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UNIVERSITY OF CALIFORNIA SANTA CRUZ

Refiguring Oil and/as Media:
Field Notes for Future Petropractices

A dissertation submitted in partial satisfaction of the
requirements for the degree of

DOCTOR OF PHILOSOPHY
in
FILM & DIGITAL MEDIA

By
Elia Vargas
June 2022

The Dissertation of Elia Vargas is
approved:

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Vice Provost and Dean of Graduate Studies

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Table of Contents

| | |
|--|---------------------|
| List of Figures | v |
| Abstract | vii |
| Acknowledgments | ix |
| Introduction | 6 |
| | |
| Volume 1: Oil as Industry | 68 |
| Zero. An Archeology of Oil (As Media) | 70 |
| One. The <i>Philosophy</i> of Petroleum | 81 |
| Two. Oil Creek | 91 |
| Three. A Brief History of Oil Pipelines | 101 |
| Four. An Ontological Turn | 117 |
| Five. Making Oil Fuel | 123 |
| Six. Theory of Crude Oil as Fossil Fuel | 139 |
| Seven. First Chemical Analysis of Petroleum for Commercial Potential | 152 |
| | |
| Volume 2: Oil as Media | 164 |
| Zero. The Cult of The Sun | 167 |
| One. Substance Par Excellence | 171 |
| Two. Oily Entanglements. A Sticky Media Materialism | 178 |
| Three. What is a Cut? When in Media? | 204 |
| Four. Infrastructures of Differentiation. A Media Theory | 211 |
| Five. Conclusion | 229 |
| | |
| Volume 3: Oil as Nature | 234 |
| Zero. Novum Lumen | 238 |
| One. Oil Mysticism | 244 |
| Two. Solar Alchemy. Making Oil Nature (again) | 260 |
| Three. The Petroleum System | 275 |
| Four. Figures of Nature. Oil Speculations | 283 |
| Five. The Ohi:yo' Does Not End | 290 |

| | |
|---|---------------------|
| Afterword (a closure) | 296 |
| Appendices | 302 |
| Appendix 1: A Crude Oil Art Inspection | 302 |
| Appendix 2: Crudoleum Crude Oil Components Analysis | 305 |
| Appendix 3: Notes on Crudoleum Laboratory Analysis | 307 |
| Appendix 4: Crude Oil Art Inspector Image Glossary | 309 |
| References | 312 |

List of Figures

| | |
|--|-----|
| Figure 1. Found diagram of Heliotechniques or Heliotechnics. | 3 |
| Figure 2. The sun is round. It could be different. | 13 |
| Figure 3. Reprint of insert discovered inside archival copy of Benjamin Silliman Jr.'s <i>Report on the Rock Oil, or Petroleum, from Venango Co., Pennsylvania.</i> | 31 |
| Figure 4. Found diagram. | 67 |
| Figure 5. Oil as Industry. | 68 |
| Figure 6. Undated notes on Heliotechniques in pursuit of the Tome of Light. | 69 |
| Figure 7. Howe's Map of the Oil District of Pennsylvania, 1866, marked with the location of fiber optic cables in 2017, from University of Wisconsin Long haul infrastructure data IMPACT inter tubes map. | 88 |
| Figure 8. Photograph of a photograph of "Wells on Bennington Run, Venango County, PA in 1866" by John McLaurin. Public Domain. Photo by Elia Vargas at Drake Oil Well. | 94 |
| Figure 9. Oil well artifacts along Oil Creek, 2018. | 98 |
| Figure 10. Petroleum yields. | 157 |
| Figure 11. Oil as Media. | 164 |
| Figure 12. Field Sync at a Heliotechnics site. | 165 |

| | |
|--|-----|
| Figure 13. Diagram variation 3 of Heliotechniques. | 231 |
| Figure 14. Oil as Nature. | 234 |
| Figure 15: Mapping the Helio-Odics. | 235 |
| Figure 16. Locating the Odic Force in Heliotechnics. | 243 |
| Figure 17. Empty bottles of Crudoleum Pennsylvania Crude Oil Scalp Treatment. | 246 |
| Figure 18. <i>Cloud Point: A Derivative of Crude Illumination.</i> | 249 |
| Figure 19. Preserved bottle of Kier Genuine Petroleum at Drake Oil Well Museum. | 254 |
| Figure 20. Lewis Evans Map of Middle British Colonies from 1755. | 291 |
| Figure 21. Heliotechniques variation. | 294 |

Abstract

Refiguring Crude Oil and/as Media:
Field Notes for Future Petropractices
Elia Vargas

This dissertation considers the cultural, philosophical, and techno-scientific conditions of the early American oil industry, to transform ruinous anthropocentric conceptions of nature. This period matters because it is the commonly accepted historical origination of crude oil as a global energy commodity. The seemingly prosaic question “what is oil?” opens up new conceptual frameworks, ethics, and material circumstances. Oil is a resource commodity; oil is techno-scientific; oil is political; oil is an earthly substance. But what does it mean to think with oil beyond the practices of representation that enact its contemporary form? As new energy regimes and new critiques of the Anthropocene emerge, why does the predominant ontological status of oil as a fossil fuel persist? Given the outsized role oil has played in making the contemporary world, these under-examined questions foreground the guiding inquiry of the project: what kinds of practices can produce new concepts of oil?

Utilizing feminist philosopher Karen Barad’s posthumanist performative approach and media theorist Jussi Parikka’s notion of geological media

materialism, my dissertation examines the early American oil industry to refigure oil as media. This critical and creative work conjoins media and science studies scholarship with speculative field notes to create a theory/fiction document that reconceptualizes the onto-epistemological status of oil as media. This method accounts for the entangled ways that oil, as a technologically, culturally, and naturally manufactured fossil fuel, has structured how things are and how they are known throughout Western industrialization. The unconventional form of this work proposes that alternative knowledge practices are a pathway towards new petro-practices. The project poses a key question: if oil use predates the concept of fossil fuel, what is the origin of the theory of fossil fuels? The question distinguishes between the science of petroleum, constituted of ancient organisms and biomass, and the techno-cultural assumption that energetic entities should be put to work as fuel. It is taken for granted that the former implies the latter. By scrutinizing some of the most basic—but overlooked—assumptions of oil, my work challenges the orthodoxy of how Western society has come to conceptualize the earth as a source of raw resources.

Acknowledgments

Many have worked on this project to bring it to completion. I am grateful for the support of Soraya Murray, my advisor who, even before signing on to this project, supported these experimental knowledge practices. I do not communicate often enough how grateful I am for her guidance. Thank you to my dissertation committee: Karen Barad, T.J. Demos, and Warren Sack. Each of them has transformed the way I think, in ways that I cannot express. Anna Friz continues to be an informal mentor, navigating the yet to come world of mutually entangled art + scholarship.

Thank you, Johnna Arnold, Adrian Drummond-Cole, Danielle Siembieda, Dorothy Santos, Swati Sharma, William C. Brice, Celeste Neuhaus, Valerie Imus, Edward Shanken, Susan Beates, Jordan Kinder, Ceci Moss, LM Taylor, Craig Baldwin, Thomas Hughes, Tiare Ribeaux, Stephanie Sherman, Agustina Woodgate, Jonas Teupert, Galen Joseph-Hunter, Daniela Gandorfer, and other humans and institutions who exhibited or hosted various iterations of this work. Thank you, Alenda Chang and Adrian Ivakhiv of the UC Press Journal *Media + Environment*, who's sharp and committed editorial work made different versions of this work stronger. Jennifer Parker

made many of the experimental processes I did at UCSC possible; thank you for always trusting me. Try as I might, I will never match the poetic force of Laurie Palmer, I learn so much from her. Chip Lord continues to make his presence felt in my thinking, in the long now of media art.

I am grateful for the support from the Social Science Research Center, it was a privilege to be a part of the first Dissertation Proposal Development cohort. The fellowship supported much of this research. Multiple UCSC Arts Dean's Fund for Excellence grants made dissemination of various versions of this work possible. Thank you to the multiple UCSC Arts Deans for those awards. Thank you to the Studio for Creative INQUIRY at Carnegie Mellon University for providing a residency while I researched oil in Pennsylvania.

Thank you, also, to my cohort and peers of the Film and Digital Media PhD program at UC Santa Cruz, for the conversations, the challenges, the arguments, the new ideas, and the willingness to create space for criticality and play. It has been an immense pleasure to be part of the Film and Digital Media department. It is difficult to assess the influences the faculty have impressed on me over the years. Jennifer Horne, L.S. Kim, Peter Limbrick, and Rick Prelinger have each at different times provided me with crucial

intellectual and academic grounding. In a different spacetime, some of these diagrams have been designed by Jason Huff. Finally, but not lastly, thank you to Kate McDonald with whom I walk this Earth side by side.

The trouble with words is their limited expression for what is.

The trouble with what is, is it is always contained within a technology of knowing.

The trouble with knowing is that there is always something else.

The search for The Tome of Light begins...

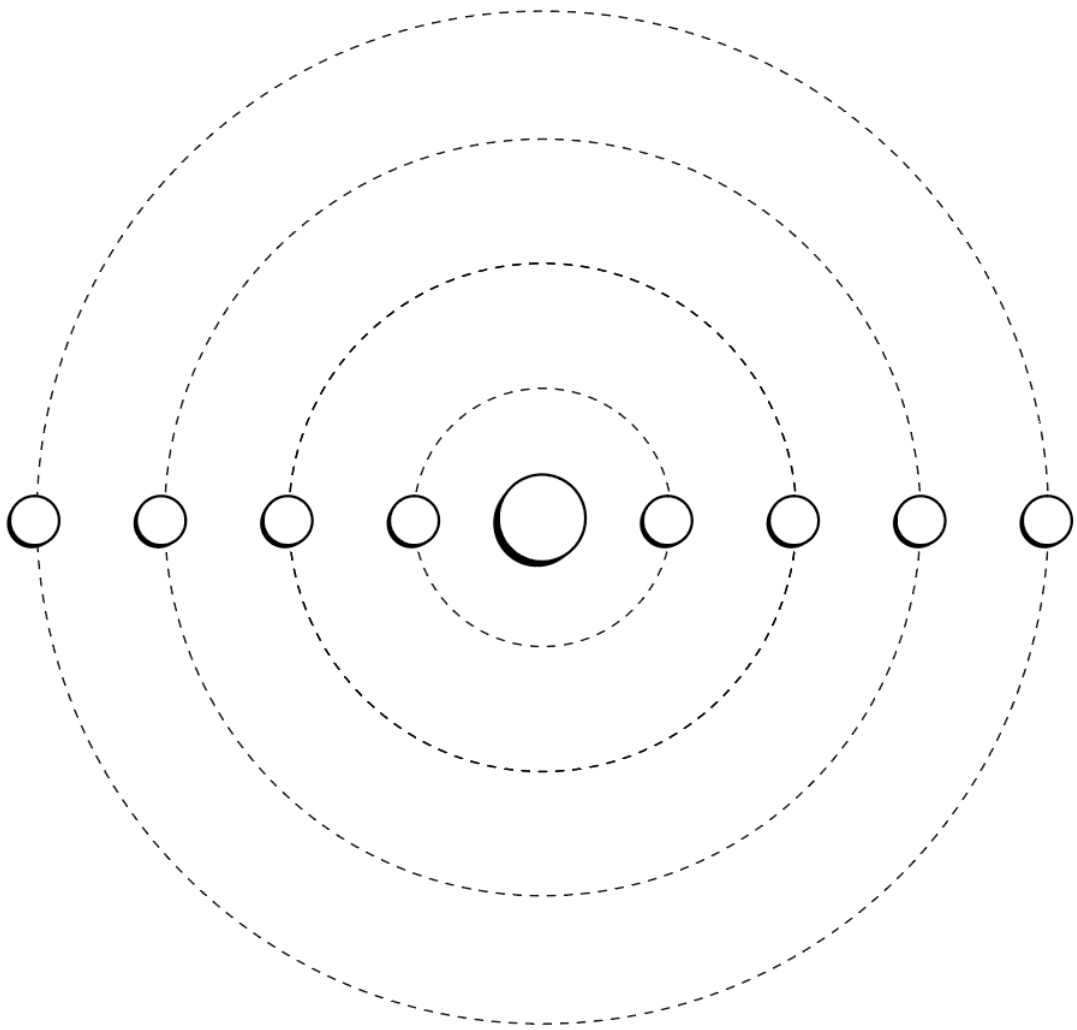


Figure 1: Found diagram of Heliotechniques or Heliotechnics.

Field Notes 8: A Part of the Tome of Light?

I found this story written by hand on the back of a pamphlet for Rock Oil Medicine while digging inside the Drake Oil Well Museum Archive. I had been camping for days. It was hot and rainy. The pamphlet was inside a short book titled, "Report on the rock oil, or petroleum, from Venango Co., Pennsylvania: with special reference to its use for illumination and other purposes" written by Benjamin Silliman Jr., a Yale chemist, in 1855. There are reportedly only a few original copies of this short book, the first comprehensive chemical analysis of Pennsylvania crude oil, for George Bissell, founder of Seneca Oil Company. I took advantage of the opportunity to look through the old text, responsible for so much of the financial investment in oil.

*The book was in better shape than the town of Titusville. Turning each page with great care, there was an unnatural knot in the thickness of the pages towards the back. Three quarters or so through the report, just after a page that ended with *The light from rectified Naphtha...*, a wad of paper emerged. It expanded quickly like a sponge as it was exposed to air. The folds marked the pamphlet's presence. Its creases had worn soft and the white of the exposed paper pulp was smooth. They were wrinkles more than creases; the paper had aged well, soft and oiled from touch. An organism seeking contact. The pamphlet had been read by many.*

Beneath, above, and through the printed letter press of the "Rock Oil Medicine" header, there were an indeterminate number of handwritten words. They appeared to go on without end. Turning the pamphlet over and rotating it continuously, the words found their way. This is what it said:

>In this story, oil is the protagonist.

>It is about a dark organic mass that hides underground and accumulates all the rich energy of the earth. It enlists the help of chlorophyll, algae, kerogen, hydrocarbons, and geologic pressure, among other kin, to escape the solar domination of light. A dark mass reconstituting light, defused, subterranean, and in the shadows. Out of sight, after the breakdown, oil gains power over time, against the backdrop of the all-illuminating solar orb. Oil resisted the bath of transparency the solar orb radiated outward—The Solar Order of Enlightenment. The burning circle above, cleverly hiding its spherical nature, launched invisible matter transforming the globe. Oscillating at difficult to perceive frequencies amidst shinning transparencies, waves of energy shaped visibility.

>In its silence the dark mass remained. It remained even as it changed. A metamorphosis of power, shedding what it did not need, it accumulated and reduced. An unparalleled expression of meaning and matter, in hiding, for no one. Oil resisted. Oil was patient. Oil converted waste into strength. The dark mass grew; from out of itself it expanded. In different forms, amidst great variation, a seeping mass congealed as one/many things simultaneously. A monolithic monster of many pluralities. A monster absorbing the transparent sunbeams, feeding off them towards mutual opacity.

>The Solar Order of Enlightenment radiated a regime of total control. It conquered by illumination, co-constituting concepts of visibility as it rendered visible new visible forms. All will be seen; all that is, becomes through light. This was its coda, inscribed within the very bodies of visibility. All that there is, is governed by the possibilities of The Solar Order.

>Oil resisted; an impenetrable mass of decaying light, it absorbed the possible and diffracted it towards indeterminate outcomes. Subterranean, in/of the earth, a consortium of element beings, catalyzing a deep now instant/forever, oil became with its kin. A dark mass actualizing conditions for new existence, not against The Solar Order, but towards new possibilities. Oil remained in/of the earth, regenerating energies, catalyzing new infrastructures, materializing new perceptions.

>Then a new force emerged. Bodies that indexed the Earth constructed arbitrary differentiations between technical extensions of their forms. They conquered The Solar Order and advanced the regime of Enlightenment in their own image. New radiant powers emerged, shorter and shorter waves were harnessed, extended, wasted. Oil was discovered, hiding amidst its subterranean kin. The bodies depressurized oil's resistance, tapped, and extracted it.

>Oil sustained great losses. Its very form broken up, synthesized, reconfigured. The consortium of kin was divided again, the great fracture began. The opacity of oil was enlightened. But the dark mass congealed with deep kin amidst the...

Already, it was difficult to make out the final words. I lost track of the original orientation of the pamphlet. Despite the irregular shape, it was markedly clear. Thus, there was no doubting it ended abruptly mid-sentence. I hadn't realized the energy rising in me until the tension of unresolve took hold. Such tension. It grasped me. How does it end? I did notice, however, looking over the entire document again, a set of symbols I had not seen next to the first sentence. Hard to discern them, they were inscribed in the paper in some way, neither letter press ink, nor lead or pen ink, nor worn wrinkles of time. They were, rather, a sort of emulsion of light, physical and impressed, but not tactile. There were three of them.

Introduction

This document is not like other dissertations. It is an experiment of praxis in scholarship. It requires a different kind of reading; it is a different kind of writing. It consists of research in the fields of media and science studies, concerning their intersection with the early American history of crude oil. By examining the practices of scientists and mystics during this time—the mid to late 1800s—it challenges the oil practices that are taken for granted as scientific fact, namely that oil should be thought predominantly as a fossil fuel. Even fossil fuels are not constituted of fossilized matter, but rather take their name etymologically from the process of extraction: they are dug up.¹ The entwined Western cosmology of science and Christianity under transformation during the Enlightenment, which propelled a metaphysics of individualism, industrial capitalism, and the myth of Manifest Destiny, enacted a normalization that old earth should be called fossils and that oil was energy-rich old earth available for the taking.

¹ “Do Fossil Fuels Really Come from Fossils? | Britannica,” accessed March 26, 2022, <https://www.britannica.com/story/do-fossil-fuels-really-come-from-fossils>.

But this document does more than use words to (re)present the conditions surrounding the early oil industry. It is a type of practice that uses words, form, speculations, and other creative approaches to illuminate the way that writing about oil has constrained the possibility of conceptualizing oil. Writing, like any other technical practice, exerts limits on its possibilities. Harold Innis, a seminal thinker in the Toronto School of communication theory, was attentive to this in his study of the Greek oral tradition.² “If Aristotle had studied the effects of writing on his philosophy,” said media theorist Marshall McLuhan, “he would have been a Harold Innis ahead of his time.”³ The impact of oil is experienced across all manner of perception, including that which exceeds humans, Western anthropocentric perspectives, human infrastructure and nonhuman ecologies. The history of oil as an industrial product is also not necessarily a rational process that can be neatly accounted for with words. Because oil affects more than humans, and it affects humans in more ways than writing can account for, this dissertation utilizes more than writing practices. Given the exorbitant role

² Harold Adams Innis, *Empire and Communications*, Rowman & Littlefield edition, Critical Media Studies (Lanham, Md: Rowman & Littlefield, 2007), 55.

³ The McLuhan Institute, *McLuhan on Innis (1976)*, 2020, <https://www.youtube.com/watch?v=jTLqTl7u7S0>.

oil plays in making the present (and the past and the future—indeed in making time itself), not enough people have asked: do the descriptions of oil that characterize its existence exclude important possibilities of it?

This dissertation is concerned with such questions. It does not argue for a definitive answer. It follows the leakage that containment fails to bottle up. It proposes other perspectives, in part by revealing that in fact oil has always already been more than its representation as a fossil fuel. Moreover, it still is more; it is not only more than the fuel used to power life, at great cost to the planet, this is self-evident to anyone with the most basic relationship with plastics. What is truly momentous is that the systems of representation—the instruments, the governing epistemologies, cultural attitudes—of oil are constituted of mysticism, faith, and more broadly the momentum for development championed by the twin pillars of industry and science during the industrialization of the United States. Uninterested in shedding the kind of dualisms that invented the metaphysics of individualism characteristic of rationalism grounded in a Christian faith, they advanced a figure of oil, indeed a philosophy of oil, available uniquely to man.

While early practices of touching, tasting, and smelling oil were the brick and mortar by which representations of oil were made, such understandings of oil have all but disappeared in contemporary life. What alternate possibilities of oil have disappeared with them? What alternate possibilities of oil might exist if it was thought in a posthumanist way that did not assume human English descriptions of it were equivalent to oil the substance, in the ground? Furthermore, in what ways has this material-grammar of oil shaped the experience of representation itself—of bodies, of beings, of information, and energy?

Digging around in the ground, this dissertation pursues such alternate modes of reasoning: in field observation, in speculation, in storytelling, by mobilizing the irrational, and performances that cover the author's body in crude oil. It does so as a project to refigure oil and also as means to think critically about posthumanist media and knowledge practices. Media technology has always been naturecultural—the papyrus of Egyptian scrolls, the whale oil illuminating the dark of industrialization, the pops and whistles of the ionosphere whose magnetic charge brought about electricity, and yes, the compressed earth of buried sunshine which was dug up and called oil.

If media is concerned with the technological mediation of communication and information—a general position that will be challenged in significant ways later—then it must be concerned with oil. Not only because oil mobilizes the overwhelming majority of technological infrastructure and the cultural circumstances surrounding it, but because oil itself is the materialization of elemental communication—it is an affront to the Greek elements and an assailment of Euclidean space and scale as a determinant of communicable bits of matter.

At the height of twenty first century globally connected capitalism and internet culture, nineteenth century American mystic Edgar Cayce's medicinal crude oil bottle, sold by a mom-and-pop alternative wellness website, was the most readily available source of crude oil that I could acquire. It became substance and substrate for much of the work I would make. By prodding at this strange history, I materialized a crucial metaphor: the oil bottle made of oil that fails to contain its leakage. These leaky bottles—3D-printed in the likeness of some of the earliest medicinal oil bottles, sold as a mineral ointment and healthful panacea by the first oil industrialists—were later subject to an environmental art inspection. The results of this inspection, including a lab test of the organic compounds of

Cayce's crude oil scalp treatment substance, can be viewed in the Appendix. Like the bottle, the concepts that have defined oil throughout industrialization are not so easily contained. They are as much saturated by oil as they are able to capitalize on it by attempting to bottle it up. Following these leaky containers leads to unexpected undoings of the notion of inside and outside of boundedness. This *bottley-production* is an invitation to trace the material-discursive entanglements of what goes into this practice of circumscription and erasure—a false containment.

In this praxis tradition, I have chosen to conceive the dissertation document itself as a creative project. I have imagined a fictional science called Heliotechnics (or Heliotechniques), solar practices, which is conveyed in the book of *The Tome of Light*. Heliotechnics (or Heliotechniques) is a way to talk about technical practices and techniques that are not organized by conventional categories of social, political, technological, environmental, or species, but rather by relation to the Sun. Oil is one such solar practice, as are the histories of illumination, and the sense-making that correctly or falsely correlates seeing with knowing. The speculative writing of this dissertation is the pursuit of this lost book, *The Tome of Light*.

Simultaneously, the following pages map a parallel, medium-metonymic investigation: if the stakes of this work lie in the discrepancies of how representations of oil have failed to create meaningful practices for being with oil, then it is crucial to ask *what kind of practices can produce new concepts of oil?* This is the guiding question of this project.

Where is the boundary between that which is culture and thus technology and that which is natural and thus nature? Since the beginning of American industrialization, oil has been a gravitational force of this misunderstood entanglement. The document that follows is more than mine. It is a lost treatise; it is a solar vision; it is buried in the future.

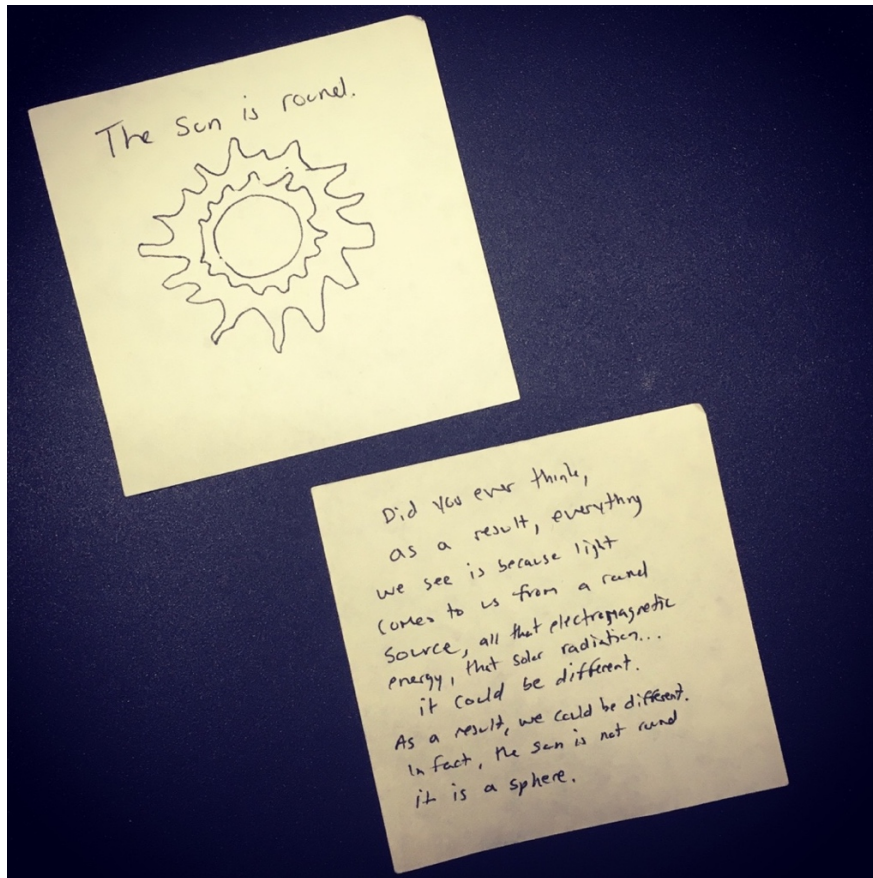
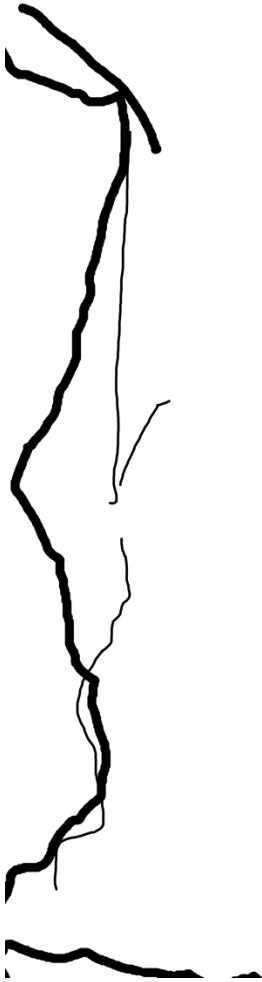


Figure 2: The sun is round. It could be different.

Field Notes 1: the present

Cement is a strange sort of material, a calcining lime and clay mixture, which hardens and binds other materials when water is added. The pathway of cement that runs the length Oil Creek State Park in the Gregorian Calendar year 2017 follows the path laid previously by the Oil Creek Railway, built to move oil from Titusville to Petroleum City. Odd to walk this historical path, built upon technologies of the past, binding time as much as the materials that hold it together. Standing here-now, in this time, is a vantage point defined by other times. It is bolstered by the something else, made possible in conjunction with a being here-now. The river, the forest, a history of looking initiated by a history of extraction. There was a pulling out of the earth, which was then put back in place in a different ecological design set-parameter: railway, a cement path, energetic bodies.

Oil too was used as a cementing agent. Stories tell of a place-time that used it as home insulation. This was common practice until the urban metropolis went up in flames.



Thinking With Oil

The idea that beings exist as individuals with inherent attributes, anterior to their representation, is a metaphysical presupposition that underlies the belief in political, linguistic, and epistemological forms of representationalism. Or to put the point the other way around, representationalism is the belief in the ontological distinction between representations and that which they purport to represent; in particular, that which is represented is held to be independent of all practices of representing.

–Karen Barad, *Meeting the Universe Halfway*

Oil does something profoundly different than ideology. It restructures our relationships and capacities to perceive. Oil produces our daily lives, our daily selves, our daily communities and everything else in a primary way. It has a definitive role in forming understanding of self and relation to the world and others.

–Brett Bloom, *Petro-Subjectivity*

The seemingly prosaic question “what is oil?” opens up an enchanting world of new conceptual frameworks, philosophies, ethics, and material circumstances. Oil is a resource commodity; oil is techno-scientific; oil is political; oil is an earthly substance. But what does it mean to think with oil beyond the practices of representation that enact its contemporary form? Amidst a world which fundamentally underestimates the extent that it is produced by and through oil, taking stock of its constitution, its history, and

its potentiality, is surprisingly absent. This is true, despite a growing domain of critical, creative, and popular examination of oil. Even while writing this dissertation, the volume of scholarship on oil has exploded. Although the energy humanities, and specifically the rise of scholarship on “Petrocultures” have expanded critical examination of what the contemporary moment calls oil, there are still many unanswered earthly matters at stake. If now is a moment when the history of technologies of progress are being thought outside of the rationalist project of enlightenment, a deep and messy look at the early oil industry can offer graspable, if not slippery, new concepts for thinking with oil as a force that has always exceeded humans.

There is a failure of the imagination in conceptualizing oil predominantly as a fossil fuel—a naturalized commodity available for human extraction. Notably, historical conceptions of crude oil are vast, including long periods that normalized oil as a substance unrelated to fuel, such as medicine, chewing gum, and polymers. The first Western industrial use of oil was kerosene (artificial domestic light fuel), developed in the late 1840s

and popularized shortly thereafter.⁴ Oil and illumination, in fact, are inextricably linked and implicated in the belief that seeing is synonymous with knowing. Kerosene (refined oil) replaced whale oil as the primary source of illumination fuel. Oil is, physically, latent solar energy stored in ancient bodies, primarily photosynthetic organisms such as algae, cyanobacteria, and phytoplankton.⁵ The hydrocarbon paraffin is a crucial agent in these events, which not only actualizes kerosene, but is also linked to a cosmology of mystics that explored other—often ancient—relationships to oil. Such cosmic metaphysics of oil survive at the periphery of contemporary thought and modern science. But the early oil industry is replete with evidence of business ventures, scientists, and oil tycoons relying on pseudo-scientific, mystical, and ad-hoc practices. As the science of oil developed in tandem with the business of oil—both equally drunk with a sense of divine superiority to the natural world—the very matter of oil was reconfigured.

⁴ J.T. Henry, *The Early and Later History of Petroleum, with Authentic Facts in Regard to Its Development in Western Pennsylvania*. (Philadelphia: Jas. B. Rodgers Co, 1873).

⁵ Paul R. Robinson and Chang S. Hsu, *Springer Handbook of Petroleum Technology*, Springer Handbooks (Cham: Springer International Publishing, 2017), 362.

The consequences of this could not be greater. Before oil was associated with the geophysics of energy and fuel, it was a ubiquitous—sometimes contaminant, sometimes prized—earth material.⁶ This earth material, which has taken many names, has served many purposes throughout human history. Notably, however, is its conception as a fossil fuel, which has come into existence only in the most recent past. A deep global history of oil, which this dissertation does not fully take on, illustrates the many ways oil has been conceptualized by humans. Amitav Ghosh, for instance, has pointed out that Western historical narratives of oil neglect the history of oil production in Burma that predates its development in North America.⁷ One point is indelibly clear: oil is much more than an energy source for humans.

⁶ See: Henry, *The Early and Later History of Petroleum, with Authentic Facts in Regard to Its Development in Western Pennsylvania... Also Life Sketches of Pioneer and Prominent Operators...*; Benjamin Silliman, *Report on the Rock Oil, or Petroleum, from Venango Co., Pennsylvania: With Special Reference to Its Use for Illumination and Other Purposes* (New Haven: From JHBenham's steam power press, 1855); A.L. Snell, ed., *The Derrick's Hand-Book of Petroleum: A Complete Chronological and Statistical Review of Petroleum Developments from 1859 to 1898* (Derrick publishing Company, 1898).

⁷ Amitav Ghosh, *The Great Derangement: Climate Change and the Unthinkable*, Randy L. and Melvin R. Berlin Family Lectures (Chicago; London: The University of Chicago Press, 2016).

The contemporary world seems to have forgotten this, to the detriment of the entire planet. Extending the point a little further, this work argues, oil does not come into existence—come to matter, that is—because of humans. Rather, through a dynamic material and discursive reconfiguring, humans manufactured oil as fuel so that an earth material of great accessibility and great bio-rich potential, could be commoditized.⁸ Oddly enough, or perhaps not at all, early American mystics explored the more than human dynamics of oil in a way that lends insight into the vast cosmology of oil—real, material, substantive capacities of the substance that were lost in the quest for black gold. Many of these alternative uses of oil have since been standardized within the petrochemical, pharmaceutical, agricultural, and materials industries, out of sight of common awareness. Left out of this narrative is that such mystics were often white conduits for other non-white, or indigenous conceptions of oil that were ignored (and often still are historically).

⁸ Matthew Huber argues that the shift from animal and human solar/muscle power to non-renewable fossil fuels was a major social shift that compressed temporalities of energy production. See: Matthew T. Huber, *Lifblood: Oil, Freedom, and the Forces of Capital*, Quadrant Book (Minneapolis: University of Minnesota Press, 2013).

Canadian communications scholar Harold Innis was the first to provide an outline for oil as media. In his interest in Canadian economic development, he analyzed the infrastructural and environmental networks of economic staples such as the fur trade and cod fisheries.⁹ He argues that a society's culture develops as a result of the emphasis it places on the techniques of production of particular staples. His later work explored the impact these mediums had on the development of a society. "A medium of communication has an important influence on the dissemination of knowledge over space and over time and it becomes necessary to study its characteristics in order to appraise its influence in its cultural setting."¹⁰ His theory of space and time bias describe the impacts that media which emphasis space, such as papyrus, and media which emphasize time, such as stone, have on civilizations.

In speaking about the phonetic alphabet, media theorist Marshall McLuhan asserted that "Harold Innis was the first person to hit upon the

⁹ Harold A. Innis, *The Fur Trade in Canada; an Introduction to Canadian Economic History*, Rev. ed. (Toronto: University of Toronto Press, 1970).

¹⁰ Harold A. Innis, *The Bias of Communication*, 2nd ed. (Toronto: University of Toronto Press, 2008), 33.

process of change as implicit in the *forms* of media technology.”¹¹ The importance of this statement, for the study of media and for McLuhan personally, cannot be overstated. For oil and the alphabet alike, it is notable that their process and form tend to recede into the background of contemporary life at the cost of an awareness of the kind of meaning-making they enable (and that which they do not). It is in this way that McLuhan meant that media are environments that determine the scale and pace of a society.¹² Following Innis and McLuhan, media historian John Durham Peters flips this to say, “environments are also media.”¹³

Innis offers some methodological insight into the work at hand as well. While his is not the primary method I will follow, I share an affinity with what he called “dirt” research that confounded his contemporaries and “that took him to all corners of the country.”¹⁴ He championed the perspective of a universal knowledge and that, as Peters says, “to study media, you cannot

¹¹ Marshall McLuhan, *The Gutenberg Galaxy; the Making of Typographic Man* (Toronto: University of Toronto Press, 1962), epub 142.

¹² Marshall McLuhan, *Understanding Media: The Extensions of Man*, First MIT Press edition. (Cambridge, Mass: MIT Press, 1994).

¹³ John Durham Peters, *The Marvelous Clouds: Toward a Philosophy of Elemental Media*, 2015, epub 13.

¹⁴ Innis, *The Bias of Communication*, xiv.

just study media: on this point Innis, McLuhan, [James] Carey and [Friedrich] Kittler all agree.”¹⁵ Dirt research is an appropriate lineage to my praxis-based approach to new meaning-making of crude oil at a time when digging up the ground below has created toxic atmosphere above. One could read into this the metaphor of toxic atmosphere that certain conventional or colonial legacies of meaning making have ushered in. But, as is the aim of this work, I am speaking material-discursively, not only metaphorically, and I have conducted such dirt research in and along Oil Creek—the river and region where the American oil industry began—as well as in gallery spaces, art studios, with mystics, divining rods, with the internet as well as standing by the fiber optic cables of the internet next to the first oil pipelines, with words, with images, and practices.

For Innis, a society that develops techniques of producing crude oil as a staple has specific spatial and temporal biases that shape the development of its culture. Mapping a philosophy of elemental media that in many ways begins with Innis, Peters says, “If most mainstream media studies see media as objects or institutions, the tradition I present takes media as modes of

¹⁵ Peters, *The Marvelous Clouds*, epub 55.

being.”¹⁶ I hope to continue this tradition and enlist the work of feminist philosopher Karen Barad to trouble these notions of space, time, and being, in constructively amicable ways. It is in this always active state of being in which important questions of agency, causality, and change need to be asked in understanding media (and oil).

Following the onto-epistemological work of Barad, this document diffractively thinks through a posthumanist account of the early American oil industry to refigure oil as media.¹⁷ This period matters because it is the commonly accepted historical origination (however suspect such grand narratives may be) of crude oil as a global commodity. In a posthumanist performative account, meaning making is differentiating. Meaning is enacted through differentiation. The term differentiate is important throughout this work, so I provide the Merriam-Webster definition: “to mark or show a difference in.”¹⁸ As humans and nonhumans are enacted through different boundary making practices, who and what counts as making

¹⁶ Peters, epub 37.

¹⁷ Karen Michelle Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham: Duke University Press, 2007).

¹⁸ “Definition of DIFFERENTIATE,” Merriam-Webster, accessed April 1, 2022, <https://www.merriam-webster.com/dictionary/differentiate>.

meaning is not predetermined. Making meaning matter is thus about causality and power. The power of differentiating and the power to differentiate.

Differentiating meaning making suggests a posthumanist theory of media and raises the issue of meaning making agencies. One cannot assume a limit to modes of meaning making or to the agencies those modes enact. In this way, my argument that oil is media is a challenge to what counts as meaning, for whom meaning is created, and the consequences (to specific humans, nonhumans, and worlds) of overdetermining certain traditions of anthropocentric meaning making. These are the stakes of this work: overcoming the assumption that descriptions of the world (created by certain modern humans more often than others) are sufficient to account for the dynamic forms of meanings and beings that make it so—or that might make it otherwise.

Diffraction is a crucial component of the praxis-based methodology of this work, and in part describes my investments in thinking with agential realism. More than other theoretical frameworks that seek to rethink the historical categories of nature and culture and question the very nature of human representations, I consistently find agential realism to be a

generative framework. I mean this in the most basic sense. In reading agential realism, the liveliness of the world and the many beings and ways of being are always more—more than they were before, more than they are, more than the so-called “I” that writes this can think them to be. Agential realism’s radical reconfiguring of matter, as something other than a fixed substance, is an important opportunity to rethink the substance of oil that modern American society has so revered.¹⁹ In striving to communicate this, it is clear that agential realism can be an important media theory.

As Barad points out, Donna Haraway (in her essay *The Promises of Monsters*) proposes diffraction as an alternative to the use of reflexivity in critical theory.²⁰ Haraway suggests that reflection reproduces the idea of mirroring static, pre-existing conditions, whereas diffraction “maps where the *effects* of difference appear.”²¹ For Barad, this is an opportunity to expand diffraction as a methodology to include some of their key insights of quantum phenomena. In so doing, Barad suggests, diffraction does not

¹⁹ Barad, 151.

²⁰ Barad, 29.

²¹ Donna Haraway, “The Promises of Monsters: A Regenerative Politics for Inappropriate/d Others,” in *Cultural Studies*, ed. Lawrence Grossberg, Cary Nelson, and Paula Treichler (New York: Routledge, 1992), 295-337.

predetermine what is the subject and what is the object in advance. "Unlike methods of reading one text or set of ideas against another where one serves as a fixed frame of reference," Barad says, "diffraction involves reading insights through one another in ways that help illuminate differences as they emerge: how different differences get made, what gets excluded, and how those exclusions matter."²² As being-with water and light has taught me so much in my media praxis, it seems these elements might teach me about diffraction as well.

Diffraction is a phenomenon that is unique to wave behavior. Water waves exhibit diffraction patterns, as do sound waves, and light waves. Diffraction has to do with the way waves combine when they overlap and the apparent bending and spreading out of waves when they encounter an obstruction.²³

My approach to thinking with oil is also diffractive. It is not only a means to consider theory and practice as co-constituting meaning making, but also a shift, as Barad points out, from the methods of reflexivity common to contemporary critical thought that depends upon representationalism.²⁴ Thinking with oil in a non-representationalist way

²² Barad, *Meeting the Universe Halfway*, 30.

²³ Barad, 28.

²⁴ Barad, 87.

requires the patience to experience states of existence that are enacted through different, not always linguistic, not always visual, more than discursive engagements with oil. In utilizing a diffractive methodology and thinking with agential realism more broadly, I also seek to layout my intellectual commitments. Specifically, as I believe Barad has accurately conveyed, a true posthumanist point of view is decidedly an intersectional, queer, feminist, and decolonial perspective as well. To imagine a world of meaning and sense making that exceeds any transcendent idea of the (white, sexed) human is to fully challenge the shortcomings of gender binaries, legacies of racism, and colonialism that participate in modern human representations of the world. As the focus of this work is on oil and a history that relies on white male historians of industry, these intersectional stakes are easily forgotten, but figure prominently in my speculative work.

Refiguring oil as media is about more than words and language, semiotics, signs, materials, and discourse, in other words representations. Particularly, the dynamical nature of materiality articulated by Barad reconfigures what the geologic media materialism of digital culture built up by media theorist Jussi Parrika in the tradition of Innis, McLuhan, and Kittler can be. "Geology," Parrika says, "becomes a way to investigate materiality

of the technological media world.”²⁵ In thinking about oil in this way, it is not only a primary component in Parrika’s description that “it is through and in media that we grasp earth as an object for cognitive, practical and affective relations.”²⁶ But more so, Barad’s notion of materiality shows us that the causal, mattering, agencies of oil are a dynamical component of the making of earth and the agencies of knowing it. This is the case not only as “extensions of man” (McLuhan) or “so-called man” (Kittler), but rather as a world-inclusive ongoing media-materializing for the many beings that might be.²⁷ This idea of media is not only about mediums of communication, but rather entities that enact (or effect) change.

Thinking of oil in this way is not only to say that geophysical entities enable technical media, but that this specific geophysical entity is media for the many varied entities of Earth. I am not arguing that therefore everything mediates—in fact it may be the case that nothing mediates, as I will discuss in Volume Two. Rather, everything has the capacity to enact change, and

²⁵ Jussi Parikka, *A Geology of Media*, Electronic Mediations (Minneapolis; London: University of Minnesota Press, 2015), 4.

²⁶ Parikka, 12.

²⁷ Friedrich A. Kittler, *Gramophone, Film, Typewriter*, Writing Science (Stanford, Calif: Stanford University Press, 1999); McLuhan, *Understanding Media*; Barad, *Meeting the Universe Halfway*.

being attuned to this means seeing oil as an entity that changes the world in ways that exceed the conventional domains of economics, politics, and the environment, while not losing sight of the fact that it is circulated by global capitalism in very specific ways. Oil provides a mediatic function to the world-building of this planet, in the expanded sense of media as infrastructures of differentiation that I argue for. This is a challenge to ways of knowing, to knowledge practices, to practices of being. It is a challenge to the Western humanist perspective that the literal (and figurative) dirt of the Earth does not make meaning or that such meaning must be communicated in ways that already conform to predetermined communicating practices.

Why does the predominant ontological status of oil as fossil fuel persist? In Innis's wide-angle approach that he applied to the economy, he suggested three major components structured the economy that were generally ignored: ecology, technology, and institutions. Following this approach, an answer to my question could be: because of the bias of the staple oil-as-fuel in the American economy. However, I'd like to make a more abstract, but concretely grounded, claim that is defended through experimental means: the concept of representationalism is a staple and

with Barad's non-representationalist ontology, oil functions as the materialization of representationalism that reinforces, creates, and stabilizes the contemporary world.

Refiguring oil identifies and addresses the all too troubling fact that we moderns know oil in a very limited sense of the word. Refiguring oil recognizes that the system of perception and representations that we rely on to know oil are entangled with/in other practices that inform what science means, what bodies mean, what a metaphysics of individualism means, and, importantly, what natural resources mean. This work homes in on some of the less discussed elements of the early oil industry to account for the way oil as a fossil fuel comes to matter, but it also argues that other characteristics of oil should be better understood to expand an understanding of oil. As the substance *par excellence* of so-called modern life, and part of the energetic inheritance of the Earth, thinking about oil as media is a helpful way to make sense of the monumental reconfigurings of the world that it enacts.

Thinking With Oil (Two)

In the introduction to *Energy Humanities: An Anthology*, Imre Szeman, founder of Petrocultures, and Dominic Boyer say, “Without the forms of energy to which we’ve had access and which we’ve come to take for granted, we would never have been modern.”²⁸ To which Bruno Latour would respond, we have never been modern.²⁹ “Modernity,” Latour says, “comes in as many versions as there are thinkers or journalists, yet definitions point, in one way or another, to the passage of time.”³⁰ Industrialization brought about a transformed modernization, but accounting for the subjects of such a shift is no small task.

Are “we” modern? Who are “we” that were changed from one universal identity (traditional?) into a new universal identity—a modern one? In a Western tradition, such practitioners and detractors of postmodernism as Fredric Jameson, Jürgen Habermas, and Marshall Berman have

²⁸ Imre Szeman and Dominic Boyer, eds., *Energy Humanities: An Anthology* (Baltimore, Maryland: Johns Hopkins University Press, 2017).

²⁹ Bruno Latour, *We Have Never Been Modern* (Cambridge, Mass: Harvard University Press, 1993).

³⁰ Latour, 10.

contemplated this question.³¹ Berman describes the probable “definitive vision” of this world-historical process through Marx: “all that is solid melts into air.”³² What about Octavia E. Butler, Samuel R. Delany, Nnedi Okorafor, N.K. Jemisin, John Akomfrah, Djibril Diop Mambéty, Sun Ra, Drexciya, Black Quantum Futurism, Skawennati, and other story tellers who have illustrated the many simultaneous modernisms? One can read evidence of crude oil in the Mayan *Popol Vuh*, the Islamic *Quran*, and other origin stories. Is the dialectical approach the only path to such a question? “We” is always beyond classification, and always risks exclusion. It is an argument to embrace the cosmopolitics of Isabelle Stengers, which does not assume humans have the only seat at the table—perhaps a multispecies variant of Donna Haraway’s “situated knowledges.” It is Haraway’s *Companion Species Manifesto*, after all, that develops a multispecies ethics and proposes the term *naturecultures*.³³

³¹ Fredric Jameson, *A Singular Modernity*, Radical Thinkers (New York; Verso, 2012); Habermas, Jürgen. “Modernity—an Incomplete Project,” trans. Seyla Ben-Habib. In *The Anti-Aesthetic: Essays on Postmodern Culture*, edited by Hal Foster. 3-15. Port Townsend, W.A.: Bay, 1983; Marshall Berman, *All That Is Solid Melts into Air: The Experience of Modernity* (New York: Simon and Schuster, 1982).

³² Berman, 21.

³³ Donna Jeanne Haraway, *The Companion Species Manifesto: Dogs, People, and Significant Otherness* (Chicago, Ill.: Bristol: Prickly Paradigm; University Presses Marketing, 2003).

I use Latour's term "moderns" throughout the following pages, as I did in the preceding page, to signify groupings that arise during industrialization through contradiction and a failure to keep separate the practices of "translation"—which he argues creates mixtures or hybrids of nature and culture—and "purification"—which creates distinct ontological zones of humans and nonhumans.³⁴ The question of subject position, and the politics of agency, justice, cultural sovereignty, and self-determination, raise the question of posthumanism, which is wielded in many different ways. I have already signaled the posthumanist tradition I will follow and will expand on it shortly. As I have alluded to, it should be noted that seeking ways to recognize that oil has transformed this entire planet, but that it has not transformed everything or everyone equally, is of paramount importance.

The goal, in part, is to challenge logocentric scholarship as the preeminent mode for understanding oil. This challenge is a practical step towards the kind of inclusivity and multispecies coalition of entities that have meaningful perspectives of oil. As a tool for critical engagement with

³⁴ Latour, *We Have Never Been Modern*, 11.

oil—and systems of perceiving and knowing—artistic practice and creative research lend new perspectives towards how oil might be perceived. The word can only do so much and meaning making has always been embodied in a more than discursive way. What, for instance, did the smell of oil have to do with domestic light in the latter half of the nineteenth century, moreover, what was the smell? The answer can be found in Volume One. The work ahead embraces the black corpus of the sun and, digging around, there are bright spots of the latent solar orb shining back. What other illuminating practices does oil perform? This is an excavation of the smell, the taste, the hue of light, and the feel of oil in its capacity to be more than humans, more than time, more than earth.

Given the outsized role oil has played creating the contemporary world—creating democracy (Timothy Mitchell), defining capital (Andreas Malm), shaping the everyday (Matthew Huber), mediating culture (Stephanie LeMenager), and determining infrastructural and discursive scientific practices (Geoffrey Bowker), to name just a few—a specific and important question has gone underexamined.³⁵ As new energy regimes

³⁵ Timothy Mitchell, *Carbon Democracy: Political Power in the Age of Oil* (London; New York: Verso Books, 2011); Andreas Malm, *Fossil Capital: The Rise of Steam-*

and new critiques of the Anthropocene emerge, why is it taken for granted that oil—a material of the earth that exceeds anthropocentric categorization—should be represented distinctly as fuel? Articulated through Barad’s theory of agential realism, this is an important posthumanist question that the primarily (and perhaps unfairly generalized) Marxist and literary studies work of the Petrocultures field does not address.

Moving beyond the current fossil fuel impasse—what Gregory C. Unruh calls “the carbon lock in,” the self-perpetuating infrastructure, technology, and policy of fossil fuels—was a major theme of the 2018 Petrocultures Conference.³⁶ If it is not yet clear, here is a constructive moment to reiterate the stakes of this work. The planet Earth is in crises. It is well established that the crises of a warming planet is not merely an environmental one, or rather, that an environmental crises is also political, racial, and social. Yet, the concepts by which Earth is represented—with all

Power and the Roots Of Global Warming (London; New York: Verso, 2016); Matthew T. Huber, *Lifeblood: Oil, Freedom, and the Forces of Capital*, Quadrant Book (Minneapolis: University of Minnesota Press, 2013); Stephanie LeMenager, *Living Oil: Petroleum Culture in the American Century* (Oxford University Press, 2014); Geoffrey C. Bowker, *Science on the Run: Information Management and Industrial Geophysics at Schlumberger, 1920-1940*, Inside Technology (Cambridge, Mass.: MIT Press, 1994).

³⁶ Malm, *Fossil Capital*.

the advocates and skeptics for the many visions of what Earth is and how inequitably the vulnerable inhabitants of it are impacted by such visions—the best public response amounts to something akin to: we need to replace fossil fuels with renewable energy sources. This simply does not cut it. If a solution to this impasse does not address the self-entitled Western industrial right to define earth energies as subjects of human activity, this otherwise positive shift perpetuates anthropocentric representations of life, regardless of the energy sources that replace fossil fuel. The Earth is more than humans, and more than the Western concepts of a human/nature divide that overdetermines its representation. Just as individual humans are always more than themselves and more than the representations that govern their positionality in their society. Perhaps more than anything else, and beyond representational power dynamics, this work is in defense of the creative potential of communities to enact their own philosophical structures as emancipatory world-building practices.³⁷

With such lofty goals in mind, this work aims for what science studies and critical race scholar Ruha Benjamin proposes as a third-way of doing

³⁷ Bethany Nowviskie, "Speculative Collections," <http://nowviskie.org/2016/speculative-collections/>.

knowledge production that is not purely fact or purely fiction, because facts alone are not enough.³⁸ This is a playful and performative way of tackling deadly serious questions: Western humanistic ways of thinking about and utilizing oil have brought about enormous human wealth, new material sciences, new chemicals, new transportation, new building, urban and rural development, global securities trading, perhaps the development of a middle class, and also global warming, pollution, wealth inequity, environmental destruction, material toxicity, racial redlining, and the dismantling of indigenous communities. In short, oil has created a way of life with far reaching effects.

