50</sup> “Kentmere Fineprint VC.” *Black and White Paper Zone*. Plumeltd. 15 July 1997. Web. 6 April 2016.

\*The equivalent weight of an average grain of sand.

order to reclaim the dissolved silver salts within it.\* By contrast, silver is generally not lost during *toning*. Toning is rather the conversion of the photo's existing, fixed silver into a different chemical compound.

This means that while I immersed my photos into these hot springs, very little of the photos' silver would have been lost during this process. Since the images are literally made of silver particles, a considerable loss of that silver would mean that there would be no image left on these photos. Additionally, any silver particles that would have been introduced into the spring would have been so minuscule as to be insignificant compared to the springs' natural flux.

### **Spring replenishment:**

Dr. Thomas Brock, who is famous for his discovery and isolation of thermophilic bacteria living in Yellowstone's hydrothermal features, describes in detail a series of "turnover studies" he conducted with his team in Yellowstone in 1978. In order to measure how quickly a spring replenishes itself, his team dumped 100 lbs. of sodium chloride into a spring named Moose Spring. While sanctioned to conduct other experiments within the park's boundaries, Brock writes in regards to these turnover studies: "in case anyone is interested, we did *not* ask the Park Service's permission to do this experiment. We knew that the salt would have no influence on the spring, and that it would eventually dilute out. It was gone by next summer."<sup>51</sup> This implies that even the introduction of a relatively large amount of an ingredient foreign to a hydrothermal spring will eventually be diluted out.

---

<sup>51</sup> Brock, Thomas D. *Thermophilic Microorganisms and Life at High Temperatures*. New York: Springer Verlag. 1978. Print. p.23

## APPENDIX B

### [photochemistry + geochemistry]

#### Elements in the darkroom:

According to a 1957 book of photographic formulae printed by the Eastman Kodak Company, “the elements of greatest importance in [black & white] photography” are listed as follows:

Sodium	Carbon
Potassium	Boron
Calcium	Sulfur
Iron	Iodine
Copper	Bromine
Silver	Hydrogen
Gold	Nitrogen
Platinum	Oxygen
Aluminum	Chlorine
Mercury <sup>52</sup>	

#### Elements in nature:

During its long, subterranean journey, thermal water passes through a dense stratum of different geological layers, dissolving and bearing traces of them upwards to the Earth’s surface. The water then becomes richly saturated with dissolved elements, resulting in “varied precipitates, chemical reactions, oxidation, reduction” and the creation of new

---

<sup>52</sup> Eaton, George T. *Photographic Chemistry: In Black-and-white and Color Photography*. New York: Morgan & Morgan, Inc. 1957. Print. p.29

minerals and compounds that are released at the spring's mouth (such as travertine, sinter, and silica).<sup>53</sup>

Comparing Kodak's list above to chemical analysis of hydrothermal systems across the globe, we can see that all of these elements are to be found in varying concentrations within thermal springs across the world, along with a plethora of other additional elements such as nickel, manganese, xenon, and even radium.<sup>54</sup> Dr. Brock's chemical analysis of various hydrothermal systems in Yellowstone show there aluminum, mercury, chlorine, potassium, iron, copper, sulfur, hydrogen, nitrogen, oxygen, gold and calcium.<sup>55</sup>

### **Thermophiles and color:**

Contrary to popular assumption, many thermal springs owe their brilliant colors not just from their elemental content, but to the thermophilic bacteria that live within them: "pigments within microorganisms are responsible for their colors...chlorophyll produces grass-green, carotenoids are yellow, orange or red. All pigments found in living cells intensify or become muted directly by the amount of light they receive daily or seasonally."<sup>56</sup>

---

<sup>53</sup> Guðmundsson, Ari Trausti. *Living Earth: Outline of the Geology of Iceland*. Trans. George Douglas. Reykjavík: Mál og menning. 2013. Print. p.73

<sup>54</sup> Schreier, Carl. *A Field Guide to Yellowstone's Geysers, Hot Springs and Fumaroles*. Moose: Homestead Publishing. 1987. Print. p.11

<sup>55</sup> Brock, Thomas D. *Thermophilic Microorganisms and Life at High Temperatures*. New York: Springer Verlag. 1978. Print.

