EXTRACTING ACCOUNTABILITY

Engineers and Corporate Social Responsibility

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For Lena Mae Rolston

May you find a career worthy of your insatiable imagination and your drive to make the world a more caring place.

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Series Foreword

We live in highly engineered worlds. Engineers play crucial roles in the normative direction of localized knowledge and social orders. The Engineering Studies Series highlights the growing need to understand the situated commitments and practices of engineers and engineering. It asks, What is engineering for? What are engineers for?

Drawing from a diverse arena of research, teaching, and outreach, engineering studies raises awareness of how engineers imagine themselves in service to humanity and how their service ideals impact the defining and solving of problems with multiple ends and variable consequences. It does so by examining relationships among technical and nontechnical dimensions and how these relationships change over time and from place to place. Its researchers often are critical participants in the practices they study.

The Engineering Studies Series publishes research in historical, social, cultural, political, philosophical, rhetorical, and organizational studies of engineers and engineering, paying particular attention to normative directionality in engineering epistemologies, practices, identities, and outcomes. Areas of concern include engineering formation, engineering work, engineering design, equity in engineering (gender, racial, ethnic, class, geopolitical), and engineering service to society.

The Engineering Studies Series thus pursues three related missions: (1) advance understanding of engineers, engineering, and outcomes of engineering work; (2) help build and serve communities of researchers and

learners in engineering studies; and (3) link scholarly work in engineering studies to broader discussions and debates about engineering education, research, practice, policy, and representation.

Jessica M. Smith's *Extracting Accountability: Engineers and Corporate Social Responsibility* shows that understanding the accountability of technoscientific corporations requires critically analyzing the agencies of the people who work within them. Observers regularly demonize the extractive industries and portray corporate social responsibility as an insidious example of capitalist deception. In a revealing ethnographic and archival study of engineers in the extractive industries, Smith critically examines actions and commitments that these accounts dismiss or ignore. She shows how engineers have framed corporate responsibility as an extension of the material and service benefits of engineering, enacting what she calls an "ethic of material provisioning." In so doing, engineers practice accountability to multiple publics, from the people who live closest to extractive operations to activists who oppose their industries. Smith concludes by demonstrating that one way to alter the accountability of technoscientific corporations is to alter the agencies of engineers who work in them.

—Gary Downey and Matthew Wisnioski, Series Editors

Prologue

Our lives shape the research that we do, whether we make those connections clear or leave only traces of them in our writing.[1] The practice of ethnography brings these interconnections into sharp relief. Through interviews, conversations, and the everyday sharing of life we gloss as "participant observation," our lives become entangled with those we seek to understand. As anthropologists Janet Carsten, Sophie Day, and Charles Stafford write, biography is a "part of the process of ethnography rather than separate from or prior to it."[2] It is not just that our life experiences lead us to particular research projects, to asking some questions instead of others. Our interactions with the people we study affect our own lives, and the connections we create "inform the moral judgements and ethical practices that pervade the experience of fieldwork."[3] This intermingling of lives and the emotional resonances it sets in motion are often viewed with suspicion, evident in accusations that anthropologists have become "too" close with their subjects. Closeness, this line of reasoning goes, sullies our ability to take a normative stance in relation to the lives we observe and participate in.

The kind of research I do requires a balancing act between "ethnography as an exercise in human empathy and anthropology as an exercise in cultural critique."[4] Ethnography usually hinges on intimacy and trust that cultural critique potentially damages. This is especially fraught space for those of us who recognize that our writing will likely end up being read by those who we write about. Diana Forsythe insightfully reflected upon her ethnographic research with technoscientists, writing, "Those of us who

write about well-educated people in the United States can be sure that our informants will be able to read everything we publish. We can also be sure that they will not agree with everything we write."[5] Nancy Scheper-Hughes's raw account of being expelled from the Irish village where she and her family once lived, after residents took offense to her anthropological portrayal of them, has stayed in the back of my mind since the first time I read it.[6] The stakes of damaging relationships in one's field site are particularly high for those of us who do anthropology "at home" in some way. As Forsythe wrote, "Where home and field are contiguous or even identical, there is no 'elsewhere' for the fieldworker to return to."[7]