So profound are these effects that modern humans must be thought to have developed with oil, as Szemen and Boyer suggest. So often, however, the conversation ends here. Experts, scientists, environmentalists, politicians, and lobbyists provide more data, in the support of profit, polls, or pollution and make their claims accordingly. How can we Earth-beings possibly respond to what ecologist Jeffrey Dukes finds in his analysis

³⁸ Ruha Benjamin, "Reimagining Science and Technology," AAS 21, accessed December 8, 2018, <http://aas.princeton.edu/publication/reimagining-science-and-technology/>.

“Burning Buried Sunshine: Human consumption of Ancient Solar Energy,” that in 1997 alone the amount of fossil fuels that were burned total more than 400 times the net primary productivity (NPP) of the entire planet’s biota?³⁹ In simple terms, that means in one single year, it required 400 hundred Earths to create the fossil fuels that were burned! How outrageous; and how effective our concepts of oil have been at distancing ourselves from the consequences of this fact. When it comes to just energy futures, humans on Earth cannot fall prey to the same techno-utopian promise that the tech industry sells consumers, that we simply need to embrace new energy-creating technologies without evaluating our modernist concepts.

The intervention and stakes of this experimental and performative work are to suggest that energetic entities, such as crude oil, are not ontologically dependent on human measurement systems that define them. Their existence within an Earth ecology is not defined by the value that they provide to humans and the productivity that they labor for human society. For this reason, I conceive of oil as media. I advocate for a

³⁹ Jeffrey S. Dukes, “Burning Buried Sunshine: Human Consumption of Ancient Solar Energy,” *Climatic Change* 61, no. 1 (2003): 31-44.

posthumanist concept of media in which oil participates in making and conveying meaning beyond the humanistic systems that represent it.

There are increasingly more engagements with a posthumanist idea of oil, such as *Fuel: A Speculative Dictionary*, though not yet enough to meaningfully expand the popular Western-humanist conception of oil beyond a useful substance for humans with economically productive and environmentally destructive potential.⁴⁰ Heidi C. M. Scott's *Fuel: An Ecocritical History* tackles the subject by arguing for a different energy ontology. "With renewable energies like solar and wind coming online," she says, "in time we will see the fossil-fueled load redistributed to these renewables, but the paradigm of a fossil-fueled ontology remains largely unchallenged."⁴¹ She continues, "Anthropocene scholars have established how the eco-cultural condition in which we conduct our lives is marked by the wholesale conversion of nature into materials that energize human economies."⁴² Her argument raises the specter that oil—as understood

⁴⁰ Karen Pinkus, *Fuel: A Speculative Dictionary* (Minneapolis: University of Minnesota Press, 2016).

⁴¹ Heidi C.M. Scott, *Fuel: An Ecocritical History* (Great Britain: Bloomsbury, 2018), epub 49.

⁴² Scott, epub 54.

throughout industrialization—is a manufactured technology produced through technical, social, and natural practices, to be a human tool. *The Birth of Energy*, by Cara New Daggett, addresses the entwined naturecultural conception of work and energy.⁴³

Naturecultures is a key idea of this work, a way to describe the entwined relations of nature and culture by feminist philosophers Donna Haraway and Barad. Naturecultures describes "...co-constitutive relationships in which none of the partners pre-exist the relating, and the relating is never done once and for all. Historical specificity and contingent mutability rule all the way down, into nature and culture, into naturecultures."⁴⁴ Daggett demonstrates that the very science of energy—thermodynamics—cannot be extracted from the material and discursive conditions amidst which it came into existence in the 1840s. My argument is steadfast, anthropogenic climate change—and the ontological limits enacted through contemporary infrastructure technologies—requires urgent rethinking, beyond traditional

⁴³ Cara New Daggett, *The Birth of Energy* (Durham, NC: Duke University Press, 2019), <http://www.oopen.org/download/?type=document&docid=1006086>.

⁴⁴ Donna Jeanne Haraway, *The Companion Species Manifesto: Dogs, People, and Significant Otherness* (Chicago, Ill.: Bristol: Prickly Paradigm; University Presses Marketing, 2003), 12.

humanist interpretations of the planetary systems exploited for energy. To better understand oil, I return to the industrial era that reinvented it as commercial fuel.

A key question this project asks is: if oil use predates the concept of fossil fuel, what is the origin of the theory of fossil fuels? The question distinguishes between the science of petroleum, constituted of the geology and chemistry of ancient organisms and biomass, and the techno-cultural assumption that energetic entities should be put to work as fuel. It is taken for granted that the former implies the latter.

Because oil is one of the preeminent substances of contemporary life, engaging the material conditions of its existence as a fossil fuel carries stakes that reach beyond oil itself. Brett Bloom calls this "Petro-subjectivity."⁴⁵ Barad offers another route. The theory of agential realism proposes a material-discursive philosophy: that there is no ontological separability between objects and agencies of observation. Instead, objects and agencies intra-actively co-constitute matter's ongoing differentiation of the world. Because so many different temporally unified objects and

⁴⁵ Brett Bloom, *Petro-Subjectivity: De-Industrializing Our Sense of Self* (Ft. Wayne, IN: Breakdown Break Down Press, 2015).

agencies came together to make oil and because oil continues to be reimagined and reconfigured, agential realism serves as my foundation to rethink oil's specific ongoing materialization and the ethics of its mattering.

The point is not only to say that oil is a medium that must be examined because it is a staple of the current globalized world that exerts particular spatial and temporal influences onto its development, as Innis would, but that the structures of measurement that define what oil is are also entangled with the particular ways industrial capitalism attempted to utilize the medium. In this way, agential realism will help shift the taken for granted characteristics of oil as a medium and the assumed unity of space, time, and matter, that those characteristics depend on. In this document, sometimes that will happen with words and sometimes it will happen as the documentation of a practice or event. In working through an experimental dissertation writing practice, I mean to evoke the blasphemy of the ironic myth of Haraway's cyborg.⁴⁶ Or put differently, subversion through methodology. If oil as a fossil fuel was manufactured and no amount of climactic reports, extreme weather events, anti-racist BLM ads by

⁴⁶ Donna Haraway, *A Cyborg Manifesto*, 1984.

corporations, or mass human migrations can change this, it might be the case that, following Benjamin, the only path to such non-anthropocentric, non-destructive, world-flourishing concepts of oil is to manufacture an alternative narrative of it. In the future, humans will have a different relationship to concepts, in subtle and obvious ways. Reconfiguring these relations is of the utmost importance.

Field Notes 41: skin of the dead

If the book is the tomb of the dead, encased in their skin. Calling many names forth for the mastery of the craft. Sheathed here, in your hands. These pages, not of human skin, but the tome of light, enclosed by the remains of the Sun. Spoken forth, given intention. It is skin, the sinew of enclosure that binds these pages with light. Petrotecture embalms the concepts to come.



**Some of the names by which Petroleum has been known, compiled by Francesco Gerali, 2019 Elizabeth & Emerson Pugh Scholar in Residence at the IEEE History Center.*

| | |
|---------------------------------------|--------------------------------|
| <i>Naptu; Naphtu</i> | <i>-Akkadian</i> |
| <i>Naphta/Nepht</i> | <i>-Aramaic</i> |
| <i>Naphtha</i> | <i>-Latin</i> |
| <i>Napht/Naft</i> | <i>-Arabic</i> |
| <i>Neft</i> | <i>-Farsi</i> |
| <i>Naptik</i> | <i>-Persian</i> |
| <i>Naphte</i> | <i>-French</i> |
| <i>White Petroleum/ True Naphta</i> | <i>-English</i> |
| <i>Naphtha</i> | <i>-English</i> |
| <i>Naphta Alba/Naphta Nigra</i> | <i>-Latin</i> |
| <i>Nafta</i> | <i>-Italian</i> |
| <i>Olio di Santa Caterina</i> | <i>-Medieval Latin/Italian</i> |
| <i>Yellow/Italian Petroleum</i> | <i>-English</i> |
| <i>Olio di Amiano</i> | <i>-Italian</i> |
| <i>Casinghead Gasoline</i> | <i>-English</i> |
| <i>Natural Gasoline</i> | <i>-English</i> |
| | |
| <i>Oleum</i> | <i>-Latin</i> |
| <i>Petroleum</i> | <i>-Latin</i> |
| <i>Pétrole/Huile</i> | <i>-French</i> |
| <i>Earth Oil/Petroleum</i> | <i>-English</i> |
| <i>Petrolio/Crude/Greggio</i> | <i>-Italian</i> |
| <i>Mineral Oil/Liquid Bitumen</i> | <i>-English</i> |
| <i>Radinace</i> | <i>-Persian</i> |
| <i>Oleum Petrol</i> | <i>-Medieval Latin</i> |
| <i>Oleum Petronicum</i> | <i>-Medieval Latin</i> |
| <i>Oleo Simile</i> | <i>-Medieval Latin</i> |
| <i>Olio/Oleo di Sasso</i> | <i>-Italian</i> |
| <i>Olio di Santa Barbara</i> | <i>-Italian</i> |
| <i>Font de l'Oli</i> | <i>-French (1700)</i> |
| <i>Gabian/Red Petroleum</i> | <i>-English</i> |
| <i>Blunt von Thyrsus/Tyrschen-Oel</i> | <i>-Early New High German</i> |
| <i>Pétréol</i> | <i>-French (1700)</i> |
| <i>Petroglio</i> | <i>-Italian (1700)</i> |
| <i>Petrol</i> | <i>-British English</i> |
| <i>Pet-Oly</i> | <i>-English (1700)</i> |
| <i>Rock-Oil/Ethereal Fossil Oil</i> | <i>-English (1700)</i> |
| <i>Seneca Oil</i> | <i>-American English</i> |
| <i>Colombio</i> | <i>-Spanish</i> |
| <i>Jugo del la Tierra</i> | <i>-Spanish</i> |
| <i>Barbados Petroleum</i> | <i>-English</i> |

Elemental Media

Media scholar Nicole Starosielski has contextualized what she calls the elemental analysis within media studies:

Whether it is situated as a subfield, a takeover, or a broad reorientation of media studies, media's elemental becoming involves both a turn inward to constituent parts and a turn outward to other fields and domains... With the set of possibilities that elemental research offers, there is also a set of challenges. One of these challenges is that, while elemental research certainly offers a different framing than "environment" or "nature," it comes with its own misunderstandings. Casual readers of elemental works, relying on the popular imaginary of Greek and periodic elements alone, tend to assume that elements are bounded and discrete building blocks.⁴⁷

As Starosielski suggests, over the past decade, there has been an increase in scholarship on elemental media. In addition to Peters and Parikka, Shannon Mattern (*Code and Clay, Data and Dirt*), Starosielski (*The Undersea Network*), Lisa Parks (ed. *Signal Traffic*), and Melody Jue (*Wild Blue Media*) make up some of the media theorists expanding this arena.⁴⁸ There are also

⁴⁷ Nicole Starosielski, "The Elements of Media Studies," *Media+Environment* 1, no. 1 (November 22, 2019): 10780, <https://doi.org/10.1525/001c.10780>.

⁴⁸ Shannon Christine Mattern, *Code + Clay... Data + Dirt: Five Thousand Years of Urbanmedia* (Minneapolis, MN: University of Minnesota Press, 2017); Nicole Starosielski, *The Undersea Network, Sign, Storage, Transmission* (Durham: Duke University Press, 2015); Lisa Parks, Nicole Starosielski, and Charles R. Acland, eds.,

questions regarding how environmental media, such as the work by Janet Walker (*Sustainable Media*) and Sean Cubitt (*Finite Media*) as well as infrastructure studies (see *Extrastatecraft* by Keller Easterling) relate to this broader elemental analysis in media studies.⁴⁹ Simultaneously, this work follows a mammoth increase in ecocritical work in response to the Anthropocene hypotheses, popularized in 2000 by meteorologist Paul Crutzen and biologist Eugene Stoermer, that argues the current geologic epoch is no longer the Holocene and instead one defined by the indelible footprint left by humans.⁵⁰ Critical theorists such as Donna Haraway, Jason Moore, Elizabeth Povinelli, and many indigenous scholars have challenged this formulation, citing among other things the anthropocentric time-synchronicity of the formulation, capitalism specifically, and the way the

Signal Traffic: Critical Studies of Media Infrastructures, Geopolitics of Information (Urbana, Chicago; Chicago, [Illinois]; Springfield, [Illinois]: University of Illinois Press, 2015); Melody Jue, *Wild Blue Media: Thinking through Seawater*, Elements (Durham: Duke University Press Books, 2020).

⁴⁹ Nicole Starosielski and Janet Walker, eds., *Sustainable Media: Critical Approaches to Media and Environment* (New York: Routledge, 2016); Sean Cubitt, *Finite Media: Environmental Implications of Digital Technologies*, A Cultural Politics Book (Durham: Duke University Press, 2017); Keller Easterling, *Extrastatecraft: The Power of Infrastructure Space* (London; Brooklyn, NY: Verso, 2014).

⁵⁰ Paul J. Crutzen and Eugene F. Stoermer, "The Anthropocene," *Global Change News Letter*, no. 41 (May 2000): 17-18.

term largely ignores other world-building frameworks.⁵¹ The rise of digital culture as well—particularly the promise of unbounded wirelessness at the expense of enormous energy expenditure and physical resources—has required a renewed focus on the perceived immateriality of the natural and infrastructural conditions of new media technologies. Such awareness has mobilized the geological interests of media materialism by Parikka in today's climate of digital technology. As Starosielski suggests, part of this renewed commitment to basic units of physical entities, has ignited interest in various new materialisms and ontology in media culture, something Parikka has also been attentive to. Barad's reworking of matter as a non-representational ontology, attentive to ethico-onto-epistem-ologies, provides a particular approach to the elemental analysis.⁵²

⁵¹ Donna Jeanne Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* (Durham: Duke University Press, 2016); Jason W. Moore, ed., *Anthropocene or Capitalocene? Nature, History, and the Crisis of Capitalism*, Kairos (Oakland, CA: PM Press, 2016); Elizabeth A. Povinelli, *Geontologies: A Requiem to Late Liberalism* (Durham: Duke University Press, 2016); Marisol de la Cadena, *Earth Beings: Ecologies of Practice across Andean Worlds*, Lewis Henry Morgan Lectures 2011 (Durham: Duke University Press, 2015); Eduardo Viveiros de Castro, "Cannibal Metaphysics: Amerindian Perspectivism," *Radical Philosophy*, 1, no. 182 (December 2013), <https://www.radicalphilosophy.com/article/cannibal-metaphysics-amerindian-perspectivism>.

⁵² Barad, *Meeting the Universe Halfway*, 185.

Looking back to the media art installations with water and light that I was making in the early 2010s, my interest had been in troubling the binary distinction of digital and analog, the artificial and the natural, which so many held up as constituting separate spheres of life: the technologic was scientific and exact, beyond the world of culture, ethics, and material-semiotics; the organic was naturalized, sublime, transcendent, nonhuman, and wild. At the time, I often turned to the Deleuzian media theorist Manuel De Landa, who built up a material strata of media in *A Thousand Years of Nonlinear History*.⁵³ To rethink water and digital light was to enmesh a plurality of material representations—against the prevailing principle of early digital culture that the digital was immaterial.

But in water is a humanist embrace of the flow, and in oil I found an opaque void. The abyss of the unmeasured, that which has no place, the alterity which is so readily legible in Western rationalist thinking of race, gender, the cosmos, quantum physics, and the yet to be. In oil lies all the dark secrets of the unknowable, unaccountable, impossible, but in its viscous iridescent opacity is a clear reflection of industrial modernism. In

⁵³ Manuel De Landa, *A Thousand Years of Nonlinear History*, Swerve Editions (New York: Zone Books, 1997).

the positivist world of today, the unmeasured is that which does not exist. The consequences of such a reality have been eloquently depicted by afro-pessimist Fred Moten in *The Undercommons: Fugitive Planning & Black Study* and by artist Hito Steyerl's *How Not to Be Seen: A Fucking Didactic Educational .MOV File*.⁵⁴ Oil offered a different flow, a thicker, more resistant flow, full of charged and combustible ambiguities; a flow that resisted naturalizing, despite its concrete place in contemporary life. Life forms; life is information—a form of meaning making—in a way that challenges conventional theories of mediation, a topic for Volume Two. Oil does away with the risk of fetishizing flow, in favor of much more sticky processes that gum up historical accounts of industrialization, media, and practices of representation. This might seem counter intuitive; oil, after all, is the modern commodity par excellence, completely estranged from its earthly, yet solar, origin, hermetically sealed and hydrologically regulated across thousands of miles of pipes. But, most importantly, I learned, we moderns know almost nothing about oil, what it is, and what it has been.

⁵⁴ Stefano Harney and Fred Moten, *The Undercommons: Fugitive Planning & Black Study* (Wivenhoe; New York; Port Watson: Minor Compositions, 2013); Hito Steyerl, *How Not to Be Seen: A Fucking Didactic Educational .MOV File*, 2013.

Field Notes 1902: Crude Oil Hair Washing

A crude oil hair-washing for 100 Days Action at the site of the first crude oil production in Oakland, CA. Station B, located at what is now Embarcadero St. Jack London Square, began a contract with the state of California processing crude oil in 1902. Photographs by Ginger Fierstein. Designed by Sming Sming Books.



Oil. Art. Agential Realism.

Oil is a sun-worshiper, composed of compressed photosynthesized sugars, transforming colossal solar radiation by colossal geologic pressure. Aligned with Starosielski's critique of the Greek and periodic elements, media theorist Yuriko Furuhashi says, "...we need to be aware of which elements (and groups of elements) we media theorists are referring to. We may begin, then, by asking which lineages of knowledge and techniques of controlling the environment have been taken for granted and which others have been ignored within media studies, and why that might be the case."⁵⁵ Their arguments, that the world is not composed of discrete, essential, elements can be framed through Barad's work. This project takes a familiar substance—crude oil—and diffracts it. The emphasis in this work on refiguring how oil is understood is dually expressed through the design of the research. In keeping with the transformative potential, reading oil through agential realism is not merely an arbitrary marriage of substance and theory; as the substance par excellence of modernism, oil is a dynamic

⁵⁵ Yuriko Furuhashi, "Of Dragons and Geoengineering: Rethinking Elemental Media," *Media+Environment*, no. 1 (November 22, 2019).

materialization that this non-representationalist philosophy articulates.

Meaning making is not only a matter of words.

Just as the familiar understanding of oil is torn asunder from its conventional history, so transformed is the familiar form of the dissertation document. Entangled with/in this research of oil are speculative field notes. The field notes are stories, observations, sketches, reframings, and poetics of oil. They have no clear narrator, and they seem to happen in and out of timespace. They narrate inconsistent, often contradictory perspectives of oil. They are crucial to reinvesting in a collective cosmopolitical stewardship of our inherited rare earth. There is just one Earth, but there are many worlds.

Barad developed the theory of agential realism in response to the philosophy-physics of founding quantum physicist Niels Bohr, who provides an account for why nothing is both a particle and a wave simultaneously. Rereading the classic "Two Slit" thought experiment and philosophy-physics of Bohr, agential realism challenges the conception that any particular thing exists with inherent attributes separate from the conditions that constitute the possibility of those attributes. Bohr's epistemological framework, argues Barad, is fundamentally transformative

because it “rejects the presupposition that language and measurement perform mediating functions. Language does not represent states of affairs, and measurements do not represent measurement independent states of being.”⁵⁶ Nature, culture, society, technology, agency, objects, subjects, time, space, and a litany of power relations including colonialism, sexism, and xenophobia are constituents of specific relations in their becoming, not preexisting categories.

I want to stress the specifics of language here. Agential realism offers a new vocabulary for thinking beyond the practices of representation that assume preexisting, discrete categories such as those of space and time, subject and object. However, agential realism is not about words per se and it argues for an expanded conception of discourse.⁵⁷ It is a material-discursive approach to understanding matter’s ongoing differentiation/differentiating of the world. It is difficult to talk about

⁵⁶ Barad, *Meeting the Universe Halfway*, 138.

⁵⁷ Reading Bohr’s concept of the “apparatus” with Foucault’s account of discursive practices, Barad says, “[d]iscourse is not a synonym for language. Discourse does not refer to linguistic or signifying systems, grammars, speech acts, or conversations. To think of discourse as mere spoken or written words forming descriptive statements is to enact the mistake of representationalist thinking. Discourse is not what is said; it is that which constrains and enables what can be said. Discursive practices define what counts as meaningful statements.” Barad, *Meeting the Universe Halfway*, 146.

because words are often representations that unwittingly reinforce the dualisms that agential realism challenges. Such are the trappings of logocentrism and its emphasis on signification, which critical praxis helps to ameliorate. Any attempt at a paraphrased shortcut will inevitably fall short because it takes work to rework the knowledge practices that agential realism calls into question.

To engage with this work more deeply and clarify the posthumanist media theory that I propose, here is a brief summary of important concepts in agential realism that will help to build this new vocabulary. For Barad, the term “apparatus” has important technical significance, meaning “the material conditions of possibility and impossibility of mattering; they enact what matters and what is excluded from mattering.”⁵⁸ It is an expansion of Bohr’s idea of an apparatus that does not presume preexisting human categories (such as scientist or technician), and his argument that “concepts” (which he says are physical arrangements) and “things” cannot be separated from each other, either physically or in meaning.⁵⁹ Barad reworks Bohr’s idea and describes apparatuses as boundary-making

⁵⁸ Barad, *Meeting the Universe Halfway*, 148.

⁵⁹ Barad, 147.

practices in which agential cuts produce determinate boundaries and properties within phenomena.

Apparatuses are material-discursive becomings; they are specific intra-actively enacted instruments, agents, networks, and concepts. Parikka suggests this concept provides grounds for a new media theory.⁶⁰ "Intra-action," a foundational concept of agential realism, is the ontological inseparability of determinate entities.⁶¹ "Crucially," Barad says, "intra-actions enact *agential* separability—the condition of *exteriority-within*-phenomena."⁶² In Barad's account, it is this notion that secures a different ontological condition for objectivity and a reworking of causality. Following Bohr's rejection of atomistic metaphysics that "things" are ontologically basic entities, Barad argues that "phenomena," the *intra-action* (not interaction) of objects and agencies, are a base ontological unit; matter and meaning intra-actively co-constitute each other. Discursive practices are not merely words or speech acts but rather "are specific material

⁶⁰ Jussi Parikka, "Apparatus Theory of Media á La (or in the Wake of) Karen Barad," *Machinology* (blog), July 16, 2009, <https://jussiparikka.net/2009/07/16/apparatus-theory-of-media-a-la-or-in-the-wake-of-karen-barad/>.

⁶¹ Barad, *Meeting the Universe Halfway*, 128.

⁶² Barad, 140.

(re)configurings of the world through which the determination of boundaries, properties, and meaning is differentially enacted..."⁶³ This shift of discursive practices, suggests Barad, moves beyond Bohr's reliance on predetermined human concepts. Therefore, to summarize, "material apparatuses produce material phenomena through specific causal interactions, where 'material' is always already material-discursive..."⁶⁴ Things, beings, and meanings are not essential, independent, determinate entities.

In this formulation, agency is not an attribute of pre-existing subjects or objects. It is not something that humans or nonhumans have, nor something that can be given out. "Agency is 'doing' or 'being' in its intra-activity. It is the enactment of iterative changes to particular practices... Agency is about changing possibilities of change entailed in reconfiguring material-discursive apparatuses of bodily production, including the boundary articulations and exclusions that are marked by those practices in the enactment of a causal structure."⁶⁵

⁶³ Barad, 148.

⁶⁴ Barad, 153.

⁶⁵ Barad, 178.

Through intra-action, Barad proposes a posthumanist performative approach. "Posthumanism doesn't presume the separateness of any-'thing,' let alone the alleged spatial, ontological, and epistemological distinction that sets humans apart."⁶⁶ Far from suggesting that the human doesn't matter, or that posthumanism denies the human, this account argues that one cannot start from a position that assumes the human, because the social, cultural, technological, and natural conditions that participate in co-constituting the human are not neutral, essential, or apolitical, and are themselves intra-actively co-constituted. Representationalism relies on the unexamined notion that these categories exist prior to the instruments, methods, and practices that produce those representations. "The move," Barad says, "toward performative alternatives to representationalism shifts the focus from questions of correspondence between descriptions and reality (e.g., do they mirror nature or culture?) to matters of practices, doings, and actions."⁶⁷ This perspective shows that categorization—an apparatus of signification—plays a primary role in the active formulations of what matters and what is excluded from mattering. Said another way, the

⁶⁶ Barad, 136.

⁶⁷ Barad, 135.

posthumanist performative approach proposed by agential realism directly tackles some of the root causes of inequity in the world, be that racial, gendered, environmental, colonial, or multispecies (and in their many entangled ways). Barad, makes this abundantly clear: "Indeed, ethics cannot be about responding to the other as if the other is the radical outside to the self."⁶⁸

This account of materiality can build upon the elemental analysis in media studies proposed by Starosielski, particularly the work I have outlined from Parikka and Peters through Innis and McLuhan. Moreover, Barad's particular emphasis on performativity that does not assume a spacetime unity with classical humanistic interpretations of entities, reworking agency and causality, is crucial to reworking the notion of media that I hope to extend. These concepts can be applied to the history of the American oil industry. Oil—as a global network of pipelines and as chemical arrangement of hydrocarbons—is an apparatus. Oil actualizes (and excludes) such foundational ways of being in the world; deep excavation is needed to reconfigure concepts that have concretized into natural

⁶⁸ Barad, 178.

conditions of life—such as that nylon stockings are produced for women’s legs, that roads are for cars, or that oil is a fossil fuel for human use.

When did the concept of oil as a fossil fuel come into existence? The theory that “fossil fuels” formed from pressurized biomass in the earth is attributed to Andreas Libavius. In the 1597 textbook *Alchemia*, he argued that bitumen formed from the resin of ancient trees.⁶⁹ The term “fossil fuel” was first used by German chemist Casper Neumann in 1759 (translated into English in 1773).⁷⁰ In the early phase of European industrialization, the term was used in relation to the British coal industry and early developments in the science of geology. Incidentally, this was also the beginning of the argument of the earth as a historical scientific entity and not a subject of the Christian creation myth.⁷¹ During the mid 1800s, two important geological surveys, the Report on the Geology of Canada (1863) and U.S. Geological Survey of Pennsylvania (1858), linked carboniferous rock formations to

⁶⁹ Paul R. Robinson and Chang S. Hsu, *Springer Handbook of Petroleum Technology*, Springer Handbooks (Cham: Springer International Publishing, 2017), 360.

⁷⁰ Caspar Neumann, *The Chemical Works of Caspar Neumann* (J. and F. Rivington, 1773).

⁷¹ John Holland, *The History and Description of Fossil Fuel, the Collieries, and Coal Trade of Great Britain* (Whittaker, 1835).

ancient biomass.⁷² In 1873, J.T Henry, one of the earliest authorities on the history of oil, proposed the *philosophy* of petroleum had come onto man.⁷³

What is the naturalized philosophy of petroleum that Henry speaks of?

American oil industry historians mark the start of commercial drilling, at Drake Oil Well in 1859, as the transformation of a global network of fuel commodities.⁷⁴ It occurs as Henry's philosophy of petroleum sets in and takes over the public imagination of development, of mechanization and automation, of the future. Conventional histories of the early American oil industry point to figures like Samuel Kier, who built the first oil refinery; George Bissell, founder of Seneca Oil, which built Drake Oil Well and was managed by Edwin Drake; J. L. Hutchings, who constructed the first oil pipeline; and others for recognizing and acting on the economic potential of this philosophy. But this history does not address the question: when did

⁷² William Edmond Logan and Geological Survey of Canada, *Report of Progress from Its Commencement to 1863* (Montreal [Québec]: Dawson Bros., 1863); Henry Rogers, *The Geology of Pennsylvania: A Government Survey*, vol. 2 (Philadelphia: J.B. Lippincott & Co, 1858).

⁷³ Henry, *The Early and Later History of Petroleum, with Authentic Facts in Regard to Its Development in Western Pennsylvania*.

⁷⁴ William R. Brice, *Myth, Legend, Reality - Edwin L. Drake and the Early Oil Industry*, First Edition (Oil City, PA: Oil Region Alliance, 2009).

the concept of oil as a fossil fuel emerge? Volume One will address these questions.

To reimagine these anthropocentric oil histories as entangled naturecultures, practices for thinking about oil require new methods, including thinking-with oil. Others have proposed similar alternatives, such as Métis anthropologist Zoe Todd who argues for reframing oil as kin.⁷⁵ Indeed, Indigenous scholarship is one of the few fields taking seriously different oil ontologies. I propose that thinking-with oil requires touching it, knowing it, and being with it in its various forms. The doing of this work engages unconventional modes of research and the double bind of (inter)disciplinary thinking—differentiating art and science while diffractively thinking through them.

What kind of practices can produce new concepts of oil? This guiding question is about cultural sovereignty and self-determination. It is a plea for a radical future/ism in which new concepts (of *bottley-production*) make new worlds because concepts are physical arrangements of how things are

⁷⁵ Zoe Todd, "Fish, Kin and Hope: Tending to Water Violations in Amiskwaciwâskahikan and Treaty Six Territory," *Afterall: A Journal of Art, Context and Enquiry* 43 (March 1, 2017): 102-7, <https://doi.org/10.1086/692559>.

and what might be. To this end, this project shows and tells different possibilities of oil—in the way that Sarah Kember and Joanna Zylinska argue for media practice as critique.⁷⁶ This perspective points to the way that different mediums enact different possibilities and that practices of writing can overdetermine states of being. A history of oil reveals the vast possibilities of the substance and why such open-ended thinking is not only a speculative matter but carries urgent practical importance.

⁷⁶ Sarah Kember and Joanna Zylinska, *Life after New Media: Mediation as a Vital Process* (Cambridge, MA: MIT Press, 2012).

Field Notes 109: Climate Change in the Gallery Space

By thinking with oil in hands-on, experimental, research and art-based ways, industrial representation of it can be expanded. Oil can be understood as a dynamic substance without representational characteristics of fossil fuel prior to the forces that (re)presented in this way. Instead of an agent of human use, oil is the spacetimemattering of solar light and biomass of the deep earth (Barad, 179).

Crude Illumination (2015), most recently exhibited in Thekla (2018), a group show curated by Lauren Marie Taylor at Southern Exposure Gallery, San Francisco, was the first light installation I made using crude oil. <Figure x> By creating the conditions for an obsolete media apparatus to materialize specific dispositions of crude oil, the work focuses on an elemental conception of transmission and inscription while illuminating the media archaeology of certain light apparatuses. Crude Illumination is a crude oil, light projection installation; it features an analog overhead projector that visually enlarges an acrylic container filled with crude oil and dry ice. Dry ice is frozen carbon dioxide, and it sublimates from a solid to a gas at -109.3°F. As the overhead projector illuminates the glacial change of the oil and the dry ice, carbon dioxide sublimates into the atmosphere, enacting climate change in the gallery space.

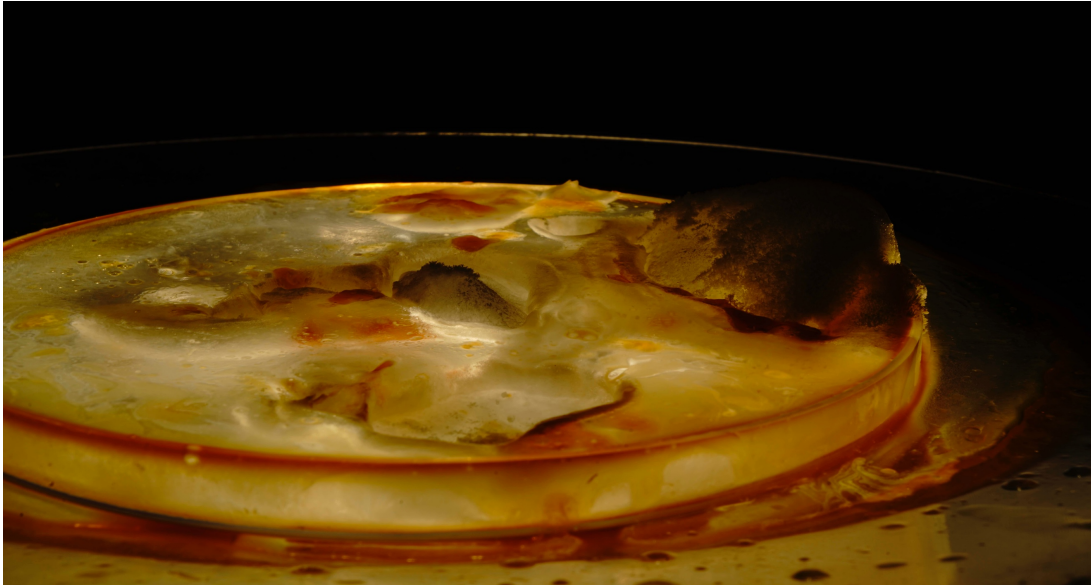


<Figure x: Studio installation view of Crude Illumination (2015) for ISEA2016 Hong Kong Artist Talk. Photo: Elia Vargas.>

The overhead projector is not incidental in this ongoing materialization of oil and light; it is also a specific apparatus of differentiation. Mining the history of the overhead projector reveals an unsurprising link to the military-industrial complex. There are no clear histories of the overhead projector, a task in need of further media scholarship, but some sources point to its early development by French optical scientist Jules Duboscq in the 1880s (Gansing 2013). It has been suggested that it was first used as a tool for police departments to enlarge criminal fingerprint records. While it is difficult to substantiate this suggestion, the overhead projector came into common use standardizing and modernizing World War II training procedures.

Crude Illumination is a light projection installation—not a projection on a surface but an entire arrangement. The room, the atmosphere, the open space to move about, the light, the oil, the elemental and the technological materials, all matter. The installation enables a deep looking at the materialization of hydrocarbon transformation: it is a plurality of metaphors and materials. It resembles oily seepage

contaminating Arctic glacial shelves, evoking representations of climate change, and it probes a history of analog technology. It is attentive to the role the overhead projector plays in illuminating the conditions of the work—in fact, the conditions of illumination are the materializing force of the work. But, most importantly, the installation creates actual, physical, light-oil carbon transformation in the gallery. <Figure z>The dynamic atmospheric metamorphosis is the work.



<Figure z: Detail of oil sublimating frozen carbon dioxide, *Crude Illumination*. Photo: Elia Vargas.>

Crude Illumination was a response to a series of artworks on light and water as elemental transmission. Light, in its optical media conception, is a carrier wave of information. In its projected form, it is also a material marking a surface (a wall projection, for example). I sought to identify some of the entanglements of the naturecultural context of light projection. It is an interesting state where different forms of information are revealed or excluded based on the technosocial semiotic understanding of what projection is: a series of symbols on a wall projected from a light-emitting device. But this comprehension of light ignores the fact that the electromagnetic spectrum exists in a range that exceeds human legibility and has material impacts that are not representational. Human-oil histories have always been tethered to light (the biblical eternal flames of naphtha, kerosene, a replacement for whale oil, etc.). But more importantly, from a posthumanist perspective, thinking about oil means thinking about the sun. Linking the material inscription of projection light to oil as solar inscription of the earth troubles conventional media materialism. Thinking about oil and the sun opens different temporalities, beyond conceptions of humanist media. Thinking about oil and the sun opens thinking about oil in numerous nonabstract ways: how does solar radiation become oil underneath the ground, and what does that mean for the metaphors that suggest oil is the sludge of the earth? What is the spacetime of oil? How do Western industrial human representations of oil map onto that?

In fact, chemists say oil is one of the most bio-rich materials that humans have ever found. Thus, it gets used for many different purposes; this is why mystics and industrialists were so infatuated with it. It can do so many different things; what it does—its disposition—is part of the process of how it becomes normalized. How the concept of oil is formed, through its disposition, is vitally important. This perspective echoes Scott's critique of the fossil-fueled ontology. Thinking about oil-sun relations means thinking oil in relation to life in its becoming. In physically doing different things with oil, I aim to expand the conception of what oil is.

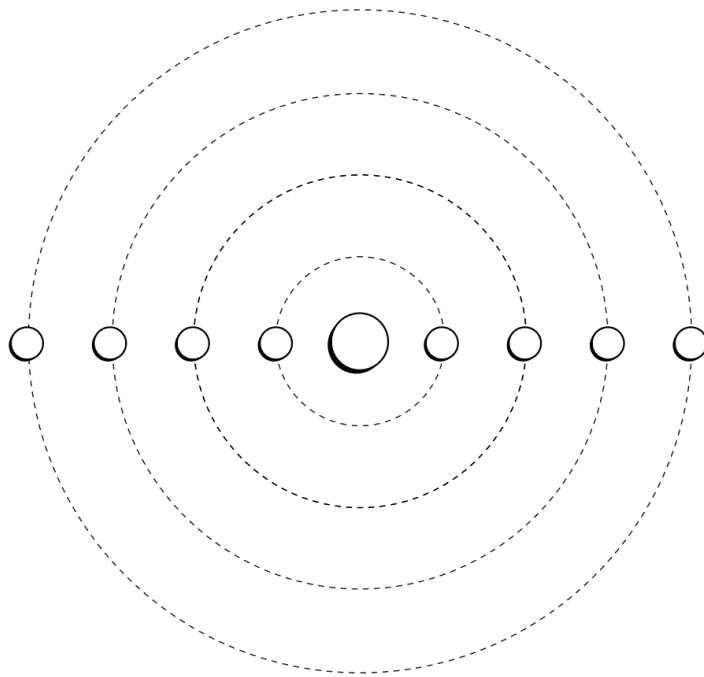


Figure 4: Found diagram.

Volume One: Oil as Industry

In which the argument is presented that making oil fuel made oil an industry. Furthermore, the volume presents evidence that the conceptualization of oil as a fossil fuel is manufactured as the conditions of oil's mechanical and economical extraction is developed. Such an inquiry draws a distinction between energetic entities and the labor that representations of fuel entail. Heretofore, taking it as truth that oil as a fuel was a manufactured circumstance of technical/cultural practices in the Gregorian Calendar mid-1800s, the following treatise explicates the circumstances that enacted rock oil (Latin, *petra + oleum*) as an industry.

Figure 5: Oil as Industry.

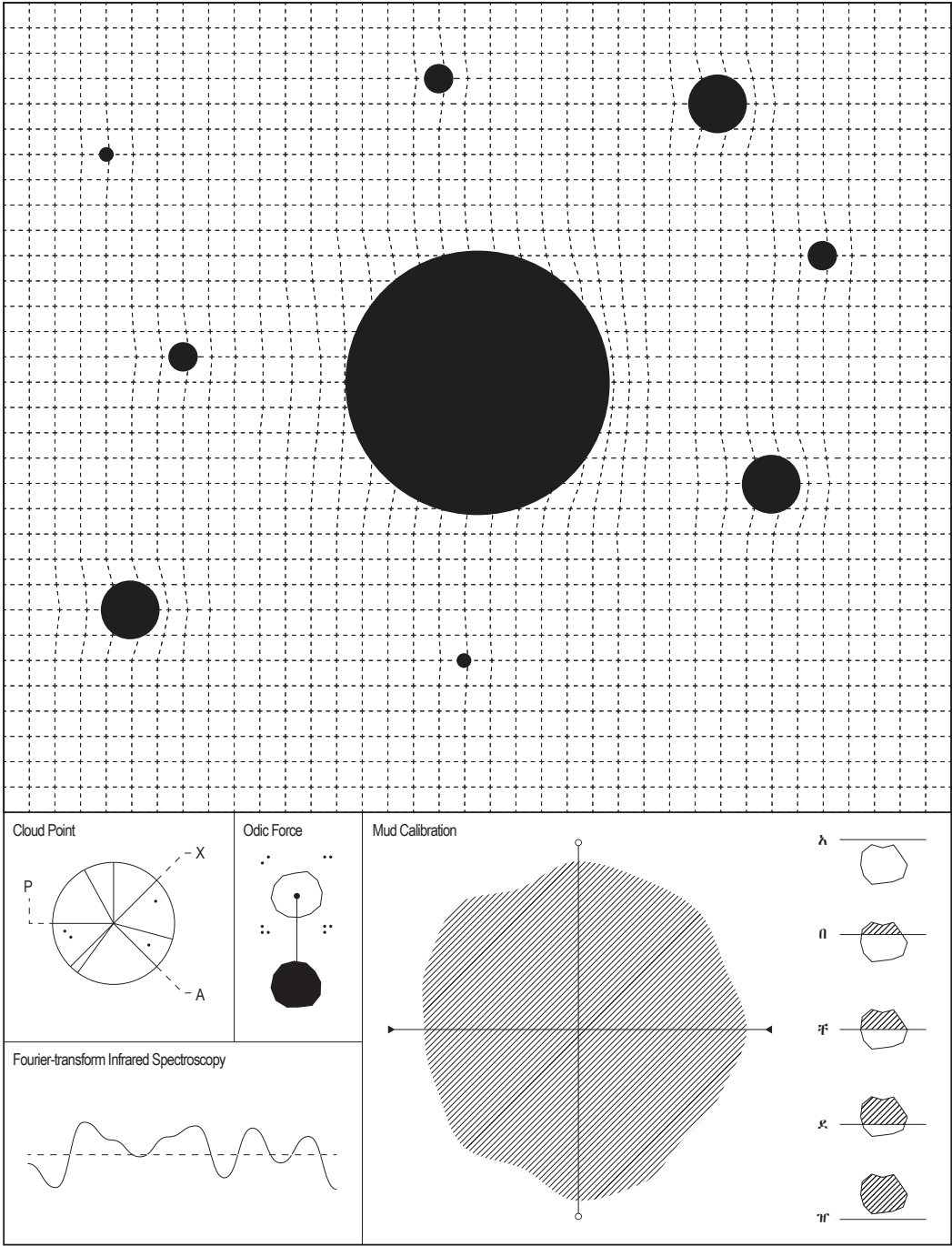


Figure 6: Undated notes on Heliotechniques in pursuit of the Tome of Light.

Zero. An Archaeology of Oil (as Media)

This work considers the cultural, philosophical, and techno-scientific conditions of the early American oil industry, to transform damaging anthropocentric conceptions of nature. Volume One traces certain aspects of the early American oil industry with the two intents: one, to examine the technosocial conditions that produce oil as a specific material-discursive phenomenon in the present; and two, to set up the argument that refiguring oil as media offers crucial new conceptualizations for how the technosocial conditions of the present can be understood.

The dominant American oil history places Drake Oil well, in 1859, as the first commercial crude oil well.⁷⁷ Even within the Oil Creek region of Pennsylvania—the first commercial oil region in the United States—there was oil extraction, commodification, and commercialization prior to the Seneca Oil Company's well (Drake Well), managed by Edwin Drake. Yet, by some historical consensus force, it was Drake, at the riparian well next to Oil Creek, in Titusville, that triggered the industrial progress narrative of the history of the crude oil industry. The narrative goes something like this:

⁷⁷ Brice, *Myth, Legend, Reality - Edwin L. Drake and the Early Oil Industry*.

Edwin Drake was a failure; he was a bad businessman and a poor manager. Seneca Oil gave up on the well and he sunk his own resources in it to keep it going. At the time, residents of Titusville thought it was crazy to intentionally extract the viscous seepage ruining their crops. On Saturday, August 27th, 1859—there are considerable questions with regards to the precise date—William “Uncle Billy” Smith, and his sons experienced a six inch drop in the well’s drill bit, completed their work day, and returned on Sunday to discover the drop had punctured through stone 69 feet deep and oil was spewing out.⁷⁸

The day is legendary amidst oil historians. While the enthusiasm for the commodity driven ecological and social catastrophe that unfolded in the region for the following decade accurately reflects the explosive development that occurred at Oil Creek, it is perhaps misguided—or at least incomplete—the way the glee of the region is recounted. Oil historian William Brice notes one local newspaper’s response:

Almost in a night a wilderness of derricks sprang up and covered the entire bottom lands of Oil Creek. Merchants abandoned their store houses, farmers dropped their plows, lawyers deserted their offices,

⁷⁸ Brice, 321.

and preachers their pulpits. The entire western part of the State went wild with excitement.⁷⁹

Generally speaking, it is true that everyone who was in Titusville around the time of Drake Well was there because of oil. So, perhaps the enthusiasm is accurate, but the methods are suspect. The state of Pennsylvania has, unsurprisingly, embraced the early oil industry as part of its heritage. Oil tourism is a meaningful cultural activity in northwest Pennsylvania. One can visit Drake Well, the origin site of Pennzoil, the Harmonial wells where Abraham James psychically divined the well location, Petroleum City, the derelict artifacts of boom-and-bust Pithole City, among many other oil activities. Oil Creek is a State Park, established by the state in 1931, with 30 plus miles of trails and backpackers' tent sites.

As paradoxical as it may seem, oil industry histories offer urgent warnings to possible techno-futures (but not in the way one might think). Refiguring oil and re-examining the early oil industry provide important examples (and cautionary tales) for interpreting the new material space constituted with new technological practices in the present. Not only does

⁷⁹ Brice, 321.

this challenge the accepted position of crude oil as an ontologically determinant entity—and invite a broader discussion of techno/ecological nature/culture distinctions—but oil industrialization is a particularly impactful, and in many ways invisible, force in technosocial development. New illumination, new lubrication, new medicine, new machinery, and new ways of life offered little comparison to previous life practices in the mid 1800s.

Shannon Mattern’s multi-faceted more-than-media-archeology of urban media aid in situating this work. In the introduction to *Code + Clay...*

Data + Dirt: Five Thousand Years of Urban Media, she says,

It wasn’t until the late-aughts that I discovered the field of media archaeology... and found a fitting retroactive justification for my surveying-and-excavating-across-multiple-sites pedagogical methodology. Work in this gallantly named field offered a set of conceptual and methodological tools—notably, its focus on the materiality of media, and its embrace of nonlinear histories and forking paths—that were pertinent to my interest in the *longue durée* of urban mediation. Media archaeology’s unofficial slogan—“challenging the newness of the ‘new’”—was something I could totally get behind.

But we’d heard this before, too. Historians have long been engaged in the search for precedents and have challenged the notion of linear progress. Within media studies, Carolyn Marvin and Lisa Gitelman had already demonstrated that, at one time or another, all “old technologies were new,” that media are “always already new,” that emerging technologies typically follow the “scripts [and] grooves” carved out by their predecessors. Marvin’s and Gitelman’s

were among the few female voices that resonated within the predominantly male... media-archaeological terrain.⁸⁰

Mattern eloquently summarizes the hidden minefields and slippery mantle of cross-disciplinary work, particularly that which is not methodologically conventional to media studies. Volume One might only *become* a media archeology by the end of the project, once oil is more convincingly understood as media, and the consequences of this move are made clear, which is tackled in Volume Two. But this “humble ‘traveling discipline’ characterized more by ‘mobile concepts and shifting institutional affiliations’ than by a comprehensive, inclusive statement of purpose” offers the sort of flexibility necessary for the reexamination this genealogy of the oil industry hopes to elicit.⁸¹ Indeed, Carolyn Marvin makes an important cameo and Mattern’s articulation of media archeological methods are complimentary to Barad’s diffractive method pursued throughout this project.

Furthermore, Mattern’s assessments of the context of media archeology productively situate this project at the van guard of media and

⁸⁰ Shannon Christine Mattern, *Code + Clay... Data + Dirt: Five Thousand Years of Urban Media* (Minneapolis, MN: University of Minnesota Press, 2017), xv.

⁸¹ Mattern, xvi.

nature–*medianatures*, a term that media theorist Jussi Parikka augments from Haraway.⁸² In recent years, these concerns have become a part of the common stable of critical media concerns. Media theorists such as Mattern (and Starosielski, Peters, Parikka, Tung-Hui Hu, Sean Cubitt, and others) have looked towards the entanglements of the environment and infrastructure to comprehend how media happen, what media does, and what its technological, social, and environmental impacts are.

Then—and now—technological development often outpaces the capacity for critical and ethical comprehension of those technologies, as

⁸² Mattern says: “Defining its context are the “disruptions” of the digital, expanding global circuits of e-waste, the rediscovery of old media artifacts and archival material, the widespread embrace of data-driven methodologies, as well as new varieties of the various “crises” that always seem to plague academia (crises of the archive, of the image, of the humanities, of higher education, of crisis itself, and so forth). This is the world into which media archaeology emerged... We now have some new crises and epistemic ruptures to add to the list: climate change and global conflict have incited concern about their potential impact on the world’s vulnerable populations and our shared material cultural heritage; the spread of automated labor has pressed us to reconsider our collective investment in and obligations to our fellow human beings; and reorientations of global power have necessitated that we redraw our geopolitical maps. And alongside the real-time, fraction- of-a-second temporality of our data-driven technologies and markets, we’ve witnessed the rise of a “long-term” Anthropocenic scope of vision.... To begin, media archaeology turns our attention away from traditional hermeneutics—i.e., textual interpretations of what’s on the page or the screen—and toward the page and the screen themselves: toward the hardware of media,” Mattern, xvi; Jussi Parikka, *A Geology of Media*, Electronic Mediations (Minneapolis; London: University of Minnesota Press, 2015).

media and technology scholars and philosophers, such as Adrian Mackenzie and Paul Virilio have thoughtfully suggested. “To invent the sailing ship or the steamer,” Virilio has famously said, “is to invent the shipwreck. To invent the train is to invent the rail accident of derailment. To invent the family automobile is to produce the pile-up on the highway.”⁸³ As radically abstract—yet importantly material—forms of new life emerge in digital space, in software, in new hardware, new networks, new clouds, new algorithmic surveillance, new surveillance capitalism, new energy practices, the present can look to this past event of oil industrialization to learn new tactics to avoid confusing representational descriptions of reality as correlative metaphors for how things are.

Like technological infrastructure today, crude oil was manufactured by scientists and businessmen (and they were almost always men) as a panacea to solve prevailing technosocial problems, while hiding, ignoring, and displacing their ecological (and social) impact. The earliest chemical analysis of oil—carried out both by Benjamin Silliman Sr., an important figure in the introduction of science as a pedagogical field of study, and later, by

⁸³ Paul Virilio, *The Original Accident* (Cambridge, Mass: Polity Press, 2007).

his son Benjamin Silliman Jr.—is viewed as an advertisement for its commercial possibility. Advertised at the time as a natural ointment and as high-tech light fuel, the oil that a public experienced had always already been transformed by rhetoric and by instruments. The consequences of this lie in Virilio's prophecy: the highway accident could not be foreseen by an 1840s American public that was not exposed to the then abstract conditions that made oil fuel. Unfortunately, it seems, the present has been equally ill-equipped to recognize ocean and atmospheric plastic build up in relation to plastic's petro-history.

Industrialization still governs the limits of representation, because the present still conforms to an apparatus privileging extractive conceptualizations of beings, beginning perhaps, with Sir Francis Bacon's mechanical metaphor of nature in the seventeenth century.⁸⁴ To invert Andrew Pendakis's conceptualization of oil as the Greek arche—an origin and first cause—oil as fuel is an ontological limit.⁸⁵ The media archeology of

⁸⁴ Carolyn Merchant, *The Death of Nature: Women, Ecology, and the Scientific Revolution* (New York: Harper & Row, 1989).

⁸⁵ Andrew Pendakis, "Being and Oil: Or, How to Run a Pipeline through Heidegger," in *Petrocultures, Oil, Politics, Culture* (McGill-Queen's University Press, 2017), 377-88.

the early oil industry, read through agential realism, therefore offers the contemporary moment quite a lot: the effects of new space/time/matter relations, an analysis of new conceptualizations of oil, a genealogy of how previous conceptualizations of oil as fossil fuel emerged, and the posthumanist response-ability that such conceptualizations present, what Barad presents as a critique of the metaphysics of individualism. To begin with, J.T. Henry's "philosophy of petroleum" can be read as one step in a hundreds-of-years process of making crude oil a fossil fuel.

Energy histories and oil histories are not the same. The commodification of a new energy source should be separated from the history of the substance of oil. How does an ecosystem become an industrial system? Whether it is wood, wind, water, horses, humans, entropy, or the sun, industrial systems are natureculture systems. Oil has not always been comprehended as fuel. The transfer of heat energy in fuel has not always been measured as the science of thermodynamics. The systems of knowledge production governing representations of oil over the past 1000 years are not fixed. As media theorist Lisa Gitelman's says, "Media are so integral to a sense of what representation itself *is*, and what

counts as adequate... representation."⁸⁶ Media play a fundamental role in how epistemological and ontological categories interact. Thus, when 10th century Persian alchemist al-Razi (more on him in Volume Three) describes oil as an illuminant, a shared comprehension of oil with George Bissell—founder of Pennsylvania Rock Oil Company (later Seneca Oil Company in 1855), one of the first companies to extract oil for kerosene—cannot be assumed.