<sup>56</sup> Schreier, Carl. *A Field Guide to Yellowstone's Geysers, Hot Springs and Fumaroles*. Moose, Wyoming: Homestead Publishing. 1987. Print. p.13

### Some notes on elements and color:

In his seminal book, *The Print* (1950), Ansel Adams asserts that all photographic toning “involves changes in both chemical structure and size of the silver grain; it is therefore impossible to predict in advance the exact quality of tone that will be obtained with different papers and developers and with various toners.”<sup>57</sup> In the case of sepia toning, the metallic silver in a photo reacts with potassium ferricyanide, and results in creating a silver ferrocyanide that is nearly colorless. If a “soluble metal salt is also present in the solution however, the colored ‘metal ferrocyanide’ is formed, and the image changes color.”<sup>58</sup> Historically many metal toners were used in this way. The guide, *The Photographer’s Toning Book* (2003) presents a list of metal toners and the colors they yield in black and white photos:

Cd	Cadmium	White
Co	Cobalt (mono-bath)	Violet-red
Co	Cobalt (two-bath)	Cyan/green
Cu	Copper	Brown and red
Fe	Iron	Prussian blue
Pb	Lead	White
Mo	Molybdenum	Brown
Ni	Nickel	Reddish brown
Ti	Titanium	Yellow
U	Uranium	Reddish brown
V	Vanadium	Yellow-orange
S	Sulphur	Sepia brown <sup>59</sup>

---

<sup>57</sup> Adams, Ansel. *The Print; Basic Photo 3: Contact Printing and Enlarging*. New York: Morgan & Morgan, Inc. 1950. Print. p.57

<sup>58</sup> Rudman, Tim. *The Photographer’s Toning Book*. New York: Amphoto Books. 2003. Print p. 66

<sup>59</sup> Rudman, Tim. *The Photographer’s Toning Book*. New York: Amphoto Books. 2003. Print. p. 66



While the use of most of these toners are quite rare now, knowledge of these historic processes helps to indicate some of the elements responsible for the colors in my thermally toned photographs. Their brilliant range of colors are a result of multiple metals and reactions combining and acting upon the photos at once. Because each thermal spring contains a unique and ever changing variety of minerals, metals and compounds, “the imaginable permutations” of such combinations “are almost infinite and capable of much further exploratory work.”<sup>60</sup>

The bleaching agent used in sepia toning, potassium ferricyanide ( $C_6N_6FeK_3$ ) will turn a deep blue when it comes in contact with ferrous ( $Fe^{2+}$ ) ions.<sup>61</sup> Thus, from cyanide, we get the word “cyan”. Originating in the early 19th century, the word for “cyanide” was derived from the Greek word *kyanos*, meaning dark blue.<sup>62</sup>

### **Important color discoveries and elements:**

The creation of Prussian blue was first discovered by accident by Herr Diesbach in 1704. While attempting to make carmine lake, by mixing “ground-up cochineal, alum and ferrous sulphate, then precipitating it all with an alkali— he realized he had run out of alkali.”<sup>63</sup> He borrowed an alkali from someone else without knowing it had been distilled with animal oil. Upon mixing this alkali to his solution, the mixture turned a brilliant blue instead of the

---

<sup>60</sup> Tait, Jack. *Beyond Photography: The Transformed Image*. 1977. New York: Hastings House. Print. p.68

<sup>61</sup> “Potassium Ferricyanide.” *Wikipedia*. Wikipedia, n.d. Web. 21 April 2016.

<sup>62</sup> “Cyan” Origin. *Merriam Webster Online*, Merriam Webster, n.d. Web. 21 April 2016.

<sup>63</sup> Finlay, Victoria. *Color: A Natural History of the Palette*. New York: Random House Trade Paperbacks. 2004. Print. p. 313

expected red. Because the borrowed alkali contained blood, and thus iron, “Diesbach had unwittingly created iron ferrocyanide, which was dubbed “Prussian blue” and was instantly popular, particularly as a house paint.”<sup>64</sup> This reaction became integral to the development of early photographic processes. Using potassium ferricyanide and ferrous emulsion, the English chemist and astronomer, John Herschel invented what came to known as “blueprints,” which was later developed into cyanotype and diazotype printing.



Figure 64. Krýsuvík, Iceland.

---

<sup>64</sup> Finlay, Victoria. *Color: A Natural History of the Palette*. New York: Random House Trade Paperbacks. 2004. Print. p. 313



Figure 65. Selection from *Thermophile*. Thermal toned silver gelatin prints.



Figure 66. Selection from *Thermophile*. Thermal toned silver gelatin prints.

## WORKS CITED:

Adams, Ansel. *The Print; Basic Photo 3: Contact Printing and Enlarging*. New York: Morgan & Morgan, Inc. 1950. Print.

Antranikan, Garabed, et al. *Thermophiles: Biology and Technology at High Temperatures*. Boca Raton: CRC Press. 2008. Print.

“Bath’s Messages to the Goddess Given Globally Recognized Status.” *Romanbaths.co.uk*. Romanbaths.co.uk. 24 June 2014. Web. 14 April 2016.

Brandt, Matthew. *Lakes & Reservoirs*. Bologna: Damiani. 2014. Print.