This book represents the second major research project in which I found myself confronting these dilemmas. My puzzlement at the internal and sometimes contradictory workings of corporations stretches back to my intertwined personal and professional trajectories. I grew up in a Wyoming town and family that revolved around mining. My father spent his career as a diesel mechanic for one of the world's largest coal companies, and both my sister and I worked as temporary laborers in that company's mines during summer breaks from college. I still remember the ironic ways that my coworkers commented on and managed their relationship with the company and its subsidiaries. They made fun of corporate discourses that bade them to practice "good teamwork," underlining the power differentials that distinguished some members of the team (technicians) from others (their supervisors). But they also proudly wore coats, hats, and belt buckles emblazoned with the company logo. A good portion of their retirement savings was invested in company stock. And they defended their companies and industry against criticism from others, both real and imagined. I later returned to that mining town as an anthropologist to conduct fieldwork, which provided the platform for writing an ethnography that examined how gender, kinship, and labor dynamics of the region had led to an unusually successful integration of women into the mining workforce there.[8] Engineers were present in that research project, but they were not the focus of it.

When I joined the faculty of the Colorado School of Mines in 2012, I found myself immersed in an academic institution whose faculty and

students were almost exclusively dedicated to engineering and applied science, with a long-standing focus on the mining and petroleum industries. I felt bewildered by my new surroundings, from the students' lock-step progression through their major's course flowchart—I had gone to a liberal arts college, after all!—to the curious ways they vehemently distinguished engineering from "emotions."

In a very real sense, the past eight years of learning to work at Mines has felt like fieldwork. Through interactions with students and faculty, I began realizing that how our students are taught to conceptualize and solve problems had a lot to do with the challenges and frustrations I observed firsthand between engineers and technicians back home in the mines, which piqued my curiosity in engineering education. That interest grew as I soon found myself collaborating with faculty across campus to make visible the inherent social and political dimensions of engineering, as my arrival coincided with the fracking boom and the rising concerns of faculty and students to understand and address the growing firestorm it had ignited.

As I started getting to know Mines students and alumni, I realized that for them to think about their accountabilities to the public, they had to first make sense of the corporate context of their work. The miners I had come to know in Wyoming identified as part of the companies employing them, but they also had clear institutional space to separate their sense of self from the companies employing them—they weren't paid to care about the company on their days off, they frequently joked. Engineers, in contrast, occupied management and executive roles that seemed to demand such care. I quickly became captivated by scholarly debates about how and why the engineering profession in the United States had become entangled with managerial pathways inside of corporations.

Writing about engineers in the mining and oil and gas industries presented different sorts of challenges than did my first research project, which directly involved family and close friends. Studying these industries via engineers implicated my institutional home: the place where I showed up to work; the place where I taught students who held a variety of hopes, fears, and desires for corporate careers; the place where I socialized with engineering and applied science professors; and the place where I was seeking

tenure and promotion, from an academic administration and university committee composed almost exclusively of engineers.[9] Mines was a very different institutional context than the anthropology departments where others in my field wrote treatises about technical professionals while remaining at arm's length from them. Echoing one of my interlocutors who struggled more with the internal than the external mining company politics, I had to *work with* the people I was supposed to be critiquing. I decided to make my intellectual project one of what Gary Downey—engineer, anthropologist, and science and technology studies (STS) and engineering studies scholar—calls critical participation. I planned and conducted my research already with an eye to it circulating at Mines and other engineering schools. I envisioned different strategies for my research and teaching to open up the questions Downey poses for engineering studies in general: what are engineers and engineering for?[10]

My own imbrication in the fields of practice I was studying has raised eyebrows among scholars who look suspiciously on those of us who get "too close" to our research. There is no question that my institutional location and biography shaped my research. In turn, the research shaped my institutional location and biography, prompting me to embrace engineering studies and engage in collaborative projects of curricular transformation. I conceptualized a successful National Science Foundation grant proposal for a research and teaching project that would (1) ethnographically develop a critical analysis of the intersection of engineering and corporate social responsibility (CSR) in the mining and oil and gas industries and (2) integrate more critical social scientific take on CSR inside the engineering curriculum at Mines and other schools with large mining and petroleum programs.