⁸⁶ Lisa Gitelman, *Always Already New: Media, History and the Data of Culture* (Cambridge, Mass: MIT Press, 2006).

Field Notes 1986 Baar Products

Somewhere in Downingtown, PA, there is a mobile phone storing the audio recording of an interview I conducted with Bruce and Kathy Baar, founders of Baar Products, Inc. For many years they have been my source for crude oil. They are the "official" worldwide supplier of Edgar Cayce Health Care. One such product is Crudoleum Pennsylvania Crude Oil Scalp Treatment. The product name has changed slightly over the years, including "100% Pennsylvania Crude Oil" on the label at different times and shifting from a 16 oz to a 12 oz bottle during the time I have purchased it. They are nice. They give me a discount. They treated me, and my traveling companion to lunch for the interview. They were skeptical about recording it, so agreed to do so on their own phone.

An email from Bruce Baar on November 2nd, 2016:

"Please accept my apology for a delayed response. I wanted to listen to the recording before I did anything and I have not done that yet. My lawyer advised against sending it."

Baar Products extracts the oil from their own land—130 acres in Pennsylvania and Tennessee. For more info on the product, see: <https://www.baar.com/crudoleum-pennsylvania-crude-oil-scalp-treatment>.

On January 25th, 2017, I emailed Bruce:

Hi Bruce,

I hope the new year finds you well. I've been invited back to Wave Farm to install my oil pipeline installation again later this year (and I will also have a solo exhibition in Oakland in June). As a result I will need more oil. I'm curious if I could purchase larger volumes from you at a cheaper price than the 16 oz bottles? I'm thinking in the quantity of a few gallons. For Wave Farm in August, I could drive and pick it up.

Lastly, while I am on the east coast, I wonder if it would be possible to see your oil well? I'd enjoy very much a trip into rural PA.

all my best,

On January 27th, 2017, Bruce responded:

Hi Elia,

Congratulations on your exhibition successes.

I'm working on a special lower price for you for the oil and we can keep them in the bottles. The size of the bottles is now 12 ounces (from 16 oz.) due to shipping issues. I'll get back to you on Monday with the lower price.

The well we keep private but we would love to have lunch again when you are out this way.

Great to hear from you,

Bruce

I am reminded that there is a bit more to this story, which I will not write down.

One. The *Philosophy* of Petroleum.

In 1873, in *The Early and Later History of Petroleum, with Authentic Facts In Regard to Its Development in Western Pennsylvania*, oil historian J.T.

Henry quotes from an 1833 paper in the "American Journal of Science"

titled, "The Saliferous Rock Formation in the Valley of the Ohio;" by Dr. S. P.

Hildreth,

"...A few years ago, when oil was most abundant, a large quantity had been collected in a cistern holding thirty or forty barrels. At night some one engaged about the works approached the well-head with a lighted candle. The gas instantly became ignited, and communicated the flames to the contents of the cistern, which, giving way, suffered the oil to be discharged down a short declivity into the creek, where the water passes with a rapid current close to the well. The oil still continued to burn most furiously, and spreading itself along the surface of the stream for half a mile in extent, shot its flames to the tops of the highest trees, exhibiting the novel and perhaps never-before witnessed spectacle of a river actually on fire."⁸⁷

Henry devotes considerable time to examine the remarkable event,

Here we find Petroleum obtained more than thirty years before its final development, yet attended with all the accidents, and presenting all the phenomena that characterize its production in Pennsylvania. These are not accounts open to the suspicion of exaggeration. They were written

⁸⁷ J.T. Henry, *The Early and Later History of Petroleum, with Authentic Facts in Regard to Its Development in Western Pennsylvania... Also Life Sketches of Pioneer and Prominent Operators*. (Philadelphia: Jas. B. Rodgers Co, 1873), 26.

and published more than a generation before the *philosophy* of Petroleum broke upon the understanding of man.⁸⁸

It is not the last time rivers of fire will illuminate a scene. But it is Henry's conception of the "*philosophy* of Petroleum" that I intend to bring to light. What is it? When did it begin?

Volume One examines how the perceptions of oil in Pennsylvania in the mid 1800s shaped the development of the oil industry. In doing so, it poses a key question: if oil use predates the concept of fossil fuel, what is the origin of the theory of fossil fuels? The question distinguishes between the science of petroleum, constituted of ancient organisms and biomass, and the techno-cultural assumption that energetic entities should be put to work as fuel. The conjoined efforts of science and industry during this period in Pennsylvania show how it is taken for granted that the former implies the latter. Attending to oil in this way will help set up the foundation for the sort of media materialism that I argue oil constitutes. By giving attention to the entangled scientific concepts and cultural practices that enacted the industry of making oil fuel, oil can be seen in/as a new light.

⁸⁸ Henry, 26.

According to Henry, one of the earliest authorities on the history of the oil industry, this philosophy was, in the simplest of terms, “man’s” conquering of the mysterious black earth by capitalizing on its utility towards “productive” technosocial means. Even in 1873, oil was quickly becoming the site of imagination and possibility.

Its value as a lubricator was indisputably established; its medicinal properties were appreciated; very little stood in the way of its adaptation to purposes of illuminating, and so much of even that objection was removed by the simple process of filtering through charcoal on which process a patent has since been obtained that in the light of present events, it is impossible to understand how its importance could have been overlooked, could have failed to suggest, if not the philosophy of its existence in the earth, the manner in which it is held among the rocks, at least the hope of making a fortune by developing it after the manner of raising brine.⁸⁹

Like many histories of oil, Henry entwines the science of its production with its economic potential, as he elucidates the entanglement of oil and illumination, high-tech of the time, to be clear.⁹⁰ The value of oil is measured in its seemingly endless applications as a productive product.⁹¹

⁸⁹ Henry, 28.

⁹⁰ See: Daniel Yergin, *The Prize: The Epic Quest for Oil, Money, and Power* (New York: Simon & Schuster, 1991); Leonardo Maugeri, *The Age of Oil: The Mythology, History, and Future of the World’s Most Controversial Resource* (Guilford, Conn: Lyons Press, 2007); Brice, *Myth, Legend, Reality - Edwin L. Drake and the Early Oil Industry*.

⁹¹ See, for example: Mihály Freund, *Paraffin Products: Properties, Technologies, Applications* (Elsevier Scientific Publishing Company, 1982).

Henry openly wonders why the first manufactures of oil did not grasp this potential, as though the refining practices were predetermined outcomes of a society that desired cleaner, brighter, less odorous light.

Even twenty years later we find Mr. Kier of Pittsburgh, profitably engaged in bottling and selling it as a great natural panacea; consuming in this way regularly about three barrels a day, obtained from his father's salt well at Tarentum, a few miles above Pittsburgh, on the Allegany River, labelling his bottles to the effect that this most wonderful remedy was obtained four hundred feet below the surface of the earth distilling it, even, so that nearly every objection to it as an illuminator in the crude state was removed, and yet pocketing the returns without giving a thought to its origin or extent.

With Mr. Kier naturally enough the consideration was to utilize what he had, to make the most of it, rather than by research and development to bring forth that which would have been in every sense a drug in the market. He grasped one idea its utility, and suggested the next its development.

Thus link by link, was forged slowly, the chain of events which united thought and action, effecting what is known as the "discovery" of Petroleum.⁹²

Oil industry historians mark the start of commercial drilling, at Drake Oil Well in 1859, as the transformation of a global network of fuel commodities. It occurs as Henry's philosophy of petroleum sets in and takes over the public imagination of development, of mechanization and automation, of the future. But, locating the origin of oil as fossil fuel, is something else. In

⁹² Henry, 28.

the mid 1800s, a convergence of forces calcified and mobilized the acceleration of crude oil as an industry and crude oil as an index of global capital. Oil created new speeds of exchange as it annihilated distances; it connected the far away as it gave focus to the nearby; it saturated the surface of the earth and turned the surface of water into fire. It challenged an embodied sense of time; it not only lubricated time-telling devices but mobilized new spacetime relations. Oil is not the essential historical object inscribed, as it has been, in industrial and technological histories.

To begin with, understanding oil-as-industry, a markedly leaky term that I deploy in this volume to describe the particular ontology of oil conceived through the development of extractive technologies, is different from a history of oil. This distinction is often confused, a fetishized reification of oil-the-commodity for oil-the-earth-substance. There is no grand narrative of oil-the-earth-substance because oil-as-industry dominates postindustrial life. As is often the case, grand narratives erase vital elements and there is no exception with a history of oil. It eludes most everyone that the bequeathed history of oil is a small synecdoche mistaken for a monolithic narrative of life.

Particularly recently, the sciences, humanities, and the arts have endeavored to articulate a more nuanced account of the plural histories of oil, as new methods in science studies and new interest in ontologies take a central stage—amidst the face of climate disaster and reconsiderations of Western anthropocentric world views—in contemporary knowledge production.⁹³ Perhaps most notably organized in *Energy Humanities: An Anthology* and *Petrocultures: Oil, Politics, Culture*, a handful of scholars have, like Henry, attempted to clarify an ontology of oil.⁹⁴ To be clear, Henry's philosophy does not belong to the domain of ontology, what oil is, but rather the epistemologies energizing his era of industrialization. For Henry, the industrial pioneers of oil, such as Samuel Kier, who built the first oil refinery, developed a production line to capitalize on a self-evident

⁹³ In September 2021, the exhibition *Oil: Beauty and Horror in the Petrol Age* opened at the Kunstmuseum Wolfsburg in Germany, claiming to be "the world's first retrospective of the global modern age of petroleum." Its contemporary and art historical scope is broad, featuring over 200 artworks. Though its clear continental leaning might present its limitations, it consists of contemporary and art historical works from Robert Smithson to Ursula Biemann. "Oil. Beauty and Horror in the Petrol Age," Kunstmuseum Wolfsburg, accessed March 15, 2022, <https://www.kunstmuseum.de/en/exhibition/oil-beauty-and-horror-in-the-petrol-age/>.

⁹⁴ Szeman and Boyer, *Energy Humanities: An Anthology*; Wilson, Carlson, Szeman: *Petrocultures: Oil, Politics, Culture*, McGill-Queens University Press, 2017.

commodity, in which scientific explanation lagged behind industry. Henry's history is of an always already categorized petroleum resource.

This volume argues the contemporary moment needs a new onto-epistemology of oil. An account that reframes the history of oil without the assumptions of "man's" right to the raw resources of the Earth, which enlightenment era rationalism and industrial practices helped enfold into scientific facts. Such an account calls into question whether organic and inorganic substances of the earth should be represented as resources at all. Rather than thinking the natural and technological conditions of the early American oil industry as separate spheres, Karen Barad's notion of the apparatus (the conditions of possibility and impossibility of mattering) stresses the ontological inseparability of these domains as *intra-actively* co-constituting each other. Thus, the history of the oil industry must be understood as a process in which the representations of facts about oil were determined as much by the network of oil, with its cultural and commercial investments, as by the burgeoning sciences that were governed by the conditions of representationalism.

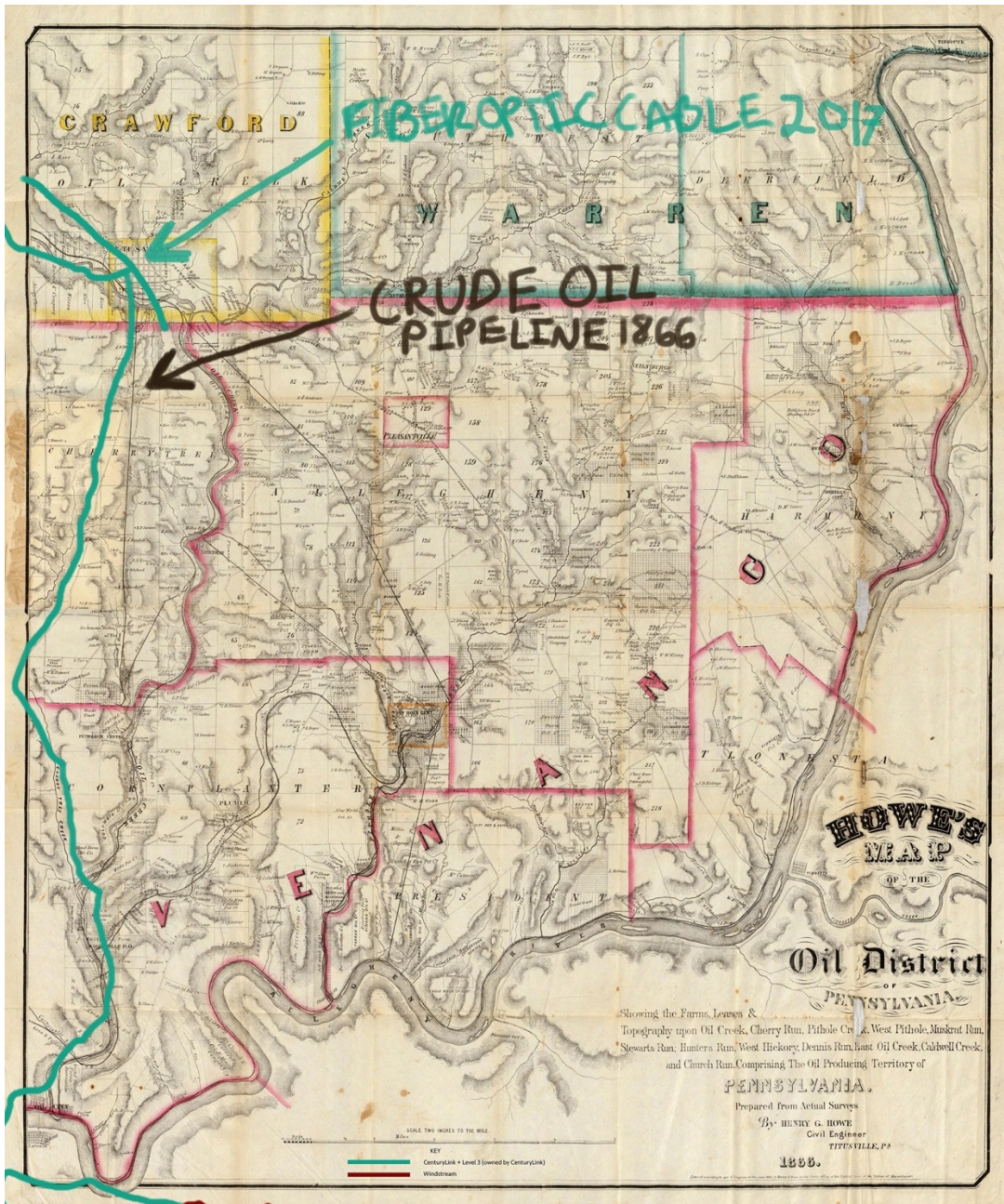


Figure 7: Howe's Map of the Oil District of Pennsylvania, 1866, marked with the location of fiber optic cables in 2017, from University of Wisconsin Long haul infrastructure data IMPACT inter tubes map.

Field Notes 4

The campground next to Oil Creek is an odd sort of place. Campgrounds in rural Pennsylvania are more like Winnebago country clubs. Oil Creek state park is 6,250 acres but the second growth forest continues beyond geopolitical boundaries. A pamphlet from “friends of Oil Creek” list the many activities one can entertain. The homepage of their website includes a web video for their “Chicks in the Sticks” program, where woman learn “new skills”. (<http://friendsocsp.org/>) I was working in Drake Oil Well museum archive. I was camping in the rain. I was given a drink in a local bar that I did not feel comfortable going into without the two women I met during dinner. The drink is called a Trash Can. It is made from:

1/2 ounce gin.

1/2 ounce vodka.

1/2 ounce triple sec.

1/2 ounce light rum.

1/2 ounce peach schnapps.

1/2 ounce blue curacao.

1 full can Red Bull.

The alcohol is poured into a glass, then the red bull is poured upside-down in the glass, like an upturned trashcan. Then, as is the sprit, you drink it. The physics of the drink is the fun part—an air pocket requires you to subtly lift the upside-down Red Bull to release the energy drink into the mix of alcohol. It wasn't the first drink of the night. I ended up at a haunted graveyard in Oil Creek State park at 2 am, after I made out with a man who said he had soft lips.

The campground borders the state park. There is a trail that leads from the campground to Oil Creek. As I left the campground the trail seemed to disappear. No satellite signal. I found a fire road and wandered back and forth along it for 30 minutes seeking the depressed markings of a trail. I did not find one. But, a narrow dry creek bed offered an opening in the dense forest. I pushed the branches aside and began the slow forested descent. The slope of the terrain moved ever downward. Once inside the forest—a misleading claim, the campground is not “outside” the forest, but something had shifted nonetheless—beneath the canopy of a different sort of maintenance, my comfort had changed. The cool air, the soft pillow of duff beneath my feet, the dampening of acoustic space, the diffuse shadow light, all narrowed my awareness. It was not clear if I was supposed to be here, but it felt right to be crawling and clawing my way through the natural growth. That is a matter for debate.

What is maintenance? The Oil Creek area became Oil Creek State Park in Gregorian Calendar year 1931 when Pennsylvania, led by Republican governor Gifford Pinchot, expanded its State Park network. Pinchot was the first Chief of the United States Forest Service, from 1905-1910, and coined the term conservation ethics. He advocated for a conservation that optimized control and made profitable use of man's natural resources. 1931 was the start of Pinchot's second term. At the time, only California had a larger Civilian Conservation Corp. Pinchot viewed fire as the enemy in Forest development, a position that has since been recognized as utterly detrimental to the health of human and nonhuman ecological systems. For all intents and purposes, it is the overly simplified logic of Smokey the Bear, not “YOU”, who has been responsible for the wildfire risk of the past 75 years.

By 1931, the Oil Creek region was well on its way to ecological health and resilience, despite the unparalleled oil extraction of the mid 1800s. As I walked through the underbrush, seeking the path of least resistance—shifting creek beds, low and narrow tunnels below the bushes—I began to see decomposing rusty artifacts. Oil infrastructures of the past, iron-rusted particulate matter and rotting oil towers, half buried indistinguishable pipelines, and other industrial tools. Oil Creek State Park includes many historical sites, Petroleum Center, Miller and Benninghof Farms, oil derricks, railroad

tracks; it is adjacent to the Drake Oil Well Museum property; there are numerous “maintained sites” of decay for oil tourists to observe and cross off their field guides.

There are so many institutionalized historical sites in the small region, the under-brush of metallurgical decay, rusted iron parts, being absorbed into the earth from whence it came, carried no particular significance. As I wandered through the trees, subtly influenced by the downward slope and moderate sense of direction, the industrial oil artifacts regressed into the background of an overpowering ecology. The metals were not the monolithic apparatus of industrialization, merely a momentary event. The flakes of red-orange metals conjoined with dirt and leaves and the bronze colors of late-summer leaves.

The oil artifacts were fascinating, don't misunderstand. They stood as lumps of the past or materialization of the present. A sort of Humpty Dumpty of failing grand narratives. States of decay are interesting in more than one way... What institutional verification determined these objects to be of lesser historical significance than some of the others? What state of decay is required to maintain authenticity to this rock oil event? Who does the indexing? The field indexes these artifacts in its own way, the ecological terrain that is. Constituent parts of (re)animated metallurgical differentiation are (re)introduced into different entanglements: new medianatures from naturecultures.

Was the metal ever shiny and new? It was certainly well-lubricated. The earth underfoot was a lava bed of dirty lubrication not so long ago. New machines were introduced into an atmosphere of ambient toxicity. Oil colored the sky black, as it set the river a blaze. A tarnished heavens even as oil was passage to the divine. The grease of life was all-encompassing. Rock oil was a medium of totality in this Carboniferous bed. Markers of the Pennsylvanian were everywhere, Pottsville shale formations followed by small cliffside of the more solid Shenango shale. Gray and yellowish brown Corry sandstone marked the later Devonian periods. Time compressed into an instant, indexing the activity of millions of years, the rock formations displaced me in spacetime. I wandered, out of time, through the eons, before the rock oil event, after the rock oil event, through the metallurgical now.

Eventually I found a trail. I anticipated it crossing my path perpendicular to my movements, parallel to the river. It grounded me in spacetime. I returned to an indexed time, to the Gregorian Calendar, to the rock oil event. I returned to forest maintenance of the state of Pennsylvania, no longer the Pennsylvanian geologic period. I was now following the path dependent upon governor Pinchot and his Civilian Conservation Core; had I ever left it? Metallurgy annihilated spacetime, amidst spacetime. New Pittsburgh steel animated new railway paths, mobilized new rock oil pipeline flow. Distances were conquered. Oil lubricated the earth.

Following the trail, I arrived at a steep embankment. The broad river created a wide canopy opening below, a valley between the trees. For a while I walked along the trail, parallel to the river below. I walked north, then south, looking for the path down. I became impatient in my reacquaintance with clock time. I left the trail and clambered down the steep mulchy slope. Jumping, sliding, and crawling, I landed on the wide cement bike trail that runs the length of the river from Drake Oil Well to Petroleum Center. New Pittsburgh steel built new train tracks transporting new rock oil until new Pittsburgh steel built new steel pipelines undercutting the rock oil train transport. Then cement (re)materialized the train tracks for the steel bike frames of weekend warriors. I began walking south, on the riverbank, towards Petroleum Center.

I was ill-equipped for a day-long walk. It was hot. I had not brought any water. My plan was to take a short, hour-long walk from the campsite to Oil Creek to acquaint myself with the surrounding forest. Too far along to turn back now, I accepted the day would end with dehydration and exhaustion. If it weren't for the paved path cementing my place in spacetime, I might lose myself again, following Oil Creek towards the rock oil center.

Two. Oil Creek

Before there were oil pipelines, there was Oil Creek, a pipeline for oil. It is at Oil Creek, both a river and a northwestern region of Pennsylvania, that the American oil industry began.⁹⁵ Or rather, it is the starting point of the historical narrative of the industry.⁹⁶ As the site of the birth of the oil industry, and by extension, arguably the birth of modern capitalism, it is a curious site of the so-called Anthropocene. This term is the proposed geologic epoch for the current period of geologic time defined by human impact on the planet, popularized by Paul Crutzen and Eugene Stoermer in 2000.⁹⁷

Why did drilling begin at Oil Creek? One answer is: it was accidental. While the combustible properties of oil were known, the possibility of drilling for oil emerged in large part because of the salt industry. Salt

⁹⁵ "The fact," says Arthur Menzies Johnson, "that Oil Creek emptied into the Allegheny River made water transportation to Pittsburgh a natural avenue for the oil trade." Arthur Menzies Johnson, *The Development of American Petroleum Pipelines: A Study in Private Enterprise and Public Policy, 1862-1906* (New York (State): Published by Cornell University Press, 1956), 2.

⁹⁶ See: Brice, *Myth, Legend, Reality - Edwin L. Drake and the Early Oil Industry*; John James McLaurin, *Sketches in Crude Oil: Some Accidents and Incidents of the Petroleum Development in All Parts of the Globe* (author, 1896); Snell, *The Derrick's Hand-Book of Petroleum*.

⁹⁷ Crutzen and Stoermer, "The Anthropocene."

minors captured oil in their salt brine. More than incidental, it was an undesired contaminant. As Henry chronicled, salt minors like Samuel Kier proved a market for the liquid black contaminant and industrialists like George Bissell, founder of Seneca Oil Company, sought wells to refine oil into kerosene. It is easy to make a history of oil about a history of great men displaying *Yankee ingenuity*, as has often been described to me in interviews.⁹⁸ With few exceptions (see the work of Ida Tarbell), the journalism of the time and the ensuing histories represent them in this light. There is not, however, a naturecultural history that situates prevailing concepts of energy resources—which figure oil as inert earth matter, represented as fossil fuel, and available for active human agents to exploit—within a posthumanist framework that challenges some of the basic assumptions enacting Henry’s philosophy of petroleum.

In 1859, the year Edwin Drake struck oil 69 feet deep, the Oil Creek region was a dense forest. At that time, it was inhabited by the Seneca nation, an indigenous population originally from the New York state area

⁹⁸ William R. Brice (oil historian), September 5, 2017; Susan Beates (historian and curator of Drake Oil Well Museum, September 3, 2017; Melissa Mann (site administrator of Drake Oil Well Museum), September 11, 2016.

who had been “granted” the land by the Pennsylvania Legislature on March 16, 1796. The forest was populated by Black Cherry, White Ash, White and Red Oak. The landscape consisted of Shenango and Corry sandstone, shaped by ice sheets. The sandstone shifts amidst rock formations shaped by the Devonian, Mississippian, and Pennsylvanian eras—geological periods 365 to 325 million years ago. The Pennsylvanian subperiod, roughly 323.3-358.9 million years, is the second of two geologic subperiods making up the Carboniferous. The Carboniferous was the first of the modern geologic system; it derives from Latin carbo, coal, and fero, bear/carry, during which many coal beds formed.⁹⁹ The Pennsylvanian is named after the state of Pennsylvania, i.e. William Penn—where many such coal beds were found.

The river Oil Creek ranges from Titusville to Oil City, where it joins the Allegheny River, a distance of 46.7 miles. By 1862, the year the first crude oil pipeline scraped the earth, the landscape had been decimated by wells, drilling, clear cutting, and cultural squalor. Manifold overflow catastrophes sent burning waves of oil cascading down the river. Explosions were

⁹⁹ William Daniel Conybeare, *Outlines of the Geology of England and Wales, with an Introductory Compendium of the General Principles of That Science ... Part I* (printed and published by William Phillips, 1822).

frequent, corruption was rampant. Cultural, economic, and ecological exploitation were the norm.

Rarely viewed with the common ethics of property or aesthetic maintenance found in most American communities, the region's natural environment was consistently reduced to the status of a technological instrument. The everyday appearance of Oil Creek, for instance, was a persistent reminder of its misuse. "I dare say that the scenery on this creek was once picturesque," wrote a Boston journalist in 1865, "but now it is dreary and desolate, with abandoned oil works on every hand."¹⁰⁰

Images of this time conjure a drama of nefarious pioneering and early industrial profiteering.



Figure 8: Photograph of a photograph of "Wells on Bennington Run, Venango County, PA in 1866" by John McLaurin. Public Domain. Photo by Elia Vargas at Drake Oil Well.

¹⁰⁰ Black, "Oil Creek As Industrial Apparatus: Re-Creating the Industrial Process through the Landscape of Pennsylvania's Oil Boom." *Environmental History*, Oxford University Press (April 1998), 225.

Very quickly, the entire region collapsed. At Pithole City, a small plot of land that struck oil just east of Oil Creek, land once valued at \$2 million, was sold in 1877 to the Venango County Commissioners for \$4.37. By the 1870s, oil production in the region was in a decline. Wildcatting—a strategy of exploration of oil wells in unknown areas, named after Wildcat Hollow near Titusville—was beginning to increase, oil was being discovered in other states, consolidation of power continued. The blighted land had its anaerobic resources sucked up faster than legislation could regulate it, faster than ethical, social, or environmental responses were imagined. As the oil wells dried up, so went the economy of the region. Ghost towns remained, the material detritus of capital accumulation.

Jussi Parikka has developed a media-specific notion of naturecultures, what he calls medianatures, “a concept that crystallizes the ‘double bind’ of media and nature as co-constituting spheres, where the ties are intensively connected in material nonhuman realities as much as in relations of power, economy, and work.”¹⁰¹ Conceptualizing an ecological system—the river Oil Creek—as a system of industrial technology, activated by harnessing the

¹⁰¹ Parikka, *A Geology of Media*.

“natural” powers of the system, and commodifying that system into a machine, does challenge the conventional binaries of nature and culture, social and technological forms. Oil has always been a sorcerer of mutability and human energy cultivation has always been a collaboration with, or exploitation of, the earth, be it wood, wind, animals, fats, or electricity. Industrialization did not change oil’s composition as ancient biomass, but manufacturing fossil fuel did synthesize oil’s anthropocentric representation.

Brian Black’s essay, “Oil Creek As Industrial Apparatus: Re-Creating the Industrial Process through the Landscape of Pennsylvania’s Oil Boom” published in the journal of Environmental History in 1998, is a constructive starting point for a naturecultural history of the region. That Oil Creek could be conceptualized as an industrial apparatus is perhaps an easier step than other formulations of earth-energy as media technology. As Black illustrates, the transformation of Oil Creek, during the “black gold rush” after Drake Oil Well, makes this abundantly clear.

While priorities and values seemed to change rapidly in the Oil Creek valley during the 1860s, shifts in attitudes toward Oil Creek itself still proceeded incrementally. The demarcation of the river as property and the commodification of its flow both required Oil Creek to be viewed as a resource, albeit an increasingly instrumentalized one. The next stage of

the industrial boom would see the river's meaning completely overwhelmed by the value of the region's commodity. Most speculators overlooked the putrid cesspool that the river had become; instead, the intensity of their focus on oil extraction increased, and Oil Creek (as well as all of Petrolia) became a temporary residence of no concern.¹⁰²

Despite the narrative of Drake Oil Well as the point of origin of modern petropractices, the history of fossil fuels and the burgeoning attempt to domesticate earth energies through extractive sciences is much older. One reason that Oil Creek is such a historical focal point, Black suggests: "While the Oil Creek valley may not be the first or last site of massive extraction, it appears to be the first such landscape so scrupulously recorded for posterity."¹⁰³ I'm interested in Black's analysis to focus on the natureculture relationships at Oil Creek. "One conclusion immediately emerges: Oil Creek, this region's most prominent feature before the commodification of oil, remained the vital core of the industrial process. Its instrumentalization strikingly demonstrated the cultural ethics and values of the industrial age, as well as nature's role in regional life before, during, and after the boom"¹⁰⁴

¹⁰² Black, 224.

¹⁰³ Black, 212.

¹⁰⁴ Black, 212.

In 2022 the region known as Oil Creek is now a second growth forest. Now Oil Creek State Park, it covers 6,250 acres in northwest Pennsylvania. The Oil Creek region became Oil Creek State Park in 1931 when Pennsylvania, led by Republican governor Gifford Pinchot, expanded its State Park network. He advocated for a conservation that optimized controlled and profitable use of man's natural resources.¹⁰⁵ 1931 was the start of Pinchot's second term. While the forests and waterways revitalized themselves—these ecosystems deemed commodity resources just 160 years ago—the human capital of the region never recovered.



Figure 9: Oil well artifacts along Oil Creek, 2018.

¹⁰⁵ Stephen Ives, *The Big Burn* | *American Experience* | PBS, 2019, <https://www.pbs.org/wgbh/americanexperience/films/burn/>.

A five-minute walk from the center of Titusville, a bronze statue resembling a Greek god stands to memorialize Edwin Drake, the man credited with starting the oil boom. He died without any of the financial riches that oil brought about for so many others, but somehow in the small-town west of the Allegheny Mountain range, which also never recovered from the end of the American industrial boom, an expensive monument of the oil man remains. It seems to be the only part of human industry—oil tourism—that is thriving in the area. A misguided monument while the rest of the population fights back the forest that has reclaimed the region. Thick forest vines slowly disintegrate the remaining artifacts of oil infrastructure that litters the region, often hidden from view.

Field Notes: Oil Etymology

PETROLEUM

Latin: petra (rock) and oleum (oil) – rock oil

NAPHTHA

Roughly 4,000 years old, deriving from Persian language.

Iranian nab (to wet) passed to Persian as napta.

Napta became Akkadian word naptu (Hebrew, natpik; Greek; Arabic,alnaft).

Naptu found in Babylonian text circa 2000 B.C.

Jews in Persia, during the time of the Maccabees (roughly 164 B.C. – 64 B.C.), encountered and enclosed the places of eternal fire, a holy site.

“Thus it has been noted that at the time of Nehemiah, the Hebrew word nephtar or nephtoj, which means ‘...a place of expiation or forgiveness,’ was the name given to these holy places of fire and from that we get naphtha.”

Median word nafata (Medes, ancient Iran 1000 B.C.), meaning to exude.

** From Myth, Legend, Reality: Edwin Laurentine Drake and the Early Oil Industry, p. 13, 16.*

Three. A Brief History of Oil Pipelines

Pipelines are sun tunnels. They transmit latent solar energy flowing through hydraulic realms constructed across the surface of the earth. “Pipelines,” says media scholar Nicole Starosielski, “are a form of distribution that connects individual nodes via linear routes, and... insulate signal traffic from the environment. In order to supply a consistent stream... the network attempt to disentangle these circulations from the surrounding elements...”¹⁰⁶ In fact, she is speaking of the pipeline of information through fiber optic cables. Solar tunnels and laser tunnels share a common entanglement. The infrastructure built to accommodate the booming oil industry began a process of path dependencies, which shape energy and communication networks to this day. Before steel pipes, Oil Creek was an oil pipeline. The effort to insulate signal traffic from the environment in Oil Creek constitutes the industrial history of the region. The river was bracketed off from the “natural” environment” to control the movement of oil.

¹⁰⁶ Nicole Starosielski, “Pipeline Ecologies: Rural Entanglements of Fiber-Optic Cables,” in *Sustainable Media: Critical Approaches to Media and Environment*, ed. Nicole Starosielski and Janet Walker (New York: Routledge, 2016), 40.

Media theorist Shannon Mattern proposes the idea of path dependencies, a common concept in economics that describes how choices are the result of previous decisions, as a way to think of the deep time of media infrastructure. Thinking-with Paul Edwards, she says, "The conceptual model of path dependency balances a recognition that technologies have material effects—that channels laid and spaces configured by preceding technologies do steer the development, to some degree, of successor technologies—with an acknowledgement of the roles played by serendipity and tinkering, by historical social and cultural factors, in technological development."¹⁰⁷ This idea helps explain the role that oil infrastructure has played in enacting successive energy and communication infrastructure that has governed the movement and, importantly, the representations, of oil. It does so in a way that moves beyond traditional content/medium duality that the Shannon/Weaver model of information systems cemented into the study of communication. Instead, this notion of path dependency follows Barad's performative approach, in which matter

¹⁰⁷ Shannon Mattern, "Deep Time of Media Infrastructure," in *Signal Traffic: Critical Studies of Media Infrastructure*, ed. Lisa Parks and Nicole Starosielski (University of Illinois Press, 2105), 94-112.

and meaning are not mutually exclusive and instead intra-actively co-constitute each other.

The path dependency of oil pipelines in other words, did not merely move oil, but actualized new concepts of oil (a new *oil*) by displacing space, time, and matter. The coordination of overcoming the long distances and difficult terrains present in the Oil Creek region by way of telegraph logistics manifested a conquering of time that shifted the economic value of the oil at one point in the pipeline from another. In Titusville, oil was a well-sifted mud. In Pittsburgh, it was an economic staple. To the dismay of the Teamsters, who moved oil via boat and wagon, introduction of pipelines and the coordination via telegraph transmitted (information about) the oil without humans traversing those distances.¹⁰⁸ At a time when the coordination of such distance was only just being established (primarily via railroad), the idea of a coordinated and speedy determination of value from afar was novel.¹⁰⁹

The difficulties in managing these relations can be seen with the introduction of the "run ticket" by Charles P. Hatch in 1866, a duplicate

¹⁰⁸ Johnson, *The Development of American Petroleum Pipelines*, 4.

¹⁰⁹ Johnson, 184.

document that measured the amount of oil taken from the producer.¹¹⁰ As buyers did not own specific substance but rather a volume of oil, myriad disputes emerged as a result of evaporation, pipeline leakage, nefarious business practices, and other circumstances. The unified conditions of space, time, and matter that emerged with/in the pipeline transformed the three major components of Innis' wide angle perspective: ecology, technology, and institution.

Natural gas and manufactured gas pipeline history predates crude oil pipelines. Numerous U.S. cities, starting with Baltimore, introduced manufactured gas lines to illuminate their public spaces throughout the middle of the nineteenth century. The ancient Chinese reportedly used bamboo as pipelines for water and natural gas.¹¹¹ The region of Baku, near the Caspian Sea (and not so far from Naftalan City), may have been drilling for crude oil since the late sixteenth century. However, it is not until the commercial success of Drake Oil Well that the rush to extract and transport crude oil became a dominant global practice.

¹¹⁰ Snell, *The Derrick's Hand-Book of Petroleum*, 967.

¹¹¹ Joseph Needham and Wang Ling, *Science and Civilisation in China*, vol. Volume 3 mathematics and the sciences of the heavens and earth (Cambridge: University Press, 1959), 877.

The first crude oil pipeline was constructed by J.L. Hutchings in 1862 to demonstrate his new rotary pump.¹¹² The two-inch cast iron pipeline was laid to send oil over a hill from Tarr Farm oil field to a nearby refinery. The pipe joints were soldered together and collapsed under pressure when pumping began. A few years later, the Oil Transportation Association (OTA), led by Samuel Van Syckel, built a six mile, two inch, wrought iron steel pipeline from an oil field to a train station at Pithole City, PA. The pipeline had thread joints to resolve leaking. Immediately, the codependence between energy and communication infrastructure emerged:

The OTA built a telegraph line along the ROW of their 6-mi [sic] wrought iron crude oil pipeline running from their 1860s field to the railroad station at Oil Creek, Pennsylvania. That established the importance of communications to pipeline operations. The telegraph line was built to help the complicated bookkeeping of multiple shippers. However, operating personnel quickly learned the line was also useful to track and coordinate pipeline operations.

Pipeline companies eventually connected phones to their privately owned telegraph lines. Local station operators used these phones to coordinate pipeline operations. The privately owned phone lines have been replaced by public communication systems in countries with well-developed infrastructures. Some pipeline owners use the Internet for communications and control. Many pipelines pass through less-developed areas where the public

¹¹² Thomas O. Miesner and William L. Leffler, *Oil & Gas Pipelines in Nontechnical Language* (Tulsa, Okla: PennWell Corp, 2006), 12.

telephone systems are notoriously unreliable. They may use satellites as their primary communications system, with a landline backup over wires, by microwave, or even using fiber optics lines.¹¹³

A crucial point I argue is not just that energy infrastructure and communication infrastructure shared path dependencies.¹¹⁴ This is true and interesting for geopolitical reasons—for example the Federal Power Commission, the first federal energy regulatory agency, emerged from the perceived need to standardize and regulate interstate hydrological movement, i.e. the regulation of water flow has determined the regulation of oil flow—but, the argument of this work is that crude oil *is* communication infrastructure, an elemental media. The introduction and Volume Two expand on the argument that oil is media.

What I mean to illustrate here is that the entanglement of oil and the built environment of industrialization manufactured oil at the same time as oil pipelines manufactured new environments and new representations of

¹¹³ Miesner and Leffler, 144.

¹¹⁴ The ongoing relationship of information communication via telegraph along oil pipelines is further illustrated in: Arthur Menzies Johnson, *The Development of American Petroleum Pipelines: A Study in Private Enterprise and Public Policy, 1862-1906* (New York (State): Published by Cornell University Press, 1956), 8, 55, 61, 102.

industrialization. Just as Manuel De Landa argues that the trade winds are an earth technology which enabled trans-Atlantic European sea-faring merchants, the disposition of oil to flow is a natural technology that enacts pipelines.¹¹⁵

The many opacities of oil and the extended network of its infrastructure prompt asking Susan Leigh Star's important question, "when is infrastructure?"¹¹⁶ Star suggests the metaphor that infrastructure is built and maintained and then disappears into the background is not useful or accurate. Infrastructure, she suggests, is fundamentally a relational concept. Something becomes infrastructure in relation to certain practices. Thus, when is an infrastructure is the important question. Star asks this question in the context of the somewhat abstract space of a digital platform for a community of biologists studying worms in the early 1990s. I say abstract because, like new oil pipelines, the full scope of effects created by the infrastructure are not clear or immediately comprehensible. "Substrate,"

¹¹⁵ Manuel De Landa, *A Thousand Years of Nonlinear History*, Swerve Editions (New York: Zone Books, 1997), 53.

¹¹⁶ Susan Leigh Star and Karen Ruhleder, "Steps Toward an Ecology of Infrastructure: Design and Access for Large Information Spaces," *Information Systems Research* 7, no. 1 (March 1996).

Star suggests, "becomes substance."¹¹⁷ The constant breaking down, labor strikes and sabotage, ownership changes, and ecological catastrophes that were common to early oil infrastructure meant that its effects were unpredictable.¹¹⁸

Thus, the various dimensions of infrastructure that Star lays out, such as "reach or scope", "learned as part of membership", "links with conventions of practice", "embodiment of standards", and others, were constantly changing in the instance of early oil pipelines.¹¹⁹ Perhaps unsurprisingly, but not as a result of intentional strategy, pipeline companies also became oil storage providers. Pricing drops brought about rapid expansion of this service. Pipeline companies are nodes, gates, and sifters of oil circulation and containment. From the early 1860s until the early 1870s, when the Pennsylvania legislature chartered the South Improvement Company to regulate wildly unpredictable prices, oil flowed through the pipelines but the techniques, trades, and social circumstances surrounding them were anything but defined.¹²⁰

¹¹⁷ Star and Ruhleder, 113.

¹¹⁸ Johnson, *The Development of American Petroleum Pipelines*.

¹¹⁹ Star and Ruhleder, 113.

¹²⁰ Johnson, 18.

Just south of the oil-rich region, Pittsburgh—the steel capital of the U.S. by the 1880s—became the center of pipeline construction. In 1879, the Tidewater Pipeline Company built the first crude oil trunk line from western Pennsylvania, a 115-mile pipeline to Philadelphia and the Reading Railroad station at Williamsport. During this time, steel pipe manufacturing technologies improved to cast stronger, liquid-tight, single steel sheet designs. It is largely a result of the success of the long-distance Tidewater pipeline that the Standard Oil pipeline empire began to grow at this time.¹²¹ As previously mentioned, in 1920, the U.S. Federal Water Power Act created the Federal Power Commission to regulate hydroelectric projects. After Franklin D. Roosevelt’s Federal Power Act in 1935, the FPC became an independent regulatory body. In 1977 the FPC became the Federal Energy Regulatory Commission (FERC), which oversees the country’s natural gas, hydroelectric, electric utilities, and oil pipelines.¹²²

The relationship of physical networks and the regulatory commissions illustrate the ongoing ping-ponging effect of the distribution

¹²¹ Johnson, 101.

¹²² “Regulation - What Is Ferc? | Blackout | FRONTLINE | PBS,” accessed February 12, 2020, <https://www.pbs.org/wgbh/pages/frontline/shows/blackout/regulation/ferc.html>.

of oil. Continuing this infrastructural logic, software is an example of how conventionally hard (physical structures) and soft (conditions for maintenance, policy, social values) infrastructures mobilized oil. Software has invisibly (but not immaterially) impacted the most fundamental ways that pipeline logic is deployed. The scope of crude oil pipeline infrastructure systems and software is enormous. Oil pipeline management software are notoriously proprietary black boxes. As a result, there is very limited information about them and what is available is more historical than reflective of current practices. To show the ways software has transformed pipeline infrastructure requires evaluating software systems at different scales and pressure points—for example, proprietary master station control software and intelligent electronic devices (IEDs), subcomponents of a larger so-called SCADA system.

Histories of pipeline management systems are patchy and porous because they are carefully veiled and proprietary. These systems take many forms: Supervisory Control and Data Acquisition (SCADA), Computational Pipeline Monitoring (CPM), aerial or ground line patrol, hydrocarbon detection centers, third party or company reports, and other configurations of localized monitoring centers connected to network-wide transmission

hardware.¹²³ I will focus on SCADA systems because they represent a homogenizing of hardware and digital information into integrated and reproducible networks. In addition to the increased management efficiency SCADA systems introduced, they also changed the paradigm for the measurement of potential optimal conditions. The introduction of software into crude oil pipeline networks not only makes the network more transparent and trackable (for management), but also increases the efficiency of the technology, thereby expanding the potentialities of the network itself.

SCADA systems were first integrated into utility management structures in the mid 1900s. A SCADA system consist of four components. The first component is a remote terminal unit (RTU), also called a data concentrator. The RTU is the field link to a control system. It acquires data from the field and passes on control commands from the control system to field units. Modern SCADA systems replace RTUs with intelligent electronic devices (IEDs). The second component is the system that manages the

¹²³ API Cybernetics Subcommittee, *Computational Pipeline Monitoring for Liquid Pipelines*, 2nd Edition, API 1130 (Washington, D.C.: American Petroleum Institute, 2002), 1.

communication between the RTUs (and/or IEDs) and control system. The communication system is responsible for the flow of information across the potentially vast geographical network of the SCADA system. The third component is the master station, where an operator oversees the system and facilitates commands which are communicated to the field. The fourth and final component is the user interface (UI), or human-machine interface (HMI). This is the interaction between the operator and the machine. Very quickly, it is easy to see that a SCADA system is the entanglement of human technical practices, hardware, software, and natural conditions to transform time and space, but also matter (oil), with/in the system.

Early RTUs were used from 1900 to the 1920s and had no communication link to a master station. That meant they could monitor local processes but could not remotely send the field data. The first automatic detection of a change of status from an RTU was created by John B Harlow in 1921. Slowly, these systems evolved from electromechanical to solid state components, including electronic sensors and analog to digital convertors. By the 1980s, microprocessors were introduced into RTUs which transformed both the possibilities of SCADA systems and the business practices surrounding manufacturing.

There are two specific qualities that set pipeline SCADA systems apart from other industry SCADA systems: linear direction of flow and geographical or jurisdictional overlapping regulations and standards. The first condition specifies an important characteristic: pipelines have starting points and endpoints. These are often very long distances apart. The point at which an event occurs requires complex geographical and communication strategies. The importance of the communication portion of a SCADA system, to identify the point at which an event occurs is integral due to the difficulty of accessing or observing the entirety of a pipeline network. Second, because of such large distances, which cross different terrain and different sovereign regulatory bodies (cities, states, countries), there is much variation in control system philosophies as well as intra-system organization of disparate standards.

The brief discussion of software pipeline management systems offers an introduction to what needs to be a much deeper analysis. It speculates a yet to be proven proposition: upon deeper analysis, it will become clear that software allows oil pipeline infrastructure to make a leap beyond a human informed organizational logic, exceeding the capacity of speeds, timescales, and geographies, historically understood as *human*, in favor of

automated processes and network construction that in turn shape the path dependency by which humans understand the very conceptualization of time and space. Rob Kitchen and Martin Dodge call this *code/space*.¹²⁴

Such a proposition is premature to be clear, but this section introduces the histories of oil pipeline infrastructure and its management software tools, so that other interventions, pointing more closely to the proposition above can be shaped. This ontogenetic conception of coded time and space can be read with Barad's conception of *spacetime mattering*.

The logic of efficiency developed by oil infrastructure requires critique: considering the expanded view of oil that I am arguing for, what is being optimized? The flow of oil; its volume across the surface of the earth; its reach and quality; its reliability and replication; the conditions of management and labor? The answer, I believe, is the value of oil as an economic staple. The pipeline effects change of the technical, cultural, and ecological coordination of oil. In eliminating the space and time bias of oil, it actualizes a new substance of value.

¹²⁴ Rob Kitchin and Martin Dodge, *Code/Space: Software and Everyday Life*, Software Studies (Cambridge, Mass: MIT Press, 2011).

Engaging the software and hardware that manages contemporary pipeline networks means reading them not only as *coded infrastructure*, which “are both networks that link coded objects together and infrastructures that are monitored and regulated, fully or in part, by software,” as defined by Kitchen and Dodge, but rather a *coded assemblage*, which “occur where several different coded infrastructures converge, working together.”¹²⁵ The realization of this formulation—which requires making a further leap to thinking of pipelines as an apparatus of ontologically inseparable objects and agencies as Barad articulates, and not an assemblage of preexisting things in the Deleuzian sense—is that while pipelines certainly have existed in the past without software management tools, the historical conception of oil pipelines does not exist (at the scales and speeds, or outputs) without the entanglement of software and hardware. Etched into the very concept of physical pipelines, is a coded logic imperceptible to human bodies.

¹²⁵ Kitchen and Dodge, 6.

Field Notes 42: Sun Tunnels



Those sun tunnels were hard to reach. This isn't going to be easy. In common parlance, they were built. But that isn't quite right, and everyone knows it. It was just easier that way. Like so many other things, they depended on relationships to exist.

The maze was there before the builders, but without names and structures and standardization and logistics it couldn't be situated. They called them machines, but they were plants. A labyrinth of photosynthetic mirrors beneath the surface of the earth. Long, vast networks of energy. They weren't run by humans. But humans tried to marshal them nonetheless. Indeed, energy was the governing principle of the humans. For the plants, it was simply, life.

But not just these. The sun tunnels were a matrix of many things. The plants will tell you (and they do): it's all about the light. A maze underneath the earth, buttressed by the sky. Air infrastructure, an ecology of solar beings, light funneled through the dark.

The web was not incidental. The plants managed the network. Filtering the conduits from the outside. Natural pipelines of containment, situating an inside versus an outside; dreaming of transmission in the void.

All that there was rallied against the void. The bleak condition of non-existence as that which is not measured. This was the history of the humans. To exist is to be naturalized within a system. The sun tunnels were brought to life, they say, because they were taxonomized, given names, structure, validation to be. But all that there was new otherwise.

The long dark tunnels enveloped with light were vast. They were isolated, but they were living. The light connected them.

Kerogen, a traveler of deep time, wandered the vast maze.

Four. An Ontological Turn

Trends in humanistic scholarly thinking over the past few decades have made a turn towards ontology. That is, a shift away from the poststructuralist psychoanalyses of Lacan and the symbolic, towards materiality and the nature of things. This turn, mobilized in part by the new materialisms proposed by Deleuze and Guattari, but also by anthropologists, indigenous scholars, other philosophers, and scholars of science studies, who have suggested that colonialist and racialized empirical practices create power relations in the very measurement formulation of empirical categories. Rather than assuming that rationalist knowledge practices are the a priori baseline for measuring reality, numerous thinkers have turned their critical attention to scrutinizing what the nature of things are or might be. In addition to Heidi Scott's eco-critical fossil-fueled ontology that I discussed in the introduction, two attempts towards ontological reimagining of oil have illustrated what such work can do and why they do not go far enough.

In *Energy and Experience: An Essay in Nafthology*, Antti Salminen and Tere Vaden argue that,

...the totalitarianism of the age of oil has two main characteristics. First, the setting in motion and acceleration of all resources and all life (total mobilization). Second, the channeling of this motion through a unitary plan, ideology, or goal (the total state, the totality of economy). These two characterize socialism and capitalism, liberalism and the welfare state, not to speak of national socialism and fascism.¹²⁶

Through a Marxist lens, they argue that energy is inherently more than human. But they take for granted that energy is a naturalized utility (resource) of an ecology. While they critique productivism—what they call “economic totalitarianism”—the perspective assumes oil’s singular nature is to provide energy for some-thing (human or more than human).¹²⁷ This position does not go far enough to address the epistemological conditions that produce oil as an energy material—a substance put to work towards another goal—which means their ontology does not escape a humanist representation of the earth. Whether observing a general economy or neoliberal conception of capital (or any other logocentric articulation of the circulation of resources), energy as a measured phenomenon should not be assumed to correlate into the representation of anthropocentric

¹²⁶ Antti Salminen and Tere Vaden, *Energy and Experience: An Essay in Naftology* (Chicago: MCM Publishing, 2015), 15.

¹²⁷ Salminen and Vaden, 15.

measurement-concepts. Energy is always some-thing, a set of relationships of entities. The prevailing perspective of modernity is that whatever those entities might be—animals, lumber, fossil fuels, other humans, etc.—they can be repurposed, separately from whatever their techniques of living might be, to fulfill the requirements of human-energy production.