Brock, Thomas D. *Thermophilic Microorganisms and Life at High Temperatures*. New York: Springer-Verlag. 1978. Print.

Cosgrove, Ben. “Drowned Towns: Preserving the Lost Communities of the Swift River Valley.” *The Harvard Advocate*. The Harvard Advocate Mag. 2009. Web. 14 April 2016.

Charlesworth, JJ. “Signs of Life.” *Seizure*. Roger Hiorns. London: Artangel. 2008. Print.

“Cyan” Origin. *Merriam Webster Online*, Merriam Webster, n.d. Web. 21 April 2016.

Eaton, George T. *Photographic Chemistry: In Black-and-white and Color Photography*. New York: Morgan & Morgan, Inc. 1957. Print.

Emerson, Ralph Waldo. *Nature and Selected Essays*. London: Penguin Books. 1982. Print.

Eno, Brian. “Generating and Organizing Variety in the Arts.” *Studio Intl.*, Nov-Dec. 1976: 270-83. Print.

Forbes, Charles Stuart. *Iceland ; Its Volcanoes, Geysers, and Glaciers*. London: John Murray, Ablemarle Street. 1860. Print.

Finlay, Victoria. *Color: A Natural History of the Palette*. New York: Random House Trade Paperbacks. 2004. Print.

Fritz, William J., and Robert C. Thomas. *Roadside Geology of Yellowstone Country*. Missoula: Mountain Press Publishing Company. 2011. Print.

- Gatten, David. "Long Biography." davidgattenfilm.com. David Gatten. 2013. Web. March 31 2016
- Guðmundsson, Ari Trausti. *Living Earth: Outline of the Geology of Iceland*. Trans. George Douglas. Reykjavík: Mál og menning. 2013. Print.
- "Kentmere Fineprint VC." *Black and White Paper Zone*. Plumeltd. 15 July 1997. Web. 6 April 2016.
- "Laura Bon & the Metabolic Studio." *Sculpture Magazine*. 34.7 (2015): 44-47. Print.
- MacDonald, Scott. *Adventures of Perception: Cinema as Exploration*. Los Angeles: University of California Press. 2009. Print.
- McNamara, Allen. *Mantle Convection Isothermal Surface*. Arizona State University. 15 January 2010. Web. 4 April 2016
- Morton, Timothy. "From modernity to the Anthropocene: ecology and art in the age of asymmetry." *International Social Science Journal*. 63.207-208 (2014): 39-51. Print.
- Morton, Timothy. "Sublime Objects." *Speculations II Journal*. 10 (2011): 207-227. Print.
- Muir, John. *Our National Parks*. Boston: Houghton, Mifflin and Company. 1901. Print.
- Nabokov, Peter & Lawerence Leondorf. *American Indians and Yellowstone National Park: A Documentary Overview*. Wyoming: Yellowstone Center for Resources. 2002. Print.
- "Niépce and the Invention of Photography." *Maison Nicéphor Niepce*. Photo-museum.org. Web. 21 April 2016
- "Potassium Ferricyanide." *Wikipedia*. Wikipedia, n.d. Web. 21 April 2016.
- Rosenblum, Robert. *Modern Painting and the Northern Romantic Tradition; Friedrich to Rothko*. New York: Harper & Row. 1975. Print.
- Rudman, Tim. *The Photographer's Toning Book*. New York: Amphoto Books. 2003. Print.
- Salinger, J.D. *Raise High the Roof Beam, Carpenters & Seymour: An Introduction*. New York: Little, Brown and Company. 1963. Print.
- Schreier, Carl. *A Field Guide to Yellowstone's Geysers, Hot Springs and Fumaroles*. Moose: Homestead Publishing. 1987. Print.

- Sears, John F. *Sacred Places; American Tourist Attractions in the Nineteenth Century*. New York: Oxford University Press. 1989. Print.
- Smithson, Robert. *Robert Smithson: The Collected Writings*. Ed. Jack Flam. Los Angeles: University of California Press. 1996. Print.
- Smithson, Robert. "Fredrick Law Olmsted and the Dialectical Landscape." *The Sublime*. Ed. Simon Morley. Cambridge: The MIT Press, 2010. Print.
- Tait, Jack. *Beyond Photography: The Transformed Image*. New York: Hastings House. 1977. Print.
- Tuan, Yi-Fu. *Topophilia*. New York: Columbia University Press. 1972. Print.
- Verne, Jules. *Journey to the Center of the Earth*. 1864. trans. Willis T. Bradley, 1956. Print.
- Volk, Gregory. "Transparent Eyeball: Toward a Contemporary Sublime." *Badlands: New Horizons in Landscape*. Ed. Denise Markonish. North Adams: Mass MoCA. 2008. 177-184. Print.
- Whitman, Walt. *Leaves of Grass; The First (1855) Edition*. New York: Penguin Books. 2005. Print.
- Whitman, Walt. *Leaves of Grass; Authoritative Texts, Prefaces, Whitman on his Art, Criticism*. Ed. Sculley Bradley, Harold W. Blodgett. New York: W.W. Norton & Company. 1965. Print.