My attempts to cultivate more robust approaches to thinking about the accountabilities of corporations inside engineering education could be critiqued for potentially shoring up the moral authority of corporations. The kinds of questions we asked of and with our students exceeded the ethical possibilities of dominant CSR discourses, but it is also true that the kinds of critical self-reflection on industry practice we nurtured are foundational to the moral register of CSR in general. Although I wish to highlight and problematize my own positionality in relation to the research, I also caution

against "purity politics" that presume that it would be possible for other academics to fully stand apart from the industries they critique.[11] As Alexis Shotwell writes in *Against Purity: Living Ethically in Compromised Times*, "Personal purity is simultaneously inadequate, impossible, and politically dangerous for shared projects of living on earth."[12] We are all complicit in corporate forms and in the mining and oil and gas industries in particular, though we occupy different positions in these networks and have different opportunities to shape them. We owe it to ourselves and to our others to do more than dutifully acknowledge the high carbon footprint of academic life and then launch into calls to simply do away with mining or fossil fuels or capitalism. The epilogue chronicles my own experiments in critical participation, so readers who are the most curious about the interweaving of my biography and the ethnography and engineering education efforts may wish to start reading there.

This book focuses on engineers who view social responsibility as central to their profession and their everyday work. This means that I have not presented an in-depth analysis of those who vociferously marginalized concerns about social responsibility—and they do exist. While I do not claim that the engineers profiled here represent their profession as a whole, there is much to learn from engineers who take public accountability seriously. We learn not by painting overly flattering portrayals of them to challenge dominant stereotypes of the profession but by giving them a good argument that is attentive to the complexity of their lives as they attempt to inhabit and detach from the corporate world. The ethnography proposes that the primary dilemma facing engineers is not a dearth of ethics that opens them up to becoming corporate automatons, as many would suspect. Rather, the primary dilemma is how to manage competing personal, professional, corporate, and public accountabilities as they attempt to craft themselves as ethical actors, to orchestrate a dense network of distributed agencies, and to enact corporate forms that are responsive to different judgments of what the world is and what it could become.

Acknowledgments

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I am grateful for each of the people who generously shared their time and their networks to make the research possible. By far, my favorite part of this project was getting to know the people whose careers form the backbone of the chapters in this book. Turning personal connections and complex lives into ethnographic "data" that can circulate beyond the interview context is exhilarating, but also somewhat disheartening. I wish I could have written a book about each of you, but I hope you will find some resonance with what I was able to include.

Chuck Shultz was an early and passionate advocate for teaching engineers to think about social responsibility dimensions of their professional practice. Your time, networks, and financial support made it possible for us to create corporate social responsibility as a generative space for research, teaching, and fundraising at Mines. I thank you, Louanne, and your whole family for generously supporting our Humanitarian Engineering program and students. I am indebted to Art Biddle and Stan Dempsey, who generously shared their archives with me. Thank you for your candor. It would take another book or more to do justice to the prescient work you did forty years ago. Art took a deep interest in engineering education, going out of his way to ensure that future generations of engineers would approach engineering problems with humility and respect for the people and places they encountered in their work. Joey Tucker also stands out as an exemplar Mines alum who was at the forefront of integrating social responsibility into engineering practice. Thank you for supporting this work, our program, and our students.

This project would be unthinkable without the Colorado School of Mines as its home. Juan Lucena introduced me to engineering studies and STS. The first book he loaned me—Edwin T. Layton Jr.'s *Revolt of the Engineers: Social Responsibility and the American Engineering Profession*—was the start of a collaboration that has never been dull. Thank you for your camaraderie. Mines is home to leading scholars pushing to make the inherent social justice and social responsibility dimensions of engineering visible and valued inside the curriculum. I have learned a great deal working with Linda Battalora, Robin Bullock, Stephanie Claussen, Sarah Hitt, Terri Hogue and her research group, Katie Johnson, Toni Lefton, Jon Leydens, Juan Lucena, Carrie McClelland, Junko Munakata-Marr, Dean Nieusma, Beth Reddy, Greg Rulifson, Jeff Shragge, Kate Smits, Ben Teschner, and Qin Zhu. Carl Mitcham's intellectual curiosity and drive will remain a source of inspiration for years to come. Kevin Moore provided crucial institutional support for our efforts to transform engineering education. Thank you to Priscilla Nelson and Erdal Ozkan for facilitating my collaborations with your faculty and students. I thank my colleagues in the Engineering, Design, and Society Division, who make our university an exciting and enriching place to be a scholar and teacher. My research on