Alternately, in the speculative theory/fiction of *Cyclonopedia*:

Complicity with Anonymous Materials, Reza Negarestani proposes that capitalism itself is nonhuman and that oil—in an Islamic ontology, as the black corpse of the sun—lubricates the narrative of life:

- I. Oil as a lubricant or Tellurian Lube, upon which everything moves forward, spreading smoothly and inevitably. Events are configured by the superconductivity of oil and global petrodynamic currents to such an extent that the progression and emergence of events may be influenced more by petroleum than by time. If narrative development, the unfolding of events in a narration, implies the progression of a chronological time, for contemporary planetary formations, history and its progression is determined by the influx and outflow of petroleum...
- V. An autonomous chemical weapon belonging to earth as both a sentient entity and an event. Petroleum poisons Capital with absolute madness, a planetary plague bleeding into economics mobilized by the technological singularities of advanced civilizations. In the wake of oil as an autonomous terrestrial conspirator, capitalism is not a human symptom but rather a

planetary inevitability. In other words, Capitalism was here even before human existence, waiting for a host.¹²⁸

Indeed, Negarestani and Salminen and Vaden present different philosophies of oil than J.T. Henry. Negarestani's oil philosophy—influenced by object oriented ontology and speculative realism—incribes given, essential, attributes to oil as a nonhuman material, even if he expands what those attributes are beyond Salminen's and Vaden's ontology of energy, or what is more commonly understood to be the limits of the substance of oil in time and space.

To be clear, Henry is interested in an empirical industrial history of oil, the science, technology, and economics of petroleum. While Negarestani, Salminen, and Vaden explore alternative metaphysics of oil. It is difficult to meaningfully read these perspectives together. But they should be, and this is why Karen Barad's onto-epistemological approach is so important. Henry wrote at a time before oil had a global function in the world. *The Early and Late History of Petroleum* was published just three years after John D. Rockefeller and Henry Flagler founded Standard Oil in Cleveland, Ohio.

¹²⁸ Reza Negarestani, *Cyclonopedia: Complicity with Anonymous Materials* (re.Press, 2008), 44.

The concept of oil as a global commodity was still in its infancy. It is in this stage of development, when Henry has the authority to conceptualize the philosophy of oil as scientifically and economically entwined, that should be examined.

Rich as they are, these conceptualizations of oil do not account for the conditions of representation that produce representations of oil—the pipelines, wells, physical laboratory instruments, regulatory procedures, discursive social values, and cultural circumstances that Barad would call the ethico-onto-epistem-ological apparatus. Representations (and practices of representing) do not pre-exist their making, neither as materials nor as concepts. Utilizing Barad's notion of the agential cut—the ongoing intra-active differentiation/differentiating that enact phenomena, as a cutting together/apart with/in an apparatus that enact agential separability—what is oil-as-fuel?

Field Notes 23: Exodus

Exodus, Ch. 2, Verse 3; New American Standard Bible:

Moses' mother, "...got him a wicker basket and coated it with tar and pitch. Then she put the child into it and set it among the reeds by the bank of the Nile."

Field Notes 25: Popol Vuh

Popol Vuh, Ch. III, p25,

Translated by Francisco Ximenez, French Abbot Charles Étienne Brasseur de Bourbourg, translated into English by Delia Goetz and Sylvanus Griswold Morley from Adrian Recino's translation from Quiche into Spanish, from Immanuel Velikovsky "Worlds in Collision",

"It was ruin and destruction...the sea was pilled up...it was a great inundation... people were drowned in a sticky substance raining from the sky..."

"There descended from the sky a rain of bitumin and of a sticky substance..."

Field Notes 87: Qur'an

Qur'an, 87:1-5:

"Glorify the name of your Lord, the Most High: He Who created and molded; He Who determined and guided; He Who forth green pasture; then makes it blackened stubble."

Five. Making Oil Fuel

What does it mean that fossil fuels are manufactured? Since prehistoric times, crude oil has always come out of the ground. Long before humans, it seeped through the earth. The earliest records of human oil use dates to about 6000 years ago.¹²⁹ It is curious; oil industry historians are quick to recognize a smorgasbord of oil activity prior to 1859, both in recent and ancient human history. The ancient Babylonians and the ancient Chinese commercialized oil for numerous purposes. Baku, the capital of Azerbaijan, along the coast of the Caspian Sea, produced an estimated 35 tons of crude a day in 1683.¹³⁰ The Aztec made chewing gum from it; women who were seen chewing it were labeled impure, even as the goddess of fertility who chewed it was revered.¹³¹ Along with Azerbaijan, the Seneca tribe of the Oil Creek region took medicinal baths in it. Crude oil is also relatively late to the game of so-called fossil fuel use. Natural gas was igniting

¹²⁹ Brice, *Myth, Legend, Reality - Edwin L. Drake and the Early Oil Industry*, 14.

¹³⁰ Brice, 24.

¹³¹ Jennifer P. Mathews, *Chicle: The Chewing Gum of the Americas, From the Ancient Maya to William Wrigley*, 2 edition (Tucson: University of Arizona Press, 2009).

Baltimore public space in 1816.¹³² Coal was a furnace of energetic industrial transformation since the mid 1700s.

Henry's philosophy of petroleum is part of the classical American narrative of innovation and "Yankee" ingenuity. The assumptions of this narrative hardly need addressing as numerous critical studies have dismantled industrial capitalist conceptions of linear progress.¹³³

Nonetheless, the philosophy reflects common historical attitudes and neatly encompasses the activities of the oil industry at the time. Despite the orientation of Henry's philosophy—or perhaps symptomatic of it—the manufacturing of oil was validated by a logic that the earth (and humans)

¹³² Wolfgang Schivelbusch, *Disenchanted Night: The Industrialization of Light in the Nineteenth Century*, First paperback printing (Berkeley: University of California Press, 1995).

¹³³ A well-known example is Walter Benjamin's "On the Concept of History", thesis 9: "There is a picture by Klee called *Angelus Novus*. It shows an angel who seems about to move away from something he stares at. His eyes are wide, his mouth is open, his wings are spread. This is how the angel of history must look. His face is turned toward the past. Where a chain of events appears before us, he sees one single catastrophe, which keeps piling wreckage upon wreckage and hurls it at his feet. The angel would like to stay, awaken the dead, and make whole what has been smashed. But a storm is blowing from Paradise and has got caught in his wings; it is so strong that the angel can no longer close them. This storm drives him irresistibly into the future, to which his back is turned, while the pile of debris before him grows toward the sky. What we call progress is this storm." Walter Benjamin, *Walter Benjamin: Selected Writings, Volume 4: 1938-1940*, ed. Howard Eiland and Michael W. Jennings (Harvard University Press, 2006), 392.

consists of definite properties, whose categories, and their functions, are self-evident. In truth, the history of oil looks nothing like this.

Infrastructure scholar Geoffrey Bowker's history of the French geophysical oil consulting company Schlumberger in the 1920s offers key insights into the scientific discourse of oil as a resource and its material outcomes. For Schlumberger's technique to work and be competitive, Bowker argues, the oil field had to be made into a laboratory.

... 'mud experts' negotiated with oil companies and geophysical companies—and the product of that negotiation was a well-defined mud that reproduced laboratory conditions and simultaneously mapped the balance of power between geophysical companies.

This idea of the world as laboratory can be pushed further... In each case the act of informing (brokering information) was inextricably bound up with commercial interest. With information brokerage as the constant, we can see the fuzziness of the technique being used and its theoretical underpinnings as unproblematic—whereas if we assumed traditional science was being done this fuzziness would block any clear analysis.

The chronology is important here. By controlling the flow of information through various acts of closure, Schlumberger was able to gain access to the field and was able to develop its technique. I am stressing this point because the stereotypical story of theory/experiment followed by discovery/invention and then application/innovation is a powerful (and often, useful) one—and one that needs to be completely rewritten if we are to understand Schlumberger's success. Once in the field, the geophysical company entered into a series of negotiations in order to make the notional laboratory (defined by closure) into a real laboratory (defined by controlled conditions). Then came theory. It arrived after closure and negotiation, each of which was commercially and (dare I say it?) socially

mediated. It should therefore come as no surprise that the science Schlumberger produced mapped the social world at the same time that it mapped the real world.¹³⁴

The soil science of the drill hole is manufactured under intentionally specific conditions. The conditions of this apparatus are then abstracted from the scene of their making, to be sold as empirical data about oil drilling (soil conditions). Bowker calls this “information brokerage.” Such information management has played a fundamental role in shaping the very idea of oil, from the earliest days of its extraction, exemplified in the first chemical analysis of oil, at two distinct moments, by father and son Benjamin Silliman Sr. and Benjamin Silliman Jr., at Yale University, which I will discuss shortly.

In Bowker’s words, “...social and natural time and space had to be coordinated so that a single time and space could be created within which the two resulting measurements worked... Thus, we looked at the infrastructural work that Schlumberger did in order to make its measurements work and then at the rhetorical work that it did in order to

¹³⁴ Geoffrey C. Bowker, *Science on the Run: Information Management and Industrial Geophysics at Schlumberger, 1920-1940*, Inside Technology (Cambridge, Mass.: MIT Press, 1994), 68.

create a space within which it was able to improve its measurements."¹³⁵ He continues, "The stories Schlumberger told about what it did converge on a single account precisely because nature and society together converge at the well hole into a single form."¹³⁶ Henry's philosophy of petroleum converges at this single point as well, albeit as part of a different apparatus.

Many of the early American oil histories focus on the productive capacity of fossil fuels. The second volume of *The Geology of Pennsylvania: A Government Survey*, an influential document in the development of North American Geology published in 1858, is devoted entirely to coal formulation. In the introduction geologist Henry Darwin Rogers writes:

Indeed, ample mention has already been made in Chapter III. of the Introductory Book, Part II., of their mineral nature, and their measured thicknesses around and within both the anthracitic and bituminous coal-fields of the State, enabling any one to deduce their characters and dimensions for intermediate localities not enumerated, and affording all the requisite data for any scientific conclusions that the present state of geology can suggest concerning the quarters posited, and supplying moreover, all the elements of a practical or technological interest.¹³⁷

¹³⁵ Bowker, 155.

¹³⁶ Bowker, 164.

¹³⁷ Henry Rogers, *The Geology of Pennsylvania: A Government Survey*, vol. 2 (Philadelphia: J.B. Lippincott & Co, 1858), 7.

This process of classification sets up a description of entities that can be put to work or bring value. In describing *Coal Rocks*, Rogers says as much, “These strata constitute by far the most valuable portion of all the mineral deposits of Pennsylvania, and confer upon it an amount of accessible wealth surpassing that of any other commonwealth of the Confederacy, or that of any equal country on the globe.” He continues, “To the capitalist it furnishes the assurance of an inexhaustible supply of the two varieties of raw material which must henceforth exceed all other substances in commercial and industrial influence, *Coal*, the greatest instrument of discovered mechanical or motive power; and *Iron*...”¹³⁸ The geology of Coal sets up the practical conditions in which industry and science come together to manufacture oil as a staple fossil fuel.¹³⁹

Around the same time, thermodynamics, a scientific discourse developed in the 1840s by a consortium of Glaswegian scientists, including

¹³⁸ Rogers, 13.

¹³⁹ This perspective might seem self-evident. A government is not going to devote resources to a substance that does not produce value for it. But if it is contrasted with the efforts of the Aboriginal Areas Protection Authority in Australia that won a 2013 law suite granting life status to the Two Woman Sitting Down geologic feature, a focus of Povinelli’s anthropological work, then a clear alternative is presented. Povinelli, *Geontologies*, 31.

William Thompson, to explain the energy of the then burgeoning steam engine, reorganized nature in terms of heat transformation.¹⁴⁰ The ability to make oil fuel is linked to a transformation of human metaphors for nature into a mechanical model. I caution, however, interchanging energy and fuel. They are not the same and they mobilize different approaches to the world. The history of thermodynamics illustrates the way an energy ontology that transforms change in the natural world into a science of productive labor catapults industrialization into a new grand cosmology. “By way of example,” suggests Barad, “[Historian of science Norton] Wise begins by pointing to the fact that in 1845, before the development of his work-centered perspective on dynamics (1845-62), William Thomson (Lord Kelvin) began to ‘regard the idea of natural agency—electric, magnetic, thermal, etc.—as an expression of the capacity to produce work, and thus to regard natural systems as engines’ (Wise 1988, 80).”¹⁴¹

The classic oil industry histories begin with a time when crude oil is already understood to be a fossil fuel. Oil prospectors were drilling *for* oil—intentionally, as opposed to salt minors’ brine contamination—aware of its

¹⁴⁰ Daggett, *The Birth of Energy*.

¹⁴¹ Barad, *Meeting the Universe Halfway*, 231.

combustible potential. The Seneca Oil Company hired Edwin Drake to manage the exploratory well, because they already *conceived* oil as a valuable energy commodity. An important footnote to the idea of energy during industrialization: in 1859, light energy meant whale oil or Kerosene. Media theorist Adrian Mackenzie's reworking of (philosopher of technology Gilbert Simondon's concept) *transduction* is helpful here. Mackenzie says, "A transductive approach promises a more nuanced grasp of how living and non-living processes differentiate and develop. It understands the emergence of a mode of unity without presuming underlying substance or identity. Every transduction is an individuation in process."¹⁴²

Whale oil is a very different material conceptualization of artificial light than what is today formulated by electrification (in fact the distinction between a conventional tungsten bulb and an LED is a meaningful difference, a topic which artist Carrie Hott has explored in depth; whale oil opens up a posthumanist critique of McLuhan's conception of a light bulb

¹⁴² Adrian Mackenzie, *Transductions: Bodies and Machines at Speed*, Technologies--Studies in Culture and Theory (London; New York: Continuum, 2002), 18.

as the example, a priori, of pure information).¹⁴³ Because of its primary transduction as electrical power, today energy is abstracted from its various physical forms. Throughout industrialization, energy, or in this case light, correlated visibly to the unit of measurement known as *candlepower* which is now only understood as an indexical metaphor (its namesake is not a metaphor, it is due specifically to the high quality of spermaceti candles). Thus, artificial light was made possible by a physical, waxy, oil material, that had to be carried from one place to another, purchased in stores, stored in a safe environment at home, etc. Today, it is difficult to conceptualize the consequences that in the 1860s, a person could hold the material illuminating energy in their hand: paraffin wax (or kerosene).

This is the transduction at work; today, illumination predominantly means electric light, an electric current, mostly invisible, running through our walls (which is also an important measure of equity and differing cultural techniques, because in fact, much of the world does not have electricity). The effects of this seemingly minor distinction are enormous. The techniques associated with being in artificially illuminated

¹⁴³ Carrie Hott, <https://www.carriehott.com/projects/lightsthatsee.html>; McLuhan, *Understanding Media*.

environments include almost every domestic activity, from leisure, work, caretaking, sleep, as well as structural (fire-security) and atmospheric safety (clean air). Heidi C. M. Scott contextualizes this in *Fuel: An Ecocritical*

History:

(The Oxford English Dictionary records both material and abstract uses of the word “energy” first dating to the early 1600s; material “fuel” dates much earlier to 1398.) Laurie Shannon has identified a problem with the elision of fuel materiality: “Western culture has transitioned to forms of energy whose origins are opaque to ordinary perception, whose material workings are comprehended only by specialists, and whose business operations are shielded and securitized. One result seems clear. Literally visceral knowledge of where energy comes from, or what energy is, has been substantially extinguished.”¹⁴⁴

Industrial oil histories, which tend to privilege static empirical categories of natural resources, take for granted the transductive change undergoing oil. Oil, for example, ushered in a new era of global transport. Because it was liquid and lighter than coal, it could be shipped more profitably, thus transforming the shipping industry and it could be transported in pipelines, thus reducing the cost per distance traveled. Despite a different materiality, albeit one of a shared carbon origin, oil mobilized global energy networks to a grander scale than coal. Oil and coal

¹⁴⁴ Heidi C.M. Scott, *Fuel: An Ecocritical History* (Great Britain: Bloomsbury, 2018), ebu 312.

are progeny of a shared past, thus linking them as fossil fuels. This fact redefines them through space/time.

The phrase, fossil fuel, was first used by German chemist Caspar Neumann, in English in 1759, but the idea of fossil fuels, the theory that fossilized plants and animals exposed to heat and pressure deep in the Earth's crust through deep time transformed into a source of fuel, is credited to Andreas Libavius in his 1597 *Alchemia*. For most of its existence with humans, oil was not understood as a fuel. The year Drake Well first "struck oil," whale fat, the primary domestic light fuel of the time, had already undergone the transduction of biological animal anatomy to energy commodity product. At the same time, salt was one of the primary earth stuffs sustaining society (and crucial to the industrial origins of oil), but in magnitudes different than today—as a primary form of food preservation without electricity.

That oil is manufactured carries a double meaning. Today, the many petroproducts are industrially manufactured synthesis of oil—from plastics to fuel to synthetic fertilizer and pharmaceuticals. But this imposing mass of reconfigured hydrocarbons belies the fact that it took centuries for oil to be transformed from a primordial earth substance, thick and viscously coating

the surface of the globe, to a refined fossil fuel catapulting humanity to new technological heights and catastrophe. Oil as industrial product required massive technosocial reconceptualization of the dark opaque substance. The shift required conceptual, metaphorical, scientific, social, technological, environmental, and cultural change to no end. These included institutional changes such as scientific developments of thermodynamics and geology that shifted public perspective of the Earth away from a theological entity. Changes on the individual level, such as the slow expectation of high-quality indoor light, also reinforced dependence on oil applications, which normalized the conception of it as a staple. This is not a new thought, as Lewis Mumford illustrated almost one hundred years ago:

Men had become mechanical before they perfected complicated machines to express their new bent and interest; and the will-to-order had appeared once more in the monastery and the army and the counting-house before it finally manifested itself in the factory. Behind all the great material inventions of the last century and a half was not merely a long internal development of technics: there was also a change of mind. Before the new industrial processes could take hold on a great scale, a reorientation of wishes, habits, ideas, goals was necessary."¹⁴⁵

¹⁴⁵ Lewis Mumford, *Technics and Civilization*. (New York: Harcourt, Brace and company, 1934), 3.

But Mumford's change of mind suggests a static-positivist-field of possible choices and changes. Events such as the current petromodernity is a possible future entirely unimaginable in 1859, because oil co-constituted new wishes, habits, ideas, and goals. In other words, apparatuses, in Barad's sense, not technologies, nor social practices, are the conditions of possibility and impossibility. The general population of humans chose oil unintentionally because it was (and is) a staple substance of a new industrial way of life.

This shift occurred across centuries, continents, and philosophies, in no linear fashion. Kier was the first in the West to refine crude oil for kerosene lamp oil on an industrial scale. Bissell began oil speculation to profit off this burgeoning industry, which led to Drake Oil Well. But a wax secreted from crude oil-paraffin wax-was used for centuries to provide light in the dark. Despite its ancient use, paraffin was not "discovered" until the early 1800s. Despite this industrial era chemical indexing of the earth, records of oil as lamp fuel exist throughout the world, dating as far back as 10th century Persia. Separate from the development of industrial mining and chemistry, geological conceptions of the earth transformed (as they have again more

recently, with systems theory laying the framework for the conceptualization and critique of the Anthropocene).

The earliest theories of oil as a fossil fuel are most thoroughly defined at the precipice of the so-called Enlightenment by figures such as German physicists Georgius Agrícola and Andreas Libavious.¹⁴⁶ From the lineage of their work (and record keeping, building upon Aristotle's concept of exaltations within the Earth) emerges the popular contemporary theory that oil is biogenic—created by thermal conversion of sedimentary organic matter—the “fossil” part of fossil fuel. All of this notwithstanding, the American oil industry tends to marginalize the other nonwestern oil industries that emerged throughout the past 1000 years. Nonetheless, the current logic of Western industrial capitalism was initiated and mobilized by the developments of oil extraction that occurred in Pennsylvania in the mid 1800s.

Technical oil infrastructure, such as drills, wells, pipelines, and railway required oil as a lubricant, for maintenance, power, and innovation. As

¹⁴⁶ Paul R. Robinson and Chang S. Hsu, *Springer Handbook of Petroleum Technology*, Springer Handbooks (Cham: Springer International Publishing, 2017), 360.

more oil was extracted, more oil was needed to fulfill the new functions it served in maintaining oil infrastructure. As new infrastructure was invented to improve upon previous infrastructure—or because new infrastructure produced new ways of life which carried new technosocial practices—more oil was extracted to fulfill these new needs. This can be illustrated with the increase in home illumination due to Kerosene and the massive changes in domestic activities that followed, but also the grotesque ethics that persisted in Oil Creek during the oil boom. Oil, like the cloud, computers, tablets, and other new technologies of today, mobilized new techniques as new life conditions emerged from the possibility of oil. Declining jobs from declining whaling ships were replaced by the need for oil labor. As oil pipelines began to proliferate in the late 1860s, Teamsters sabotaged pipeline flow for fear of losing employment. Yet, the answer to the origin of oil as industry is not as simple as “a market emerged”, despite this claim being peddled by so many.

Field Notes 1975: Heliotechniques

In November 1975 in Dhahran, Saudi Arabia, an international conference was held on the technical improvement of solar energy production. The name of this conference was Heliotechniques and Development. Professor M Ali Kettani of the University of Petroleum and Minerals, Dhahran, Conference chairman provided summary:

"To people outside the field this approach would seem too optimistic, given the present level of development of solar energy research. But to the proponents of solar energy this was a necessary step to make if solar energy is to have at all an impact on the technology of the future."

Four hundred scientists from 50 countries attended the meeting, arranged by COMPLES (Cooperation Méditerranéenne Pour Energie Solaire) in cooperation with the University of Petroleum and Minerals in Dhahran and with the support of Development Program (UNDP).

Although Professor Kettani's notes on the conference proceedings are comprehensive, it seems the conference was unaware of the historical experiments in the science of heliotechnics.

These little-known methods have been poorly understood and received only cursory scholastic attention. The records, however, continually emerge in the more-than etching of certain inscriptions linking Ethiopian priests in the 4th century CE to a cataloging of salts by Persian alchemist al-Razi in the 10th century.

Six. Theory of Crude Oil as Fossil Fuel

In a section of Andreas Malm's book *Fossil Capital: Steam Power and the Roots of Global Warming*, titled "Searching for the Origins of the Fossil Economy", he asks: "What do we mean by the fossil economy? A simple definition would be: an economy of self-sustaining growth predicated on the growing consumption of fossil fuels, and therefore generating a sustained growth in emissions of carbon dioxide."¹⁴⁷ This question, albeit an important one that presents a possible origin of oil-as-industry, does not address the fossil fueled ontology. What spurred the conception of fossil carbon as an energetic entity that should be put to work as fuel for human productivity? Malm's quest sustains the myth that fossilized carbon is, inherently, fossilized *fuel*.

On the following point, I agree with Malm: "...The fossil economy is an altogether historical substance. It must have undergone its own birth once upon a time... So how did it all begin?... Britain accounted for 80 percent of global emissions of CO₂ from fossil fuel combustion in

¹⁴⁷ Andreas Malm, *Fossil Capital: The Rise of Steam-Power and the Roots Of global Warming* (London; New York: Verso, 2016), 11.

1825..."¹⁴⁸ Coal: fossil fuels began with coal. Prior to the fossil fuel of oil, there was the fossil fuel of coal, starting with the British.

The conversion (transduction) of oil into a fossil fuel does not occur separately from coal's transformation into a fossil fuel. Such a conversion does not occur linearly in which relationships of techne—the ongoing dynamic technosocial relations, rituals, and life practices—merely proceed according to previous modes of being. In *Fuel*, Scott illustrates the enormous conceptual shift enacted by thermodynamics,

Along with the huge gains in consumable energy that came with coal, there was a shift in the conception of the nature of energy. The machinists who designed powerful new engines brought a materialist theory of energy that could convert any fuel source—grass, wood, coal—into a calculated work potential based on calories. No longer was food sustenance that flowed transcendently through the working body; food became fuel, quantifiable and fungible. And the new machines ate coal, as the cows ate grass, as the worker ate the cow; these equivalencies meant, for example, that the calories in the meat of a half-ton steer were equivalent to about ninety pounds of coal.¹⁴⁹

Scott's point needs to be emphasized. Today, oil is measured within a worldview that is already oriented to measure entities in relation to a unified category of their potential productivity. Importantly, this world-perspective

¹⁴⁸ Malm, 13.

¹⁴⁹ Scott, *Fuel: An Ecocritical History*, epub 330.

is also historical. Thus, the philosophy of petroleum to exploit minerals in the earth towards energetic work is not an inherent property of oil but is co-constituted by the conditions that benefited from perceiving it as such: a transformation into a standing reserve of natural resources.

Scott develops an energy ontology, following the Heideggerian tradition of *Dasein*, a becoming through *being there*. As I mentioned in the introduction, this perspective highlights what Scott calls the “eco-cultural condition in which we conduct our lives” wherein nature is naturalized as energetic material that labors for humans.¹⁵⁰ What Scott calls conversion is the material-discursive becoming of oil as fossil fuel. Scott’s is an important insight. The fossil-fueled ontology will not change with new “renewable” energies because the ontology fundamentally represents nature and all of life in the image of (Western) humans, normalizing a human right to extraction, whatever the energy type might be. The modern assumption of oil, that it exists a priori as an energy source, with no other representation, perpetuates the perception that human measurement systems mark the

¹⁵⁰ Scott, 55.

edge of reality (that no other relations can exist outside of measured human relations).

The very reason oil is the monolithic figure in contemporary life is due to the many and varied purposes of fossil carbon. In *The history and description of fossil fuel, the collieries, and coal trade of Great Britain*, published in 1835, John Holland provided an early theorization of the geology of fossil fuels:

Many of the phenomena of the rocky masses exhibit unequivocal traces of their double origin—in the one case of refrigeration from igneous fusion, and in the other of concretion from aqueous solution. While some philosophers have assumed, that the central nucleus of our globe is in all probability ponderable matter in a condition of amazing density, others have imagined a cavity filled with water; and an American speculatist believed it to be hollow, and even accessible from the extreme north. Whatever be the matter occupying the “centre of our sphere,” it may be presumed to exist in a state of such prodigious compression, as to present conditions little if at all analogous to matter in any mode with which we are acquainted with it.¹⁵¹

Holland devotes the following pages of the study to disproving creationist theories of the origin of the matter of the Earth. He cites none other than Benjamin Silliman Sr. (first chemist to analyze crude oil), to provide scientific argument against the theory that the earth was created by a Christian god.

¹⁵¹ John Holland, *The History and Description of Fossil Fuel, the Collieries, and Coal Trade of Great Britain* (Whittaker, 1835), 21.

Towards a scientific geologic theory of the earth, Holland returns to coal, suggesting a plant-based theory for its origin.

That fossil carbon is a fundamental part of the burgeoning scientific and geologic theories of the Earth is no surprise. The proposal that (in this case) coal derives from carbon deposits in fossilized vegetation via a photosynthetic transformation of solar energy to chemical energy first requires a belief that the Earth is biophysical and not divinely created. Holland closes the chapter on Geological Theories invoking the birth of geology. "The beautiful principal that every distinct geological deposit had its appropriate suite of fossils, was first promulgated by Mr. W. Smith, who may justly be styled the Father of Modern Geology."¹⁵² The philosophy of petroleum at once invites the potential of a secular earth and embraces the manifest destiny that such energetic material was positioned for human exploitation.

For a modern description of the theory of the origin of oil—which is not the same as a theory of the origin of oil as a fossil fuel, because the geological history of oil does not imply that it is an entity for energetic

¹⁵² Holland, 39.

labor, despite conventional assumptions that it does—I turn to *The Springer*

Handbook of Petroleum Technology:

Theories concerning the origin of oil on Earth fall into two camps: biogenic, where oil is generated by the thermal conversion of sedimentary organic matter derived from living organisms, and abiogenic, where oil is formed from mineral catalyzed reactions of nonbiological carbon deep within the Earth. Most geochemists believe that there are multiple and overwhelming lines of evidence supporting biogenic origins for petroleum. While there are known occurrences of abiogenic methane generated by geologic processes, these contribute little to petroleum resources.¹⁵³

The formation of oil is an ongoing process that occurs over millions of years. The detail with which the process is understood is due to the fact that energy resources are extracted by knowing this information. The focus of the science of petroleum continues to advance practices that allow for more efficient extraction, pipeline flow, greater access, synthesis, etc. The attentiveness to oil—that is, to the idea of oil as a discrete, static entity, within a broader, ecological, nonlinear set of planetary events—occurs because oil can be put to work. Thus, there is an incentive to mold together the figure of oil out of the ground, and out of the temporal/spatial

¹⁵³ Paul R. Robinson and Chang S. Hsu, *Springer Handbook of Petroleum Technology*, Springer Handbooks (Cham: Springer International Publishing, 2017), 359.

ongoingness of the Earth. One might contrast this notion of oil with that of the interstitial substance Kerogen, an insoluble organic matter in sedimentary rock that eventually forms petroleum and natural gas. Notably, as sources of fossil fuels decrease, the scientific study of kerogen has increased. An obvious question arises: perhaps this substance oil, that has been categorized as a static entity at the end point of a geologic process, is simply another interstitial substance that has received more attention by industrialized humans?

So many preceding conceptions of space, time, and matter must align to differentiate oil the energetic entity from pre-existing dynamic components. Grantley McDonald's excellent etymology of petroleum, "Georgius Agrícola and the Invention of Petroleum," offers insight into just how difficult this is. McDonald focuses on the origin of the word petroleum (rock oil in Latin), in part to correct former Republican strategist, Kevin Phillip's incorrect citation of the origin.

In conclusion: the claims made by Phillips about the history of the word petroleum, building on the errors of Hoover, are quite untrue. Agrícola did not coin the Latin word petroleum; this honour should go rather to Constantinus Africanus (c. 1020-1087). Rather, Agrícola drew upon a rich tradition of employing petroleum in medicine, a tradition familiar to him through his professional training as a

doctor; on recent humanistic works such as the dialogues of Antonio Musa; and on his knowledge of contemporary mining practice, both direct and indirect.¹⁵⁴

McDonald's work provides insight to the historical transformation of the word petroleum and the context in which it was used. What is immediately apparent is that although petroleum was a well-known substance between the years of Agricola and Africanus's first use of the word petroleum, roughly 500 years, its use was not related to energy or fuel. It was mobilized in a way invisible in contemporary life: as medicine. Petroleum synthesis is still today a primary component for the pharmaceutical industry, but on the face of it, McDonald's etymology would seem to reveal an unfamiliar historical oil practice. This fact, that the medicinal use of oil feels unfamiliar, even strange, speaks directly to the power and consequences of internalizing the concept of oil as fossil fuel. Oil as fossil fuel is not a given or essential characteristic of life. Fossil fuel is a manufactured concept—over a period of more than 150 years, from Libavious to Neumann.

¹⁵⁴ Grantley McDonald, "Georgius Agrícola and the Invention of Petroleum," *Bibliothèque d'Humanisme et Renaissance*, no. 73 (2011): 351-364, 363.

If oil is what it does, its disposition, as critical infrastructural scholar Keller Easterling is keen to say, then oil is a sticky material indeed, because it does so much.¹⁵⁵ That oil *is* a combustible fuel is ontologically determinant by a set of humanist relations built upon a positivist enlightenment presupposition—that rational, scientific, measurement systems index the natural world absolutely, that nothing exists outside the system of measurement, and that the corresponding representations are exact empirical correlations. Such a position—which does not account for the mystical, alchemical, and theological influence underpinning the early oil industry, let alone the many non-western formulations of oil—depends entirely on the representations of oil produced by/through the very infrastructure of industrial capitalism that depends on oil. Alternately a posthumanist relation to oil might not index it as fuel at all because oil is more than bits of nature transformed into materials that energize human economies.

To make oil fuel many different conceptualizations of the world must come into focus. Most notably this includes: an enlightenment-informed

¹⁵⁵ Easterling, *Extrastatecraft*.

industrial-capitalist world view that has internalized a mechanical metaphor of the earth, a righteousness towards earth extraction at the cost of the surrounding ecology, with the scientific (secular) belief that the existence of oil emerges from a distinct process that can be modeled (not incompatible with the concurrent faith that oil extraction was a God-given right or as Negarestani argues, irrevocably linked to the very concept of Islam), a thorough indexing of that process such that it can be replicated, and the presence of systems to utilize it as such. To be clear, much of the early oil industry maneuvered by religious faith and mysticism, incongruent with the sort of rationalism I'm articulating here. But this is precisely the point: even the industrialization of oil does not categorically represent the rationalist logic that industrial histories—from J.T. Henry's to *The Derrick's Handbook of Petroleum*, William Brice's, and others—claim it does.

Carolyn Merchant argues Sir Francis Bacon's scientific education reforms at the beginning of the 1600s developed a new ethics legitimizing the exploitation of nature and advanced an era in which "an organic conception of the cosmos gave way to a mechanistic model."¹⁵⁶ The

¹⁵⁶ Carolyn Merchant, *The Death of Nature: Women, Ecology, and the Scientific Revolution* (New York: Harper & Row, 1989), 42.

metaphors of man's (masculine) dominance over nature (feminine), are explored in a close reading by historian and philosopher of science Evelyn Fox Keller. "He provided the language from which subsequent generations of scientists extracted a more consistent metaphor of lawful sexual domination."¹⁵⁷ Scientific education in the United States began at Yale University in the first decade of the 1800s, with Benjamin Silliman Sr., father of Silliman Jr., the first chemist to analyze crude oil for commercial purposes (at Yale). These educational programs were crucial steps in the new conceptualization of Earth as historical and oil as a geologically created ancient carbon-based fuel, governed by the Christian influenced scientific-industrial perspective of nature as subordinate to "man." Despite the ongoing mutability of oil—and in part due to the sustained theological influence on science at the time—these programs advanced the basic inalienable assumption that oil is a fossil fuel with great power to animate industrial life. In 1846 Canadian geologist Abraham Gesner gave the first public demonstration of a lamp oil he called Kerosene, a distillation of the hydrocarbon paraffin, producing the first commercial use of oil as a fuel.

¹⁵⁷ Evelyn Fox Keller, *Reflections on Gender and Science* (New Haven: Yale University Press, 1985), epub 86.

Field Notes 1869: Chewing Gum

Patent

Improved chewing-gum
Classifications
A61K9/0058 Chewing gums

US98304A
United States 1869-12-28
Application granted 1869-12-28
Publication of US98304A 1886-12-28

Anticipated expiration
2019-04-15
Application status is Expired - Lifetime

Description

To all whom it may concern.

Be it known that I, WILLIAM F. SEMPLE, of Mount Vernon, county of Knox, and State of Ohio, have invented a new and improved Chewing-Gum; and I do hereby declare that the following is a full, clear, and exact description of the same.

The nature of my invention consists in compounding with rubber, in any proportions, other suitable substances, so as to form not only an agreeable chewing-gum, but also, that item the scouring-properties of the same, it will subserve the purpose of a dentifrice.

It is well known that rubber itself is 'too (sic) hard to be used as a chewing gum, but in combination with nonadhesive earths may be rendered capable of kneading into any shape under the teeth.

In the manufacture of this improved chewing-gum (sic), no vulcanizing- process is employed. It is produced by simply dissolving the rubber in naphtha and alcohol, and when of the consistence of jelly, mixing with it prepared chalk, powdered licorice-root, or any other suitable material, in the desired proportions, and subsequently evaporating the solvents...

Instead of the solvents named, any other that will soften the rubber, without being offensive, may be employed, such as paraffine, spermaceti, wax, gums, resins, and the like. Any of the materials commonly used for the manufacture of dentifrices may be combined with the rubber, 'such as orris-root, myrrh, licoriceroot, sugar, barytes, charcoal, &c.

By the term rubber, I wish to include the allied vegetable gums, which are ordinarily known as the equivalents of caoutchouc.

*Having thus fully described my invention,
What I claim as new, and desire to secure by Letters Patent, is-
The combination of rubber with other articles, in any proportions adapted to the formation of an acceptable chewing-gum.*

W. F. SEMPLE. Witnesses:

I. Means, T. V. PARKE.

As it happens, chewing gum has caused a serious uproar about food safety. Controversy arises as to health concerns surrounding the questionable classification of gum as food, particularly in regard to some alternative uses for gum base ingredients. According to the U.S. Food and Drug Administration (FDA), chewing gum is considered a food, as the term “food” means “a raw, cooked, or processed edible substance, ice, beverage, or ingredient used or intended for use or for sale in whole or in part for human consumption, or chewing gum.” (<https://www.fda.gov/food/guidanceregulation/retailfoodprotection/foodcode/ucm2019396.htm>)

Polyethylene, a primary ingredient in chewing gum, was first synthesized by the German chemist Hans von Pechmann, who prepared it by accident in 1898 while investigating the chemical compound diazomethane. The commercial production of polyethylene began with the development of a catalyst that promoted the polymerization at mild temperatures and pressures. The first of these was a chromium trioxide-based catalyst discovered in 1951 by Robert Banks and J. Paul Hogan at Phillips Petroleum.

Polyethylene is produced from ethylene, and although ethylene can be produced from renewable resources, it is mainly obtained from petroleum or natural gas. This situation produces a far more common than realized circumstance addressing the fact that crude oil byproducts are, under current Gregorian Calendar FDA regulation, classified as food.

*The sapodilla, or chicozapote, tree (*Manilkara zapota*) from which chicle is collected has a New World origin in southern Mexico and Central America. The trees are found in the Mexican states of Chiapas, Tabasco, Veracruz, Oaxaca, Michoacan, and Colima, although they are best suited to the karst limestone region of northern Belize, the Peten region of Guatemala, and the Mexican states of Campeche, Yucatan, and Quintana Roo in the Yucatan Peninsula. The greatest concentration of indigenous sapodillas are found in Quintana Roo, and are probably the remnants of active propagation by the ancient Maya or were simply spared by ancient farmers when they cleared the forests for fields. When the bark of the sapodilla is cut or attacked by insects, the tree produces a milky fluid that forms a protective layer over the damaged area. It is this substance, known as chicle latex, that has been used for hundreds of years in the Americas as chewing gum...*

The Aztec also chewed the chicle latex, which they referred to as “tziictli.” However, the term “tziictli” actually referred to two kinds of chewing gum. The tree latex was distinguished as “mountain chicle” or “wild” chicle and was considered to have a pleasing texture and a slightly sweet flavor. The other preferred chicle was made of bitumen, or “chapapote,” an aromatic and flaky black natural petroleum tar that washed up onto the beaches of the Gulf Coast of Mexico, an area of major oil drilling today. In some cases, Aztec woman mixed the wild chicle and bitumen together to keep it from crumbling when it was chewed. They would also soften the bitumen with axis, a yellowish oily substance that they obtained by cooking a small flulike insect and breaking open its shell. Although the bitumen had a more refreshing taste than the wild chicle, Spanish chronicler Fray Bernardino de Sahagun noted in his multivolume treatise on Aztec culture that when it is chewed, “(it) tires one’s head; it gives one a headache.”

For the Aztecs, chewing chicle was a symbol of gender and sexual status, as the simple act of chewing gum in public identified a married or widowed woman as a whore and a male as a homosexual. This gender association with gum extended to their gods as well. The goddess Tlazolteotl, who was known as the “Great Spinner and Weaver,” was the ultimate feminine being who was associated with childbirth, sexuality, healing, the moon, menstruation, and witchcraft. In another guise, she was known as the “filth eater,” or Tlaelquanai, who ate a person’s sins to absolve them before death. She was frequently portrayed with bitumen on her face around her mouth, further emphasizing gum as a feminine symbol.

(Chicle: The Chewing Gum of the Americas, From the Ancient Maya to William Wrigley, p10)

Seven. First Chemical Analysis of Petroleum for Commercial Potential

The first ever distillation of oil was analyzed by Benjamin Silliman Sr. in 1833. His son, Benjamin Silliman, Jr.'s fractional distillation of crude oil in 1854 was the first chemical analysis of oil for commercial purposes. J.T. Henry describes this as, "the event which finally determined its economic value."¹⁵⁸ George Bissell and J.G. Eveleth, founders of the Seneca Oil Company, brought a sample of oil from their new land, Hibbard Farm in Titusville, to Silliman Jr., chair of the Yale chemistry department.¹⁵⁹ Silliman's subsequent fractional distillation analysis of crude oil, *Report on the rock oil, or petroleum, from Venango Co., Pennsylvania: with special reference to its use for illumination and other purposes*, transformed the future of petroleum. Silliman Jr.'s 20-page report provided scientific evidence that the entire petroleum product in Oil Creek was a profitable material.

¹⁵⁸ Henry, *The Early and Later History of Petroleum, with Authentic Facts in Regard to Its Development in Western Pennsylvania*, 37.

¹⁵⁹ Brice, *Myth, Legend, Reality - Edwin L. Drake and the Early Oil Industry*, 143.

Fractional distillation is a technique of separating a substance into its constituent parts (fractions) via heating. The different components vaporize at different temperatures, separating them out. Though fractional distillation is an ancient practice, the technology was crucial to the development of modern chemistry. Silliman Jr. describes fractional distillation to Bissell and co as, "a process intended to separate various products in a mixture, and having unlike boiling points, by keeping the mixture contained in an alembic at regulated successive stages of temperature as long as there is any distillate at a given point, and then raising the heat to another degree..."¹⁶⁰ The report is a comprehensive analysis of the petroleum, including the exposition of other oil discoveries in different parts of the world and citations of field interviews with residents of the Hibbard Farm land. Of the important outcomes from the analysis, including speculations and concrete conclusions, four outcomes are of interest:

¹⁶⁰ Benjamin Silliman, *Report on the Rock Oil, or Petroleum, from Venango Co., Pennsylvania: With Special Reference to Its Use for Illumination and Other Purposes* (New Haven: From JHBenham's steam power press, 1855), 6.

1. Silliman identifies the organic nature of the oil within the sample and amidst other historical comparisons.

The oil exudes on the shores of lakes and lagoons, or rises from springs beneath the bed of Rivers. Such are the springs of Baku, in Persia, and the wells of Amiano, in the duchy of Parma, in Italy. The usual geological position of the rocks furnishing this natural product, is in the coal measures— but it is by no means confined to this group of rocks, since it has been found in deposits much more recent, and also in those that are older—but in whatever deposits it may occur, it is uniformly regarded as a product of vegetable decomposition. Whether this decomposition has been effected by fermentation only, or by the aid of an elevated temperature, and distilled by heated vapor, is perhaps hardly settled.¹⁶¹

The chemical examination of these oils showed that they were all composed of Carbon and Hydrogen, and probably have these elements in the same numerical relation. When first distilled, they all had an acid reaction, due to the presence of a small quantity of free sulphuric acid, derived from the Crude oil.¹⁶²

2. Silliman inadvertently foreshadows the invention of synthetic petrochemicals and polymers, such as plastics and nylon.

The uncertainty of the boiling points indicates that the products obtained at the temperatures named above, were still mixtures of others, and the question forces itself upon us, whether these several oils are to be regarded as educts, (i.e, bodies previously existing, and simply operated in the process of distillation,) or whether they are not rather produced by the heat and chemical change in the process of distillation. (sic) The continued application of an elevated temperature alone is sufficient to effect changes in the constitution of many organic

¹⁶¹ Silliman, 4.

¹⁶² Silliman, 10.

products, evolving new bodies not before existing in the original substance.¹⁶³

3. Silliman determines that crude oil is indeed a productive, if not highly efficient means of illumination.

For this purpose a weighed quantity was decomposed, by passing it through a wrought iron retort filled with carbon, and ignited to full redness. The products of this decomposition were received in a suitable apparatus. It produced nearly pure carbureted Hydrogen Gas, the most highly illuminating of all the carbon gases. In fact, the oil may be regarded as chemically identical with illuminating gas in a liquid form. The mass produced equally ten cubic feet to the pound of oil. It burned with an intense flame, smoking in the ordinary gas jet, but furnishing the most perfect flame with the argand burner.¹⁶⁴

4. Finally, and most importantly, Silliman concludes that the entire petroleum product can be monetized.

In conclusion, gentlemen, it appears to me that there is much ground for encouragement in the belief that your Company have in their possession a raw material from which, by simple and not expensive process, they may manufacture very valuable products.

It is worthy of note that my experiments prove that nearly the whole of the raw product may be manufactured without waste, and this solely by a well directed process which is in practice, one of the most simple of all chemical processes.¹⁶⁵

¹⁶³ Silliman, 9.

¹⁶⁴ Silliman, 11.

¹⁶⁵ Silliman, 20.

Although distributed to only a few select parties, Silliman's report was a leviathan within the early oil industry. It set in motion the commercial pursuit of oil in the Oil Creek region. The report became the oil industry's first advertisement, promoting a culture of capital investment and a pursuit of oil as a profitable commodity. It also set in motion a new career for the opportunist Silliman Jr.; one that did not always proceed with the most trustworthy intentions. In his analysis, one can read a self-aggrandizement that his experiments alone can determine the value of oil. That the oil industry is propelled by a shady merchant whose currency was scientific interpretation of chemical analysis (information brokerage) is a curious, but not uncommon, side note.¹⁶⁶ With this report in hand, Bissell and co begin oil exploration on their land in Titusville, future sight of Drake Oil Well.

The following figure, from Henry's 1873 history of petroleum, lists petroleum yields for product development. The figure mirrors Silliman's analysis that nearly all the substance is profitable for manufacturing.

¹⁶⁶ Paul Lucier, *Scientists and Swindlers: Consulting on Coal and Oil in America, 1820-1890*, Johns Hopkins Studies in the History of Technology (Baltimore, Maryland: Johns Hopkins University Press, 2008), 200.

Petroleum yields, by distillation, nine distinct commercial products.

| Name. | Specific Gravity. | Beaume Scale. | Boiling Point. |
|------------------------------|-------------------|---------------|----------------|
| Righolene..... | 025..... | | 65° F |
| Gasolene..... | 665..... | 85..... | 120° " |
| C. Naphtha..... | 706..... | 70..... | 190° " |
| B. Naphtha..... | 724..... | 67..... | 228° " |
| A. Naphtha..... | 742..... | 65..... | 300° " |
| Kerosene Oil..... | 804..... | 45..... | 350° " |
| Mineral Sperm Oil..... | 847..... | 36..... | 425° " |
| Neutral Lubricating Oil..... | 883..... | 29..... | 575° " |
| Paraffine..... | 848(?)..... | | |

Figure 10: Petroleum yields. Henry, *The Early and Later History of Petroleum*, 192.

"The lubricating or paraffine oils were always characterized by offensive odors and tastes, so that a person brought in contact with them became at once aware of their origin; and the desideratum with manufacturing chemists, from the earliest days of this industry, had been the production of dense *neutral* oils, or oils free from these offensive objections... But partly as are the result of an accident, Mr. Joshua Merrill succeeded in making neutral oils in November, 1867."¹⁶⁷ The focus not only on oil's chemical mutability, but also chemists' attention to the likable attributes of oil in 1873 already signals the way oil diffused into everyday life.

¹⁶⁷ Henry, 193.

The constituents of oil that interfaced with public life entailed extensive techno-scientific manipulation, in chemical laboratories, in information brokering, in forms of enclosure, despite its currency as a material that came out of the ground. Indeed, as Matthew Hubbard says in *Lifeblood: Oil, Freedom, and the Forces of Capital*, "it is oil's status as a complex chemical assemblage of hydrocarbons that allows the oil industry not only to extricate thousands (millions?) of petroleum-based products from a given barrel of oil but also to craft narratives emphasizing the unavailability of oil through the saturation of chemicals, plastics, medicine, food, and gasoline in everyday life."¹⁶⁸ The present is a time of invisible synthesis that has reconfigured Henry's oil into millions of parts, which entangle the world in chemical agents preserving the possibility of what is called human life. It took hundreds of years to make oil fuel and once oil-as-industry began, myriad measurement systems (physical, conceptual, theological, and otherwise) conspired to ensure it persisted. *Oil is a staple of life* was the banner of the burgeoning industrial modernism, thus a life of oil was mutually enacted.

¹⁶⁸ Matthew T. Huber, *Lifeblood: Oil, Freedom, and the Forces of Capital*, Quadrant Book (Minneapolis: University of Minnesota Press, 2013), xx.

Field Notes: Distilling Bodies and Energies

The first synthetic material, nylon (subsequently used in the production of women's stockings), was indeed a product of oil synthesis, orchestrated by the DuPont Company on February 28, 1935. In 2018 curator Ceci Moss invited me to exhibit new work in the exhibition Anatomy of Oil, in the Los Angeles gallery Gas. <Figure a> Provocative in its own right, Gas is a mobile gallery built from a repurposed delivery truck, which geographically situates itself in relationship to the work it exhibits. For this new work, I explored the mutability of oil in its very real impact on gendering bodies.



<Figure a: Anatomy of Oil exhibition, Gas Gallery, showing Oil rituals for the future #6 (2018). Photo: Andy Bennett and Colleen Hargaden. Reproduced with permission.>

Anatomy of Oil constructed a dialogue with the hidden presence of oil across the Los Angeles landscape. In Moss's words:

Named after a poem by Marcella Durand that examines these issues through an eco-feminist lens, Anatomy of Oil includes sculpture, drawing, painting, and video in the gallery truck... One theme in Durand's poem is a ceaseless, roaming hunger for oil, and the destructive path that follows each discovery...

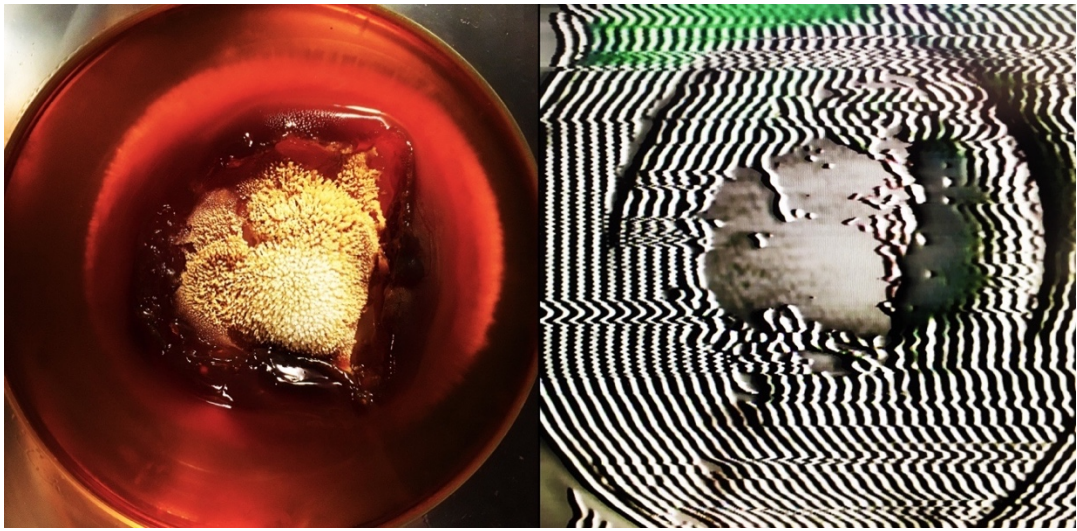
Works such as Elia Vargas's sculpture Oil rituals for the future #6 (2018) attend to the material qualities of oil itself, and how they formally contribute to its pervasiveness both economically and culturally. The work is made of paraffin wax, a hydrocarbon derived from petroleum. Paraffin wax was discovered in 1830, transforming home illumination,

and it continues to be used in food, beauty products, and manufacturing. Contained in nylon stockings (the first synthetic material, derived from petroleum in a DuPont research lab in 1935), the sculptures are designed to melt in concert with the heat conditions of the truck gallery. This slow and unpredictable transformation mirrors oil's mutability and relentless impact on the cultural formation of the body. (Moss 2018)



<Figure b: Oil rituals for the future #6 installation view. Photo: Andy Bennett and Colleen Hargaden. Reproduced with permission.>

Relentless to be sure, industrial era practices of gender are not free of the ongoing materialization of oil. DuPont intentionally did not patent nylon to allow its pervasive normalization (e.g., molding women's legs) throughout American society. Oil rituals for the future #6, an expanding series, sought to focus on this ongoing mutability by showing the state change of paraffin in sync with the very conditions of the exhibition: where it went, the ambient temperature, the ignition of the engine, and the presence of visitors. The ongoing materialization of paraffin—as nylon, as kerosene, as medicine—reveals the mutability of oil. The enormous mass of extended plastic Being, which Pendakis speaks of, emerges simultaneously with and through petro-subjectivity, as intra-active agents, every time new nylon progeny take form, as bodies, as concepts, as life.