## LIST OF ILLUSTRATIONS:

Figure 1.	Thermal toning a photo in a hot spring, Wyoming	9
Figure 2.	Geothermal seep, Wyoming	9
Figure 3.	Thermally toned silver gelatin prints	10
Figure 4.	Detail of a map of Iceland	12
Figure 5.	Black and white photo in potassium ferricyanide	12
Figure 6.	Studio shot, drying black and white photographs	13
Figure 7.	Tomographic model of Yellowstone mantle plume	15
Figure 8.	Tomographic model of global mantle convection	17
Figure 9.	Vernal pool in New Salem, Massachusetts	19
Figure 10.	New Salem, Massachusetts	20
Figure 11.	<i>Thermophile negative no. 13.</i>	21
Figure 12.	Thermal toning a photo, Iceland	22
Figure 13.	Selection of thermally toned silver gelatin prints	23
Figure 14.	<i>Heaven has claws; love has teeth</i>	25
Figure 15.	Video still: copper sulphate solution	26
Figure 16.	Detail of copper sulphate crystals on painting	27
Figure 17.	<i>Things Fall Apart</i>	28
Figure 18.	Keystone View Company, <i>General View of Norris Geyser Basin, Yellowstone</i>	30
Figure 19.	<i>Henderson's Travels: Geysir and Strokkur erupting</i>	31
Figure 20.	Geothermal hotspot at Gunnuhver, Iceland	34
Figure 21.	Mud pot, Gunnuhver, Iceland	35
Figure 22.	Video still of "jar-throwing" toning process	37
Figure 23.	Notes on the back of a thermal toned photo	38
Figure 24.	Video stills of various thermal toning methods	39
Figure 25.	Blue thermal toned silver gelatin print	41
Figure 26.	Fumarole toned silver gelatin print	43
Figure 27.	Robert Smithson, <i>Spiral Jetty</i> , ariel-view	47
Figure 28.	Robert Smithson, <i>Spiral Jetty</i>	47
Figure 29.	Robert Smithson, <i>Non-site: Line of Wreckage</i>	49
Figure 30.	Peter Doig, <i>What Does Your Soul Look Like?</i>	50
Figure 31.	Peter Doig, <i>Blotter</i>	51



Figure 32.	Caspar David Friedrich, <i>Monk by the Sea</i>	53
Figure 33.	Mathew Brady, <i>Portrait of Walt Whitman</i>	55
Figure 34.	Laura Bon & The Metabolic Studio, lakebed toning	58
Figure 35.	Mathew Brandt, <i>Lakes &amp; Reservoirs</i>	60
Figure 36.	Mathew Brandt, <i>Lakes &amp; Reservoirs</i>	60
Figure 37.	David Gatten, <i>What the Water Said</i>	61
Figure 38.	David Gatten, <i>What the Water Said</i>	61
Figure 39.	The artist working in Iceland, 2015	63
Figure 40.	Dr. Thomas Brock working in Yellowstone, 1977	63
Figure 41.	Dr. Brock, immersion method	64
Figure 42.	Dr. Brock, glass slides of thermophilic bacteria	64
Figure 43.	“	64
Figure 44.	“	64
Figure 45.	“	64
Figure 46.	“	64
Figure 47.	Horseshoe encrusted with silica	65
Figure 48.	Roman curse tablet	65
Figure 49.	Thermophilic bacterial mat	67
Figure 50.	Toning in thermophile-rich hot spring	67
Figure 51.	Thermal toning in a hot spring, Seltún, Iceland	68
Figure 52.	Thermal toning in a hot spring, Seltún, Iceland	69
Figure 53.	<i>Thermophile</i> , exhibition view at Argus II	70
Figure 54.	View of digital video	71
Figure 55.	<i>Thermophile</i> exhibition view	73
Figure 56.	<i>Thermophile</i> exhibition view	74
Figure 57.	<i>Field</i> , installation detail	75
Figure 58.	<i>Field</i> , video still	75
Figure 59.	<i>Thermophile negative no. 13</i>	76
Figure 60.	<i>Wellspring</i> , installation view	77
Figure 61.	<i>Developer</i> , installation view	77
Figure 62.	<i>Wellspring</i> , detail	78
Figure 63.	Seltún, Iceland	82
Figure 64.	Krýsuvík, Iceland	89
Figure 65.	Selection from <i>Thermophile</i>	90
Figure 66.	Selection from <i>Thermophile</i>	91