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I drew great sustenance from my professional networks. I am grateful for the unshakable solidarity from the Liberal Education/Engineering and Society Division of the American Society for Engineering Education. Abby Kinchy, Roopali Phadke, and our STS Underground network have provided an exciting intellectual environment to think about the underground. I appreciate the wise advice of Gwen Ottinger, Beth Reddy, Christy Spackman, and Caitlin Wylie in our ad hoc committee on navigating academic life. I will be forever grateful for the University of Michigan intellectual community and friendships that continue to endure long beyond my time in Ann Arbor. Thank you especially to Kelly Fayard, Bridget Guarasci, Jessica Robbins, Mikaela Rogozen-Soltar, and Cecilia Tomori.

The final substantive revisions to this book were completed in the midst of the global COVID-19 pandemic and the protests calling for racial justice. Both of these events make it impossible to ignore the inherent social, environmental, and health injustices built into systems of scientific

and engineering knowledge and practice. These massive upheavals were also a reminder of the dense social networks that sustain our intermingled personal and professional lives. I could not have found the time, space, and emotional presence to write without Lena Mae Rolston; Mike and Juanita Smith; George and Marilyn Smith; Luella Johnsen; Katie, Josh, Kaden, and Cameron Christy; Erin Roosa Cohen; and Kelly Fayard. When Lena was not with me during the unfolding crises, she had the good fortune to be with her dad; her grandparents; Ashley, George, Jack, and Luke Athanasopoulos; and Taylor Worsham.

All shortcomings in this book are my own.

Some of the material on the ethic of material provisioning in chapter 1 was previously published in the journal *Extractive Industries and Society*, some examples from chapter 5 were published in the journal *Engaging Science and Technology* in a paper I co-authored with Nicole Smith, and the epilogue's summary of the engineering education research was adapted from paper "Counteracting the Social Responsibility Slump? Assessing Changes in Student Knowledge and Attitudes in Mining, Petroleum, and Electrical Engineering," which I presented at the 2020 American Society for Engineering Education Virtual Annual Conference and that was co-authored by Greg Rulifson, Courtney Stanton, Nicole Smith, Linda Battalora, Emily Sarver, Carrie McClelland, Rennie Kaunda, and Elizabeth Holley. I thank the journals for the permission to repurpose that material here.

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1 INTRODUCTION

When petroleum engineer Aaron set out to change how people in the oil and gas industry engaged the public, he described himself and his like-minded colleagues as "waging two wars": one inside their companies and one outside them. It was 2012, in the heady days of the oil and gas boom that brought energy production to places unaccustomed to it, such as the rapidly expanding suburban neighborhoods along the metro Denver Front Range in Colorado where Aaron worked (figure 1.1). The twinned technologies of horizontal drilling and hydraulic fracturing had sparked a rush for new drilling and intense controversy. A few Colorado cities and counties had approved bans and moratoriums on this kind of oil and gas development—which critics glossed as "fracking"—and companies like the one Aaron worked for scrambled to respond. Seeking to gain a better understanding of people's perceptions of their industry, Aaron and some of his coworkers began attending public meetings and hearings, where they described feeling attacked by residents and anti-fracking activists who accused them of endangering the health, safety, and livelihoods of their communities. They then returned to their company and the people whom they thought should have been their allies. "But instead of receiving a hero's welcome, we were treated as sympathizing with the enemy," Aaron recalled. "It was as if by *listening* to 'those people' we were sympathizing with them."[1]

Compelled to change the antagonism on both sides, Aaron continued looking for different ways to engage the public. While studying for an MBA he learned about the intense controversies the mining industry faced in the 1990s as it expanded globally. He described experiencing a lightbulb