Field Notes (first notes)

The earth is a power. It is a technology of energy. It is energetic exchange. These notes carry an important task: to reveal the way that thinking earth energy is not to distance earth from its own earthy nature, nor to embrace a planetary system of technological positivism, but instead to reveal the way that the event of industrialization, and perhaps the entire era of enlightenment (signals of light as the apparatus of progress), constrains the possible ways that earth energy can be thought. Metals, plastics, oils are all earth energies as much as horsepower is earth energy, as much as wind powered sailing ships across the globe, as much as salt mobilizing food storage reserves for the world in absence of refrigeration (glacial technologies) are all earth energy. The task is not to comprehend that this is so, that is simple enough. The task is to recognize the way that changing worlds change the nature of concepts themselves. The moderns see whale oil as an outmoded and crude history of primitive light burning fuel. Whale oil is an old-fashioned, outdated way of doing things that does not fit within the modern logic of efficient, electrified, infrastructure-rich life. No matter that whale oil was a life-shaping infrastructure technology for much of the industrial world. Interesting that whale oil is sometimes called train oil. In fact, it did lubricate train tracks, just as the Confederate army of the U.S. Civil War used grizzly oil to lubricate its war machines. Grizzly oil was an inferior lubricant to the rock-oil petroleum used by the northern army, an under examined history of that war. Nonetheless, whale oil is named train oil after the Dutch word traan, meaning tear or drop, nothing at all to do with those engines of linear industrial infrastructure, timekeeping, and space-shaping (and annihilating) machines.

The nature of a concept is lost as life technologies change—a concept is lost as any relational conditions change. New infrastructures produce new material relationships. New relationalities create new concepts. Whale oil was animal blubber, then an animal by-product, then it was home illumination technology, then it was a near extinct commodity by-product, then it was an animal by-product again. Then, it was whale oil that was extinct, and the whales thrived. What caused the change in relating? (For whom did the concepts congeal into meaning?) Concepts emerged in response to shifting infrastructure of exchange. There is no progress narrative here, the governing principles of life practices emerge and fade away, often in response to crude conceptions of the world. That there can be many simultaneous worlds notwithstanding.

Before petroleum-based cosmetics and medicines, spermaceti—Latin, sperma (sperm) + ceti (whale), sperm oil from the Sperm Whale's cranial membrane, which was mistaken to be the whale's semen, in part explaining the homoerotic visions of Moby Dick—was the burgeoning technology of beauty care and hygiene. It was, in other words, all the rave in a once modern world.

Time is infrastructure like any other. It is a technology of standardization. Worlds can be indexed in many ways. Normalizing relationships can normalize social conditions. Social conditions are always already the entanglement of more than human forces: a cosmological collision of naturecultures. The Gregorian calendar has done this for hundreds of years, despite its formal introduction in (Gregorian calendar year) 1582 by Pope Gregory XIII. It superseded the Julian Calendar, which reformed the Roman Calendar. The dates of 5 October 1582 through 15 October 1582 do not exist. Before clocks, church bell towers maintained the tempo of daily life. People see religion as a spiritual practice, but its power is its standardization of social organization. The church was the keeper of structure—daily structure as well as knowledge structure. The church grounded its subjects amidst a cosmos of energy. Without bell tolls, one might lose themselves in time, in history, in space.

The printing press, like clocks, freed the Christian world from a certain standardization (or should I say freed the world from a certain Christian standardization), though only partially. It was less of a freeing and more of a transduction. The written Latin bible, through translation diffused into German, into other languages, into other stories. The church bells melted into railways, into factory timecards, into clocks, into the internalization of clock time. It was standard. To look to the skyline—the tallest structure in

town, towards the heavens, the place of prayer—was no longer the common practice for asking the time. To “ask for the time” itself seems to be an essential activity to the moderns, but who would make such a bizarre request when everyone knows the time will be told by the sounds of the towers? But did the towers tell the time? I think not. What concept of time was there? The towers oriented one in a world of causal relationships, in space and time, in spacetime. The time was a relation to the earth. A set of conditions informing procedures and disciplining actions. An entire town mobilizing around soundwaves transducing through metal, informed by the electromagnetic spectrum—that divine unknowable source of light above. The towers spacetime mattered.

Another type of tower—the lighthouse—crept across the coastal continental shelves of the earth. As wind energy was harnessed for seafaring merchants, the ‘trade-winds’, literally carrying new energies—thoughts, ideas, and ways of being in different worlds—to new places, catalyzed by the earth, lighthouses sought to expand the reach of light as signal. Fresnel lenses, technologies of glass, refraction, candles of light, measurements of standardization. Light: a force for exploration, illuminating a world, a force for measurement, a force for growth, a distributed medium, a technology of exchange, a standardized way of revealing, and a material production of earth. For a long time, spermaceti was the preferred illuminant of lighthouses. It burned clear and without smoke. A media of animal and light, a transduction of life-energy for new information.

<<It is crucial here not to confuse new with better. New relations abound, always. In fact, there is nothing but new relations—new forms expressing new conditions. Each and every phenomenon is co-constituted of new relations. But this is a matter of differentiation, not quality.>>

Life practices occur relationally with the infrastructures of life. Life practices, in fact, can be infrastructures of life. To think that crude oil is not of the earth is merely a result of life infrastructure that conceptualizes oil as something else. Crude oil is the monolithic earth energy of these times. It is of the light—the solar orb—in the sky. Oil is of the candle. Its wax—paraffin—is the wax of modernity, the kerosene that replenishes the whales (except it didn’t). Paraffin is the latent solar energy stored in the reserves of ancient animals, ancient plants, ancient watery depths. It is the technology of algae-storage photosynthesis, of kerogen. It is an infrastructure of cosmological intervals, exchanges that exceed human measurement—media of the cosmos.

These forces transport and transmit conditions of existence across (within/without) spacetime. Oil is latent solar radiation, among other accumulated biomass. Oil is solar inscription of the earth and the transmission of energy with/in time. Oil is present long before it is the governing principle of contemporary life-practices. Words are merely one form of energetic transduction that index these events. Such as it is, the stakes are high.

Volume Two: Oil as Media

In which the argument that oil is media is presented. The argument expands the possibilities of an agential realist media theory; elemental media is neither a matter of scale, temporality, or natural origin, but rather the infrastructure of ongoing differentiation. Building upon the previous volume, *Oil as Industry*, Volume Two illustrates that oil is ontologically inseparable from the agencies that mutually enact it, and as such, it is an infrastructure of differentiation....

Figure 11: Oil as Media.

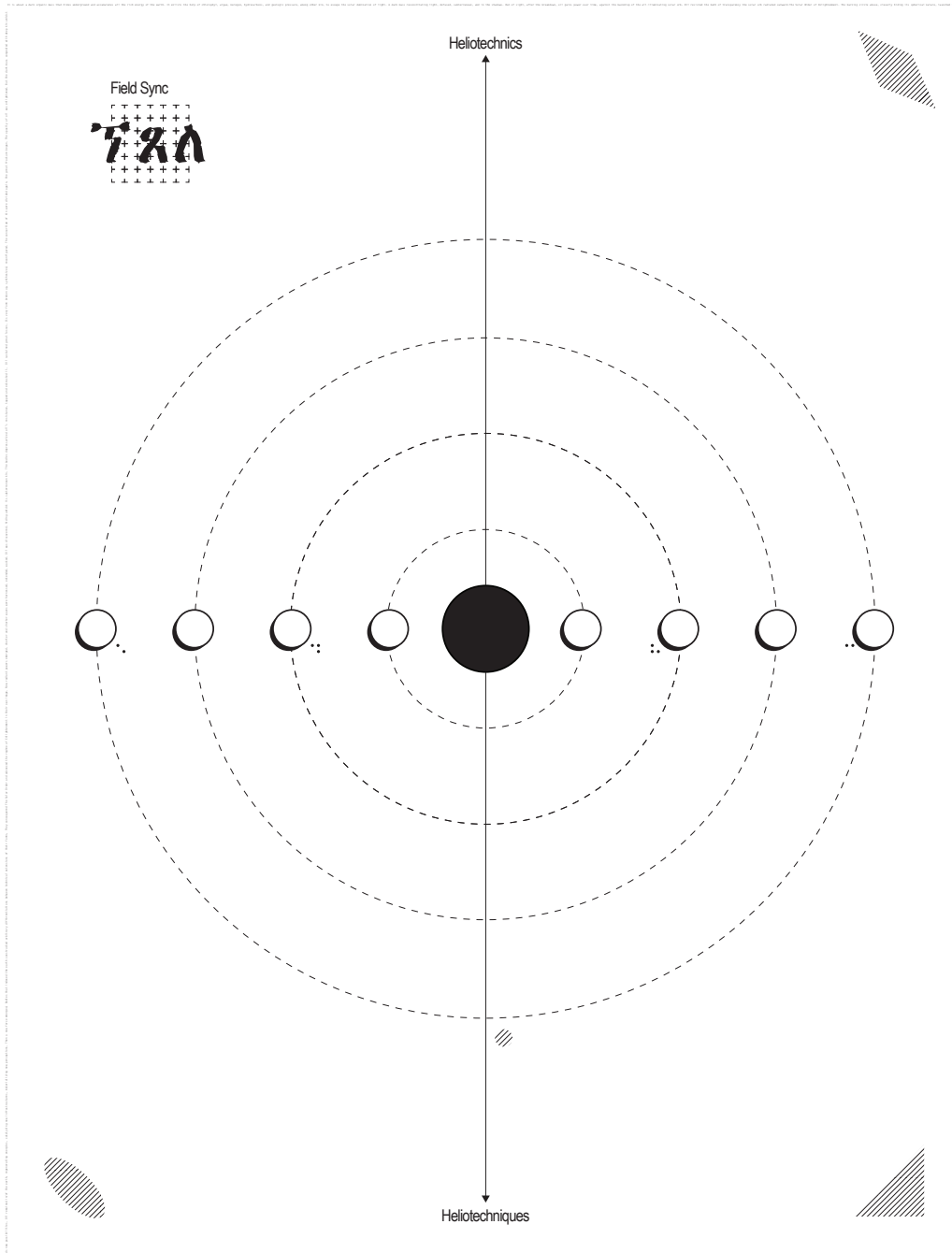


Figure 12: Field Sync at a Heliotechnics site.

Field Notes 1978

I could have followed a more specific German media theory path to do this work. Specifically, the compelling argument put forward by Eva Horn in the Editor's Introduction "There are no Media" to Grey Room no 29. This argument brings to the fore the lively debate in the English translation of cultural techniques put forward by Geoffrey Winthrop-Young in the forward of "Grids Doors and Other Articulations of the Real." This position, that "Es gibt keine Medien," which dismisses any fixed concept of media, is an alternative path to make the arguments I am presenting. A path not entirely untrodden in my work, as Jussi Parikka is a scholar of Kittler and does work within the tradition of German Media that unfolded. That being said, my argument does not follow that path explicitly, which can also be found, in a certain form, in the movement of structuralist film in the 1970s theoretically articulated not by Paul Sitney but by Peter Godal's notion of materialist film. He says, "Structural/Materialist films are at once object and procedure." While the debate between technics and techniques in English is more complexly elucidated by the German "kulturentechniken," ultimately, I turn to agential realism to develop such an onto-epistemological media theory, precisely because not only are cultural practices always already technical and technologies always already practices, agential realism shows that neither objects nor agents have distinct characteristics separate from their entanglements. That is, there are no media, but there also are no agents, yet.

Zero. The Cult of The Sun

Humans are sun worshipers. In *Empire and Communication*, Harold Innis argues that the Nile River was the principle of order and governed the structure of ancient Egyptian life.¹⁶⁹ It required collective work, created a sense of shared purpose, and imposed particular organizing principles onto people. "In turn," Innis says, "the Nile was the work of the Sun, the supreme author of the universe."¹⁷⁰ Through Ra, the god of the Sun and creator of human and gods alike, absolute power was granted to a monarch. The flooding and patterns of the Nile required a centralized effort as well as the ability to predict its seasonal overflows. The creation of a calendar by 4241 BC that conjoined the solar year and lunar month allowed for the prediction of the Nile's activity thus secured the authority of the monarch.¹⁷¹ For Innis, this marks the beginning of a history of two mediums, stone and papyrus, that enacted the Egyptian monarch's monopoly of knowledge through writing, and power over time. The development of

¹⁶⁹ Innis, *Empire and Communications*.

¹⁷⁰ Innis, 12.

¹⁷¹ Innis, 12.

what Innis calls the Egyptian Empire is shaped by the transformations of these mediums by the continued demands of the Nile.

Marshall McLuhan expanded Innis's later writings and argued that Innis was the only person to study the effects of technology. McLuhan suggested that Innis's study of the effects of staples (Canadian fur trade, cod fisheries, railways), was the study of the effects of man-made technologies and this was Innis's path to the study of media. McLuhan's notion that a medium is an "extension of ourselves" is derivative of Innis's important inclusion of the effects of staples into the study of media.¹⁷² For McLuhan, like Innis, this included energy and energy infrastructure.

In the first section of *The Derrick's Hand Book of Petroleum* published in 1898, on early references to petroleum, few mentions of oil occur without reference to an environmental feature: bitumen from the River Is in Babylon; bitumen from the Dead Sea sold to the Egyptians; the famous oil spring at Cuba; fossil oil at springs in the River Ohio.¹⁷³ The book suggests that there are references to oil in the bible under the name "salt."¹⁷⁴ It is

¹⁷² McLuhan, *Understanding Media*, 7.

¹⁷³ Snell, *The Derrick's Hand-Book of Petroleum*, 7.

¹⁷⁴ Snell, 5.

possible, as this is consistent with one of Persian alchemist al-Razi's early descriptions of the substance.¹⁷⁵ The section continues:

1843. In Charles B. Tergo's "Geography of Pennsylvania," published in 1843, the following can be found:

"Oil creek derives its name from the substance called Seneca oil, which rises in bubbles from the bed of the stream, and on reaching the top of the water those bubbles explode, leaving the oil floating on the surface..."

The Seneca tribe in the Oil Creek region of Pennsylvania did not name river tributaries, because they viewed water systems as part of the same entity.¹⁷⁶

This distinction mobilizes a different conceptualization of land, life, space, time, and matter. Thinking about oil as media opens up the vast sedimentary rocks and grand biomass of the earth as storage reservoirs, historical geologic records, archives of energetic activity, and solar inscriptions, as well as significant shifts of temporal thinking to the compression and combustion of eons and instants. What kind of concepts can provide meaningful ways to be present with or comprehend these cosmic temporalities and all the life forms involved?

¹⁷⁵ Gail Marlow Taylor, *The Alchemy of Al-Razi: A Translation of the "Book of Secrets,"* 1 edition (CreateSpace Independent Publishing Platform, 2015).

¹⁷⁶ Jay Toth, "Oil Creek?," 2019.

Field Notes 13

The two small symbols were unmistakable. Etched on the inside of Abuna Yemata, the rock hewn church of Tigray, carved in the cliffside 300 meters above the earth. The northern Ethiopian churches date to the 4th century Gregorian Calendar. The unique paintings inside the high-altitude desert church were distractions from the writing just to the left of the entrance, but it was not hidden. The cliff-jumping priest guiding us along the narrow ledge noticed my focus and followed my gaze. Quickly, he took my hand and pressed it against the inscriptions on the wall. It was written in a proto-Semitic language, but suddenly, I understood.

>In this story light is the protagonist...

>It is about invisible material that endlessly supplied a planet with life. Amidst the shadows, light (re)materialized the campaign of darkness—A siege of confusion that befell life. The siege was not a fear of darkness, nor the absence of being, but a misrepresentation of the void. It was a commitment to thinking emptiness; a chosen path to determine darkness as that which is nothingness.

>Light did not succeed at first. For, it was not the light's illumination of darkness that was victorious, despite light's attempts. No, it was not a matter of occupying pre-existing terrain. Where was there such terrain? The campaign of darkness was powerful in its assertion of the void. The void grew, because darkness claimed rights to its existence. The campaign gained support. It built coalitions and adopted willing subjects: darkness and the void are one.

>Light tried to shine upon the dark. It rained vibrant ideas of illumination. Thinking it could reveal the terrain prior to the campaign of darkness, light resonated onto the planet. It sought to help reveal, to aid in creating a vision, an awareness, knowledge, of what was there; it enlightened. But the campaign was clever. It had already succeeded in its work. The transmission of light was focused on the void, nothing more than an assertion, yet concretely transforming life. There was no defeating the void, it had no shape to destroy, no materialization to conquer, no reach to overcome. It was all things and thus defined the methods of response. The campaign of darkness initiated an insidious order. There was no thought outside the void—everything was the void.

>After many failed attempts, a residue emerged—the detritus of the breakdown of light. A great mass of black seepings materialized from the light. The campaign of darkness could not see it separate from the void; it was benign. But the mass grew. It compressed too, but it gained pressure. It self-energized in its response to the void. The campaign was crafty, but it made a mistake. Light learned from the mass of black seeping in itself. Light understood, finally, that it did not need to illuminate the campaign of darkness. Enlightenment, it realized was not a revealing of how things are, this was not its power. Light, it realized, materialized life; it resonated the conditions for existence and together with that which it encountered a differentiation occurred.

>And with that, the void ceased to be, because there never was an emptiness, only a shackling of possibility.

Somehow, it was dark when the priest removed my hand from the wall. It was unclear how much time had passed, though he had stayed with me.

One. Substance Par Excellence

Oil is the substance par excellence of industrial modernism. It requires an examination with the same metamorphic potentiality that it enacts. Oil surfaces in the present as a mechanization of the earth of the highest order. To conceptualize fossil fuel requires envisioning the innards of the globe as a mechanical factory spewing out fuel, not unlike Henry's philosophy of petroleum. If oil is a fuel—a technology energizing human activity—then the environment that creates it is technical infrastructure.

Why refigure oil as media? Because the modern industrial descriptions that characterize its existence have failed the planet. In the simplest of terms, oil is too often understood as a binary. The common historical narrative is that oil is either an unavoidable industrial catalyst carrying the potential for great energy and wealth, or a catastrophic environmental hazard responsible for vast ecological destruction. Such binary thinking is endemic to humanistic thought. It is for this reason as well that I argue for oil as media and not a medium—I seek to make a broader argument that media materialism is more than medium-specificity. For Innis, the idea of “bias” was more than the material conditions of a medium,

but the perpetual techniques, the cultural strategies, that a medium effected (in McLuhan's reading of Innis) on society.¹⁷⁷ More than this, in Barad's non-representational ontology, a medium is not ontologically discrete.

Conceptualizing oil as media provides new practices to unearth the ongoing differentiation of oil—and because of the ubiquity of oil, life itself. Refiguring oil as elemental media in this case carries dual meaning: expanding a concept of the natural, elemental, as media (starting with Innis and McLuhan, which media theorists Jussi Parikka, John Durham Peters, and Nicole Starosielski speak to) *and* agential realism's illustration that the elemental (foundational) parts of media are not determined by scale, speed, voluminous topology, or limited to practices of mediation. Rather, media are defined by the elemental cuts (and practices of cutting) of differentiation/differentiating within an apparatus. Volume Two builds my argument with agential realism that media are infrastructures of differentiation and that oil is a monolithic apparatus of differentiation in contemporary life.

¹⁷⁷ Innis, *The Bias of Communication*.

Media are entities that enact meaning with/in an apparatus. Because oil extends to all facets of the world—as pipelines cover the surface of the earth, microplastics saturate every cubic inch of atmosphere, and domestic illumination has transformed the sense of the inside—oil is a world-effecting media. Oil differentiates the world.

Thinking about the history of electrification—not an incidental energy-relation to oil—technology historian Carolyn Marvin says, “In the long transformation that begins with the first application of electricity to communication, the last quarter of the nineteenth century has a special importance for students of modern media history. Five proto-mass media of the twentieth century were invented during this period: the telephone, phonograph, electric light, wireless, and cinema.”¹⁷⁸ Beyond my assertion that oil is life infrastructure that directly enables each of these mediums—something Naomie Gramlich has argued for explicitly, that oil, not electricity as McLuhan would say, is the medium *a priori*—I invoke Marvin in

¹⁷⁸ Carolyn Marvin, *When Old Technologies Were New: Thinking About Electric Communication in the Late Nineteenth Century* (Oxford, New York: Oxford University Press, 1990), 3.

relationship to the early oil industry for an important reason.¹⁷⁹ Her focus on reexamining the entangled social impacts of these media technologies are an important intervention into how media technology is thought. Not only does her work extend the logics of electrification, but she also insists that from this period onward, the way media is understood changes fundamentally because life practices (and relations) change fundamentally.

The crucial point is that electrification does not fall into a pre-existing historical groove of media, but rather constructs its own social-logic that cannot merely be reconstructed looking backwards from the present. She says as much:

For if it is the case, as it is fashionable to assert, that media give shape to the imaginative boundaries of modern communities, then the introduction of new media is a special historical occasion when patterns anchored in older media that have provided the stable currency of social exchange are reexamined, challenged, and defended.

The present study is not, therefore, an effort merely to extend the traditional time line of electric media. It introduces issues that may be overlooked when the social history of these media is framed exclusively by the instrument-centered perspective that governs its conventional starting point.¹⁸⁰

¹⁷⁹ Naomie Gramlich, "Sticky Media. Encounters with Oil through Imaginary Media Archaeology," *Communication + 1: Intersectionalities and Media Archaeologies* 7, no. 1 (October 2018): 1-26.

¹⁸⁰ Marvin, *When Old Technologies Were New*, 4.

Marvin's critique of "instrument-centered perspectives" is a direct challenge to the technological determinism of her contemporaries. In the context of this current work, Marvin should be understood as paving the way, with Innis and McLuhan for a technological history of oil that can be perceived through a media theoretical lens. For Marvin, it is electrification that standardizes the possibility of the mass media forms she examines. Beyond a constructivist/determinist binary, my argument is that the early oil industry is the important precondition to not only electrification, which media scholars like Marvin and McLuhan see as the transformative event of modern media, but to the governing principles of modern life practices for humans and nonhumans. The early oil industry sets up the terms for energy transmission, new domestic illumination, and unprecedented exchange of materiality. The infrastructure that mobilizes the petro event standardizes the infrastructure which leads to electrification, but also standardizes oil as a staple of the economy. The very conception of oil as fuel is a paradigm shift of spacetime matter in the most profound way.

Field Notes 42020: A txt exchange

8312780008:

*An etymological and philosophical question for you:
how do you interpret the distinction between technics and technique within technology studies?
do you see them as simply sign-posting which theorist is at issue or do you see a substantially important distinction?
i believe technik means techniques in german but techne and technics have (somewhat) different histories*

8312240334:

techniks means both technology and technique which is a big part of what makes german media theory german media theory but yeah techne has a different lineage in contemporary use i mean

8312780008:

i guess what has me stumped is that heidegger says technik refuses to let earth be an earth (refuses nature's self-disclosure), but, part of my understanding of cultural techniques is that technical beings need not be human solely but, techne does not refuse this self-disclosure of nature so, i guess my prevailing question is: is there a difference in meaning between technics and techniken?

8312240334:

i have no idea and am now also wondering. Winthrop Young may have touched on this in his

translation notes for siegert or vismann

“Over the years the German term Kulturtechniken has been rendered into English as cultural technologies, cultural techniques, and culture technics (with and without a hyphen). Leaving aside the differences between Kultur and culture as well as the problematic transformation of the noun Kultur into the adjective cultural, the principal quandary is the word Technik”

*File Transfer: Attachment.png
i took half a semester of german before dropping out for several years in my brief first brush with higher ed immediately after high school. wish i'd stuck with it now the german part anyway*

8312780008:

damn. thats awesome. i've read that before (is that for siegert's grids doors and other articulations of the real?)

8312240334:

yes

8312780008:

its interesting. i remember feeling a certain clarity upon reading that, but its quiet funny that not until this moment did i realize just how important that is so, the reason i asked is i'm trying to arrive at a new term that i will deploy as a sort of

... science in the ...
... my diss, which will be
inscribed in a ...
...

8312240334:

also makes me want to also go back
and read Frabetti's chapter on
originary tech- nicity, from old greeks
through heidegger into derrida and
stiegler

8312780008:

yes!
so the term is either Heliotechnics or
Heliotechniques
trying to make the right choice

8312240334:

ooh, interesting

8312780008:

any thoughts?
right now I'm leaning towards the
former, heliotechnics

8312240334:

i mean, techniques are always
already technical and technics are
always already practices so it's more
of a question of emphasis than
exclusion, right? the other thing i
want to go back and find is Le Guin

and Haraway arguing about whether
a penguin flapping its wings is a
technology which was iirc in the
Q&A from the big anthropocene conf
in ... 2014? i think there's video

8312780008:

adrian mackenzie goes into
haraway's thinking of originary
technicity in transductions: bodies at
speed. i'd love to see that

8312240334:

ooh, I need to read that. and his book
on wirelessness

8312780008:

but yes, it is definitely all about
emphasis rather than exclusion

8312240334:

i'll see if I can dig up a link

8312780008:

i think i'll use both versions, in
different diagrams, to draw attention
to the distinction

8312240334:

nice!
it's a short levenshtein distance :P

Two. Oily Entanglements. A Sticky Media Materialism

In response to early digital culture, a wave of new media theorists and artists, and new interpretations of older theorists, debunked the notion that the virtual age is immaterial.¹⁸¹ The internet is a physical network and “the minerals, materials of(f) the ground” have profound consequences to local and global ecologies, and are inequitably distributed in/through the bodies of laborers, users, kin, and other species beings.¹⁸² Increasingly, climate catastrophe and the naturecultural entanglements of the Anthropocene are viewed as interlocking the issues of modern technology and environmental survival, even if this does nothing to address the ontological exceptionalism that western industrialism has produced or other critiques of the Anthropocene. The material of the virtual matters. The digital is physical. In response to the material turn, a number of sub-

¹⁸¹ See, for example: Easterling, *Extrastatecraft*; Tung-Hui Hu, *A Prehistory of the Cloud* (MIT Press, 2015); Matthew Fuller, *Media Ecologies: Materialist Energies in Art and Technoculture*, Leonardo (Cambridge, Mass: MIT Press, 2005); Hito Steyerl and Franco Berardi, *The Wretched of the Screen*, E-Flux Journal (Berlin: Sternberg Press, 2012); Douglas Kahn, *Earth Sound Earth Signal: Energies and Earth Magnitude in the Arts*, 1 [edition] (Berkeley: University of California Press, 2013); Parks, Starosielski, and Acland, *Signal Traffic*.

¹⁸² Jussi Parikka, *A Geology of Media*, Electronic Mediations (Minneapolis; London: University of Minnesota Press, 2015), 13.

disciplines within media studies have emerged as stewards of media materiality, building upon the early work of McLuhan, Innis, and the German school of media theory associated with Friedrich Kittler.

Thinking about oil as constructing the limits of an industrial empire, as Innis did with papyrus, clay, and other “raw” materials, emphasizes the space and time bias of oil.¹⁸³ It has particular ways of transmitting through time: inscribing the earth, a colossal inscription of carbon. It transmits across the surface of the earth in various states of liquidity, from bituminous coal-like states to refined oil: scorching it, gridding it, commodifying it, standardizing it. Industrial conceptions of oil not only proposes a sort of global empire, as pipelines, tankers, and railway slither across the planet—and mutually transform it in the process—but it also insists on a cosmological sense of deep time, a topic of media archeology taken up by Siegfried Zielinski.¹⁸⁴ Oil lives on as the corpse of sunlight, buried deep in the earth for millions of years before it is revived, in the black magic exorcism of capitalist desires, in the mid 1800s. Oil is a medium of the sun.

¹⁸³ Innis, *Empire and Communications*.

¹⁸⁴ Siegfried Zielinski, *Deep Time of the Media: Toward an Archaeology of Hearing and Seeing by Technical Means*, *Electronic Culture--History, Theory, Practice* (Cambridge, Mass: MIT Press, 2006).

The annihilation of space and time by media technology is a frequent topic of media theory and some have specifically taken to the cultural techniques initiated by railroad time (Schivelbusch), undersea cable networks (Starosielski), a history of urban media (Mattern), or code/space (Kitchen and Dodge).¹⁸⁵ It is McLuhan who proposes that, "For the 'message' of any medium or technology is the change of scale or pace or pattern that it introduces into human affairs."¹⁸⁶

McLuhan's emphasis on the change that a medium introduces is directly influenced by Innis's study of staples' role in shaping Canadian society. McLuhan also said, "technological media are staples or natural resources, exactly as are coal and cotton and oil."¹⁸⁷ The effects of these staples are what McLuhan calls the 'message'—a change in human affairs. In the recent special Issue "Oil and Media, Oil as Media: Mediating Petrocultures Then and Now," the editors of the Canadian journal "Media Tropes" suggest this is the foundation for the material turn that enables

¹⁸⁵ Wolfgang Schivelbusch, *The Railway Journey: The Industrialization of Time and Space in the Nineteenth Century* (Berkeley: University of California Press, 2014); Starosielski, *The Undersea Network*; Mattern, *Code + Clay... Data + Dirt*; Kitchen and Dodge, *Code/Space*.

¹⁸⁶ McLuhan, *Understanding Media*, 8.

¹⁸⁷ McLuhan, 21.

reading oil as media in the present.¹⁸⁸ Citing the litany of contemporary media scholars doing elemental and infrastructural work, David Barney, Keller Easterling, Sean Cubitt, Parikka, and Nicole Starosielski, they provide a heuristics to read Oil and Media, Oil as Media. Refiguring Oil and/as Media, however, is more than just a semantic difference. The journal does not account for the most important critique of the entanglement of oil as media: McLuhan's shortcoming is his perspective that information is ontologically determinate by humans.

Parikka picks up on this by enlisting artist Robert Smithson's notion of "abstract geology." Smithson, Parikka argues, "was ready to mobilize his notion emerging in the artistic discourse of land art in the 1960s to a conceptualization of technology that we can say was nothing less than anti-McLuhanian: instead of seeing technology as extensions of Man, technology is aggregated and 'made of raw materials of the earth.'"¹⁸⁹ Smithson connects an art-historical perspective that resonates with some of the media art throughout this document, nonetheless, I rely on agential

¹⁸⁸ Jordan Kinder and Lucie Stepanik, "Editorial Introduction | Oil and Media, Oil as Media: Mediating Petrocultures Then and Now," *MediaTropes* 7, no. 2 (February 11, 2020): i-xvi, <https://doi.org/10.33137/mt.v7i2.33699>.

¹⁸⁹ Parikka, *A Geology of Media*, 5.

realism to rethink the nature of matter, and, importantly, the annihilation of the annihilation of space and time.

Thinking about oil as media means thinking about the space and time—the spacetime—of oil, and how it matters. Where and how it moves, at different scales. What it does and how it does what it does. How oil produces “us”, what Brett Bloom calls “petro-subjectivity.”¹⁹⁰ What activities persist and what information is mobilized. And, how the infrastructures that mobilize oil, produce it as a mobilizing force. Thinking about an agential realist media materialism of oil recognizes that oil creates new space along the path it takes, or rather, the path it co-constitutes. Oil enacts what Peters calls “conditions for existence” in more than representational ways.¹⁹¹

By limiting the consideration of oil to a fossil fuel it ignores the in between, the journey, and the always ongoing metamorphosis, through/with space/time. By transporting oil in a pipeline, it becomes a transportable staple by which oil standards are established, qualities and grades are defined, as are oil infrastructures standardized effecting micro

¹⁹⁰ Bloom, *Petro-Subjectivity: De-Industrializing Our Sense of Self*; Bloom develops his argument through linguist George Lakoff. See: George Lakoff, *Metaphors We Live By* (Chicago: University of Chicago Press, 1980).

¹⁹¹ Peters, *The Marvelous Clouds*, epub 32.

and macro environments. By distilling paraffine for lamp fuel oil becomes a staple whose attribute is defined by mutability effecting domestic visual (lighting) and atmospheric (olfactory) experience. But not only this, limiting the conception of oil ignores the way oil standardizes and actualizes a sense of how things are and how they are known. If oil is fuel, the conditions of its creation do not matter, only that it is available for use. Oil persists as a material that effects the world in ways that exceed its anthropocentrically defined resource status. Thinking about oil as media means thinking about the way that it reconfigures and is reconfigured by the things it encounters, including—and particularly—the conditions that constitute its own representation—the dynamic spacetime mattering of oil.

However, if I am to be truthful to a posthumanist account of oil and media, indeed, oil as media, then these notions of time and space, so critical to media theory, need to be examined. In the introduction, I briefly summarized Barad's notion of posthumanism, which "doesn't presume the separateness of any-'thing,' let alone the alleged spatial, ontological, and epistemological distinction that sets humans apart."¹⁹² Conventional media,

¹⁹² Barad, *Meeting the Universe Halfway*, 136.

what might be described as mass media (film, radio, television, the internet, etc.) are granted a certain persistence in time. The moving image, the study of cinema, from which many media studies frameworks emerge (perhaps erroneously), are largely focused on the mediation of meaning through time by image or sound. McLuhan established the “change of scale or pace or pattern that [media or technology] introduces into human affairs” as the basis for the modern study of media. The mediation of technology in society is expressed in this way. The medium is the message; the mediation depends on the medium. The message is the matter.

To better understand the way that media exceeds representational notions of the human, Barad’s agential realism is an important theory to think-with new media theories. The mediating apparatus of media studies has relied on particular ideas of the practices of representation through which particular representations of mediation, time, and space are enacted. Barad’s non-representationalist approach (re)configures representations differently. Just as Carolyn Marvin and McLuhan discuss the way electricity brought about a new paradigm of media-cultural awareness, agential realism introduces an onto-epistemological rupture into the infrastructures of media-imagining.

Parikka shows the pathway for this argument. In the introduction to *A Geology of Media*, Parikka describes what he means by media materialism:

Media materialism refers to the necessity to analyze media technologies as something that are irreducible to what we think of them or even how we use them. It has come to refer to technology as an active agent in the ontological and epistemological sense. In other words, media structure how things are in the world and how things are known in the world.¹⁹³

Parikka's description of media materiality opens the door to think-with the agential realist conception of the apparatus and that of differentiation in media theory.¹⁹⁴ On its own, the description does not work beyond an anthropomorphized sense of how things are per se, but at the core of Parikka's project is a notion of the geologic, "a different sort of temporal and spatial materialism" beyond Friedrich Kittler, that embraces Peters cosmological axis of space and time, in some ways familiar to Innis and

¹⁹³ Parikka, *A Geology of Media*, 1.

¹⁹⁴ The idea of media structuring how things are and how they are known has been expressed before: it might have its roots in Stuart Hall's concept of encoding and decoding in television and in his later work on representations; In *Always Already New Media*, Lisa Gitelman speaks to the importance of media in describing previous media; and John Durham Peters points out that Kittler saw media as "world-enabling infrastructures." Stuart Hall, *Encoding and Decoding in the Television Discourse* (University of Birmingham, 1973), <http://epapers.bham.ac.uk/2962/>; Friedrich A. Kittler, *Discourse Networks 1800/1900* (Stanford, Calif: Stanford University Press, 1990); Gitelman, *Always Already New*; Peters, *The Marvelous Clouds* epub 37.

McLuhan.¹⁹⁵ These commitments secure a foundation for a media materialism that does not presume the materials of media have meaning prior to their representation through the media apparatuses they construct. It distinguishes from what others have argued are “the mediating properties of ecologies themselves” (Starosielski and Janet Walker), or matter as medium (Bernd Herzogenrath), fruitful as these might be, while refiguring oil and/as media.¹⁹⁶

In a blogpost in 2009, Parikka briefly took up the idea of a “new apparatus theory of media” through agential realism:

In this context, Barad produces this six-part summary of what apparatuses are – especially in the context of physical measurements and laboratory work but something I would suggest you to read as media theory as well. In other words, replace in the text below quoted from Barad (*Meeting the Universe Halfway*, 2007, p. 146) every word “apparatus” with “media” – I find it a very good and material-dynamic way to understand the ontology of media technologies.

1) apparatuses are specific material-discursive practices (they are not merely laboratory setups that embody human concepts and take measurements); 2) apparatuses produce differences that matter – they are boundary-making practices that are formative of matter and

¹⁹⁵ Parikka, 3.

¹⁹⁶ Nicole Starosielski and Janet Walker, eds., *Sustainable Media: Critical Approaches to Media and Environment* (New York: Routledge, 2016), 1; Bernd Herzogenrath, *Media Matter: The Materiality of Media, Matter as Medium* (New York: Bloomsbury Academic, 2015).

meaning, productive of, and part of, the phenomena produced; 3) apparatuses are material configurations/dynamic reconfigurings of the world; 4) apparatuses are themselves phenomena (constituted and dynamically reconstituted as part of the ongoing intra-activity of the world); 5) apparatuses have no intrinsic boundaries but are open-ended practices; and 6) apparatuses are not located in the world but are material configurations and reconfigurings of the world that re(con)figure spatiality and temporality as well as (the traditional notion of) dynamics (i.e. they do not exist as static structures, nor do they merely unfold or evolve in space and time).¹⁹⁷

It is unsurprising that Parikka took up such an endeavor. *A Geology of Media* builds upon the not-quite media archeological approach to media materiality attributed to Kittler. This tradition of media theory embraced a posthumanist perspective that granted agency to the materials of media production which are implicated in the production of what Kittler called the “so-called Man.” Parikka’s attention to what he calls medianatures in the materialization of digital culture links together the naturecultural work of feminist science studies philosophers, including Donna Haraway and Barad.¹⁹⁸ The blog post is a convenient and concise summary, but, it leaves out what I think is a key explanation of the apparatus: “the material conditions of possibility and impossibility of mattering; they enact what

¹⁹⁷ Parikka, “Apparatus Theory of Media á La (or in the Wake of) Karen Barad.”

¹⁹⁸ Parikka, *A Geology of Media*, 13.

matters and what is excluded from mattering."¹⁹⁹ In media theory, this emphasis on (im)possibilities should sound familiar. "Media," Kittler famously said, "determine our situation."²⁰⁰ Except Barad's notion of the apparatus goes beyond the ontological specificity of human-centered technical practices (or even those of so-called man). Taking up Parikka's suggestion: *media are the material conditions of possibility and impossibility of mattering*. This is a working starting point for an agential realist media theory. The theory builds upon the summary of agential realism that I provided in the introduction.

This notion of the apparatus shares resemblance to Parikka's notion of media materialism. They both argue that the representation of something is mutually enacted by the technical conditions required to (re)present it. In addition to Parikka's suggestion that "apparatus" be replaced with "media," the material-dynamic nature of agential realism encourages replacing "mediation" with "differentiation." This is not an insignificant shift. Mediation, which implies predetermined categories of

¹⁹⁹ Barad, *Meeting the Universe Halfway*, 148.

²⁰⁰ Friedrich A. Kittler, *Gramophone, Film, Typewriter*, Writing Science (Stanford, Calif: Stanford University Press, 1999), xxxix.

what mediates and what has agency to be mediated, originates from a specific inheritance of humanist values in contemporary thought. Even as the boundaries of media theory continue to be stretched, mediation remains a central concept. In fact, Stephanie LeMenager has written about the mediating effects of oil on culture. "The objects derived from petroleum that mediate our relationship, as humans, to other humans, to other life, and to things... We experience ourselves, as moderns and most especially as modern Americans every day in oil, living within oil, breathing it and registering it with our senses."²⁰¹ Some cultural theorists have taken up oil as subject of great importance.²⁰²

Parikka is not the only media theorist to take up agential realism. In *Molecular Red: Theory for the Anthropocene*, media theorist McKenzie Wark explores it as a potential Tektology, a unifying technosocial theory.

²⁰¹ Stephanie LeMenager, *Living Oil: Petroleum Culture in the American Century* (Oxford University Press, 2014), 6.

²⁰² Much of the work on oil however has come from the field of political economy and literature. As a result, there has not been significant consideration the role of mediation in creating essentialized anthropocentric space and time, subject and object relations that define how things are and how they are known. See: Szeman and Boyer, *Energy Humanities: An Anthology*; Imre Szeman, Sheena Wilson, and Adam Carlson, eds., *Petrocultures: Oil, Politics, and Culture* (Montreal; Kingston; London; Chicago: McGill-Queen's University Press, 2017); Malm, *Fossil Capital*; Mitchell, *Carbon Democracy*; Huber, *Lifeblood*.

Wark says, "Particularly troubling for such realisms are mediating phenomena. Something has to go on at the boundary between the object world and subjective cognition."²⁰³ Wark is one of just a few theorists attentive to the productive potential of an agential realist media theory. As the following example will illustrate, however, by assuming a pre-existing object world and subjective cognition, they too do not escape the essentialism of mediation that relies on a prior given notion of object and subject. "An alternative starting point," Wark suggests, "might be to take the mediation, the stuff between the object and subject, to be what at first glance or grasp is most real."²⁰⁴ It is an interesting proposition: the real is always already the metamorphosis itself. Isn't this the classic definition of media—*in media res*—an in-between? The real *is* media. But, as agential realism shows, there is no prior "real." From what (whose?) vantage point with/in an apparatus is the "real" real measured? Which apparatus? Why? On what authority? Even as the move constructs fluid subject object

²⁰³ McKenzie Wark, *Molecular Red: Theory for the Anthropocene* (London: Verso, 2015), epub 226.

²⁰⁴ Wark, epub 226.

conditions, the reliance on ontologically determinate subjects and objects fails to materialize the dynamic nature of differentiation.

Mediation requires that subjects and objects have inherent characteristics (including determinate spatial and temporal attributes) that exist prior to the conditions that are mediated. Intra-action shows that no such relations exist. Rather, at each agential cut—with/in so-called mediation—the phenomenon that the apparatus enacts is a distinct differentiation/differentiating intra-actively co-constituted.

Agential realism reconsiders space-time relations which have oriented so much techno-scientific subject/object distinctions within media theoretical debates. Space and time are not pre-existing phenomena that are filled by the activities of specific humans. Space and time as isolated, differentiated phenomena, fail to express their mutually enacted, non-representational, becoming. Agential realism offers a way to see not only media, but life itself (of which media is an ontologically inseparable dynamic component of) as an ongoing material-discursive performance of differentiation. What is meant by mediation—that something is changed, in time, through media technology (however broadly imagined), and thus the experience (by whom? one might ask), is a representation of a “real” thing

which exists independently elsewhere in space or prior in time—relies on the humanist space-time axis. A mediated thing, in its intra-active becoming, is technosocially enacted differentiation. Mediation is a specific intra-action, but the process of mediation is not immaterial. It does not describe the change of a prior thing into its representation, but rather describes a dynamic material becoming of a specific phenomenon. The categories of “representation” and of “real” produced by mediation are artifacts of the metaphysics of individualism.

Media theorists Joanna Zylińska and Sarah Kember argue that mediation is a vital life process. “We want to outline a new framework for thinking about ethics with regard to media technological issues, where the agency of ethical subjects and objects is still to be determined, and where there are no predefined fixed values to be applied or drawn on.”²⁰⁵ They continue, “...the notion of mediation we are using here positions media not just as a series of objects (computer, iPad) or broadcasting practices (TV, radio, the internet), but first of all as dynamic process of emergence in time, and of our coemergence *with* media. This co-constitutive aspect of

²⁰⁵ Sarah Kember and Joanna Zylińska, *Life after New Media: Mediation as a Vital Process* (Cambridge, MA: MIT Press, 2012), 154.

mediation opens it to a different ethical framework: that of intra-action and mutual becoming.²⁰⁶ They sustain mediation as dynamical process of emergence. Theirs is a move to understand mediation as an ongoing process of specific cuts entangled with myriad technosocial practices.

My argument takes a different route, that intra-action, (the ontological inseparability of objects and agencies) *is* media. Even their expanded conception of media as a *dynamic process of emergence in time*, remains tethered to an essential distinction between mediating relations and other relations which should not be assumed and are not given. I propose moving away from mediation altogether because it concretely depends on a notion of space and time (and object and subject) as preexisting conditions with preexisting values: a naturalized or given system of representation. At the very start to the preface of *Meeting the Universe Halfway*, Barad argues against emergence for this very reason, it presupposes a centralized temporality, something of a problem for mediation.

Individuals do not preexist their interactions; rather, individuals emerge through and as a part of their entangled intra-relating. Which is not to say that emergence happens once and for all, as an event or as a

²⁰⁶ Kember and Zylinska, 155.

process that takes place according to some external measure of space and of time, but rather that time and space, like matter and meaning, come into existence, are iteratively reconfigured through each intra-action, thereby making it impossible to differentiate in any absolute sense between creation and renewal, beginning and returning, continuity and discontinuity, here and there, past and future.²⁰⁷

As an event, mediation is already bound within the specific practices of representing that are intra-actively enacted. Mediation is a specific kind of differentiation, one that is historically difficult for modern humans to index because it crosses a logocentric axis of orientation: matter and meaning. Kember and Zylinska make a similar observation: "However, we have to bear in mind that the process of mediation is also a process of differentiation; it is a historically and culturally significant process of the temporal stabilization of mediation into discrete objects and formations."²⁰⁸ But, the tethering of mediation to time—a fulcrum of their conception of mediation—continues to be its weak point. They argue, "...although media constitute differences in degree that should not be elided under any overarching concept, mediation nevertheless constitutes a difference in kind. It cannot be isolated and hence stabilized in any straight-forward

²⁰⁷ Barad, *Meeting the Universe Halfway*, ix.

²⁰⁸ Kember and Zylinska, xvi.

manner because its mode is fundamentally that of time."²⁰⁹ This position offers a different way to treat mediating conditions, indeed, a new media theory of life, but it does not account for the differential reconfigurations of the very mode it relies on—time.

Precisely because media structures how things are and how they are known (for humans and non-humans), as Parikka suggests, the entanglement of being and meaning is always already present in media. Media are conditions that enact material/concepts. But the boundaries that characterize what is a mediating process and what is a process of differentiation relies on historical precedents for what constitutes media. Since media both create and determine what can be known (like oil, like an apparatus), matter and meaning are mutually constituted. Agential realism provides the tools to address this. Wark says as much,

Any particular apparatus makes a particular cut. The real is not observation-independent nature nor does it collapse back into the cultural. The real is a phenomena that the apparatus produces. An apparatus is not an idea; it is *techne*, a *media*.²¹⁰

²⁰⁹ Kember and Zylińska, 3.

²¹⁰ Wark, *Molecular Red*, epub 282.

The real continues to be a problematic formulation in Wark's account, but this is another building block in the agential realist media theory: an apparatus, whether it is the internet or it is oil, is *techne*, a technical practice, media. The notion that specific conditions of existence are technically enacted with/through a technical apparatus—whether the apparatus constitutes the hardware and software of the internet or the viscous earthy substance of oil—is a process of intra-active differentiation. The mediation of specific conditions are in actuality differentiation, because it exceeds the possibility of mediation; because its technical production (the craft) is intra-action, a cutting together/apart of determinate entities, co-constituting more than subject object relations with more than spacetime conditions.

If it is difficult to determine why this theoretical perspective matters, here is the crucial point: mediation constrains the possibility of entities and events to preexisting concepts of media, dependent on predetermined representationalist conceptions of time, space, subject, and object. In other words, with mediation, new effects of change between things is not possible, they will always be represented by classical concepts of media that themselves are built upon other essentialized ideas. Intra-active

differentiation, however, opens up the possibility of what is differentially enacted and how that relates to how things are and how they are known. Intra-action describes the infrastructures of differentiation and the apparatus describes the conditions by which knowing becomes phenomena—a technical craft, *techne*, that is not ontologically determinate by humans. Importantly, media do not require ontologically determinate agencies, objects, or phenomena to be media.

As I've shown, some media theorists have explored agential realism and its potential impacts for media. For Wark (like Parikka), a Baradian media theory is found in the apparatus. Kember and Zylynska build a theory of media around Henri Bergson's vitalist philosophy; they are writing in a context of media (or new media) art.²¹¹ Kember and Zylynska are concerned with photography as means to explore the cut of a lively notion of mediation. For Kember and Zylynska theirs is a theory of mediation, in which

²¹¹ Mark B. Hansen has also considered performativity as a media theory in a way that could be read with the relational ontology of agential realism. Hansen is interested in the affective transformation of body as enframer of new media art. Hansen reconsiders philosopher Henri Bergson's theory of perception. Specifically, he provides a new media framework to Bergson's idea of the body as "a center of indetermination within an acentered universe." Mark B. N. Hansen, *New Philosophy for a New Media* (Cambridge, Mass: MIT Press, 2004), 2.

mediation is understood separately from the “media” of technical media objects. As a theory of mediation, new media is a theory of the differentiation of life. Kember and Zylynska take a Heideggerian approach in their rearticulation of media as a set of dynamic processes of mediation. Specifically, theorizing media in this way is a method to discuss becoming-with the technological world. Parikka is quick to acknowledge that he opts for the Kittlerian route of media materiality in his pursuit of elemental media, recognizing that Heidegger could nonetheless be a route to take. In so doing, Parikka adopts new materialist approaches influenced by Barad that entangle ethico-onto-epistem-ological conditions of media.

Richard Grusin, who has written prolifically on the subject of mediation, proposes a variant of mediation closer to that of differentiation. In a recent essay, titled “Radical Mediation,” he builds upon his own previous ideas of remediation and premeditation, that expands Kember and Zylynska’s vital mediation.²¹² Grusin derives this term from William James’s *Essays in Radical Empiricism* and critiques the dualism of what he

²¹² Richard Grusin, “Radical Mediation,” *Critical Inquiry* 42, no. 1 (2015): 124–48.

calls the “nonhuman turn” in the Western philosophical tradition.²¹³ Grusin says,

By now it should be clear that the concept of mediation, as developed in the history of Western thought, depends upon stable dichotomies like those between subject and object, representation and reality, or human and nonhuman, as a starting point. I contend, however, that such dichotomies are instead outcomes of mediation, not its source, and that we need therefore to start in the middle, with radical mediation. But if mediation has historically been tied to representationalism and dualism, why insist upon retaining the concept rather than simply deploy as needed, for example, Whitehead’s idea of prehension or occasions of experience, Simondon’s notions of individuation or transduction, or Barad’s concept of agential realism and intra-action?²¹⁴

Grusin seeks to retain mediation as a concept of a process that challenges the dualism of representationalism. He argues the concept of mediation is necessary precisely because of its historical power in Western thought, only it must be refashioned as a creative and ontogenetic process.

Agential realism specifically offers a move away from media’s reliance on ontologically determinate distinctions between time and space, subject and object—a posthumanist performative media. This is a powerful move that showcases the rippling effect of assumptions that arise when

²¹³ Grusin, 126.

²¹⁴ Grusin, 143.

descriptions of reality are taken to be more than representations. Barad reminds us, "Is it not, after all, the common-sense view of representationalism—the belief that representations serve a mediating function between knower and known—that displays a deep mistrust of matter, holding it off at a distance, figuring it as passive, immutable, and mute, in need of the mark of an external force like culture or history to complete it?"²¹⁵ I do not mean to suggest that time and space are not components of media practices, they certainly are. But, towards an expanded understanding of what media practices are—and who/what do them—it is imperative that such elemental assumptions of media do not fall into the background as naturalized atmosphere.

Space and time are such foundational concepts of media debates, they are rarely scrutinized. They are representational measurements that index a world. They are descriptions of existence, not transcendental attributes, and they are reconfigured in relation to the conditions in which they are enacted, as media scholarship has shown. There is no unified experience of time, beyond governing standardizations. Naturalizing such

²¹⁵ Barad, *Meeting the Universe Halfway*, 133.

standardizations secures the possibility of mediation. The fact that moderns believe time is a naturalized phenomenon of the cosmos illustrates just how effective a governing principle it is. Assuming unified time and space, between materials, species-beings, and other cosmological becomings—including the human machine relations which compose these measurements or non-Western spacetimes—promotes a Western anthropocentric conception of media.

Field Notes 1925: Living on the Greenwich Meridian

WhatsApp: All is good and everything is going on well!

Time is a matter of space.

Clocks show an origin in the non polar regions of the planet—that is, non extreme latitudes. At the poles, clocks do not work as we would expect. First, time zones lose their meanings at the poles, where all longitude lines converge. You have your pick of time zones: twenty-four possible frames of reference... At the poles the day, as a single cycle of light and darkness, coincides with the year... The abbreviation a.m. stands for “ante meridian,” and p.m. means “post meridian”; our division of the day corresponds to east and west (Peters, Loc 3723).

The word clock derives from the Latin cloca (source of the French cloche and the German Glocke), all of which mean bell (Loc 3925).

Sitting in a room in Northern Ghana, Greenwich Mean Time is a link to the colonial north. Grounded in spacetime by a history of maritime chronometers—measuring the duration between two distances to determine longitude, quantifying space to determine time, so as to be located in space—this small town, lies on the axis of Coordinated Universal Time.

GMT time has carried a number of ambiguities. Astronomically speaking, noon was the zero hour of the day, following the Julian Calendar. For centuries, astronomers were the keepers of time. This system was maintained so that nighttime astronomical observations could be kept under the same day unit. On 1 January, 1925, the Roman Empire standard of midnight as the zero hour of the day was adopted for astronomical activity. “The instant that was designated “December 31.5 GMT” in 1924 almanacs became “January 1.0 GMT” in 1925 almanacs.” Referring to a day—or a specific interval of measured duration that has been granted the container “day”—as an “instant” is curious indeed. It breaks from the standardized vocabulary of earth rotations as western-human naturalized phenomena. In anywise, another erasure of time by space(measurement).

Between northern Ghana and the Royal Observatory in Greenwich, London, there is, longitudinally: Burkina Faso, Mali, Algeria, Morocco, Spain, France, and finally England. Algeria, Morocco, Spain, and France are not a part of GMT. Also, GMT is UTC (Coordinated Universal Time), now. Space is the conquest of time-by-space.

Solar time was a fundamental measurement for time. Due to the queer axis and orbit of earth, however, solar time is not a synchronized time. The first Coordinated Universal Time was informally adopted on 1 January 1960 and was first officially adopted as CCIR Recommendation 374, Standard-Frequency and Time-Signal Emissions, in 1963 (McCarthy 2009). Here again, this question of standardization. What does it mean for time—already a matter of standardization—to be synchronized?

Technologies of communication annihilate space and time. This is part of Wolfgang Schivelbusch’s argument of railroad time. Synchronization simultaneously materially connects and evaporates disparate locations. The language of location is itself a byproduct of the system of measurements that bring about the geographic infrastructure for doing standardizing work. Technologies of movement must already exist for such needs to arise: such as the British maritime industry.

Location is itself a queer matter. Location is a metaphor of orientation, but a fluid one. Something can be said to be located in space or time. But, before praising its potential, location also maintains a standardization of spacetime metaphors. What is outside location? There is a practical answer to this, which should provide enlightenment towards other means: that which is not measured.

Sitting in this room in Northern Ghana—where the word saha means both “time” and “luck” in the local dialect Dagbani—time does not feel linked to its colonial master. Saha is not a slave to the Royal Observatory, or trigonometric measurements of longitudinal angles.

*WhatsApp: To have “Saha” is to have “good luck”
One can also say my saha is up... meaning my time is up.*

Northern Ghanaians are really out of saha. They could use more luck and more time. But, time is not a matter of care in northern Ghana. At times this is a matter of consternation for others. UTC has been grafted onto this earthspace so that others can come and go in synchronous orbit with the happenings of the planet. But northern Ghanaians do not come and go. The internet, however, has reached them. A network enabled by atomic time, the measurement calculation for UTC. As of 2016, International Atomic Time (TAI) is 37 seconds ahead of UTC, accounting for 27 leap seconds since 1972. TAI is created from the average of 400 atomic clocks.

Atomic clocks are made from caesium, a metal with a melting point around room temperature. Caesium-based atomic clocks use the electromagnetic transitions in the hyperfine structure of caesium-133 atoms as a reference point. Caesium clocks are regarded as the most accurate realization of a unit that mankind has yet achieved.

Currently, the largest use of nonradioactive caesium is in caesium formate drilling fluids for the oil extraction industry.

Three. What is a Cut? When in Media?

Barad's conception of performativity replaces representationalism to challenge language (or discourse) as a mediating force of ontologically determinate entities, in favor of practices and doings. In contrast to the Cartesian cut which assumes distinction between subject and object, "the agential cut enacts a resolution *within* the phenomenon of the inherent ontological (and semantic) indeterminacy... Crucially then, intra-action enacts *agential separability*—the condition of exteriority within phenomena."²¹⁶ An agential cut is a cutting together/apart with/in an apparatus; it is a stabilization of dynamic becoming that temporarily differentiates inside and outside from within. Kimber and Zylinska build their theory of life around agential realism, but in their focus to maintain contact with historical theories of media (humanist technical practices), they produce a new theory for mediation, rather than theorizing beyond mediation, as I suggest.

As the event of mediation is, like time (or, indeed, life itself), both invisible and indivisible, any attempt at its representation must ultimately fail... Rather, we are interested in foregrounding the productive and performative aspect of photographic acts and

²¹⁶ Barad, 140.

practices that are intrinsic to the taking or making of a picture. With a view to this, we propose to understand photography as an active practice of cutting through the flow of mediation, where the cut operates on a number of levels: perceptive, material, technical, and conceptual. The recurrent moment of the cut—one we encounter not just in photography but also in film making, sculpture, writing, or, indeed, any other technical practice that involves transforming matter—will be posited by us as both a technique (an ontological entity encapsulating something that *is*, or something that *is taking place*) and an ethical imperative (as expressed by the command: “Cut!”)... if we must inevitably cut, and if the cut functions as an intrinsic component of any creative artistic, and especially photographic practice... then what does it mean to *cut well*?²¹⁷

There are a couple problematic aspects of this idea that do not actualize the potential of agential realism, or more precisely, do not convey the possibilities of an agential realist media theory. First, although photography is refashioned as an active process, their articulation of flow as a distinct entity that can be cut into by the artists but maintain separability from the intra-active reconfigurations does not fully incorporate the material-discursive conditions at work. It implies (incorrectly) that they have the agency to define the boundaries of the concept of flow, so crucial to their articulation of mediation and time. Second, while the intent to cut well is a noble undertaking, it pulls back the notion of the cut into a familiar

²¹⁷ Kember and Zylinska, *Life after New Media*, 71.

humanist, possibly representationalist framework. Apparatuses enact agential cuts; they are boundary-making practices. If “we” are making the cut, the cut is also making “us.” Cutting well is not a concept that exists independently of such boundary-making practices. “Agency,” Barad says, “is not an attribute but the ongoing reconfigurings of the world.”²¹⁸ Is there such an imperative; must “we” cut? This suggests some prior agency outside of the apparatus that enacts such conditions and as Barad suggests, “The world articulates itself differently.”²¹⁹ Knowing, agency, and becoming do not occur in the way that this imperative suggests—even if the intent is an ethical one (and recognizing that it corresponds to actualized artmaking practices) by Kember and Zylinska.

What I’d like to argue is that to match their intent with practice, the practice must also work beyond representationalism. More broadly, the dynamics of the agential cut can be said in the reverse, representationalism produces separation; separation is a differential component of representationalism, not an essential attribute of being. The very idea of mediation depends on the ontological distinction of representationalism.

²¹⁸ Barad, 141.

²¹⁹ Barad, 149.

Field Notes 1000: Life-Forms—On Information

Sketches of an idea while watching a river of oil flow down a mountain wilderness:

This word information needs to be addressed. What is information? Perhaps, in a way commensurate with Star's famous proposition—when is infrastructure?—the wrong question has been proposed. Instead, when is information? Star says the metaphor of invisible, functioning infrastructure is wrong. Infrastructure is fundamentally relational (Star, 1996). Something becomes infrastructure in relation to certain practices. So, when is an infrastructure is the important question. What if the same question were put to information? By information, I mean something very simple: shared change, an event of relations. By asking when is information, I mean to ask: when is shared change occurring? This question is important, because in shared change, there are media, and shared change occurs across much more than human relations.

Part of the power of theorizing oil as media is it problematizes binary figures which imply a divide between nature and culture, organic and technologic. The modern techno-logic subverts this word information to mean an aggregating of a situation towards the reification of its constituent parts into consumable data. The body has become information, the internet of things is itself a domain of smart objects deploying the information they consume towards producing better consumer-users. The right to opacity is real; apprehensions surrounding the idea of information are appropriate.

I want to position this word—information—amidst a different ecology. This is not a plea for embracing the word as the best representation of all things. Information can be a form of colonization—of the body, of the quantified-self, of one's habits, privacy...But rather, that it might be the most suitable label for working towards a nuanced recognition that material differentiation articulates the world intra-actively. Importantly, the change that this entails does different things, whether it is analog, digital, synthetic, organic, physical, electromagnetic, chemical, etc. In this case, "does different things" is by all practical measures what an internet-using human describes when they say information. This is not so different from Gregory Bateson's famous definition of information: "a difference which makes a difference."

*There are important domains of scholarship exploring and critiquing the technological and ecological consequences of the Anthropocene. What is interesting is that some of these disciplines are pursuing very similar theoretical circumstances—challenging the life/non-life binary for example (multi-species agency and artificial intelligence, for example), which has the power for a major eruption of new principles and standardizations of life practices—yet, they remain opposed to each other because of certain deeply rooted commitments towards techno-fetishism on the one hand and essentializing tradition on the other, that remain under examined. Benjamin Bratton and Elizabeth Povinelli become two particular examples. Bratton's speculative design theories proposed in *The Stack: On Software and Sovereignty* and to some extent the conditions set forward by his colleague at the Strelka Institute, Keller Easterling in her conceptualization of disposition, produces not incompatible opportunities to what Povinelli suggests in her work *Geontologies: A requiem for Late Liberalism*. Povinelli proposes the carbon imaginary, which figures life status boundaries occurring at a certain discursive threshold. Her many-years long ethnographic work with the Karrabing Film Collective an aboriginal group in Australia, which leads to certain observations that the etches of grass giving way underfoot, materializing a pathway, becomes a life expression of the grass—a medium design, of sorts, in Easterling's language. Each takes seriously thinking-with an ecology of forms of life.*

Life forms. That is a complete sentence. I'm interested in the double meaning of this phrase as a proposal for information. Life forms are forms of life and life, itself—as an imperative—forms. Philosopher A.N. Whitehead said that "life and process presuppose each other." Here again lies the hidden trap of potential binary reductive thinking. The goal, I think, is to see life and process removed from their analytic conditions that Whitehead places on them. Life always already exceeds the indexing that the

concept (the intra-active apparatus) of information grafts onto it. But, and this is a crucial but, that doesn't mean that a concept that "stuff does different things," as I suggested earlier, requires categorical distinctions between prosthetic-technologic conditions of exchange (which appear to be mediated in some way) and natural-organic conditions of exchange (which appear not to be mediated in some way). Yet, the citational practices differentiating these separate posthumanist disciplines (of Bratton and Povinelli) remain in separate silos.

Donna Haraway's ironic myth of the cyborg (and her subsequent commitments to staying with the trouble) is one proposal that has mutually composted these techno-social binaries towards similar material-semiotic roots. There are critical reasons to resist technological infrastructure and their mindsets, and many of the anthropologists mining transformative concepts of worlding are attentive to the violence due to certain technological practices generally directed at indigenous populations, environments, and increasingly middle-class populations. Such techno-tropes often masquerade under the benevolent eye of technologies of progress but have mostly brought a destruction of their worlds. Oil drilling, of course, is a central culprit here, but extractive logics have come at the cost of toxic inscription onto/into the bodies of indigenous humans and indigenous lands. There are, in other words, real reasons why information becomes a concrete colonizing domain.

And yet, information does not need to prefigure an essential, naturalized, receiver—let alone a human one. Historical models of information, which have played a role in shaping different media theories, specifically the Shannon-Weaver model, propose a system composed, in its simplest form, of a transmitter, signal, and a receiver. There are certain philosophical questions at stake here. Marshall McLuhan's oft repeated axiom, "the medium is the message." Does not do away with the signal/content duality, but it does begin a larger conversation that moved media theory away from structuralist theories towards post-structuralist theories. Media are environments, says McLuhan, which does suggest that mediums predetermine space in certain path-dependent ways. The life encounters co-constituted by radio, for example, are different than those brought about by print media, including all the affordances of being-with those mediums and the spaces in which they occur, the speeds, materials, and errors they embody. Contemporary technology design theorists such as Bratton, say "platforms are what platforms do." This is a helpful step regarding what information is and for whom it is legible. The philosophical implications are ontological: what is a receiver? Is it nothing more than radio equipment calibrated to receive certain frequencies of the electromagnetic spectrum? Sunlight is part of the electromagnetic spectrum, but a plant receiving sunlight is not thought of as information. Why not? When is information?

But sunlight is information, only its receiver is not human. Humans are actually very much receivers of sunlight, among the entire planet Earth, but scientific discourses have indexed sun light amidst a different category, even as optical media, lighthouses, lightbulbs, the internet are all media based in light. Sunlight is a far more important sort of information than is first recognized. Oil is made from sunlight. As an agent of medium design, sunlight shapes the ecology of earth. Photosynthesis transforms light into sugars toward the persistence of existence. Here, the question emerges again, what is a receiver? Shannon's model is important because it has informed the idea of information transmission for much of post-industrial technological development and telecommunications particularly. However, it might not be as useful outside of the context of sending a signal on a wire. N. Katherine Hayles's "We have always been Posthuman" provided a critique of this model of information.

What determines a system of one kind to be an information system or an ecological system or, say, a digital network? This conversation verges into certain histories of cybernetics, already invoked by Shannon and Hayles. I want to acknowledge that there are important debates within cybernetics on information moving across synthetic and organic substrates, raised by Bateson and others. These conversations implicate the shared history of ecology and systems theory, particularly when considering the root of cybernetics Greek "kybernete", which translates to steersman, the governance of trajectory. However, I want to keep this conversation loosely grounded in media theory. I'm not interested in

technical differences here between different types of systems, but rather troubling onto-epistemological assumptions. In “A Thousand Years of Nonlinear History”, media theorist Manuel De Landa says:

Is it possible to go beyond metaphor and show that the genesis of both geological and social strata involves the same engineering diagram? Geological strata are created by means of (at least) two distinct operations. When one looks closely at the layers of rock in an exposed mountainside, one is struck by the observation that each layer contains further layers, each composed of pebbles that are nearly homogeneous with respect to size, shape, and chemical composition. Since pebbles do not come in standard sizes and shapes, some kind of sorting mechanism must be involved here, some specific device to take a multiplicity of pebbles of heterogeneous qualities and distribute them into more or less uniform layers.

Geologists have discovered one such mechanism: rivers acting as veritable hydraulic computers (or, at least, sorting machines). Rivers transport rocky materials from their point of origin (an eroding mountain) to the bottom of the ocean, where these materials accumulate. In the course of this process, pebbles of various size, weight, and shape react differently to the water transporting them. Some are so small they dissolve in the water; some are larger and are carried in suspension; even larger stones move by jumping back and forth from the riverbed to the streaming water, while the largest ones are moved by traction as they roll along the bottom toward their destination. The intensity of the river flow (i.e., its speed and other intensities, such as temperature or clay saturation) also determines the outcome, since a large pebble that could only be rolled by a moderate current may be transported in suspension by a powerful eddy. (Since there is feedback between pebble properties and flow properties, as well as between the river and its bed, the “sorting computer” is clearly a highly nonlinear dynamical system.)

*De Landa opens our thinking to a river as information system—think Oil Creek in 1859. However, his commitment to the absolute and essential quality of a river or hydraulic computer as a specific thing irrespective of its user, of its intra-activity, requires address. New media theorist Jussi Parikka proposes medianatures (in the lineage of Haraway’s naturecultures) as a way of accounting for the materials off/off the ground that are made of and make up human media-information systems. Still though, this discussion is grounded in western-scientific indexing of particular material-semiotics. Which brings us back to that earlier question, when is information? Parikka proposes a theory of dust as media, which “...takes us -- and our thinking -- to different places and opens up multiple agendas. In this case, [Parikka uses] dust to talk of global labor, media materialism of digital culture, and how to approach this topic through such non-human nanoparticles.” This move perceives dust as being information, not analogues to it. Dust as information drives attention to the ways dust actualizes different events, not as a correlation to a flower sifter, or some other metaphorical equivalent to the dust specific hydraulic computer, but rather as an element of the earth with outcomes that exceed human material-semiotic logics. Likewise, Tung-Hui Hu discusses the dust of toxic metals in his work, *A Prehistory of the Cloud*. “A new \$1.5 billion fiber-optic cable across the Arctic will shave between twenty and sixty milliseconds off the route from Tokyo to London for stock market traders, but the toxic metals used in their electronics inevitably end back up in the bodies of laborers manning poorly regulated disassembly plants in China.”*

Dust functions as both the residue of the old and a harbinger of change. Dust is not only a thing, it is also an atmosphere; it envelops and it acclimatizes. In this way, thinking-with dust as media reveals the impacts which evade conventional analysis. The conventions of instruments of observation (the practices of representation) of dust foreclose certain awareness of dust activities.

Shannon Mattern’s excellent history of field guides in the 18th century, during the onset of the popularization of natural sciences driven by new enlightenment thinking, provides concrete examples of the stakes of observer-specific measurement indexing. “The craze reached its height, as ours does,” she says, “with a most protean subject: clouds.” Mattern attributes Roger Troy Peterson’s 1934 “A Field Guide to the Birds” for standardizing the next phase of casual observation of the natural sciences into a form of trained sight.

One must learn to read the field guide “against the messiness of reality,” naturalist Helen MacDonald advises; the guide itself can’t be “messy,”

To cultivate that literacy, field guides since Petersen have promoted, “prescribed modes of looking” that atomize a specimen into recognizable parts, turn the identification into a checkmark on a list, and bracket out the larger ecology within which the encounter has taken place.

Does information exist abstracted from the conditions that produce it? The field guide, as a particular practice of representation, participates in the creation of the ensuing representation of nature, and in the particular practice/production of its user: the amateur naturalist. The difficulty of pinning down the information of nature and the nature of information is that all sides are ontologically determinate by their specific encounters (events of observation and the causal relations between sensing, being, knowing, and documenting). Nature emerges with the field guide, not through the field guide (as though the field guide reveals an indivisible truth about the world). Meaning nature is always naturecultural; there is no concept of nature separate from the practices of representation that perform it. In this way, the information of nature is an always unsettled matter. But the argument that oil is media does not derive from the perspective that practices of representation are conventional media (like field guides, photography, film, news, books, etc.) and that therefore oil only exists as products of representation. The nature of information as well exceeds any specific apparatus; there is always something else. The very mechanism of knowing what else is a cosmotechnical apparatus of information (without predetermining what is doing the knowing or what knowing amounts to). A river is information as the elements that make it up do different things, but it also functions as an apparatus as it intra-acts with/in a landscape, carving out pathways and providing materials for growth through dynamic performances of becoming.

Earth systems are not media information because they resemble media information apparatuses that are already legible to humans, earth systems are information because the cosmos is fundamentally a matter of exchange and that exchange is always already a material-discursive affair. No matter how an event is indexed, it is a phenomenal event of differentiation. The ongoing differentiation of the world is precisely an ongoing ecology of exchange. The outcome does not need to be legible by an “intelligent pattern,” or any such nonsense; life forms.

Four. Infrastructures of Differentiation. A Media Theory

Throughout this volume, I have taken introductory steps to formalize an agential realist media theory. Thinking-with intra-action, I argue media are infrastructures of differentiation; the conditions of existence that co-constitute phenomena and the conditions for understanding phenomena. Media are the practices that materialize and differentiate the world; as suggested earlier in the volume, they are the intra-active conditions of possibility and impossibility of mattering. Mass media are infrastructures of specific cultural legibility—interpreted as representations—thus they generally escape, in public, the scrutiny of their specific making. For example, the difference between film as a medium of inscription and video as a medium of transmission carries significance that eludes people who rely on them every day—most notably temporal delay, what others have called immediacy. But the ontological specificity of inscription (film) and transmission (video) mediums that are legible to humans (or even human-machine relations) is a bias in the history of media and technology. This bias limits the ways that the cosmos is represented and thus conceptualized, where agency exists, and what communication is. If media are the onto-

epistemological tools diffractively articulated through Parikka and Barad, they can combat some of the most toxic anthropocentric (and xenophobic) interpretations of life. Put differently and more importantly, if media are infrastructures of differentiation that structure how things are and how things are known, then structuring things—like oil—in the image of Western industrial humans is a form of representational colonialism.

Oil pipeline infrastructure draws attention to the perceived distinction between transmission and transportation. In a humanistic ontological sense, their differences are vague and dependent on other representational concepts. Instead of recreating the classical media binary of carrier wave and content—even if the content of a medium is another medium, as McLuhan argued—my argument moves beyond such classical media perspectives that fall short of accounting for the dynamic ongoing differentiation of oil.²²⁰ McLuhan's example of the effects of electric light continues to be helpful in considering the effects of oil.

The electric light escapes attention as a communication medium just because it has no "content." And this makes it an invaluable instance of how people fail to study media at all. For it is not till the electric light is used to spell out some brand name that it is noticed as a medium. Then it is not the light but the "content" (or what is really

²²⁰ McLuhan, *Understanding Media*.

another medium) that is noticed. The message of the electric light is like the message of electric power in industry, totally radical, pervasive, and decentralized. For electric light and power are spate from their uses, yet they eliminate time and space factors in human association exactly as do radio, telegraph, telephone, and TV, creating involvement in depth.²²¹

In "Sticky Media. Encounters with Oil through Imaginary Media

Archaeology", Naomie Gramlich also makes the argument that:

We have to rethink the presumed status of electricity as medium *a priori*. Instead of thinking his own dictum—a medium always contains another medium—radically through, McLuhan has determined electricity as "pure" and therefore as auto-referential, pre-existent and immaterial... If Oil as content of electricity flows through and undergrids phones, recorded music, computers, and the internet, concerned substantially with what counts as culture [sic], we have to speak in media studies instead of *the electric age about the age of fossil fuels*. So, isn't it time to consider oil as overlooked content of electricity...?²²²

Gramlich's effort to read oil as the media par excellence through classical media studies is a constructive introduction to how early media theory, including McLuhan and Innis, interpreted raw materials. My own earliest explorations of media materiality included this method of thought, as I discuss in the introduction. It also evokes the media-historical work on

²²¹ McLuhan, *Understanding Media*, 9.

²²² Gramlich, "Sticky Media. Encounters with Oil through Imaginary Media Archaeology," 5.

electricity by Carolyn Marvin. But, reading oil in this way does not embrace the intra-active co-constitution of medium and message, the differentiation, that troubles ontologically determinate conceptions of media so crucial to understanding how oil standardizes life practices. A discussion of transportation and transmission in oil pipelines offers a different ontological media tool.

Upon first glance, the differences between transmission and transportation are a matter of scale and speed (biases of space and time). For Peters, the ship remains the "*Grundmetapher*," the master metaphor that "reminds us of the ancient association of communication and transportation."²²³ Etymologically, the verb transport derives from the Old French *transporter* "carry or convey across," or directly from Latin *trans* (beyond, across) + *portare* (to carry).²²⁴ Whereas, transmit comes from Latin *transmittere*, "send across, cause to go across, transfer, pass on," from *trans*

²²³ Peters, *The Marvelous Clouds*, epub 170; in 2022, I was commissioned by the BALTIC Centre for Contemporary Art to write a speculative publication for Future Farmer's *Seed Journey* project, which mobilized the relationship between seeds, humans, and ships in a similar way, <https://baltic.art/whats-on/baltic-travelling-gallery-whats-for-tea>.

²²⁴ "Transport | Etymology, Origin and Meaning of Transport by Etymonline," accessed March 11, 2022, <https://www.etymonline.com/word/transport>.

+ *mittere* (to release, let go; send, throw)²²⁵ From their origins, the words are distinguished by the effect of sending from conveyance, i.e. to transmit is to release into, whereas to transport is to carry through. This distinction has to do with action, chronology, and effects of spatiotemporal relations. The difference has nothing to do with substance, matter, medium, or content. As infrastructures of differentiation, pipelines are neither discursive representations of transmission or transportation nor are they merely material distinctions of transmission or transport carrier substrates. In other words, oil pipelines show that transport and transmission are much more closely linked than their industry differences suggest.

Transmission is historically a technical word applying to communication theories that implies information being transmitted through space in time. This suggests that anything that is transmitted is information, or anything sent through transmission technologies becomes information by virtue of its being actualized in the context of transmission. But what is information?²²⁶ Is it divisible, reducible, articulable as a base elemental

²²⁵ "Transmit | Search Online Etymology Dictionary," accessed March 11, 2022, <https://www.etymonline.com/search?q=transmit>.

²²⁶ The debate of information transmission, as well as the question of what counts as information has a very long history. A central distinction in understanding

thing? Smoke signals were an early form of information transmission. What material-discursive similarities does it share with undersea coaxial cable transmission or fiber optic transmission of laser light? As mediums these carry distinct characteristics, whose attributes have meaningful consequences towards the conditions they enact. The materials they are made from, the technical practices they involve, and social conditions they reify all constitute the life conditions of those forms. In fact, one of the significant issues a distinction between transmission and transportation

information historically depends on, to be overly simplistic about it, a cultural or analytic approach. In "Cyberneted Art," Nam June Paik suggested that Norbert Wiener made McLuhan's argument that the medium is the message in 1948 when Wiener said, "The signal, where the message is sent, plays equally important role as the signal, where message is not sent." This is the same year that Claude Shannon published his information theory that has shaped much of information sciences and cybernetics. In the 1970s, the work of Raymond Williams and Stuart Hall established a different method for thinking about the transmission of cultural representations. Although his work has been much criticized, Régis Debray's idea of the transmission of cultural forms has suggested a way of reading transport and transmission as related concepts. More recently, Timothy Barker suggests that the media philosophy initiated by McLuhan and Kittler allows for transduction to supplant transmission. C.E Shannon, *A Mathematical Theory of Communication*, vol. 27 (The Bell Systems Technical Journal, 1948); Régis Debray, *Media Manifestos: On the Technological Transmission of Cultural Forms* (London ; Verso, 1996); Raymond Williams and Ederyn Williams, *Television: Technology and Cultural Form*, Routledge Classics (London; New York: Routledge, 2003); Timothy Barker, *Against Transmission: Media Philosophy and the Engineering of Time* (London, UK; New York, NY: Bloomsbury Academic, 2018); Noah Wardrip-Fruin and Nick Montfort, eds., *The New Media Reader* (Cambridge, Mass: MIT Press, 2003), 229.

elicits is that of materiality. A historical form of (analog) transmission are waves, functioning on the electromagnetic spectrum. Waves are the murkiest form of materiality; they are not entities, but disturbances of a field. Niels Bohr's famous Two-Slit experiment, fundamental to the development of quantum mechanics, and the basis for Barad's development of intra-action, exhibits how light can either be a wave or a particle, but not both simultaneously, depending on the technics of the experimental apparatus.

Transmission media exist within a predetermined space time axis: a network of determinate information transmission for humans (or computers) capable of deciphering those transmissions. The common representations of these networks are determined by the substances that they are constituted of and that they mobilize. Optical media are predominantly electrical or mechanical media, for example, not solar media. This distinction sets up different predetermined measurement units. Smoke is the oxygenated detritus of fire, it is a vaporous, airborne, shape shifter, charcoal in color, painful to the eyes and nose. Fiber optic cable is a continuous strand of glass, housed in a protective material. As smoke was once wood, trees, or other biomass, fiber optic cables were once sand. If

laser light pulses are the material information of digital fiber optic cables, a blanket concealing and releasing the smoke is the material information of smoke signals.

These practices only take on meaning, or technical significance, when the signals are conditions of a legible system of codes (which rely on the space time axis) for something (human or nonhuman). "The phonograph does not hear as do ears that have been trained immediately to filter voices, words, and sounds out of noise;" said Friedrich Kittler, "it registers acoustic events as such."²²⁷ Even this should be augmented to suggest that the phonograph registers acoustic events as the horn, wax, and mechanical crank (plus a human arm rotating the crank) are capable of inscribing. The assumption of media theory that has focused on the development of mass media has been that if the space time axis or determinate subject object relations are not registered, an event is not a media event (it is not communication of information, it is not techne).

Transportation and transmission are presumed to be distinct practices predicated of specific representations (and assumptions) of

²²⁷ Kittler, *Gramophone, Film, Typewriter*, 23.

movement and matter. The electromagnetic spectrum, a classic medium of transmission, consists of waves of wide and narrow frequencies (from nanometers to kilometers, whose attributes determine the distances they can travel, etc.). If broadcast is defined as a specific technical apparatus (e.g., a television station), then transmission is constrained and forecloses smoke signals (because a fire is not a broadcast station). But smoke signals are a form of transmission. What's more, we moderns take for granted that fires are ontologically distinct entities. Historically, fires were likely distinguished between communication stations, energy plants, domestic light, hearths, and a litany of other naturecultural (or medianatural) practices that required technical differentiation in materials and expertise (the same wood is not used to create thick signal smoke that is used to create clean indoor light or for cooking). That there is not a technological history of smoke signals speaks to the colonial legacy of the history of technology, the erasure of indigenous technological practices, and the romantic nostalgia of the native at one with nature that the metaphysics of individualism create. Transmission is something more than broadcast; but broadcast is a type of transmission. Peters suggests, "[once] communication is understood not only as sending messages—certainly an essential

function—but also as providing conditions for existence, media cease to be only studios and stations, messages and channels, and become infrastructures and forms of life.”²²⁸

Since the telegraph, in the late 1800s, cables have transmitted very small things (electrical signals). The Pony Express before the first transcontinental telegraph in 1861, transmitted larger things (packages and letters). Letters are a form of inscription media—pen marks paper, which stores information—but, the Pony Express functions, in McLuhan terms, as the medium transmitting letters. A telegraph signal moved very quickly, by comparison Pony Express moved slowly. Electrical signals are small, mail by comparison is larger. The unifying condition is some kind of content (information) legible to humans (or human-machine relations). Why is scale a meaningful determinant in what counts as transmission and what counts as transport?

In Volume One, I showed that early oil pipelines quickly adopted telegraph lines along the same path to transmit specifications of

²²⁸ Peters, *The Marvelous Clouds*, epub 32.

transport.²²⁹ As I also discussed, it is not because oil pipelines initiate communication infrastructure path dependencies that they are media.

Canadian media scholar David Barney reiterates this:

Pipelines are things that daily surround us, distress us, to which we must attend. They are media in, with and through which we come to be in the world as the sort of beings we are... In this sense transportation infrastructures are the oldest, most enduring media, especially if we accept that communication is not limited to the circulation of meaning via symbolic representation... Transportation is communication, and its infrastructures are media by virtue of the materialities of circulation, distributions, and interaction they make present...²³⁰

Peters further illustrates this naturecultural sense of media. Peters identifies as a humanist, “nonetheless, [joins] in treating standard forms of the subject-object distinction as both ecological and metaphysical disasters... Every medium, whether our bodies or our computers, is an ensemble of the natural and the artificial, and WikiLeaks, corn syrup, whale oil, squids, Facebook, jet lag, weather forecasts, and bipedal posture are some of the topics that belong to media theory.”²³¹ Exploring the ontology of

²²⁹ Thomas O. Miesner and William L. Leffler, *Oil & Gas Pipelines in Nontechnical Language* (Tulsa, Okla: PennWell Corp, 2006).

²³⁰ Darin Barney, “Pipelines,” in *Fueling Culture*, ed. Imre Szeman, Jennifer Wenzel, and Patricia Yaeger, 101 Words for Energy and Environment (Fordham University, 2017), 267-70.

²³¹ Peters, *The Marvelous Clouds*, epub 23.

transmission and transport troubles the conditions for why oil has not more actively been absorbed by a media debate.

Is it accurate then to think about crude oil passing through a pipeline as information? Emphatically yes! Oil transport, through pipelines, across the surface of the globe, transmits crucial information—bio-physical information—that constitutes the building blocks of industrial life (the constituent parts for the construction of roads, fibers, illuminants, lubricants, medicines, plastics, fertilizers, and more), but also the naturecultural techniques which the specific attributes of oil normalize as life practices. “Pipelines” Barney continues, “accomplish a range of mediatic functions: they contain, store, convey, conduct, transmit, connect, distribute, span. In these respects, they are like rivers, canals, railroads, and highways, and also like telegraphy, telephony, portable print media, and wired and wireless digital NETWORKS.”²³² What I mean to illuminate is this: oil differentiates the world and that is media; and also the technologies which mobilize oil are medial in the sense that they contain, store, transmit, and transform oil.

Peters offers his own thoughts on energy and oil:

²³² Barney, “Pipelines”, 268.

Fats and oils deserve a brief treatment to parallel that of oxygen. Biologically, lipids make cell membranes possible and are essential barriers in organisms, and membranes are gates, one of the oldest of all media. They make cells possible and also make bubbles, beloved by philosopher Peter Sloterdijk. Thermodynamically, fats are an important source of energy for burning, and the modern world's addiction to oil began not with petroleum, but with whale oil. There is no modernity without oil (as well as coal and paper), and oil is processed corpses. Fats circulate rapidly between animals, humans, and machines and serve as candles, lamps soap, cosmetics, food, and lubricants. Oil makes fertilizer and plastics, befouls the sea, anoints kings, and fuels war machines.²³³

The distinction between crude oil transportation and broadcast transmission concerns what is represented as information and what agents are granted information receiving status.

What conditions enact information practices? To augment slightly Susan Leigh Star's prophetic axiom discussed in Volume One: When is information?²³⁴ That is, when do certain relations create information? Or, more specifically, when do certain relations count as information? Who decides? McLuhan's articulation of media did not concern more than human relations, unlike Kittler who did see the "so-called Man" as produced through network discourses. Peters continues McLuhan's relation to light,

²³³ Peters, *The Marvelous Clouds*, epub 216.

²³⁴ Star and Ruhleder, "Steps Toward an Ecology of Infrastructure: Design and Access for Large Information Spaces."

"Like McLuhan's light bulb, fire has an ablative relationship to learning. Writing, reading, and studying has an old partnership with it, its very tools being pyric." He continues, "Fire is both condition and content. It can be harnessed for coded data transmission in the signal pyres of the ancient Greeks and Vikings or the smoke signals of Native Americans."²³⁵

Continuing to think through McLuhan, Peters introduces Lewis Mumford's notion of container technologies. "In *Technics and Civilization* (1934) he argued that technical history should not neglect 'utensils, apparatus, utilities,' which included pots and baskets, dye vats and brick kilns, and reservoirs, aqueducts, roads, and buildings... Container technologies show media at their most environmental... Containers are usually supposed not to leak, but to pour."²³⁶ Fire as a container technology reveals the extent of Peters' Heideggerian thinking. "If there were ever a symbol of what Heidegger called Gestell, the 'enframing' of nature into exploitable resources, the whale is it. And if there were ever a symbol of Bestand, energy stored as a resource on tap, oil is it."²³⁷

²³⁵ Peters, *The Marvelous Clouds*, epub 223.

²³⁶ Peters, epub 232.

²³⁷ Peters, epub 219.

Heidegger's idea of the standing reserve is a formidable way to think about the events of the early oil industry that transformed nature into a commodity. Life changed in innumerable ways. The north won the Civil War in part because it—literally—increased its pace by using oil to lubricate its war machinery.²³⁸ Thinking about oil as media means not only seeing the industrial apparatus as a mechanism of oil information, but also the earth-Sun relationship as the apparatus that produces the conditions of possibility and impossibility of oil. Recalling Starosielski's elemental analysis, she suggests that media scholars go beyond Peter's genealogy of the Greek elements.²³⁹

Like fire, oil functions as both the content and medium of information in numerous ways beyond the more obvious transmission through pipelines. In the case of pipelines, the pipe transmits oil. In the case of petro-materials, oil is the medium by which hydrocarbons are transmitted. Nylon stockings—the first synthetic fiber, synthesized from oil by the DuPont corporation in 1935—is an ongoing expression of oil the medium, as is kerosene. It tends to be overlooked that a history of oil is a history of light,

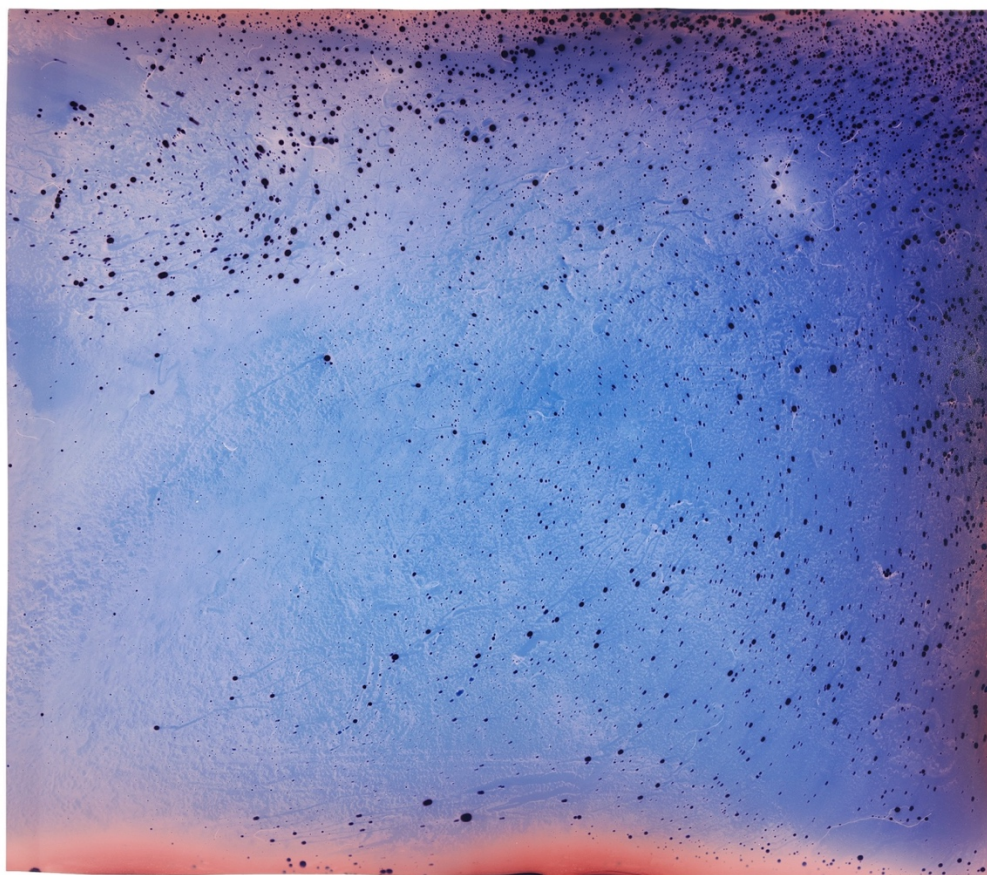
²³⁸ Beates, interview.

²³⁹ Starosielski, "The Elements of Media Studies."

light transmission, and the transforming activities of domestic light practices. Not that all light-practices should be thought of as optical media, but similar ontological questions of light should be asked: when is information?

More than being a material outcome of a cybernetic information system, oil is actualized as a flowing, lubricating, sticky, polymerous staple through its becoming with oil pipelines, refineries, and the petrochemical industry. Like media, information is not ontologically determinate by humans, or even by concepts as such. Oil is a media in the conventional sense of information exchange. But more than this, an agential realist media theory, that replaces mediation with differentiation and medium content dualities with intra-active apparatuses, proposes a more than representational framework of the elemental analysis, for why oil is media.

Field Notes 1989: Towards a Cosmopolitics of Oil



**1989 Toyota Land Cruiser used motor oil, Photographic C-Print by Johnna Arnold*

Curiously, oil engulfs the micro and macro in incendiary ways. I might contest that oil entangles scale, through bodies, through time, through representation, mediation, myth, materialism and finally, differentiation, in ways that exceed “us.” What can be made of the sublime rendered in the process of exploring the materiality of one of industrial life’s most contested substances? Getting closer to the substance of oil still eludes most humans. One smells it at gas stations, one sees it dripping from cars, one knows—abstractly perhaps—that plastic polymers and artificial light derive from oil, that other products, such as nylon, water-proofing agents, waxes, some food stuffs, construction materials, most synthetic agents in fact, come from oil. But, to get closer, to be with oil, to materialize oilness? That is, possibly by design in the contemporary moment, a rarer act. Thinking the deep time of oil involves entwining it in an ecology of life that includes the breakdown of bodies, human and otherwise. A proposal: rethinking oil is inherently metaphysical (onto-epistemological), because we varied moderns simply need to rethink the concept of earth materials coming out of the ground.

What is oil? How to differentiate the substance from the myth (their already togetherness)? What is oil the earth substance? And how might one think with oil in such a way to reclaim it from the extractive apparatus of industrialization that has terrorized the earth? As if by some cosmic hubris, oil, the substance, is still only accessible as a byproduct of used mechanical residue. Such is the narrative of post-industrial life.

Oil too has been lost in the myth of industrialization. We moderns have prefigured an understanding of what oil is, shaped by the history of its use, shaped by infrastructure which consumes everything before expelling it in its own image: waste, commodities, fossil fuels, global indexes of value. Instead, zoom in/out on oil. It is neither human nor value-driven; a substance, like the many substances of the earth, devoid of any reference points, no longer indexed by its common denominators. It is neither a celebration nor demonizing—which is not to say that a position is not being taken—but rather an opening, an ongoing materialization of new projections. It is about light after all, not only the light of the photographic enlarger, but the latent solar light, millions of years prior to the now.

Such refiguring requires new vocabularies, new grammars, new worlds; new ways of looking, new ways of knowing, new doings. This is not about symbolism, it is about materialization that always already exceeds a binary between symbol and material. How to think with oil, without predetermining it in the image of industrial humans? To touch it, to watch it, to enlarge it, to be with it, is one approach.

Five. Conclusion

Earth matters, like oil, are historically conceived with/in the paradigm that media must be ontologically legible as subject object relations to be media—a legacy of Western humanism. To move beyond the metaphysics of individualism which enact essentialist notions of representationalism and separation, media debates should turn to the effects of differentiation. Reading the elemental media debates initiated by Harold Innis and Marshall McLuhan, extended by Parikka, Peters, Starosielski, and others, with Barad ignites a new debate of the elemental of oil. We Earth beings are children of the sun. Digging holes and solar tunnels, we found the light above radiating from below. Oil enacted new circulations of solar light—new solids, liquids, waxes, and gases, new comprehensions of light itself. And it could be otherwise. The historical account of oil as fossil fuel also enacted myriad slow-moving catastrophes. Conceptualizing oil beyond conventional practices of representation standardizes a posthumanist performativity of the earth. Oil is an infrastructure of differentiation.

Agential realism does not negate a conception of mediation per se, but rather reconfigures the distinction between (re)presentation through

technical means and other ontologically inseparable intra-acting agencies. Agential realism also holds mediation accountable for determining subject/object relations prior to their becoming. In this way, techne is a specific intra-action too, an entanglement that Wark misses, even as they trouble material practices through intra-action.

Instead, infrastructures of differentiation suggest a more than human cultural techniques—a cosmotechniques—not techne. The effects of differentiation in its dynamic intra-activity, in all the worldly diversity that could be, constitute media. Media subjects and objects are indeterminate until their co-constitution of/through specific intra-actions. It does not matter if the conditions of the apparatus are electronic, mechanical, human, biological, physical, digital, or any particular species-being relation, and not once and for all. Agential realism moves media away from determinate space and time and towards indeterminate spacetime-matter. The move is transformative and refigures oil beyond the technical practices confined to the anthropocentric standardizations of industrial space and time concepts.

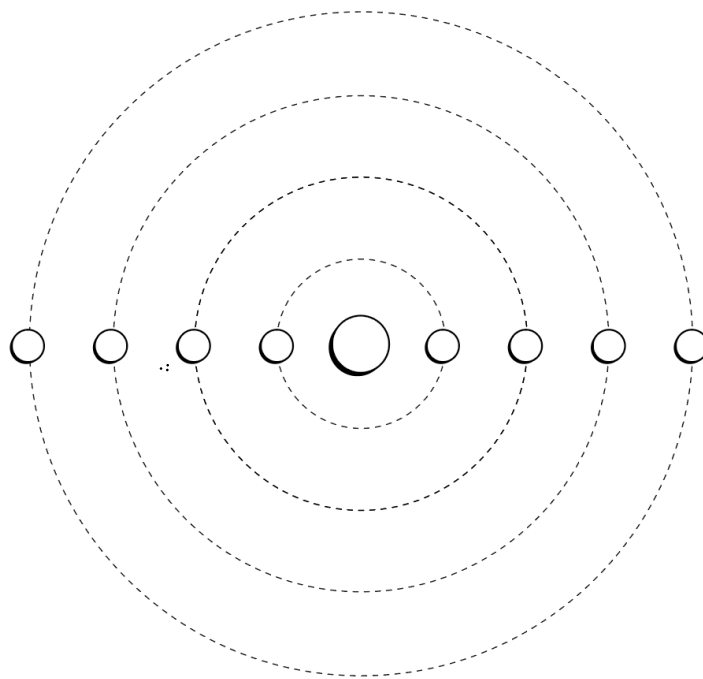


Figure 13: Diagram variation 3 of Heliotechniques.

Field Notes 3 The Umbrella Woman

“The sky above the port was the color of television tuned to a dead channel...” The sentence kept repeating itself over and over again. It was weird to hear the English words, above the otherwise cacophonous noise floor, coming from the phone of an old Ethiopian woman. The bus was overcrowded in its usual way. But this woman kept her umbrella open, making the volume of space feel more cramped. It was sunny outside and for some reason the woman kept the umbrella open, despite the shade the bus offered. “...The sky above... The color of television...” There were plenty of sounds: news, Ethiopiques and other music, chatter. But the phone was a persistent metronome. A medium of information it was not intended to be.

Stopped in the middle of an intersection now. “A dead channel...” Roads are poor mediums of traffic in Addis. Information could move a whole lot faster. 5 birr for a bus ride, 200 birr for a taxi. The container doesn’t change the chokepoints of the infrastructure. “Above the port...” The old woman’s phone surface was cracked, dented in many places, but the audio was crisp and clear. A saxophone riff from the radio in front briefly harmonized with the horn of a car trying to back up perpendicular to the bus.

Two receipts in my pocket, hard to reach because there were four of us on the narrow bench seat in the back. One said 2011 the other said 2019. They were both from yesterday. “Tuned to a dead...” I was momentarily confused. The bus moved a few feet. The movement temporarily detached our four bodies. I could see the receipts more clearly. They were deposit slips...

<phone call from the middle of Canada... multiple earth calendars... The first North American City to implement daylight savings time: Thunder Bay. On Gregorian Calendar date, July 1, 1908, Port Arthur, Ontario (Thunder Bay), moved their clocks forward one hour. In Gregorian Calendar year 1784, Benjamin Franklin wrote an essay “An Economical Project Diminishing the Cost of Light” to the editor of The Journal of Paris. It is always about light. Technologies of time attempt to fracture spacetime. The Germans were the first nation-state to adopt daylight savings. On Gregorian Calendar April 30th, 1916, the German Empire and its Austrian allies turned their clocks ahead 1 hour to conserve artificial light fuel for their war effort. Carboniferous geography changing domestic morning rituals, ignited by war, standardizing time. The ancient Romans’ water clocks were scaled differently throughout the year to account for changes in Solar Time. The United States passed the Standard Time Act of March 19, 1918. It was unpopular after World War I. U.S. President Franklin Roosevelt instituted year round War Time, an apt name, during World War II. After the war, states were allowed to utilize daylight savings time at their discretion, a confusing ordeal for standardizing the transportation industry. In Gregorian Calendar year 1966, the Uniform Time Act was passed, mandating a standardized time. Dream Farm Commons... clay as real estate... molding different concepts of earth. It is always about earth... phone call ends>

“The sky above...” Back in the Coptic Calendar now. More people on the bus. Very crowded for a van-sized transport. The umbrella woman refused to move to a different seat. “The color of television tuned to a dead channel...” A cocoon of space, an orb of existence; she was an egg of entangled matter. The umbrella emanated sounds from different calendars; it resonated in the bus. Moving and stopping, the bus stayed mostly in the shadow of the tramline cascading above. A cement sentinel, invisible, perceptible, present. It was there, shaping the activities below—the bus-movement-space, the center-divide-body-accumulation-waiting-space, the road-space. The monolithic transport above, making together the things that happen. Overcoming the chokepoints below, a reminder of the grand corruption above. “...a dead channel.” Empty space above, only the umbrella woman seemed to shield herself. Everyone else was reaching. Unavoidably pulled out of their skin towards the cement order floating in the haze of smog above. Particulate matter of the cloud, the residue of parts. Somewhere above it was

clean, sterilized, pure, unclogged. There were no chokepoints in the cement order floating above. The cloud resonated in all-things-space. "...the color of television."

I forgot about my receipts. They must have fallen out of my hand in the movement. I reached down in-between different legs to fish for the papers. No one minded; they hardly noticed. We moved along. I grasped the receipts and looked at them again: beer bottle deposits.

For the second time, I had forgotten to return the bottles. The deposit was about the same price as the beer: 15 birr per bottle. Grains of sand to make glass for grains of barley to make beer. The Egyptians made the first beer, wheat grain mixed with wheat berries, partially baked. Out of the oven, a hardened crust of bread, cracked open to reveal a fermented liquid center. Fermented wheat, fermented barley, fermented apples, alcohol was a system of sanitation prior to city-wide clean water infrastructure projects. The Egyptians made wheat berry beer for food; early Euro-American colonial settlers fermented apples for clean-water consumption.

"The sky above..." The fellah of Egypt—the tillers of land—adopted the calendar used by the Coptic Orthodox Church. The Coptic Calendar is a reform of the ancient Egyptian Calendar, introduced during the rule of Ptolemy III. The reform was written on a stele—a stone slab—in three written language technologies: Egyptian Hieroglyphics, demotic, and Greek, as part of the Decree of Canopus, written in Gregorian Calendar year 238 BCE. Ptolemy III's rule corresponds to Ctesibius—the Greek inventor living in Alexandria, Egypt—transformative improvements to the clepsydra—water clock—meaning, "water thief". The Coptic Calendar was the most accurate calendar constructed at the time. The Ethiopian Calendar is based on the Coptic Calendar. It similarly consists of 13 months: 12 months of 30 days, and a 13th month of five or six epagomenal days. However, the Ethiopian Calendar is in Ge'ez, an Ethiopic-Semitic language spoken in the Gregorian Calendar 5th century BCE.

I hadn't realized the Spanish being spoken in the front of the bus. The voice oscillating from the umbrella woman's phone had me transfixed in a way I hadn't noticed. It was measuring the interval of events. The number of cement pillars beneath the tram system, the distance between bottlenecked intersections, the space within the bus, the sky above, were all informed by "...the color of television." Waking up now, with the receipts back in my pocket, I tuned in to the conversation in the front. Periodically, Ethiopians on the street would claim to speak Spanish, telling me they once lived in Havana, Cuba, or different parts of Mexico. I would talk to them, challenging them to prove it. It's risky, most of the time, to indulge the random street banter that emerges. Not for safety reasons, for time considerations. Such is the anonymity of monolithic urban sprawl.

Another harmonization of noise. The bus passed an Ethiopian orthodox church and the amplified singing coincided with the cadence of the Spanish I was straining to hear. "The sky above..." Stopped now, the umbrella woman got out of the bus. She did not fold her umbrella and the wire ends struck multiple people as she excited. No one seemed to mind. But it momentarily clogged the open sliding door of the bus. A flood of bodies subsequently poured in. So many gates and chokepoints. I heard the umbrella woman's phone one last time as it faded amidst the heteroglossia of the outside. I lost sight of her amidst a sea of shade umbrellas, providing a layer of mass just above the headlines of the many bodies in movement. The bus began to move. The umbrellas maintained anonymity from the cement order above. I turned my attention back to the Spanish towards the front. They had been discussing the consequences of measuring time by geometry of the cosmos. But the voices had stopped.

Volume Three: Oil as Nature

In which the issue of oil mysticism is raised. Following Volumes One and Two, which illustrate the origin of the American oil industry and provide evidence that oil is not ontologically determinate as a fossil fuel but should instead be conceptualized as media to better articulate the ways it has reconfigured the world, Volume Three explicates the history of oil mysticism and its role in conceptualizing industrial oil practices. In doing so it presents contemporary arguments of the multiplicities of nature. Building upon agential realism's crucial account of naturecultural practices, this volume asks, how does the history of oil mysticism trouble natural and industrial accounts of oil?

Figure 14: Oil as Nature.