Figure 1.1
A workover rig in close proximity to a Colorado neighborhood. Photo by milehightraveler, used by permission.

moment when he realized that the long-term success of his company and the entire oil and gas industry rested on community acceptance, just as the major mining companies had learned. He began translating the tools and techniques developed by the mining industry to oil and gas development in Colorado. He and his coworkers went on to devise public engagement strategies that would eventually transform how oil and gas company personnel in Colorado interacted with an array of stakeholders, from nearby residents to government officials.[2] They formed a stakeholder engagement team and went door to door in each of the neighborhoods where their company planned development, talking with residents to understand their concerns and answer their questions. They hosted community meetings in which people could talk directly with employees in more informal and dialogic ways than was allowed by the public hearings mandated by government regulation. They established a hotline that was answered in person by a stakeholder engagement team member, who logged and categorized each

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call and tried to address each complaint or concern. They set up booths at county fairs, beer fests, and science outreach events, making company employees available to whoever stopped by and wanted to talk. By the time I was getting to know others who worked for Aaron's company, a few years after the stakeholder engagement team began their work, even the most hard-nosed engineers spoke about the importance of the social license to operate, if only because it minimized risk to their company's investments. Other oil and gas companies operating in Colorado began calling them to seek guidance in replicating their efforts, and similar public engagement techniques began appearing all over the Front Range (figure 1.2).

The experiences of engineers like Aaron who found themselves held accountable for issues of broad public concern provide a crucial window through which to analyze much broader concerns about the accountability of large, technoscientific organizations in the era of corporate social responsibility (CSR).[3] These organizations have tremendous potential to affect the well-being of the people who live near their operations or who make or

Figure 1.2
Education and outreach booth hosted by an oil and gas company. Employees invited children, such as my daughter featured here, to engage in hands-on learning about topographic maps and the stratigraphy of the formations where the company drilled to produce oil and gas.

use their products. Political theorist Langdon Winner influentially named engineers and technical professionals as the "unacknowledged legislators of our technological age," given the inherent politics of the technologies they design, build, and maintain.[4] Philosopher Carl Mitcham has noted that, "by designing and constructing new structures, processes, and products, [engineers] are influencing how we live as much as any laws enacted by politicians."[5] Yet corporations can shield themselves from public scrutiny, and asymmetrical access to knowledge and expertise further excludes many members of the public from participating in decision making about those structures, processes, and products.

The field of CSR arose in direct response to these and other critiques, positioning corporations as voluntarily promoting the well-being of people and the planet, in addition to profit. Like other forms of audit and accounting, CSR gains its power from the "twinned concepts of economic efficiency and good practice."[6] While corporations had long engaged in philanthropy, some in the 1960s and 1970s began focusing on specific issues such as urban decay, racial discrimination, environmental pollution, and workplace safety.[7] Stakeholder theory flourished in the 1980s, legitimizing efforts to engage people beyond shareholders and employees. In the wake of growing public pressure in the 1990s, many businesses began staking their reputation on their contributions to sustainable development, including in the mining and petroleum sectors.[8] In the 2000s, frameworks such as "natural capitalism," "shared value," and B Corps certification proposed that companies could be socially and environmentally responsible while being profitable.[9] The appeal and hazards of all these versions of CSR share much with historian Matthew Wisnioski's assessment of earlier invocations of reform in engineering: "The rhetoric of responsibility was infinitely malleable and universally desirable, which gave reformers legitimacy but also fostered cooptation."[10]

CSR as a field of practice is internally variegated. Though *corporate social responsibility* generally refers to the notion that corporations have obligations to society beyond generating profits, the term means different things depending on the industry, company, geographic or institutional location, and person invoking it. There was great interpretive flexibility