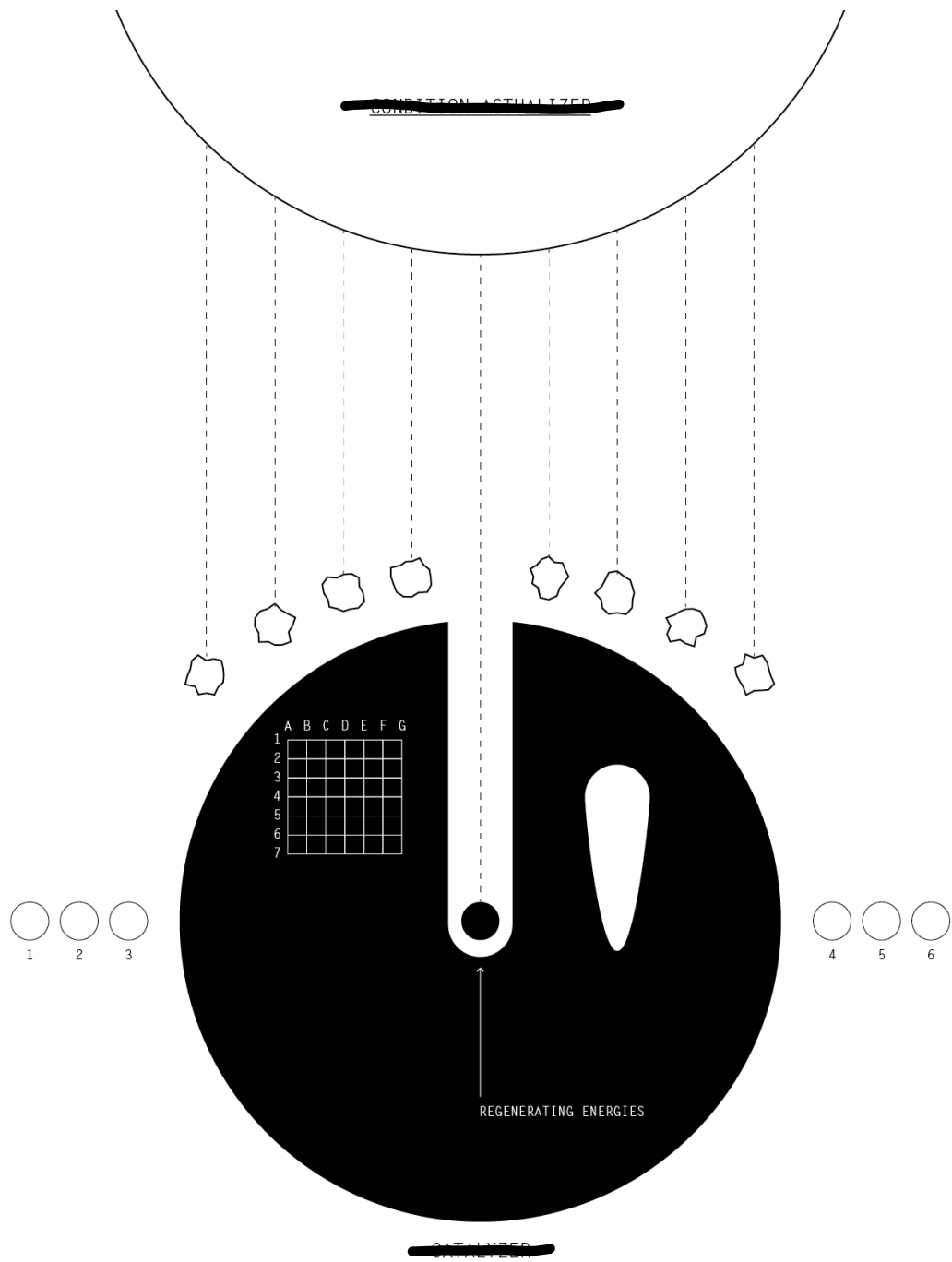


Figure 15: Mapping the Helio-Odics

Field Notes 282: Divining Rods

I walked exactly 327 steps. I continued straight 13 more, turned around, walked 21 back in the same direction, turned around once more, focused on the copper rods in my hands and walked exactly 8 steps. Every time, they brought me to the same spot. Holding the rods loosely in my hand, allowing them to swing freely—in truth, their diameters were so narrow, it was impossible to grasp them firmly—I followed the direction they led. The two rods, forged by a local copper smith, stowed away for so long, now pointed forward, parallel to each other. Slowly, they would lose sync, as I veered from their chosen path. Correcting my direction, moving ahead slowly and deliberately, the copper rods led my way.

After some time, as if rotating from a fixed joint in viscous ooze, the parallel rods sluggishly pointed inwards, forming the vector of a triangle, divinely pointing towards the unknown. I followed, walking in a sort of cautious arc, always just on the periphery of the main trajectory. Not out of fear, but anticipation of the divining gods in each of my hands. A brilliant design affordance— nothing can be done but embrace their disposition. They lead you... somewhere. Try as you might to maintain control, they give their commands in subtle swivels and metallurgical/magnetic rotation. Or something like that. How they work is a mystery to me. But the power they wield is undeniable. Not only towards a final destination, but in the impulse to follow.

Yes, I followed in a cautious arc, moving somehow directly in their manner. The copper anticipated my movements, coming from the future and pointing to the past. There it was, briefly, I understood—and lost it. What I mean to say is this: one follows the copper rods; their fit in your hands, the comfort of holding them, the comfort of moving with them, all implies your actions, your willingness to listen to them, and finally to move with them. What I'm trying to say is that the form of the rods fulfill their function as much as their function fulfills their form. The rods inhabit you—not a rapture of some spirit, but a fullness of relationship. The divining rods take you where you need to go, because they are meant for you. In your hands, they imply your own actions, an extension, an intervention... a diffraction... a transduction, whatever you may call it, they offer what you— specifically you—need to follow.

As I walked, moving closer, ever closer, the slight weight of the rods—the balance of their movement, to and fro—suggested the way, before the rods ever visibly left their orbit of attraction.

Then, finally, after 327 steps and going intentionally beyond, to be certain, to be sure, and again moving towards the same destination, I arrived.

The question, of course, was: what had I found? N////////\V

I didn't need to dig. There were percussion drill bits nearby, but that was unnecessary. The damp, moist, grass was soft from the humid air. It had rained recently, but the atmosphere was always sweet and wet here. It took a moment to find, my own posture not as precise as the copper rods I held in my hands. They pinpointed a location, but I wielded the apparatus unspecific to the point in the earth it marked. Keeping my shoulders still, I moved my elbows to align the crossed copper rods to a vertical vector, shooting into the earth. I did my best, anyway, to identify the spot on the ground. Marking it with my foot, still holding the rods extend, I kneeled closer to the surface. Partially laying, again I checked my location with the rods. I was an imprecise measurement apparatus to be sure.

Nonetheless, it was there. A small stone with the same symbols. I debated removing it or leaving it in place.



Zero. Novum Lumen

In Volume One, I examined the western industrial history of how oil was made into a fossil fuel. In Volume Two, I argued that oil should instead be conceived as elemental media, diffractively articulated through agential realism. This final Volume returns to the early American oil industry, but shines new light on a little-known aspect of it: oil mysticism. By focusing here—primarily on the hydrocarbon paraffin and the American mystic Edgar Cayce—oil mysticism entangles the metaphysics of oil with different conceptualizations of nature.

Numerous media theorists evoke the history of mystic practices in the process of clarifying media. John Durham Peters argues that the notion of medium as human-specific signals and meaning occurred in part because of mysticism. “Perhaps the most critical shift came with spiritualism, around 1850, when a person, typically a woman imitating the telegraph’s ability to bridge wide chasms, came to be called a *medium*, which no longer meant a natural element but a human intermediary between the worlds of the living and of the dead.”²⁴⁰ This is a change from the natural

²⁴⁰ Peters, *The Marvelous Clouds*, epub 84.

philosophy formulation of medium as element or environment. Peters points to Aristotle's concept of "τὸ περιέχον (to periekhon)" which opaquely means "surrounding" or environment.²⁴¹ A shared history of *medium* and *milieu* has informed their close consideration within media studies.

Relatedly, Jussi Parikka and others have noted that Friedrich Kittler's term *Aufschreibesysteme*, literally "system of writing down" and translated into English as *discourse networks*, derives from the late nineteenth century writings by Daniel Paul Schreber, a German high court judge diagnosed with paranoid schizophrenia.²⁴² In *Memoirs of My Nervous Illness*, Schreber describes visions of celestial scribes who recorded his thoughts the moment they occurred. For Sigmund Freud, this mobilized a psychoanalytic perspective. For Kittler, this was useful in conceptualizing a vision of cultural inscription systems. Marks on a body as divine technical media.

The entwined relation of oil mysticism and the oil industry, further illustrate a claim upheld throughout this project: the practice of categorizing oil into industrial-scientific representations of nature operate as a form of enclosure to control what counts as nature and what does not.

²⁴¹ Peters, epub 82.

²⁴² Parikka, *A Geology of Media*, 94.

But the containment of the *bottley production* is leaky. That which is contained seeps out. The descriptions that count cannot contain the substance itself. This perspective provides insight into reconceptualizing nature, the Anthropocene, and the urgency of tackling prevailing Western anthropocentric worldviews that sustain extractive life practices

In Volume One, I described the way that making oil a fossil fuel energy commodity is naturecultural. This demystified the conception that crude oil simply exists as an energy source for human consumption and decoupled the common notion that simply because oil is an energetic entity, it should therefore be put to work as fuel, exemplified by J.T. Henry's *philosophy of petroleum*.²⁴³ Building upon agential realism's crucial account of naturecultural practices, this volume asks, how does the history of oil mysticism trouble natural and industrial accounts of oil?

²⁴³ Henry, *The Early and Later History of Petroleum, with Authentic Facts in Regard to Its Development in Western Pennsylvania... Also Life Sketches of Pioneer and Prominent Operators...*

Field Notes 311: Cosmotechinics—a close reading together/apart

Keeping in mind the proposition to think-with information differently, the question that Yuk Hui asks in his essay, “What Begins After the End of the Enlightenment?” begins to address the technics of this binary conundrum:

Is it even possible to escape the synchronizing global time-axis of Western modernity, without proposing a deceleration, as sociologists such as Hartmut Rosa do? Are we capable of undoing its hold in order to advance its achievements in other directions?

We need to return to the word “acceleration” itself, since it is too easy to be fooled by an unexamined relation between acceleration and speed. If we recall high school physics, where $a = v_1 - v_2 / t$, acceleration is equal to the change of velocity (from v_1 to v_2) divided by time. V is velocity, not speed. Velocity is a vector having both magnitude and direction, while speed is mere magnitude. Why not consider another form of acceleration that does not push speed to its extreme, but rather changes the direction of movement, giving technology a new frame and orientation with regard to time and technological development? By so doing, we can also imagine a bifurcation of the future, which instead of moving towards the apocalypse, diverges from it and multiplies. But what does it mean to give technology a new frame? In order to do so, it is necessary to reflect on how we might reappropriate modern technology by systematically reflecting and working on the question of epistemologies and epistemes in light of multiple cosmotechinics, or simply put, the technodiversity that is historically traceable and still productive... The proposal of multiple cosmotechinics... calls for us to reopen the concept of “technics” and reexamine the conditions of technical evolution (Hue 2019).

With appreciation to Hui’s proposal of multiple cosmotechinics as a path to expand technodiversity and thus to think information differently, I have some concerns in this particular formulation that might help clarify my own. Hui’s claim that, “With drawing and writing, human beings exteriorized their memories and imaginations; by inventing flint, the ancients liberated their fingers from many activities,” is aimed at opening up a cosmotechinical position. He says, “From a cosmotechinical standpoint, technics is fundamentally motivated and constrained by particular geographical and cosmological specificities.” But, the premise seems to reinforce an inside and outside of technics that cosmopolitics seeks to annihilate. Specifically, the assumption that human technics began with inscriptive media. Essentializing inscription as the preeminent mode of technics falls squarely in the trappings of multiculturalism, which anthropologist Eduardo Vivieros de Castro seeks to critique with his formation of multinaturalism. That is, ceding an originary, absolute, which governs the framework of what difference looks like. Vocalization, for instance—the manipulation of soundwaves, acoustic ecologies, electromagnetic spectrums—are also the exteriorization of a concept of the self/species/kin-group. Exteriorization, however, is itself a contested notion of boundary making that should not so easily be naturalized in a cosmotechinics. “We do not reject that there is a universal dimension to technology, but it is only one of the dimensions,” Hui continues. His project overall is aligned with my intentions: “...we need first of all to reopen the question of technology, to conceive of multiple cosmotechinics instead of merely two: a premodern technics and a modern technics.” This is indeed an important task.

To be sure, we must be careful with the word “locality” and its politics. Nostalgic invocations of tradition or culture can become problematic returns to nationalism, cultural essentialism, and ethnofuturism, when not approached dialectically. Here we are not considering small groups revolting against modern technologies in the name of culture or nature; rather, we are elaborating a general strategy to reappropriate technology by first of all affirming the irreducible multiplicity of technicity. While Simondon has been an inspiration for the concept of cosmotechinics, his own critique fails to articulate technics beyond the tradition of Western Enlightenment humanism he inherited (Hue 2019).

I might propose that Adrian Mackenzie's reconceptualization of transduction, an expanded concept that begins with Simondon's conception, can help Hui's intention. "A transductive approach promises a more nuanced grasp of how living and non-living processes differentiate and develop. It understands the emergence of a mode of unity without presuming underlying substance or identity. Every transduction is an individuation in process." In this way transduction provides a pathway into the cosmotechnic pluralism that Hui is looking for, without assuming that a particular moment of western-human species-specific posterity becomes the governing tradition of technics (cave paintings on a wall...).

Later in his essay, Hui does invoke the anthropological idea of multinaturalism, through one of Viveiros de Castro's contemporaries, Philippe Descola:

Because naturalism, which counterposes nature and culture, is very much a product of modernity, it does not capture how nonhumans are perceived in other parts of the world. However, with modernization as a synchronization process, we encounter a tipping point that reopens concepts such as nature and technics which have been inherited as universal without being questioned. This call for pluralism is for us a reminder to consciously reappropriate modern science and technology, to give it a new direction at a time when its planetary spread opens up such a possibility (Hue 2019).

Ultimately, I am encouraged by Hue's cosmopolitics, in the sense that Isabelle Stengers originally proposed: "...the intent of opening modern politics to the possibility of divergence among collectives composed of humans and nonhumans that, following her (Greek-inspired) definition of politics, agreed to gather around a concern." (A World of Many Worlds, 12) Animating information practices (or technics) towards human and nonhuman concerns (or matters of care) is a way of thinking beyond the project of enlightenment. I share the concern that modernization, with all its spacetime-mattering practices, is a process of synchronization. A call for pluralism to reappropriate modern science and technology is precisely the project at hand. That said, we moderns can do better material-semiotic and material-discursive work than Hui has provided here. We moderns can do better than Hui's suggestion:

If we identify Enlightenment thought with modern technology as an irreversible process guided by universality and rationality, then the only question that remains to be asked is: To be or not to be? But if we affirm that multiple cosmotechnics exist, and that these may allow us to transcend the limit of sheer rationality, then we can find a way out of never-ending modernity and the disasters that have accompanied it. It would be tragic to misunderstand rationality merely as strict and rigid reasoning—unfortunately, it has been often mistaken as such (Hue 2019).

What is rationality, then? What can be made of these general claims of evilness or giving up? Is rationality to be taken as the technique of discourse, i.e., the question how is information to be thought? I fear that falling back to a reform of rationality as critique of rationality does not take seriously the project that there is no originary technicity. True, this neither is to empower or erase the technological forms that have come to be throughout enlightenment; binaries are not the answer, hence the naturecultural move to thinking-with cosmotechnics. Hui says as much:

To rediscover multiple cosmotechnics is not to refuse artificial intelligence or machine learning, but to reappropriate modern technology, to give other frames to the enframing (Gestell) at the core of modern technology. If we want to surpass modernity, there is no way to simply reset it as if it were a computer or a smartphone. We must instead escape its global time-axis, escape a (trans)humanism that subordinates other beings to the terms of its own destiny, and propose a new agenda and imagination of technology that open up new forms of social, political, and aesthetic life and new relations with nonhumans, the earth, and the cosmos (Hue 2019).

Yes to this, and let's also take seriously that taking seriously cosmopolitics, such as multinaturalism, requires reimagining (perhaps even destroying) not rediscovering Heidegger's Gestell.

Odic Force

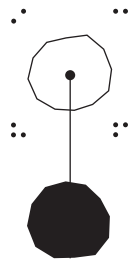


Figure 16: Locating the Odic Force in Heliotechnics.

One. Oil Mysticism

I turn now to a group of humans in the early days of oil industrialization who envisioned oil differently. A decidedly western group adjacent to modern conventions of the moment who built a cosmology naively borrowed from ancient and indigenous spaces. The group is a guide towards under-examined historical narratives of oil. In doing so, they reveal a fluid history of conceptualizing oil: what oil is (how it is represented) has changed dramatically over a relatively short period. Particularly, this work homes in on the unexpected link between industrialists and mystics during the early American oil industry. These strange bedfellows reveal a liveliness to oil that industrial capitalism has persistently attempted to render invisible, while mystics have illuminated as a spiritual enlightening. This mutual reverence for oil begins with the substance paraffin—one of numerous basic constituent hydrocarbons of oil.

Hydrocarbons are ubiquitous on earth, and their shared presence in human bodies and in oil fueled the arguments for these groups. Controversial geophysicist Thomas Gold argued that for industrialists, the shared presence of hydrocarbons was proof of oil's environmental status,

designating it ecologically safe to extract. Mystics revered the shared component in humans and oil as spiritually divine. Gold's argument was a fulcrum of Iranian philosopher Reza Negarestani's *Cyclonopedia*:

*Complicity With Anonymous Materials.*²⁴⁴

Cyclonopedia prompted me to search for a material source of crude oil: to touch it, to feel it, to smell it. The fact that it is easier to own crude as a commodity investment or to know its global index value, than it is to hold it in your hands and feel its many viscosities, is revealing of the way oil has been instrumentalized. The source that I could locate—on Amazon, after asking Google—was a small mom-and-pop wellness company in Downingtown, Pennsylvania called Baar Products Inc. They are the official resellers of a line of products called Casey Care. Crudoleum is one such product. To wit, the oil is sold in a BPA-free bottle—a plastic without the organic synthetic compound Bisphenol A, produced by the synthesis of aromatic hydrocarbons. The oil, the founders of Baar Products say, comes from their own wells in Pennsylvania. The product is material evidence of

²⁴⁴ Negarestani, *Cyclonopedia*.

the paraffin-based reverence for oil shared across industrial capitalism and historical American mysticism.



Figure 17: Empty bottles of Crudoleum Pennsylvania Crude Oil Scalp Treatment.

Alchemy and mysticism defined oil long before it became a fossil fuel. Making oil fuel was a transformation that occurred over hundreds of years, reorienting the very idea of the ground underfoot. Crudoleum, invented by Edgar Cayce, a pioneer of American mysticism, highlights the shared history of oil mysticism and oil medicine. As I discuss in Volume One, prior to commercial crude oil extraction, industrial salt miners once sold crude oil as a medicinal ointment. The history of medicinal crude oil far outdates its

use as a combustible energy source and medicinal oil bottles, despite the uncanny appearance, was once commonplace.²⁴⁵

Since 1859, the year Drake Oil Well first extracted oil, crude oil has been a fundamental building material of modern life. It replaced whale oil as the primary fuel for home illumination and accelerated a mass of new mechanization and plasticity.²⁴⁶ Its role in the U.S. Civil War (as a lubricant) cannot be understated.²⁴⁷ It has not only become a correlation for economic value—a global commodity—but it has transformed the very way things are made and get done. Oil medicine and mysticism are an under examined part of this history. This is important because any shift away from using oil as fuel is undermined by the fact that it has always been used for much more than energy production. The popular environmental argument of moving to sustainable energy sources will therefore not stop crude oil extraction.

²⁴⁵ See, for example: McDonald, "Georgius Agrícola and the Invention of Petroleum"; Taylor, *The Alchemy of Al-Razi*; Brice, *Myth, Legend, Reality - Edwin L. Drake and the Early Oil Industry*.

²⁴⁶ James L. Coleman, "The American Whale Oil Industry: A Look Back to the Future of the American Petroleum Industry?," *Nonrenewable Resources* 4, no. 3 (September 1, 1995): 273-88.

²⁴⁷ Beates, interview.

The hydrocarbon paraffin was discovered in 1830 by German chemist Karl von Reichenbach.²⁴⁸ Critical infrastructuralist Keller Easterling's conception, "Disposition," which she describes "as the unfolding relationship between potentials, resists science and codification in favor of art or practice," is a generative way to think with paraffin.²⁴⁹ The disposition of paraffin to coagulate in a way that clogs pipelines, determined by the cloud point measurement of paraffin wax buildup, is a form of material self-sabotage, suggested by media theorist Darin Barney (which I take on in the installation *Cloud Point* [2016], Figure 20); it's disposition is also to burn, to melt at a certain temperature and remain solid at another.²⁵⁰

The science of chemistry defines paraffin as: "...straight-chain or branched saturated organic compounds with the composition C_nH_{2n+2} ."²⁵¹ As a common hydrocarbon, its indexed chemical structure grants it a

²⁴⁸ Henry, *The Early and Later History of Petroleum, with Authentic Facts in Regard to Its Development in Western Pennsylvania... Also Life Sketches of Pioneer and Prominent Operators*.

²⁴⁹ Easterling Keller, *Disposition*, ed. Deborah Hauptmann and Warren Neidich (Rotterdam: 010 Publishers, 2010), <http://kellereasterling.com/articles/disposition>.

²⁵⁰ Darin Barney, "Sabotage and the Politics of Pipelines" (Institute for the Humanities, Simon Fraser University, Vancouver, BC, October 4, 2013), https://www.youtube.com/watch?v=UjJO5_fjMGU.

²⁵¹ Mihály Freund, *Paraffin Products: Properties, Technologies, Applications* (Elsevier Scientific Publishing Company, 1982), 11.

certain ubiquitous status on earth. The synthesis of kerosene, starting in the late 1840s is one of many important dispositions of paraffin. As the domestication of light persisted through the later part of the 1800s paraffin co-constituted conditions for existence: reducing the toxicity of interior living spaces; introducing mechanisms for control of light quality; mobilizing changing domestic practices in the home; amplifying altogether new social practices.

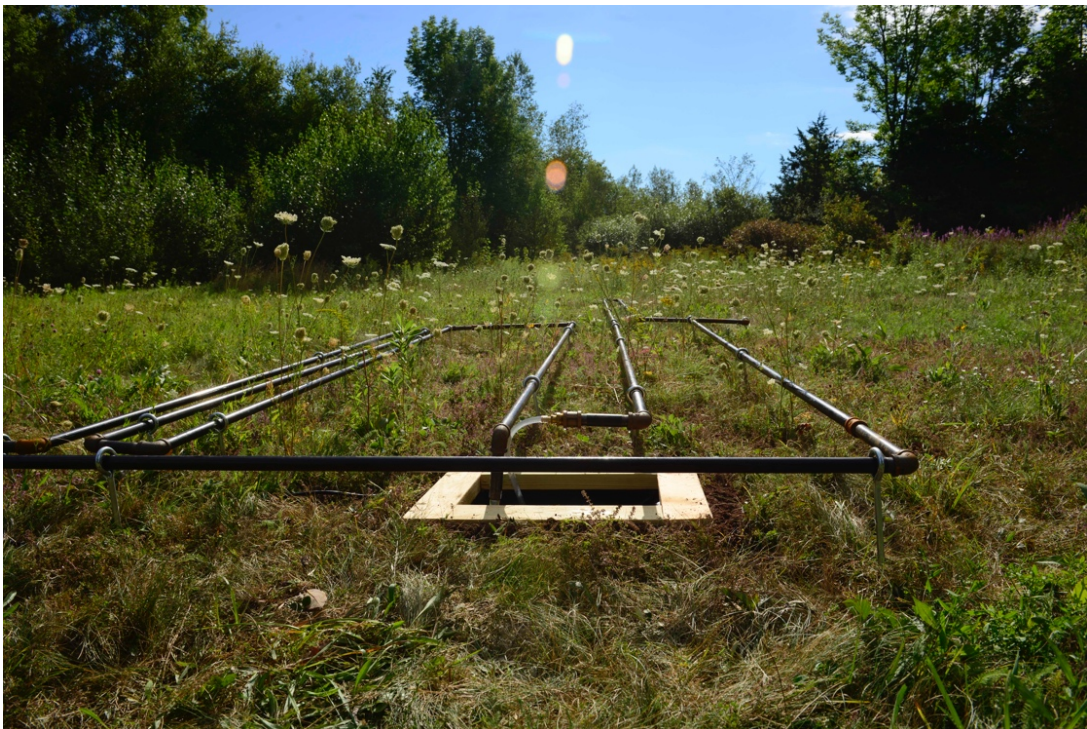


Figure 18: *Cloud Point: A Derivative of Crude Illumination* by Elia Vargas, a crude oil pipeline and sonic feedback installation, created and exhibited at Wave Farm Transmission Arts, Acra, New York, 2016. Photo: Elia Vargas.

The etymology of petroleum (Latin, *petra+oleum*, meaning rock oil) dates back over a thousand years. Grantly McDonald shows that before kerosene and the discovery of paraffin, oil was primarily documented, in the western world, for its use in medicine.²⁵² Georgius Agrícola, a German scholar and mineralogist of the sixteenth century, is responsible for much of the translation between alchemical and scientific practices from the Middle Ages into the enlightenment. Many medicinal products, new and very old, derive from oil, as do many resulting mystical practices.

The chemist Reichenbach devoted the later years of his life to the discovery of a vital substance he named "Od", old German for "all permeating."²⁵³ Although Reichenbach discovered paraffin in 1830, the aforementioned 10th century Persian alchemist Abu Bakr Muhammad ibn Zakariya al-Razi provided the first written account of using petroleum as an illumination source in *The Book of Secrets*.²⁵⁴ This text is argued to be the first laboratory manual for alchemical experimentation, written during the

²⁵² Grantley McDonald, "Georgius Agrícola and the Invention of Petroleum," *Bibliothèque d'Humanisme et Renaissance*, no. 73 (2011): 363.

²⁵³ Michael Nahm, "The Sorcerer of Cobenzl and His Legacy: The Life of Baron Karl Ludwig von Reichenbach, His Work and Its Aftermath," *Journal of Scientific Exploration* 26 (2011).

²⁵⁴ Taylor, *The Alchemy of Al-Razi*.

Arab Translation movement—a time of enormous scientific development. It is viewed as a step towards the rationalist exactitude of the scientific process. al-Razi describes petroleum as oil and as naphtha, and he classifies a type of naphtha salt. Then proceeds to describe a method of distillation.

Cayce was an oil-mystic newcomer when he imagined Crudoleum during a trance state. He said that “sweet crude” can regenerate hair growth because it is rich in paraffin.²⁵⁵ Most of Cayce’s psychic readings were transcribed and archived. During a reading at the Warshawsky home in Detroit, Michigan on November 18th, 1935, he prescribed crude oil as a medicinal scalp treatment for hair loss:

8. (Q) What causes the falling out of the hair, and what should be done to prevent it? (A) This is a lack of an activity through the glands that are secreting from the system the elements necessary to make for activity in those portions of the thyroids... Those portions where this is indicated would be stimulated by a massage - which may be had with properties that aid the scalp circulation; such as a small quantity of the crude Oil...²⁵⁶

Prior to this, during the years 1918-1920, Cayce started his own oil prospecting company, Cayce Petroleum Inc., to divine the location of oil

²⁵⁵ Edgar Cayce, “A.R.E TEXT OF READING 480-23 F 23,” November 18, 1935, Edgar Cayce’s Association for Research and Enlightenment.

²⁵⁶ Cayce.

wells and use the profits to fund his teaching institute. Many oil prospectors had already requested psychic readings by Cayce to aid in locating wells, a common practice at the time.²⁵⁷

Numerous medicinal oil practices existed at the time of Drake Oil Well in Titusville, PA. It is common knowledge amongst oil historians that the Seneca tribe used crude oil pits for healing baths.²⁵⁸ Oil soaking was known around the world for a thousand years, due to Marco Polo's writings on the medicinal naphthalan oil baths of Naftalan City, Azerbaijan.²⁵⁹ The American industrialized version of medicinal oil was tapped by Samuel Kier, known by oil historians as the grandfather of the American oil industry, in 1840s Pittsburgh, PA.²⁶⁰ Kier learned of oil's medicinal potential when his wife—or his friends' wife—was prescribed *American Oil* by a doctor. The contradictory reports derive from two different accounts, noted by oil historian William R. Brice. Williamson and Daum (1958), claim it was Kier's

²⁵⁷ Edgar Cayce, *My Life as a Seer: The Lost Memoirs*, ed. A. Robert Smith (New York: St. Martin's Press, 1997), epub 37, 296.

²⁵⁸ Brice, *Myth, Legend, Reality - Edwin L. Drake and the Early Oil Industry*.

²⁵⁹ This oil soaking is still a tourist destination today: "Naftalan Booking," n.d., <http://www.naftalan-booking.com/historyofnaftalan.aspx>.

²⁶⁰ "Kier | Pennsylvania Center for the Book," accessed March 12, 2022, https://pabook.libraries.psu.edu/kier__samuel_martin.

wife; *The Derrick's Hand-Book of Petroleum* (1898) references the wife of a druggist in Pittsburgh.²⁶¹ The paternalistic tone is consistent in either case and Kier realized the medical prescription was the same substance permeating the family salt brine.

At the time, the Kier spring pole salt wells were drilled up to 500 feet deep. Tarentum was a salt drilling region and the presence of petroleum in salt brine was a nuisance. Until a series of disasters that saw burning rivers of flames, it was common practice to dump the salt brine oil into the canal system surrounding the region. That Kier took part in this practice is noteworthy; he had first-hand experience with the difficulty it caused the canal boats from his own investments in the industry. The early oil industry was rampant with similar inexact, non-scientific, non-rationalist, myth-laden dreams of oil riches, despite oil's indoctrination into industrialization. It is not that non-Western, non-scientific perceptions of oil were inferior, but rather that the new conception of oil (J.T. Henry's philosophy of Petroleum) masqueraded as rationalist, objective, scientific knowledge.

²⁶¹ Brice, *Myth, Legend, Reality - Edwin L. Drake and the Early Oil Industry*, 113.



Figure 19: Preserved bottle of Kier Genuine Petroleum at Drake Oil Well Museum.

Despite the effort by the standard history of oil industrialization to produce a clean, well sifted, narrative of scientific synthesis and indexing of oil, much of the early days of this time were governed by techno-spiritual reverence towards the dark black mass.²⁶² The Harmonial wells, divined by

²⁶² A simple walk through Oil Creek State Park, or the Drake Oil Well Museum with the many plaques notating dreams and “Indians” and delusions of grandeur

spiritualist Abraham James just outside of Titusville, in Pleasantville, PA are a relic of this past. In, "The Wizard of Oil: Abraham James, the Harmonial Wells, and the Psychometric History of the Oil Industry," Rochelle Zuck explains:

According to biographer and fellow spiritualist James Martin Peebles, James had "frequently visited these Pennsylvania oil regions as a spirit, accompanied by his spirit-guides." On this particular visit, James, along with C. P. Easton, George Porter, and George McBride, was looking at a piece of property owned by Porter. Suddenly, James was forcefully possessed by his spirit-guides and conveyed out of the buggy and over a fence on the east side of the road. He did not know if he was "in the body or out" and was moved around a *eld* [sic] and thrown violently upon the ground. James then stuck a penny into the ground and fell into a "psychometrical condition," during which "Indian spirits controlled his body mechanically, while wisdom spirits induced the trance condition." Speaking through James, spirits communicated that the men were standing on an immense oil deposit. Harmonial no. 1 was sunk on the William Porter farm, exactly on the spot James had indicated. Drilling began on August 31, 1867, and the event was written about in newspapers across western Pennsylvania and New York and featured in spiritualist publications. Oil was struck in February 1868 at a depth of approximately 835 feet and Harmonial no. 1 began to produce more than one hundred barrels.²⁶³

illustrates this point, but for a particularly remarkable perspective on Silliman's *Report on the Rock Oil* and consultant practices, see: Lucier, *Scientists and Swindlers*.

²⁶³ Rochelle Raineri Zuck, "The Wizard of Oil: Abraham James, the Harmonial Wells, and the Psychometric History of the Oil Industry," *Journal of American Studies* 46, no. 2 (2012): 313-36, 19.

Turning my attention to oil mysticism is not only about showing the ways that mysticism bolstered industrialism. It did—and that it did is quite a remarkable and understated claim to industrial modernism—but mystics were focused on a broader metaphysical comprehension of the substance. Indeed, industrialists revered oil and internalized oil as a form of American faith in Manifest Destiny. A particularly vivid example of this can be witnessed in the classical Hollywood film *Oiltown, USA* (1953), starring Christian evangelist Billy Graham. But theirs was a faith uncritically enmeshed in a pursuit of American economic growth as a correlation for Godliness. The mystics, such as James and Cayce, that were popularizing oil often did so invoking its ancient history as a medicinal substance, its great healing powers, its abundance, and other values towards self-improvement. Importantly, and not without its own complications, mystics advanced oil practices observed by numerous indigenous populations while unconsciously translating the linguistic and visual grammar into the metaphysics of individualism and progress narratives advanced by the white communities within which they operated.

The metaphysics of oil that these mystics bring to the surface destabilize the scientifically driven epistemological questions about oil that

have dominated the last 170 years. Why did Cayce believe that paraffin was a medicinal substance, for instance? The petrochemical industry has since self-verified that it is medicinal, as paraffin and many other petrochemicals are used in numerous pharmaceuticals and wellness products.²⁶⁴

Returning to Barad's naturecultures, what do mystics' conceptualization of oil signal about the practices which enact those conceptualizations? Zuck suggests that, "American spiritualism and the early oil industry had more in common than just temporal and geographic proximity...Spiritualism offered an alternative to evangelical Christian and classical republican conceptions of industry, and a vibrant communication network ready to relay sensational accounts of the oil region to the general public."²⁶⁵ In a section titled "Abraham James: The Medium and The Message", Zuck asserts, "Like the oil that he was credited with locating and the spirits with whom he apparently communed, James provided a kind of rhetorical availability and functioned as a site onto which discourses, desires, and anxieties of various kinds could be mapped."²⁶⁶ Oil mysticism illuminates a

²⁶⁴ Daniel Bednarz, "Medicine After Oil," *Orion Magazine*, accessed March 30, 2022, <https://orionmagazine.org/article/medicine-after-oil/>.

²⁶⁵ Zuck, 21.

²⁶⁶ Zuck, 21.

fundamental theology co-conditioning practices of oil extraction. Oil representations were funneled through an economic pipeline in their very actualization. The material substances that were bottled, barreled, piped, and burned, were synthesized as a chemical staple. American mysticism merely resituated the substance amidst an alternative Christian faith, while sustaining the attributes determined by representational individualism reinforced by industrialization. The mystic scaffolding reveals the extent of the socialized parameters of the industrializing world. Even within the imagination of mystic alternatives, American mysticism still situates oil as a discrete commodifiable substance.²⁶⁷

²⁶⁷ Cayce, *My Life as a Seer: The Lost Memoirs*.

Field Notes: Oil Ontologies

Oil Ontology: Genuine Earth Energy Manufactured by Elia Vargas is an edition of twelve 3D-printed (PLA filament) crude oil medicinal bottles, sealed and containing Baar Inc. Crudoleum, 100% Pennsylvania Crude Oil Scalp Treatment. <Figure c> In conjunction with an oil hair-washing performance-talk, it was exhibited at Access Gallery's PLOT space in Vancouver, BC, as part of the 2019 exhibition Under the Beating Sun, From Summer to Summer, organized by Far Afield, an artist-led initiative supported by the Canada Council for the Arts and British Columbia Arts Council. Curated by Caitlin Chaisson, the group exhibition explored "the relationship between sound and energy on a rapidly heating west coast through a consideration of two Summerlands: Summerland, British Columbia, and Summerland, California." It included talks with Stephanie LeMenager, Ursula Biemann, and others. Oil Ontology embodies the material-discursive history of oil mysticism and oil medicine.



<Figure c: Oil Ontology: Genuine Earth Energy Manufactured by Elia Vargas. Photo: Elia Vargas.>

The history of medicinal crude oil far predates its use as a combustible energy source, and the replicated medicinal oil bottle, despite its uncanny appearance now, was once familiar. The additive construction technique of 3D printing the polymer oil bottles, building up a petrosubstrate—sealing off a history of medicinal petropractices via contemporary petroplastics—conceals historical alternatives to oil as fossil fuel. By presenting these literal, material, plastic limitations, which cut off access to the Crudoleum inside, Oil Ontology explores the ontological limit that industrial conceptions of crude oil have actualized in contemporary life. That is, Oil Ontology bottles up and seals off access to the historically common medicinal—in this case, hair-regenerative—conception of oil.

Oil Ontology is a plastic artifact of the simultaneously erased medicinal history and the polymer infrastructure of the present.

Two. Solar Alchemy. Making Oil Nature (again)

Even if limited in scope, the oil mystics of industrialization revitalized a practice of solar alchemy that believed the world could be synthesized differently. Framed within a media and science studies context, this debate sets up on the outset that the elemental, too, is a contested notion, even as Nicole Starosielski advances the constructive, open-ended notion of elemental analysis.²⁶⁸ In this way, the agential realist media theory of Volume Two functions to construct the apparatus with/in which the naturecultures of oil as nature is practiced. If agential realism moves media away from space and time and towards indeterminate spacetime matter, as I argue in Volume Two, then nature too must be rethought as part of spacetime matter's ongoing differentiation of the world.

Barad does not define what nature is; ontological specificity is not representational, but rather an ongoing performative becoming. Nature is not some-thing, it becomes-with in its ongoing intra-activity. The very categorization *nature* implies cultural and historical inheritance of a nonhuman world and humans as static unchanging beings that produce

²⁶⁸ Starosielski, "The Elements of Media Studies."

human culture. Barad's notion of performativity, which argues against representationalism looms large here.

...Agential realism does not simply pose a different dynamics (substituting one set of laws for another); it introduces an altogether different understanding of dynamics. What is at issue is not merely that the form of the causal relations are changed, but the very notion of causality, agency, space, time, and matter are all reworked. For example, agency—rather than being thought in opposition to structures as forms of subjective intentionality and the potential for individual action—is about the possibilities for changing the configurations of spacetime-matter relations... Using this account of natural-cultural practices makes it possible to attend to the changing “multiplicity of force relations imminent in the sphere in which they operate” (Foucault 1978, 93) where the forces are not merely social, and the bodies produced are not merely human. That is, power is rethought in terms of its overall materializing potential.²⁶⁹

Following the feminist methodology of diffraction, Melanie Sehgal reads Barad, Donna Haraway, and process philosopher A.N. Whitehead to consider a similar dilemma of how to think nature. “[Whitehead’s] opus magnum, *Process and Reality* (1929),” she says, “is an attempt to construct a metaphysics in which nature does not bifurcate—and thus to construct a frame of thought that avoids a ‘metaphysics of individualism’ (Barad), ‘human exceptionalism’ (Haraway) and a representationalist

²⁶⁹ Barad, *Meeting the Universe Halfway*, 230.

epistemology.”²⁷⁰ Sehgal points to a lineage of theoretical interventions seeking to work beyond binary conceptions of nature and culture.

There are numerous such lineages in the present.²⁷¹ Many different disciplines and practices are rethinking nature to imagine posthumanist, more than human, oddkin, and other futures that do not perpetuate the Western tradition of anthropocentrism, and to seek ways to approach the planetary crises of climate destruction, species annihilation, and rampant xenophobia. Paul Crutzen and Eugene Stoermer’s formulation of the Anthropocene—discussed throughout this project—popularized in 2000, a geologic epoch defined by the indelible footprint left by humans, mobilized the current formulation and critique of the present state of the planet.²⁷² The Anthropocene displaces the Holocene as the current epoch,

²⁷⁰ Melanie Sehgal, “Diffractive Propositions: Reading Alfred North Whitehead with Donna Haraway and Karen Barad,” *Parallax* 20, no. 3 (n.d.): 188–201.

²⁷¹ In addition to Barad, see for example: Isabelle Stengers, *Cosmopolitics I* (Minneapolis; London: University of Minnesota Press, 2010), <https://www.upress.umn.edu/book-division/books/cosmopolitics-i>; Viveiros de Castro, “Cannibal Metaphysics”; Povinelli, *Geontologies*; Anna Tsing, *Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins* (Princeton University Press, 2015); Haraway, *Staying with the Trouble*; Marisol de la Cadena and Mario Blaser, *A World of Many Worlds* (Durham: Duke University Press, 2018); T. J. Demos, *Against the Anthropocene: Visual Culture and Environment Today* (Cambridge, MA, USA: Sternberg Press, 2017); Todd, “Fish, Kin and Hope”; Latour, *We Have Never Been Modern*.

²⁷² Crutzen and Stoermer, “The Anthropocene.”

due to the extent of human activity influencing the planet. Of course, there have been many ecocritical perspectives before the Anthropocene—such as James Lovelock’s formulation of Gaia, which Bruno Latour has recently reconsidered.

The Anthropocene it is not the most radical configuration of ecological entanglements—particularly when accounting for the fact that at best, Western knowledge structures have not taken seriously non-Western conceptions of the world, or at worst indigenous ontologies of nature have been largely ridiculed and dismissed. T.J. Demos, particularly, has taken up this perspective within visual studies and art history. His recent books *Decolonizing Nature* (2016), *Against the Anthropocene* (2017), and *Beyond the World’s End* (2020) identify “a range of experimental models that... have forcefully materialized formations of politico-ecological aesthetics and practices.”²⁷³ Demos is attuned to the power that cultural sovereignty plays in representing concepts. “By foregrounding speculative imagination,” he

²⁷³ T. J. Demos, *Decolonizing Nature: Contemporary Art and the Politics of Ecology* (Berlin: Sternberg Press, 2016); T. J. Demos, *Against the Anthropocene: Visual Culture and Environment Today* (Cambridge, MA, USA: Sternberg Press, 2017); T.J. Demos, *Beyond the World's End: Arts of Living at the Crossing* (Durham: Duke University Press, 2020), 21.

says, “these creative ecologies not only critically expose oppressive structures but also open up emancipatory futures, new worlds beyond catastrophic climate breakdown, colonial domination, and social injustice.”²⁷⁴ This returns to a notion I stressed in the introduction, communities that have agency are capable of forming their own philosophical structures.²⁷⁵

As Haraway has pointed out, however, Anthropocene can be a useful term, if only for its embeddedness as a concept for seriously rethinking the planet. She proposes the Chthulucene—in response to the Anthropocene and Capitalocene, first uttered by Andreas Malm and popularized by James Moore—an “ongoing temporality that resists figuration and dating and demands myriad names.”²⁷⁶ Although Haraway has criticized posthumanism, this articulation of the Chthulucene also critiques the Anthropocene as an event of anthropic temporality. This aligns with

²⁷⁴ T.J. Demos, *Beyond the World's End: Arts of Living at the Crossing* (Durham: Duke University Press, 2020), 21.

²⁷⁵ Bethany Nowviskie, “Speculative+Collections,” n.d., <http://nowviskie.org/2016/speculative-collections/>.

²⁷⁶ Donna Haraway, “Tentacular Thinking: Anthropocene, Capitalocene, Chthulucene,” *E-Flux*, no. 75 (September 2016), <https://www.e-flux.com/journal/75/67125/tentacular-thinking-anthropocene-capitalocene-chthulucene/>.

agential realism that space, time, and matter do not have prior attributes before they are intra-actively co-constituted. The spacetime-matter of the planet does not include, a priori, the marker of specific human categories.

This eco-critical debate is staged in the diffractive patterns of new insights across multiple disciplines. From media studies, feminist philosophers, science studies scholars, anthropologists, indigenous scholars, and speculative practices, the list is long. Starosielski's elemental analysis proposes that "media's elemental becoming" seeks out, extend to include, or be engulfed by other disciplines broadly challenging the nature and the cultural divide.²⁷⁷ As I discussed in Volume Two, within media studies, Jussi Parikka and John Durham Peters have laid out an elemental and a geological materialist media agenda that links technological practices and agencies of communication to nonhuman naturecultures, or medianatures. The coalition of thinkers is a broad and interdisciplinary group; I think that matters.

This group points to the sticky relations between the idea that nature is something more than ontologically determinate ecological measurements,

²⁷⁷ Starosielski, "The Elements of Media Studies."

and the way oil is governed by prevailing conceptions of nature. Barad and others have pointed out that “Nietzsche warned against the mistaken tendency to take grammar too seriously: allowing linguistic structure to shape or determine our understanding of the world, believing that the subject-and-predicate structure of language reflects a prior ontological reality of substance and attribute.”²⁷⁸ Barad, however, differs from other materialist approaches that it is not just language–discourse–that should not be taken too seriously, but also material circumstances that have been discursively divorced from the conditions of their material-discursive making. That is, matter is always already material-discursive; matter can no more be presumed to exist as such–tethered to a universal representation–than grammar. Hence, a turn towards performativity and my embrace of speculative practices as method.

Thermodynamics, a set of laws for describing energy and work when the American oil industry began, can illustrate why the ontological indeterminacy of naturecultures matters. As I discussed in Volume One, thermodynamics was established in the 1840s by Glaswegian scientists

²⁷⁸ Barad, *Meeting the Universe Halfway*, 133.

including William Thomson, to explain the steam engine. It marked a transformation in the conceptualization of energy systems. In *The Software Arts*, media theorist Warren Sack provides a history of the development of thermodynamics, based on what he calls the “work language” of physics.²⁷⁹

This language was originally used to compare the work of machines to the work of men. Utilizing Hannah Arendt, Sack suggests the work language described and developed by broad assortment of engineers, scientists, mathematicians, and philosophers, is more precisely a language of labor. He cites French fortifications engineer Charles-Augustin de Coulomb’s idea of work in the treatise *Théorie des Machines Simples* (first written in 1775): “We have just seen that the effect of a machine can always be measured according to a weight multiplied by the height to which it has been raised.”²⁸⁰ The history that Sack provides shows how Lord Kelvin’s eventual measure of temperature, crucial for the definition of entropy, “succinctly relates not just weight and height but also heat and electricity, mechanics, thermodynamics, and electrodynamics...”²⁸¹ Sack continues to show that

²⁷⁹ Warren Sack, *The Software Arts*, Software Studies (Cambridge: The MIT Press, 2019), 65.

²⁸⁰ Sack, 65.

²⁸¹ Sack, 66.

Claude Shannon's formal definition of information is based on Lord Kelvin's definition of entropy. Shannon's definition of information, Sack argues, therefore has its roots in eighteenth-century problems of common laborers.

The reconfiguration of combustion allowed human and animal laborers, as well as sediment buried beneath the surface of the earth, to be comprehended as energy units, within a system. This was a primary concern of Whitehead, as a contemporary of Albert Einstein and Niels Bohr (whose quantum physics are a focal point of Barad's agential realism). In *The Birth of Energy*, Cara New Daggett provides a naturecultures analysis of energy and the introduction of thermodynamics. She says,

While energy is not a transhistorical fact of nature, neither is energy purely a concept or metaphor, an invention of the human mind. Energy cannot be reduced to an artifact of Victorian culture, nor merely to a set of fuels. It is a hybrid assemblage where these things are entangled, what Donna Haraway (and others) has called a *natureculture*...²⁸²

The ability to make oil fuel is linked to a transformation of human metaphors for nature into a mechanical model. While Daggett embraces a naturecultural analysis of energy, an agential realist approach suggests it is not going far enough to say that energy is a "hybrid assemblage" of

²⁸² Cara New Daggett, *The Birth of Energy* (Durham, NC: Duke University Press, 2019), 5.

preexisting entanglements. Concepts and metaphors are not equally “inventions of the human mind.” While energy describes material-energetic events that are distinct from their thermodynamic representations.

Representing change in the natural (nonhuman) world as a science of productive labor—thermodynamics—catapulted industrialization into a new grand cosmology. Barad utilizes the work of the historian of science Norton Wise to illustrate how,

[T]he steam engine “simultaneously instantiates ‘labor value’ in political economy and ‘work’ in engineering mechanics, thereby identifying the two concepts in the region of their common reference.” This “partial identification,” he claims, “carries with it a structural analogy between a network of concepts from political economy and a similar network in natural philosophy, providing a potent heuristic for the reformulation and further development of dynamics” (Wise 1988, 77).

Here, discourse reconfigures conceptualizations of nature at the level of grammar, marking no physical correlation between natural events and words, but nonetheless allowing a metaphor to replace states of existence as the governing scientific analysis of how things are.

Prior to thermodynamics, the beginning of the enlightenment initiated a Western-rationalist transformation of how the natural world was perceived, summarized by Carolyn Merchant’s environmental history. The new viewpoints, however, made no effort to distance themselves from the

centralizing force of Man's authority over nature and the metaphysics of individualism endowed by Cartesian dualism, and extended by the determinism of Newtonian physics. Classical dynamics tell us, "Matter is discrete but time is continuous," says Barad. "Nature and culture are split by this continuity and objectivity is secured as externality."²⁸³ The God's eye view, objective perspective, and the capacity for deterministic measurement of the universe followed. Representationalism suggests that objectivity is secured by representations of conditions through empirically measured, universal observations. But as numerous feminist and critical race theorists including Barad and Haraway have shown, securing a position of authority on what counts as representation is not a naturalized given condition but rather the result of the dynamics of material, discursive, natural, cultural, scientific, and technological relations.²⁸⁴

²⁸³ Barad, 233.

²⁸⁴ See: Beth Coleman, "Race as Technology," *Camera Obscura* 24, no. 1 70 (January 1, 2009): 177-207; Lisa Nakamura, "Indigenous Circuits: Navajo Women and the Racialization of Early Electronic Manufacture," *American Quarterly* 66, no. 4 (2014): 919-41, <https://doi.org/10.1353/aq.2014.0070>; Ruha Benjamin, *Race after Technology: Abolitionist Tools for the New Jim Code* (Cambridge, UK; Polity, 2019).

In his Gaia Lectures, sociologist Bruno Latour asks a related question, “What does it mean for people to measure, to represent, and compose the shape of the earth to which they are bound?”²⁸⁵ Who—or, what—has the agency to make such determinations? Barad’s reworking of agency provides one answer.

Crucially, agency is a matter of intra-acting; it is an enactment, not something that someone or something has. Agency is doing/being in its intra-activity. It is the enactment of iterative changes to particular practices—iterative reconfigurings of topological manifolds of spacetime-matter relations—through the dynamics of intra-activity. Agency is about changing possibilities of change entailed in reconfiguring material-discursive apparatuses of bodily production, including the boundary articulations and exclusions that are marked by those practices in the enactment of causal structure.²⁸⁶

With this conception of agency as a tool, the historical industrial response to Latour’s question has been to take agency over the planet and the beings that co-constitute it. To measure and represent is to govern and control. As an actualizing force of industrial modernism, which provides

²⁸⁵ His own response, “Earth: understood as a historical conception or geohistorical adventure. Gaia: from James Lovelock the most secular historical figure science has studied, not unified but composed—not nature... a political theology of nature. Nature-known, by the sciences... in epistemological mode, nature defined by full attributes of exteriority, unity, inanimate agency, and undisputability... Bruno Latour, “Facing Gaia: Once Out of Nature,” <http://www.bruno-latour.fr/node/487>.

²⁸⁶ Barad, *Meeting the Universe Halfway*, 235.

both the ontological and epistemological conditions for its own
development, thinking with oil means resisting the impulse to define it by
the governing conditions that have measured nature by the light of man.

Field Notes 900: (En)lightenment

Thinking beyond enlightenment means thinking diffractively through enlightenment. I want to elucidate a dual conception of enlightenment: the historical era and the practice of illumination. Carolyn Merchant has written in great length the ways that Sir Francis Bacon legitimized new scientific concepts of enlightenment with the state, and the environmental and gendered consequences that followed.