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even among my relatively focused group of interlocutors, who variously viewed CSR as philanthropy, sustainability, health and safety, and/or community relations and who practiced CSR as a rhetorical strategy, a management technique, a collection of performance standards, or an ethical goal. For some of them, CSR was separate from what they viewed as their "technical" work as engineers, while others viewed CSR as integral to their professional practice. Some instrumentally limited CSR to a useful tool to minimize social risk to investment, while others viewed it as a mandate to transform industry. The concept of CSR itself is thus best understood as a boundary object: a set of information that is interpreted and used in different ways by different people while maintaining a common identity. As proposed by their theorizers, boundary objects are "plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites."[11] Like other boundary objects, CSR facilitated collaboration without consensus, providing a common organizing framework for employees with otherwise disparate values, goals, and responsibilities.[12]

This vagueness leads critics to argue that "the use of the term CSR has become so broad as to allow for people to interpret and adopt it for many different purposes" and for businesses to "appropriate the meaning of ethics."[13] While even a cursory glance at CSR in practice shows that it is not a panacea for reconciling ethics and economics or morality and the market, nor can it be dismissed as disingenuous greenwash. The suite of concepts and practices that make up the field of CSR effect politics of their own. For example, the ubiquitous term *stakeholder* can reduce oppositional groups or government regulatory agencies to "simply individual players in a multi-stakeholder process that purports to accord equal footing to governments, corporations, communities, and civil society organizations."[14] In engineering practice, the stakeholder framework opens up a wider array of people to whom engineers ought to be accountable but leaves the power to define who legitimate stakeholders are, how they will be prioritized and engaged, and what engineers will do as a result of that engagement largely with engineers and other "systems owners."[15] Rather than generating consensus, CSR concepts and tools seed new forms of dispute, concerns, sites,

problems, and subject positions for people who are employed by corporations, as well as those who seek to critique them.[16]

This book argues that, to understand the accountability of technoscientific corporations, we must understand the agencies of the people who constitute them. While some engineers I met depoliticized their work by restricting it to technical concerns, it was far more common for them to ground their work within larger moral aspirations of being "good" people or creating "good" in the world. The corporate context of their work, however, meant that they frequently found themselves trying to reconcile contradictions within and among multiple domains of accountability, including formal standards and policies, public demands, their personal ethical frameworks, and professional norms that enjoin engineers to serve as loyal agents for corporations while protecting the safety, health, and welfare of the public. Moreover, the corporate context of their work presented particular opportunities and constraints for those attempts at reconciliation: engineers experienced a distributed agency in which they were not always authors of their actions and frequently acted through others.

The multiple domains of accountability and distributed agency I observed are central features of engineers' corporate employment that likely stretch beyond my particular focus on the mining and oil and gas industries. But there are also specificities of these industries that raise caution for hastily extrapolating this book's findings to others. To start, mining and oil and gas companies deal with far more material stuff, wresting resources from the ground, than do those that trade in information. Moreover, the mining and oil and gas industries have a particularly thorny public reputation that distinctly colors how industry actors imagine and practice accountability to their others.

UNSTEADY MORAL TERRAIN

The mining and oil and gas industries have served as easy targets for social scientists and social movements committed to ideals of justice. All industrial activities have environmental and social effects. Many communities have found ways to coexist with or even welcome such activity, but the

effects have been devastating for others, from attention-grabbing oil spills and dam failures to the "slow violence" of long-term pollution.[17] These harms have disproportionately been borne by poor and minoritized populations around the world, making the extractive industries a key engine—as well as product—of racial capitalism.[18] All too often, elites promote extractive activity as a means of national economic development while failing to safeguard the well-being of the people who live closest to such activities.[19] While I was researching and writing this book, two major mine tailings dams in Brazil failed, one in 2015 and one in 2019, claiming nearly three hundred lives while polluting hundreds of miles of waterways. In 2016, Native American activists on the Standing Rock Reservation galvanized a vibrant grassroots movement to protest the Dakota Access Pipeline, which they argued violated international human rights standards for informed consent, protection of sacred ground, and water quality. In 2020, an iron ore mine in Western Australia bulldozed—with legal permission—a sacred Aboriginal site that showed forty-six thousand years of continual occupation and provided a four-thousand-year-old genetic link to present-day traditional owners. Long-standing patterns of troubling appropriations of resources and wealth have led academics to identify the "extractive logics" of even renewable energy projects.[20]

The mining and oil and gas industries also come under fire as "angels of the Anthropocene."[21] In part, this is due to their contributions to anthropogenic climate change. But even more fundamentally, these industries are emblematic of the Anthropocene in how they move and transform massive amounts of earthen materials. Already by the late nineteenth century, copper mines in Butte, Montana, stretched a mile underground. If their inner infrastructure could have been turned on its head and stretched upward, it would have stood twice as tall as the world's tallest skyscrapers. When the state's Anaconda Smelter smokestack was completed in 1918, it was classified as the "largest freestanding masonry structure in the world," soaring thirty feet taller than the Washington Monument.[22] Mining equipment used around the world became progressively larger until, by 1980, "giant shovels, trains, and trucks moved more earth on the planet than did the forces of natural erosion."[23]

Current offshore oil production is emblematic of the increasingly complex—and risky—sociotechnical systems required to access ever more difficult resources.[24] The Perdido oil platform in the Gulf of Mexico, for example, is one of the world's deepest, floating in about eight thousand feet of water with an estimated peak production of one hundred thousand barrels of oil per day. It was built at a cost of $3 billion and is 267 meters tall, stretching almost to the height of the Eiffel Tower. The 2010 *Deepwater Horizon* disaster, the largest marine oil spill in the history of the petroleum industry, made clear the extent to which these kinds of technologies raise the stakes for errors and accidents.

Engineers play particular—but not omnipotent—roles in the sociotechnical systems that can facilitate or slow the sweeping global transformations glossed as the Anthropocene. Academics struggle to theorize accountability in these vast social, material, and environmental assemblages, generally taking one of two approaches that seem to be characterized by opposite impulses. On the one hand, "anti-anthropocentric" scholarship emphasizes materiality, objects, and other species, which may "index and oppose the toxic legacies of radically human-centered thinking and action."[25] This approach risks obscuring questions of human beings' differential responsibilities for the current predicaments in which we find ourselves. As Arjun Appadurai asks:

> If agency in all its forms is democratically distributed to all sorts of dividuals, some of which may temporarily be assembled as humans and others as machines, animals, or other quasi agents, then do we need to permanently bracket all forms of intrahuman judgment, accountability, and ethical discourse? . . . Will our very ideas of crime and punishment disappear into a bewildering landscape of actants, assemblages, and machines? If the only sociology left is the sociology of association, then will the only guilt left be guilt by association?[26]

On the other hand, academic and popular criticism can also take the extreme opposite approach by holding very particular actors responsible for the harms of entire systems. Implied in conference hallway jokes, podcast banter, and published research is the belief that the social and

environmental harms wrought by natural resource production result from engineers and other corporate actors knowingly (and perhaps gleefully) placing profit above their other responsibilities.[27] This reading collapses the effects of people's everyday actions with their motivations: harms must be the result of a faulty or absent moral compass. My interlocutors picked up on this attribution of blame and universally described feeling demonized by people outside industry. One explained, "I tell people I'm a petroleum engineer and they just give me the stink eye. They think I'm evil. [They think] 'Oh, earth raper,' right?" Others refused to tell their neighbors and social circles that they worked in industry because they had experienced such severe judgment by them (more on this in chapter 4). This individualization of blame is likely due at least in part to legal systems that emphasize intentionality and locate culpability with individuals. But it might also be rooted in a more fundamental American moral imagination of nature. Religious studies scholar Evan Berry argues that Christian understandings of individual salvation underlie dominant American imaginations of nature and hamper our ability to imagine and grapple with the collective challenges of climate change.[28]

The engineers and applied scientists I came to know each explicitly or implicitly placed their work within their larger life projects of creating "good" in the world.[29] Like Andrea Ballestero's interlocutors, they considered "their technical work . . . a tool to attain ethical goals."[30] These moral ambitions and desires to craft themselves as ethical professionals thus framed how they thought about and practiced accountability. They acknowledged and grieved mistakes—both personal and collective—that had caused harm for people and environments. But even the most hard-nosed engineers who denigrated CSR for detracting from profits still imagined themselves as morally righteous actors, for example, by putting their faith in corporations to create wider societal benefits or by justifying their actions within the ethic of material provisioning (see chapter 2).[31] One of the questions this book poses, therefore, is *how a group of professionals who all believe they are doing the "right thing" end up facilitating industrial development that can be judged as ethically suspect by others—and, at times, by themselves.*