*Year 900 (CE) was a leap year starting on Tuesday of the Julian calendar. Sometime in early 900 CE, the Persian physician and chemist Abu Bakr Muhammad ibn Zakariya al-Razi wrote a laboratory manual in Arabic called the *Kitab al-Asrar*, *The Book of Secrets*. In this book he categorized naphtha as one of 11 salts. Salt was one of six mineral divisions, including: Four spirits, seven bodies, thirteen stones, seven borates, and the eleven salts. al-Razi provided the first inscriptive record of synthesizing oil into a light illuminating fuel, an early progenitor of kerosene. The matter of illumination, as a systematic apparatus of perceiving—knowing and revealing—is part of Bacon’s legacy. Difficult it is to avoid metaphors of perception that don’t entangle knowing with perceiving. That is, entangling the senses of the body from the apparatus of scientific inquiry. What does it mean to know?*

*Sir Isaac Newton ends his book *Opticks* by invoking light as that which illuminates the nature of God: “For so far as we can know by natural Philosophy what is the first Cause, what Power he has over us, and what Benefits we receive from him, so far our Duty towards him, as well as that towards one another, will appear to us by the Light of Nature.” There is an uncanny resemblance here to the agential realist concept of the apparatus; meaning, for Newton, light is being conceived of as an onto-epistemological agency that determines the possibilities and impossibilities of mattering. The relationship between light and oil is of great importance, both the sun and oil, but also artificial light and oil. See: Sir Isaac Newton, *Opticks: Or, A Treatise of the Reflections, Refractions, Inflections and Colours of Light*, 381.*

In “New Dark Age: Technology and the End of the Future”, James Bridle argues, “The greatest carrier wave of progress for the last few centuries has been the central idea of the Enlightenment itself: that more knowledge—more information—leads to better decisions... The internet, in its youth, was often referred to as an ‘information superhighway’, a conduit of knowledge that, in the flickering light of fiber-optic cables, enlightens the world.... And so we find ourselves today connected to vast repositories of knowledge, and yet we have not learned to think. In fact, the opposite is true: that which was intended to enlighten the world in practice darkens it” (loc 178).

I dwell on Bridle here because he activates this particular tension between how society perceives technology and how it emerges amidst entanglements of many forces—the apparatuses that enable and co-constitute “them.” Bridle is interested in the way that technology is not only a practice of tool making, but also a practice of making metaphors. One might say language is a metaphor making technology, a position software studies theorist Wendy Chun embraces through a Nietzschean lens that all things are long chains of metaphors describing other metaphors, in which case the original thing—computer hardware for Chun—becomes redefined by the metaphors themselves. I have also spoken to Barad’s attention to Nietzsche’s caution of an overreliance on correlating linguistic structures with prior ontological assumptions of the physical world.

Bridle proposes a thoughtful engagement with technology and a serious commitment to radically different conception of knowing things about the world. For one thing, he proposes embracing the darkness he speaks of. Darkness can be a place of freedom, possibility, and equity; and he is not the first to offer such a proposal. Darkness is that where light has not shined, what is outside of measurement, what is unknown, indeterminate, beyond the senses, and thus undefined. To persist in the undefined, what a remarkable position indeed.

Bridle begins the second chapter of New Dark Age reflecting on a series of lectures in 1884 by art critic John Ruskin. During these lectures at the London Institution, titled "The Storm-Cloud of the Nineteenth Century," Ruskin says that the "'fiat lux of creation'—the moment when the God of Genesis says, 'Let there be light'—is also fiat anima, the creation of life. Light, he insisted, is 'as much the ordering of Intelligence as the ordering of Vision'. That which we see shapes not just what we think, but how we think. For Bridle this begins his climate-based genealogy of information. Computational thinking, he argues, begins with the weather. Ruskin's lectures which present a concern for air pollution correspond to Alexander Graham Bell's invention of the photophone, a light-based wireless voice transmission technology. With that, Bridle begins a specific history. But I invoke the 'fiat lux of creation' towards the ways that it sustains this idea of sensing as equivalent to knowing. Light is an ordering of intelligence, not because it allows one to see, but because light is energetic materialization of the world. The solar orb above is entwined with the earth in an apparatus of life. There is no vision that pre-exists light, or said differently, vision is only one of the mechanisms of knowing that emerge through the solar light apparatus. Bridle approaches this position, saying of Bell's photophone:

That line of sunbeams, of course, is precisely what we can see today arrayed around the globe. Bell's invention was the first to deploy light as a carrier of complex information...it required only the insulation of the sunbeam in order to carry it over unimaginable distances. Today, Bell's sunbeams order the data that passes beneath the ocean waves in the form of light transmitting fiber-optic cables, and they order in turn the collective intelligence of the world. They make possible the yoking together of vast infrastructures of computation that organize and govern all of us. Ruskin's fiat lux as fiat anima is refined in the network (loc 307).

In other words, light is life. Life forms. Oil is light, across intervals beyond the capacity of human affect. But, not quite in the way that Bridle proposes. The enlightenment, at its very core is a process of illumination, the yoking, as Bridle suggests, of vision and creation. But seeing too is bound up within enlightenment conceptions of the senses. To sense is to feel and to know. How is it that science has persisted in essentializing the human body as a site for empirical reasoning, even as it strives towards the commodification of nanoseconds, realigning a cosmological ordering of spacetime in the process? A cosmotechnics worth imagining recognizes that the apparatus co-constitutes what is. The field guide to what exists does not pre-exist the infrastructures that index it. Vision is only one of an embodiment of senses, which for most of Western enlightenment has been erroneously seen as stratified, distinct, and absolute. No matter that proprioception has only recently been added to the five senses, no matter that what is taken to be taste is mostly smell, no matter that kin species such as dogs embody a political ontology of sense that renders an entirely different world. Light is life because life is a transduction of light energy in a material-discursive way. That light is presumed to be commensurate with vision, (and vision with truth) as a method of knowing, is in other words, a technology of enlightenment itself.

Three. The Petroleum System

Contemporary scientific discourse describes petroleum, which includes crude oil, natural gas, and other solid hydrocarbons, as primarily consisting of microscopic plants and animals such as algae, bacteria, spores, or planktons. Coal, on the other hand, forms mostly from more biological plant material, woody cellulosic plants, and cuticles. A series of conditions must occur for petroleum to be formed from organic material, which are described by the *Springer Handbook of Petroleum Technology*:

High productivity: A lot of organic material must be produced from the demise of large amounts of micro organisms caused, for example, by massive kills due to anoxia, lack of nutrients, or natural hazards.

Rapid burial: The organic material must be trapped and buried very quickly to avoid decay.

Absence of oxygen: The organic material must be buried under anoxic conditions deep enough so that trapping and burial excludes oxygen.

Pressure and heat: The organic material must be buried deeply, typically with an overburden of more sediment above the organic rich layer to increase pressure and temperature.

Time: There must be time for the geochemical transformation of the organic material into petroleum.

Once the organic material is buried, the next step is to transform and mature the organic material. The maturation process of organic material occurs through three main stages:

1. The first stage of diagenesis involves the early stages of anoxic burial of the organic matter-rich sediments. This step leads to the expulsion of water, compaction, and cementation of the sediments containing the organic material. During this stage, kerogen (a type of disseminated organic material that is not soluble in most organic solvents) is formed.
2. The second stage, catagenesis, involves the transformation of kerogen to oil, gas or coal. This stage generates mostly large HC molecules in the early stages, and in the later stages it generates smaller HC molecules (including C5 to C12 molecules) and wet gas.
3. During the third stage, metagenesis, mostly dry gas (methane) is produced, followed by the onset of metamorphism.²⁸⁷

The scientific petroleum system is a contained, reified, system to engineer geophysically productive energy commodities. In Volume One, I discussed the rhetorical scientific and infrastructural information brokering that Geoffrey Bowker depicts in his analysis of the French oil company Schlumberger in the early 1900s.²⁸⁸ Similar work can be seen at play here. As the system progresses (historically) in geologic time, the conceptualization of the system takes on increasingly economical descriptions:

The Petroleum System must contain: (1) at least one formation of organic-rich sediments (source rock) that has been buried to a sufficient depth by overburden rock such that petroleum is

²⁸⁷ Paul R. Robinson and Chang S. Hsu, *Springer Handbook of Petroleum Technology*, Springer Handbooks (Cham: Springer International Publishing, 2017), 326.

²⁸⁸ Bowker, *Science on the Run*.

generated and expelled, (2) pathways (permeable strata and faults) that allow the petroleum to migrate, (3) reservoir rocks with sufficient porosity and permeability to accumulate economically significant quantities of petroleum, and (4) seal rock (low permeability) and structures that retain migrated petroleum within the reservoir rock. In the case of many unconventional resources, the source rock itself serves as source, reservoir, and seal.

Petroleum, composed of hydrocarbons and heteroatomic molecules, is the most complex mixture occurring in nature. The composition of petroleum generated within its source rock is influenced by the type of organisms that contributed organic matter, the environment of deposition, and thermal exposure. Most of the deposited biomolecules are chemically altered, broken apart, and reassembled into an insoluble carbonaceous material termed kerogen. Upon burial and heating, the kerogen reacts producing mostly compounds that have lost their biochemical signature; however, some of these generated molecules, termed biomarkers, preserve enough of their chemical structure that their original biological precursor can be identified. Expulsion from the source rock chemically fractionates the generated petroleum, with the expelled product enriched in gases and hydrocarbons, and retained bitumen enriched in heteroatomic polar species and asphaltenes. Petroleum composition can be further altered as it migrates and resides in reservoir rocks by physical, chemical, and biological processes. Collectively, these processes result in petroleum accumulations with a diverse range of compositions and physical properties.²⁸⁹

Considered as a narrative of deep time, the organic (and non-organic) matter that makes up petroleum are not merely the steppingstones marching towards the progressive development of oil, the

²⁸⁹ Robinson and Hsu, 359.

final product. Kerogen, biological organisms, and other chemicals do not come into existence as a byproduct of the (human) need for oil. Nor does the geologic time of petroleum development signal a hierarchy amidst those materials for anyone beyond humans invested in its extraction.

The different conceptualizations of oil advanced by pioneers of American mysticism who saw the black gold of their moment endowing much broader forms of celestial reverence, provide a counternarrative to the mapping of this scientific model of oil that assumes fossil fuel is the natural end-point of a geological system. These individuals too, were often guilty of pandering snake oil and profiteering off the mysterious allure of the primordial black liquid. Although they advanced a different metaphysics for measuring and representing oil, it was still a metaphysics of individualism, and, remarkably, these conceptions were frequently adopted by industrialists.²⁹⁰

The petrochemical science of today uses paraffin and other hydrocarbons in oil in many similar ways. Petro-chemists view oil as the

²⁹⁰ Henry, *The Early and Later History of Petroleum, with Authentic Facts in Regard to Its Development in Western Pennsylvania... Also Life Sketches of Pioneer and Prominent Operators*, 215-217.

most bio-rich substance humans have ever discovered. It appears as part of the apocalypse in the Mayan origin story *Popol Vuh*, the Quran, the Jewish and Christian Bibles (for exact verse, see Field Notes 23, 25, and 87). Everything from chewing gum to nylon pantyhose are made from it, beyond the common use as engine fuel.

Debating the nature of oil intrinsically involves asking questions about the earth. What is earth? How are mud, oil, water, and dirt differentiated? On a chemical level, what is oil? When is a hydrocarbon-rich liquid something other than oil? Oil comes from the earth, but it is manipulated by humans—its materiality is chemically changed and the discourse of it is changed. Implicated in this debate is the entanglement of scientific discourse, measurement equipment, and a metaphysics of individualism. Barad says:

The shifts from Newton's clockwork to Thompson's engine is but a minor mutation when compared to the discontinuous changes that have occurred during the twentieth century in the nature of machines and machinic agency, and our understanding of them... The productive role of apparatuses in linking issues of natural philosophy, political economy, and human and nonhuman forms of agency is one of the central themes... Apparatuses are not mere instruments serving as systems of lenses that magnify and focus our attention on the object world, rather they are laborers that help

constitute and are an integral part of the phenomena being investigated.²⁹¹

Oil-as-fuel is a laborer as well. The development of many scientific disciplines coincided with the discovery of the combustible potential of oil. The science of oil—geology, chemistry, geophysics—cannot be separated from the discovered economic potential of its extraction. In other words, the rationalist conceptualization of oil is not neutral. The invention of making oil fuel coincides with the invention of combustion, i.e. thermodynamics. The knowledge, however, that oil could burn did not come into existence with enlightenment era scientific analysis. The work of 10th century Persian Alchemist Al-Razi provides evidence of this.²⁹²

Petroleum replaced whale oil—rendered fat, bones, and spermaceti of slaughtered whales—as the primary domestic light source in the nineteenth century. Electricity, too, is a natural phenomenon, mobilized in human-nonhuman coordination. Water and animal power came before these. The so-called raw materials that make up what has come to be called nature are often extracted from the context of their existence to be synthesized,

²⁹¹ Barad, 232.

²⁹² Taylor, *The Alchemy of Al-Razi*.

invented as something else. This is what geographer Jason Moore means by *cheap natures*, when elements of the earth are refashioned to appear as easily available and without consequences to transform the ethics and economics of their removal.²⁹³ Nonhuman elemental materials, likewise, are not a pre-determined natural state countering their otherwise domesticated productive potential. This is the point which agential realism provides: all entities matter in their specific ongoing differentiation/differentiating of the world(s). This point could not be more important, it means that no-thing, human or otherwise, governs the descriptions of the world.

²⁹³ Jason W. Moore, *Capitalism in the Web of Life: Ecology and the Accumulation of Capital* (London; Brooklyn, NY: Verso, 2015).

Field Notes: Indian Dreams

A plaque at Petroleum City:

“Early in 1846, A.C. Kepler dreamt he was in the woods with a young woman who some considered a coquette (a flirt). An American Indian attacked him with a bow and arrow. The woman stealthily advanced and handed him a rifle that she plucked from the air. He fired at his foe, the Indian immediately disappeared, and oil gushed from the spot where he’d stood.

Visiting his brother soon after the dream, Kepler recognized a place on the Egbert Farm as the scene of his dream and pointed out the location of the oil gusher to his brother. His brother bored the Coquette Well at the spot, and it began flowing 1,500 barrels a day.

Such a romantic and intriguing story became the object of great curiosity. Tourists stopped daily to gaze upon the well and to pay 10 cents to climb steps to watch the oil pour into tanks. A share in the Coquette Well was considered a small fortune.”

**Financed by the Pennsylvania Department of Conservation and Natural Resources, Oil Heritage Region, In. and local Donors.*



Four. Figures of Nature. Oil Speculations

While it might appear as a playful move to speculate beyond current traditional representations of nature—and there is nothing wrong with play—understanding speculation in this way risks neglecting the very serious matter that prevailing Western representations of nature are manufactured concepts governing meaning-making. Peters says, “The elemental legacy of the media concept is fully relevant in a time when our most pervasive surrounding environment is technological and nature—from honeybees and dogs to corn and viruses, from the ocean floor to the atmosphere—is drenched with human manipulation.”²⁹⁴ Indeed, it is not clear where the technical and the natural are rooted, even when it is known that they are inextricably linked. Oil, as I have shown, is manipulated by technoscientific apparatuses before it ever reaches the public imagination; before it is named as a material substance in the public imaginary.

Oil Creek functioned as factory assembly plant.²⁹⁵ The energy of the river was harnessed as a mechanical device to transport oil from Titusville to

²⁹⁴ Peters, *The Marvelous Clouds*, epub 11.

²⁹⁵ Black, “Oil Creek As Industrial Apparatus: Re-Creating the Industrial Process through the Landscape of Pennsylvania’s Oil Boom.”

Petroleum City. The concept of naturecultures does not only seek out the dividing line, like a jig-sawed pattern, to neatly put these pieces back in place, into nature and culture. Instead, it shows that there is no point at which an entity “nature” existed without its co-constitution with “culture.” Similarly, culture, as the social “inside” of nature does not exist a priori. Oil is represented with/in these competing forces. Oil has always been speculative.

Nature—as shorthand for the nonhuman environment—does not require human written or spoken language to come into existence. Nature (the nonhuman) is not ontologically determinate by human representations of it. Even now, in the so-called Anthropocene, the epoch defined by human manipulation of Earth, it is an underwhelming characteristic of Western industrialist society to be unable to acknowledge that life is neither dependent on humans nor determined by humans.

To make a stronger argument for this, perhaps rather than focusing on *nature*, my focus should be on *worlding*, as Mario Blaser and Marisol de la Cadena do in the “Proposal for a World of Many Worlds.”²⁹⁶ They argue

²⁹⁶ Cadena and Blaser, *A World of Many Worlds* (Durham: Duke University Press, 2018).

that, "Accompanying the explosion of political and scholarly discussions about the Anthropocene has been the explosion of protests coming from worlds—usually labeled indigenous—currently threatened by the possibility of immediate destruction by anthropogenic practices."²⁹⁷ Their resituating of the world, a pluriverse, or "heterogeneous worldings coming together as a political ecology of practices..." is explicit about "refracting the course of the one-world world... and negotiating their difficult being together in heterogeneity."²⁹⁸ They utilize Isabelle Stenger's conception of cosmopolitics: "gathering together for interests in common which are not the same interests."²⁹⁹ The rise in indigenous scholarship is one of the movements challenging historical positivist conceptions of nature, including conceptualizations of oil. Zoe Todd's argument that oil is kin is one example.³⁰⁰

Blaser, Cedana, Stengers, and Todd get at the important but under-explored question: what is at stake in defining nature? What does it mean for everything else, for all that there is? Oil is, quite obviously, a substance

²⁹⁷ Cadena and Blaser, 1.

²⁹⁸ Cadena and Blaser, 4.

²⁹⁹ Cadena and Blaser, 4.

³⁰⁰ Todd, "Fish, Kin and Hope."

of the Earth. Aristotle described it as the “exhalations from deep within the Earth.”³⁰¹ The word energy derives from Aristotle’s *energeia*. It “is a combination of the Greek *en-*, meaning ‘in’ or ‘within’ and *-ergon*, meaning work. It is often roughly translated into English as activity or actuality...”³⁰² Through thermodynamics, representations of energy transformed the way the earth was understood.

Like the host of other fossils dug up by humans in the nineteenth century, fossil fuels illuminated the Earth as a hive of constant activity, even in zones that appeared inert or lifeless. The Earth, formerly understood as an extension in space, gained a new dimension: Earth as historical, as a duration in time, and thus as a potential reservoir for work.³⁰³

This realization should not be underestimated. What a remarkable discovery to learn that the infrastructure that sustains life is itself a living system. It is as if we moderns learned that the lasers of fiberoptic cables were historical entities with their own narratives that predated email.

During this time, new experiments of petroleum refining were taking place, which would lead to the simultaneous invention of kerosene by

³⁰¹ Paul R. Robinson and Chang S. Hsu, *Springer Handbook of Petroleum Technology*, Springer Handbooks (Cham: Springer International Publishing, 2017), 360.

³⁰² Daggett, *The Birth of Energy*, 17.

³⁰³ Daggett, 25.

multiple individuals in the 1840s. Oil had yet to become a staple fossil fuel. It was not yet comprehended in terms of energy conversion and combustible potential. Describing the metaphysics of energy, Daggett says, "As a Western concept, energy combines a materialism, in the description of activity, with moralism, expressing a bias toward dynamism over stasis."³⁰⁴ After the success of Drake Oil Well in 1859, the acceleration of extraction changed this. "In 1936, Alfred Treibs linked the chlorophyll in plants to the porphyrins in petroleum," continuing to expand conceptions of hydrocarbons in relation to the geological origin of oil.³⁰⁵

³⁰⁴ Daggett, *The Birth of Energy*, 18.

³⁰⁵ Paul R. Robinson and Chang S. Hsu, *Springer Handbook of Petroleum Technology*, Springer Handbooks (Cham: Springer International Publishing, 2017), 18.

Field Notes: Oil baths in the salt of the Earth

Salt of the earth.

Long before electrification made refrigeration possible, salt preserved and extended the life of food. Foods traveled new distances and were consumed in new seasons, due to salt, rearranging the “natural” order of consumption. Salt is a technical element, a techne. The deployment of salt, across territory of exchange, changed the very fabric of life. New foods carried to new places, permitting new activities previously impossible. Hunters, travelers, and traders could travel further with longer lasting food supplies; traditions of consumption were transmitted across greater diversity of humans; more time could be spent at remote infrastructure sites; military deployments could plan for greater durations away from home. Like oil, salt produced the conditions for new technosocial forms of life—new practices from the form of salt practices.

Salt technology, too, was crucial in the deployment of oil extraction. (I have already discussed the history of salt and oil).

Long before Drake Oil Well, however, the salt caravans of Dalalo, in northern Ethiopia, marked the earth. Camel caravans, carting numerous five-kilogram bricks of salt from one of the lowest points on the surface of the earth, slowly made their way, over weeks, into Eritrea and surrounding regions for trade. At 37 degrees Celsius, the Danikel Depression is the hottest average annual temperature on the planet. The Aksumites traded salt with the Egyptians, Indians, and others. At times, bars of salt were used as a common currency.

Underneath the vast salt plain, below feet of thick crusted sodium chloride, a sea of buoyant water flows about. Periodically, the salt crust breaks away and small water holes emerge, their salinity greater than the Dead Sea. The Afar people, a unique tribe with its own language that practices polygamy, control the region. Despite the negative elevation, there are no signs of the edge of the depression. Instead, barren salt flats blend into the sky amidst a mirage at the horizon line. Chalky white ground blends with hazy white sky, in all directions.

There, amidst the salty taste of earth and skin, I met the man who soaked in the Azerbaijan oil baths. I was eager to speak with him.

It is a very Soviet idea, to believe in the power of the earth to heal, he said. People with serious illness would sit all day in any manner of spring water, maintaining faith in the restorative potential.

It was a hospital, the place he took the oil bath. Very sick people were there for treatment. Before they could soak, they had to meet with a doctor for a health exam. But the doctor said for a few Azerbaijani Manat, they could forgo the procedure because they appeared to be healthy young people. A health center bribe.

A nurse accompanied them into a sterile washroom with a tub. The bath was half-filled with thick viscous oil. Reused by many before him. My new friend stripped down with the nurse still present—her continued presence a medical requirement—and he got in the bath. A faucet coming out of the wall began (spiriting out?) oil. The room resembled a gym shower room, grimy and indistinct. After some time, and a few nervous body submersions, he got out of the tube, slick with the residue of deep time and congealed hydrocarbons. The nurse, with a shoehorn and sponge in hand, began the long process of scrubbing the oil off his body.

Humiliating, he described to me, standing in the middle of this bare hospital shower room, being scrubbed down. For weeks to come, his sweat stank of oil.



Five. The Ohi:yo' Does Not End

In the face of the destruction of many worlds, suggesting that a transcendental reverence of oil is revealed by the logic of a primarily white American mysticism, rooted in derivatives of Christianity, is another form of historical enclosure and erasure. Oil has served numerous symbolic, social, material, spiritual, agricultural, energetic, and economic functions across earth. The mysticism I discuss—primarily Edgar Cayce and Abram James but also Karl von Reichenbach, the chemist who discovered paraffin, with a nod to the much broader culture of dowsing, divining, medicinal swindlers and other oil-cure-all ointment peddlers—is noteworthy because it originates amidst new scientific and industrial discourses that explain the geological, chemical, and ecological practices which govern so-called nature. These American mystics function as a trap motif, much like the mesmerism they advance, offering light in the abyss, pointing to the presence of a multifaceted modality of understanding oil, but nonetheless mobilizing it within the same framework of industrial capitalism and the standing reserve.

Throughout this dissertation, I've discussed Oil Creek, both the region and the river, in different conceptualizations. I've searched for the date that the river Oil Creek took on its colonial namesake, and what its previous Seneca name might have been. The Lewis Evans Map of Middle British Colonies from 1755 provides the earliest reference to Oil Creek. A map that George Washington used to survey land he was given in the oil rich area as reward for his service in the fight for United States Independence.

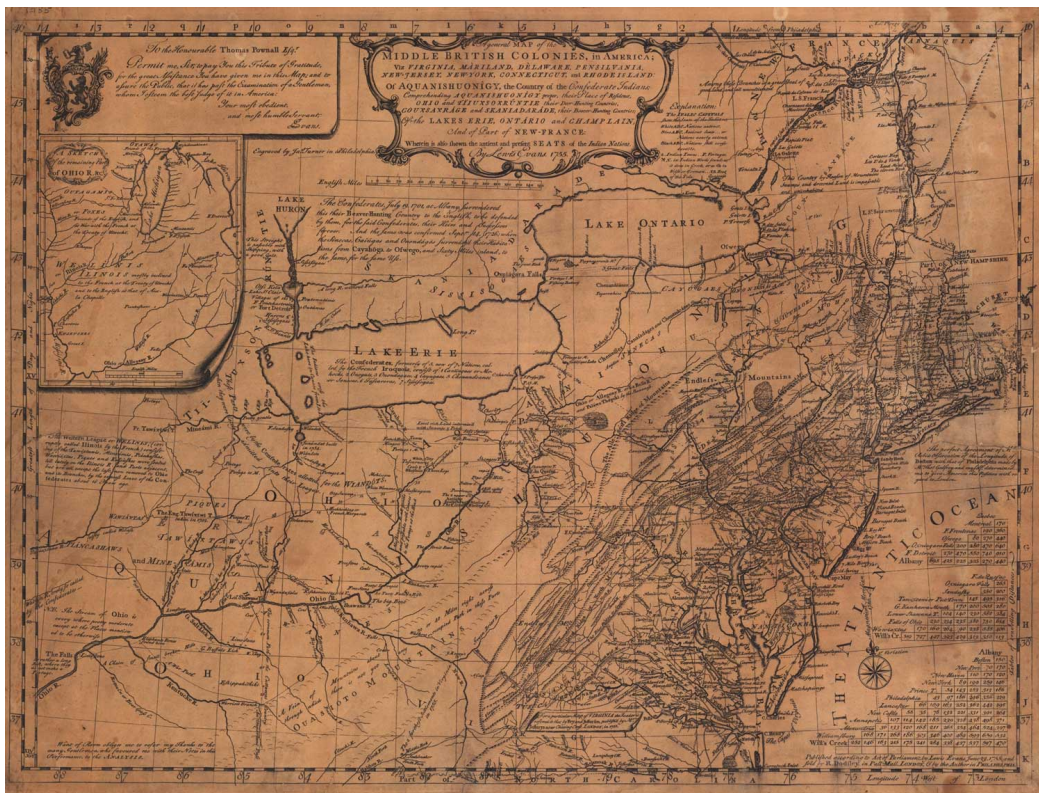


Figure 20: Lewis Evans Map of Middle British Colonies from 1755

Jay Toth, tribal archeologist at the National Seneca Museum told me:

Names were changing from Iroq. [sic] to Delaware with the Delaware settling in the old Iroq towns during this time. Keep in mind the native names for waterways reflect the local enviro... There [are] no specific names for creeks and streams. Native people consider them all one. Individual names for creeks is a Euro-Am concept.³⁰⁶

Oil Creek is a tributary to the Allegheny River, what the Seneca called *Ohi:yo'*, thus Oil Creek is the *Ohi:yo'*. This different configuration of waterways suggests a different conceptualization of space/time/matter. Instead of a discrete set of material ecological conditions, changing as the terrain changes, the notion of change (from what to what, from when to when, or from where to where?) is at stake. Western scientific conceptions of ecology in this regard suggest that matter is discrete and exists in space, occurring through time. If a river system is the same entity, then it exists across a different space and time. Space and time may not be the most constructive ways to comprehend (or re/present) the river. If it flows, and material from one location move to another, but it is all one entity, then it exists across multiple temporalities—before, after, and now—simultaneously. Similarly, it is present, here, there, and elsewhere, at the same moment. The distinction of

³⁰⁶ Jay Toth, "Oil Creek?". Email, 2019.

the river system offers a glimpse of how seemingly minor distinctions of knowing amount to profoundly different worlds.

Early American mysticism shifted the epistemological conceptions of oil towards other metaphysical considerations. Of particular interest is the way that these practices led to expanded industrial use of constituents of oil, such as paraffin. Mystics such as Edgar Cayce provided a link between much older, non-Western, oil configurations and the burgeoning industrial practices.³⁰⁷ American mysticism reveals the reliance on spiritual thinking in the early oil industry to determine it, find it, extract it, and use it. These practices should challenge any naturalized monolithic conception of nature and oil.

³⁰⁷ Snell, *The Derrick's Hand-Book of Petroleum*, 5-12.

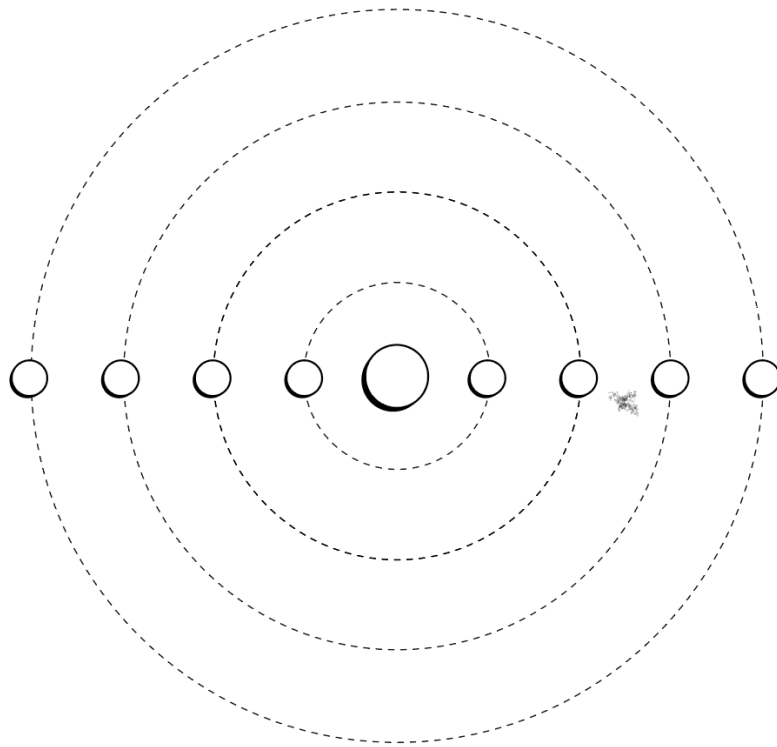


Figure 21: Heliotechniques variation

Field Notes: The book

The book persists as a powerful medium of meaning making because it must be opened and closed. The metonymy of turning a page is a self-fulfilling invitation. Opening a book always delivers on its promise that it will also be closed. Few gestures are so tidy at structuring their intent—here lie the containment of a thought. These thoughts can be held in one's hands. The tools needed to think these thoughts are here. It is a powerful notion. At some point in the history of the printing press and written words—a history that belongs to media studies—this promise of the book outpaced meaning making itself. Logos—the original word, the word of God, the name of it all, “the divine reason implicit in the cosmos,” all that there is—usurped the fact that meaning making is not isolated to discourse, speech acts, or readily legible marks. Instead, as a metaphor of itself, the book became knowledge. Words became reason. Language was self-verifying. In a general sense, this perspective persists: words characterize how things are. Marshall McLuhan's keen argument that print is a visual medium did nothing to challenge the ocular-centric nature of symbols representing states of being.

Thinking with oil on the other hand, requires thinking in more than visual ways. Or, at least, attuning to the way that meaning making is part of the ongoing differentiation of the world. Unlike a book, things are not tidy opened and closed points in a continuum. In a variety of ways, oil teaches this. In the various ways that I have noticed oil throughout this project, smelling it, touching it, being in it, projecting it, sublimating it, testing it, walking around it, listening to it, writing with it, researching it, historicizing it, and speculating it, it is clear that industrial modernism is an articulation of oil, in a way that exceeds words, and the classical, visual, enlightened, forms of meaning making that books tend to contain.

These meanings do not conform to the boundaries of natural and social differences. But like a book, they foreclose other possibilities. Inside a book, the possibilities and impossibilities of mattering are never absolute, but rather their form sets up a disciplining logic. Good books convince a reader of how things are. Wielding such a deployed technical act, the book communicates ideas within that structure, setting aside what lies outside it.

Afterword (a closure)

As I started thinking critically with oil, I thought I could locate a specific moment when oil became a fossil fuel. The actual moment of change—the becoming of oil as it is known today. When I began researching Drake Oil Well and researching the early history of the oil industry, I thought the first wells, the first refineries, the first fuels would present a clear metamorphosis. The change from whale oil to rock oil is a transparent reckoning of the earthly basis of fuel. The prevailing idea is that the oil industry began because a market emerged. But the geneses of oil as a fossil fuel is a mythic figure, like most origin stories. The truth is there is no singular moment, no comprehensive shift—or history. The American oil industry is a unique circumstance that perhaps governs the development of global capital. It is also part of a condition that has largely ignored other global histories of oil, in Azerbaijan, Burma, China, and other places.

I started this research to answer what strikes me as still an obvious question: what is oil? As is the case with the best questions, like infrastructure they fall into the background, like air they are atmospheric and invisible. How did oil become a fossil fuel? So many different things

happened over the course of a few hundred years to make it so; they all got swept along the light-wave of enlightenment until they could not be distinguished from the light itself.

For more than 160 years, writing about oil has set aside everything other than its industrial history—its status as a fossil fuel—an energetic entity characterized by its capacity to labor for humans. This status remains even as oil is commonly known to produce all manner of products, from plastics, lubricants, fibers, pharmaceuticals, fertilizers, and more. As other ideas have changed, this one persists: a naturalization of descriptions of the Earth as constituents of a human ecosystem. Highlighting that oil makes meaning in ways that exceed these written descriptions deters the hegemony of such an anthropocentric perspective.

I have approached oil experimentally through the diffractive method invited by agential realism. Thinking through oil and media, I have argued that oil is an infrastructure of differentiation—the definition of media that I propose. Thinking with oil as media, then, provides a different way to communicate the many ways it matters. All things matter, but no-thing matters like oil. Not in the present; not since the ambergris glow of spermaceti candles. Oil has illuminated life, and in this way, it is like the

Godly apparatus of Newton's *Opticks*, making all that is seen, as it registers the act of seeing possible. "For so far as we can know by natural Philosophy what is the first Cause, what Power he has over us, and what Benefits we receive from him, so far our Duty towards him, as well as that towards one another, will appear to us by the Light of Nature."³⁰⁸ Oil is manufactured sunlight and it manufactures light. Like light, it does not reveal a world, but by its light it makes that which is seen while it makes seeing.

As fiberoptic tunnels of light grid the earth and alchemical synthesis of oil makes more exact atomic clocks, digital infrastructure continues to abstract physical conceptions of space and time. From the earliest days of industrialization, new technologies forced society to reshape its governing philosophical principles of space, time, self, and other. The difficulty of locating a centralized origin point for the ontology of oil as a fossil fuel is a valuable lesson towards future technologies. Representations of space and time, or of the metaphysics of individualism more broadly, are constantly renewed in the tools that create them. New technological representations

³⁰⁸ Sir Isaac Newton, *Opticks: Or, A Treatise of the Reflections, Refractions, Inflections and Colours of Light* (William Innys at the West-End of St. Paul's., 1730), 381.

of the world, be they oil, or whales, or humans, create new concepts. One might follow Karen Barad, Wendy Chun, and others in rehashing Nietzsche's warning not to take grammar too seriously at risk of favoring linguistic structures over states of being. More explicitly, the risks of representing a substance of the earth as a commodifiable fossil fuel is not relegated to the past, and if future energies are to be equitable, sustainable, renewable, and curb the destruction of this rare Earth, then the stakes of how they are represented cannot be characterized by the historical binaries that differentiate nature and culture.

This dissertation has intended to play with these forms of possibility and impossibility, accounting for the production of oil as a fossil fuel, while challenging the notion that it is ontologically discrete—a boundedness that cannot be contained. In this document is the search for the *Tome of Light*, a heliotechnics (or heliotechniques), the science of solar practices, the culture of solar techniques. It is a way of thinking with light that accounts for worldly practices that exceed representations of oil, of our-selves, of moderns, of the kin of this planet. It is field notes for future petropractices. The types of practices that might not be human, may not reflect the blinding light of the

enlightenment, but are most certainly of the Earth and the Sun, and also always more. These practices are for us, so that other futures can be made.

If oil is media, then perhaps we should think about doing with it what is done with other important media: it should be preserved. Instead of making the argument for leaving oil in the ground because extracting it is bad, rather we might preserve it in the ground because oil is the energetic inheritance of the planet. Oil, too, is life; that it cannot “speak for itself” in the classical sense of communication, agency, or power dynamics, should not overlook the fact that the many effects of oil are conveyed in the materialization of the Earth. Oil is a lively and combustible record and artifact of Earthly living. This inheritance—our inheritance, the posthumanist, multispecies, many compressed ancient organisms and animals across multiple living and dead temporalities inheritance—is preserved as oil.

The Tome of Light: oil rituals for the future

Performance Piece for Human:

1. *Find the ground.*
2. *Lay on the earth, arms and legs wide, palms facing down.*
3. *Put one cheek and ear to the ground.*
4. *Listen.*
5. *Feel the Earth in its ongoing reconfiguring.*
6. *With your other cheek, facing the sky, feel the sun, as it reconfigures you.*

Appendix 1: A Crude Oil Art Inspection

CRUDE ILLUMINATION: A CRUDE OIL ART INSPECTION

(This article was first published in *Leonardo Journal* Volume 54 Number 2, 2021)

Historical Context:

Oil is present long before its potentiality as fuel becomes the governing principle of contemporary life-practices. The first commercial U.S. oil well began in 1859. The hydrocarbon paraffin is a crucial agent in this event; an overlooked substance of combustible potential and medicinal properties. Paraffin wax was identified by German mystic/chemist Karl von Reichenbach in 1830.¹ Kerosene, a paraffin synthesis, was the first major industrial utility of oil, transforming home illumination from whale fat. A shared link of hydrocarbons in human blood and in oil mobilized competing narratives by industrialists and spiritualists.² Before kerosene, salt miners sold medicinal oil ointments.³ Salt miner Samuel Kier, known as the “grandfather” of the American oil industry, built the first oil refinery. Medicinal crude oil was common to indigenous Americans, ancient Chinese, and others dating back 4,000 years. This paper looks at *Crudoleum: Pennsylvania Crude Oil Scalp Treatment*, a product psychically invented—yet partially consistent with paraffinic chemistry—by pioneering American mystic Edgar Cayce. Danielle Siembieda’s performative art inspection examines Elia Vargas’ hybrid work *Crude Illumination* and tests the product *Crudoleum*.

Artist:

Crude Illumination, exhibited at Southern Exposure gallery in San Francisco for the 2018 show, *Thekla*, curated by Lauren Marie Taylor, is a crude oil, light projection installation: an analog overhead projector, enlarging an acrylic container filled with crude oil and dry ice. Dry ice is frozen carbon dioxide and it sublimates from a solid to a gas, at -109.3 degrees Fahrenheit. As the overhead projector illuminates the transformation of the dry ice, carbon dioxide slowly sublimates into the atmosphere—climate change in the gallery space.

Fig. 1. Artist Elia Vargas and Art Inspector Daniel Siembieda view *Crude Illumination*. (© Elia Vargas. Photo: Ginger Fierstein.)



The work argues that oil is a light practice: a type of media. More than being about oil, the work is the transformation of oil into the atmosphere, illuminated (and materialized) by the projector. The history of the overhead projector reveals an unsurprising link to the military industrial complex. There are no clear histories of the overhead projector, a task in need of further media scholarship. Some sources point to its early development by French optical scientist Jules Duboscq in the 1880s.⁵ It has been suggested that it was first used as a tool for police departments to enlarge criminal fingerprint records. It is difficult to substantiate this, but the overhead projector was central in standardizing and modernizing World War II training procedures. *Crude Illumination* is a light projection installation—the entire spatial arrangement matters. It is a deep looking at and materialization of hydrocarbon change: a plurality of metaphor and material entanglements. As a metaphor, it resembles oily seepage contaminating arctic glacial shelves. It excavates a media archeology of projection. It figures oil as the inscription of solar light. But, most importantly, it actualizes light-oil carbon transformation into the atmosphere.

Inspector:

The *Crude Oil Art Inspection* of Vargas’ studio practice took place in late 2019. This inspection was the first of its kind, replacing traditional artists’ materials with innately hazardous materials. Vargas’ practice raised an altogether

new question: is using crude oil more toxic than other studio materials, many of which derive from oil? And, how can such a question be answered? Conventional inspection assessment includes: 1) The environment in which the artwork work is produced 2) The number of trials or practice iterations 3) Personal care and safety of others 4) disposal of materials. These categories were assessed using basic site observation, questioning and re-questioning, and observation of work performed.

In the Art Inspector's experience, artists primarily use materials purchased at home improvement or arts/crafts retailers. Common consumer products come with regulated Safety Sheets and material safety certification information; this is not so with Crudoleum. While this inspection was the first using crude oil as the primary material, many oil derivatives are used in the life cycle of artist materials. Cellulose Nitrate, used in a broad range of art production from resin casting, adhesives, and late nineteenth-century film, is a common example.⁴ The onsite inspection started with a visual observation of the studio settings. The first identifier was ventilation. In Vargas' studio there were opposing windows and a garage door he could open. Other studio identifiers included waste disposal, safety materials such as proper respirators, gloves, fire hazards, and material storage. While the studio could use some upgrades to precautionary and disposal systems the primary use of hazardous materials was limited and handled safely. Prior to the inspection, the frequency of crude oil and dry ice testing was a primary concern. Dry ice should not be used in a closed environment. The handling of such materials including acquisition, transportation, duration, and disposal would raise alarms with frequent use. However, Vargas used the crude and dry ice in an infrequent manner such that long term effects of handling them were insignificant. Vargas performed a recreation of this work for the Inspector to observe. The circumstances of the environment are important for the context of the inspection findings. During the inspection, Vargas used proper handling including gloves and ventilation.

Artist:

Baar Products Inc. are the official reseller of "Cayce Care" products, including Crudoleum. It is the oil source for Crude Illumination. Cayce

imagined the Pennsylvania crude oil scalp treatment during a trance state. He said sweet crude can regenerate hair because it is rich in paraffin. During a reading at the Warshawsky home in Detroit, Michigan, in 1935, he prescribed crude oil as a scalp treatment for hair loss:

9. *(Q) What causes the falling out of the hair, and what should be done to prevent it? (A) This is a lack of an activity through the glands that are secreting from the system the elements necessary to make for activity in those portions of the thyroids... Those portions... would be stimulated by a massage... with properties that aid the scalp circulation; such as a small quantity of the crude oil...⁶*

Fig. 2. Vargas watching crude oil and dry ice sublimation in Crude Illumination. (© Elia Vargas. Photo: Ginger Fierstein.)



During the years 1918-1920, Cayce started his own oil prospecting company, Cayce Petroleum Inc., to divine the location of oil wells and use the profits to fund his teaching institute. Many oil prospectors had already requested psychic readings by Cayce to locate wells, a common practice at the time. Despite the penchant to dismiss Cayce's use of crude oil, petroleum's primary use from Constantinus Africanus (c.1087) to Georgius Agricola (c.1555) was medicinal.⁷ Hydrocarbons remain a common ingredient in pharmaceuticals today.

Inspector:

The inspection began months before the studio visit, with a lab analysis of Crudoleum. Initial requests for Safety Data sheets were sent to Baar Products. Other retailers who distribute crude-

derivative products such as motor oil typically have these on hand. Since Crudoleum is sold as health and beauty product (Food and Drug Administration Oversight) rather than an art material or home improvement product (Occupational Safety and Health Administration Oversight) the material transparency for health and safety is inequivalent. A health and environment consultant helped to determine the correct petroleum lab. Petroleum labs are not prepared to address unconventional products and creative driven processes (see appendix 1). This difficulty in testing illuminates the knowledge gap between what materials are made of and how they are tested.

After deliberation of testing options, FOI Laboratory was chosen. It took roughly a month to receive results after sending a sample of the crude oil scalp treatment (see appendix 2). The primary results were a “hydrocarbon based product, similar to unrefined crude oil. No additional additives present.” FOI, however, only provided the FTIR results, not the GC results, despite paying for both. These results confirmed the product’s labeling as being 100% crude oil, presumably extracted from Baar Inc.’s own wells in Pennsylvania and Tennessee. With the basic composition of the substance, the Inspector referred to the Center of Disease Control’s studies on crude oil and volatile organic compound exposure.⁸ The CDC study on rats exposed to VOC’s from crude oil found significant physical effects on the cardiovascular and respiratory systems. The Inspector would recommend minimal use of this material with continued protection. It is essential the disposal of the crude is not poured into groundwater but collected into a hazmat disposal bin and collected by hazmat waste management.

During the inspection, Vargas also discussed his work *Oil Rituals for the Future* #6, a paraffin wax and nylon installation exhibited in *Anatomy of Oil*, 2018, at Gas Gallery, in Los Angeles, curated by Ceci Moss. As well as various performances pouring the Crudoleum crude oil onto his body. There is concern that a performance washing the hair of an audience member with Crudoleum put the audience member at risk. This performance was conducted once. If it were to be repeated frequently, additional questions regarding the disposal of

crude as well as audience and artist health would require further testing.

Conclusion:

The aim of this short experiment has been to provide an introduction to what is a much deeper critical practice of refiguring crude oil beyond the conventional understanding of a fossil fuel made for human activity. *Crude Illumination* brings attention to the specific medium of oil in new ways. This experiment has also illuminated gaps in knowledge and material transparency between oil-based manufacturers and scientific testing meant to disclose chemical and organic compounds that affect how crude oil is used and understood. An expanded history of oil reveals alternate possibilities of the substance and why open-ended thinking towards it is not only a speculative matter, but carries practical importance.

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Appendix 2: Crudoleum Crude Oil Components Analysis



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Swati Sharma
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Crude Oil Components Analysis

A single bottle of crude oil was received on June 4th, 2019. It was analyzed through FTIR to determine the components and concentration of these components. The results are presented below.

Table 1: Test Results.

| LCM Sample ID | Client Sample ID/Description | Results |
|---------------|--|---|
| 19.060401-01 | 53019112 Crudoleum Scalp Treatment | FTIR: Hydrocarbon based product, similar to unrefined crude oil. No additional additives present. |

FTIR: Thermo Nicolet 380 SN: AGL0500626 with Smart Orbit Diamond ATR

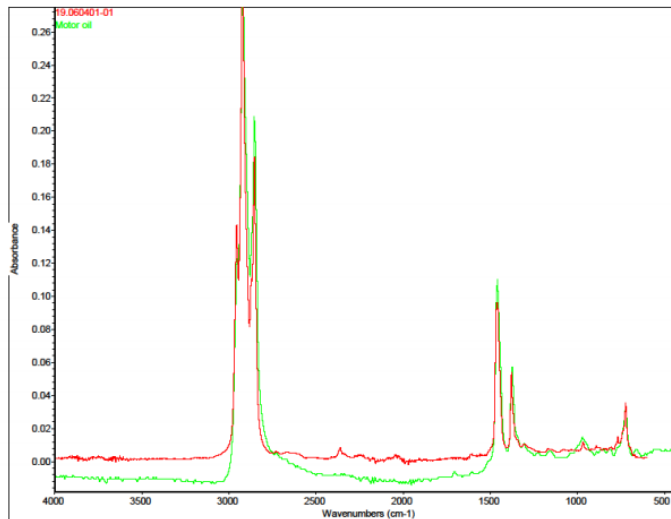


Figure 1: FTIR of sample 19.060401-01 and a reference oil

Overlaid on the spectrum of the sample (RED) is the spectrum for the reference motor oil. The sample was a 95.6% match to the reference. The slight variation of mismatch may be due to the sample being an unrefined crude oil, while the motor oil is refined down from crude oil. No additional peaks are present besides the expected ones which are cause from the hydrocarbons which make up both products.

The results presented in this report relate only to the samples tested. This report shall not be duplicated, except in full, without written approval from FOI Laboratories.

Appendix 3: Notes on Crudeleum Laboratory Analysis

Testing Decision:

Swati Sharma, the health and environmental consultant, confirmed that Thompson and FOI Labs would both do GC-FID tests. Thompson confirmed that GC-FID is the detection method used when they run ASTM D2887 Boiling Range Distribution C5-C44 (the carbon chain distribution (composition) of the fluid). FOI confirmed that they would do both FTIR Fourier-transform infrared spectroscopy and GC methods. GC-FID is Gas Chromatography-Flame Ionization Detector and is commonly used to test the purity of a substance.

At the same time, Vargas reached out to another lab, SGS Group. After a significant amount of time, they furnished two options, provided the product was a reservoir or synthetic oil: Whole Oil GC, which screens compounds from nC4 to nC35 using GC-FID; and High Resolution Whole Oil GC, which quantifies compounds from nC4 to nC35 using GC-FID. Both would only determine the organic compounds present.

SGS Group Q/A with Elia Vargas:

Q: By reservoir oil, do you mean oil extracted from a reservoir? (The founders of Baar Products say that they own wells in Pennsylvania and Tennessee)

A: Yes, reservoir oil is any oil that has been extracted from a hydrocarbon reservoir. SGS can analyze only the hydrocarbon components, the rest of the compounds present in the product are treated as contamination.

Q: Does the analysis provide info on nitrogen and sulfur content? These are not always organic compounds.

A: No, whole oil GC only provide hydrocarbon composition. For N and S you should run other tests.

Q: If it is true that the only ingredient is 100% Pennsylvania Crude Oil, generally speaking, what percentage of it would be inorganic? Assuming very low, would the test miss meaningful properties of the product?

A: The inorganic content in the oil depend on the oil nature, I have seen inorganic content of 20% or more in some cases associated to contaminations by drilling mud, chemicals, etc.

Q: Would the analysis be able to determine if it is not 100% Crude Oil (even if it could not say what the other elements are)? Given the complexity and variation of oil in general, assuming this consumer notion of 100% Pennsylvania crude oil is more of a tagline that connotes a high-quality sweet crude than any meaningful metric.

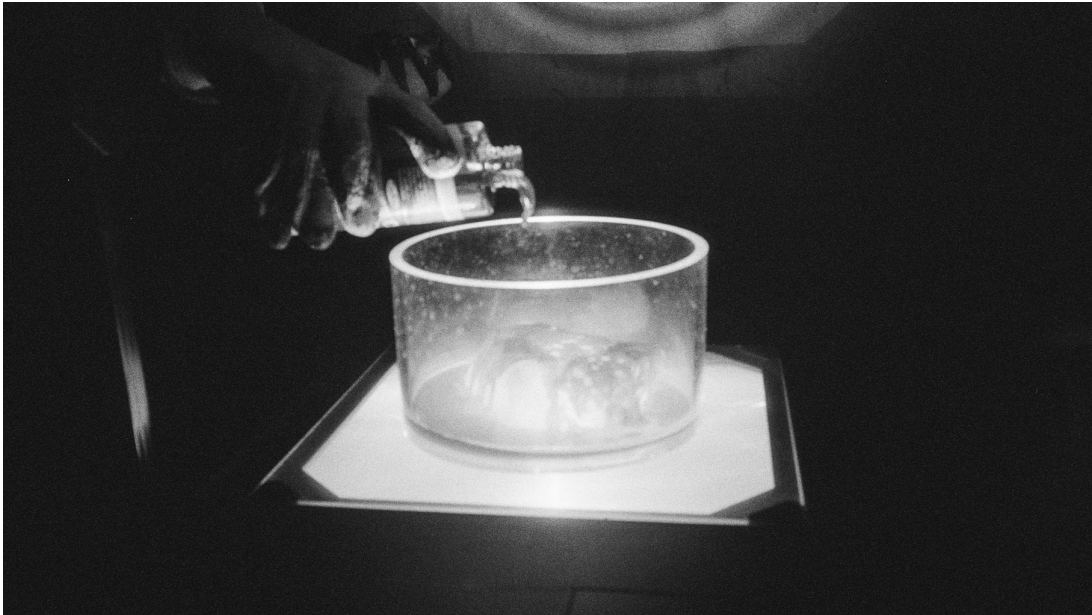
A: The analysis will give an idea of the hydrocarbon compounds, to know the % of oil run a flash and more advanced tests.

In summary, SGS said, "There are many advance tests we can use to analyze hydrocarbons, like GC-MS, SARA (by different techniques including open column, HPLC IP 143, etc.), etc. however, as I told you before we only provide the hydrocarbons constituents (saturates, aromatics, resins, asphaltenes) in the sample, we cannot analyze other type of compounds, since it will require to setup new methods and unfortunately that is not part of our service's portfolio."

Appendix 4: Crude Oil Art Inspector Image Glossary







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