Hannah Appel's ethnography of US oil companies in Equatorial Guinea sheds some light on this question. Theorizing the "licit life of capitalism," she shows how exploitation is made through devices that are "legally sanctioned, widely replicated, and ordinary": contracts and subcontracts, infrastructures, economic theories, corporate enclaves, and transparency projects.[32] In her analysis, these devices serve "not only as powerful tools in and of themselves, but also as a felicitous moral architecture through which to sanction capitalist practices."[33] This book complements Appel's ethnographic focus on these devices by deeply exploring how industry personnel themselves imagine and navigate the competing accountabilities that characterize corporate work. In this process they create, transform, reinforce, and undercut various and sometimes competing "moral architectures." Rather than creating a mutually reinforcing ethical framework that provided clear guidance for practice and decision making, I will show that corporate work generated multiple accountabilities that engineers and other technical professionals worked furiously to reconcile.

This ethnography shows that the "problem" of engineers' contribution to the extractive industries is not that they lack an ethical framework and therefore embody corporate drives for profit. Rather, the corporate context of their work generates competing accountabilities that engineers attempt to reconcile without clear guidance on how to do so. This analysis invites us to see how ethical dilemmas stem from multiple sources beyond the intentions or (in)actions of particular individuals. They stem from notions of accountability that frame questions of responsible extraction as *how* rather than *if*; from a division of labor and authority that disperses agency and responsibility among corporate engineers and consultants who all imagine they are doing the "right thing" but who pass recommendations and decisions off to others; from engineers who, when they reach their limits of being able to shape their colleagues' agencies to align more closely with their understanding of right action, reluctantly throw up their hands and distance themselves from the corporate person; and from engineers becoming so frustrated with the constraints of their work that they quit their corporate jobs, only to be replaced by a fresh batch of new hires.

STUDYING CORPORATIONS

Academic and public criticism often blackboxes corporations, treating them as unitary entities with an unwavering dedication to profit maximization. In contrast, understanding the accountability of technoscientific corporations by investigating the agencies of the people who constitute them is predicated on analytically disaggregating the corporate form.[34] Companies do exist as legal persons that have juridical agency, such as to make and break contracts. But this legal fiction of singularity belies the dense, uneven, and nested geographies of parent companies, subsidiaries, contractors, and subcontractors through which corporations actually act in the world. This "archipelagic" corporate form powerfully visualized by Appel has direct implications for its multiple accountabilities:

> This disaggregation or dispersion is, in effect, the legal (licit, intentional) thinning of liability, accountability, and responsibility, such that what seems clearly to be the singular exercise of corporate power—global companies in contract with governments around the world, maneuvering the world's largest mobile infrastructures and reaping spectacular profit—in practice fractures rapidly into a legally slippery tangle of subsidiaries and consortia and subcontractors.[35]

It is difficult to pin accountability to one node of a dizzying archipelago.

The legal fiction of corporate singularity also masks the internal heterogeneity of corporate forms. Anthropologists emphasize that corporate forms "act" in the world through the everyday practices of their employees.[36] This perspective opens up what can be perceived externally as a unitary corporate "person" to be a collective one, characterized by internal fissures and contradictions.[37] Marina Welker's ethnography of Newmont mining company's CSR activities shows that corporations must be made to "hang together"[38] in the face of competing enactments and contestations over a corporation's boundaries, interests, and responsibilities.[39] In her analysis, corporations are enduring and powerful because they are partible, composite, permeable, and in flux.

Tracking movement within corporate forms underscores Welker's point. The engineers I met experienced a "work organization in perpetual flux, with

teams forming and disbanding, and team members and supervisors constantly circulating around the country and, indeed, all over the globe."[40] This constant movement makes it difficult to hold corporate forms accountable for the promises made by particular personnel, who move from site to site. This slipperiness is compounded when projects or entire companies are bought out by other companies that bring their own personnel and policies to bear on their operations and external engagements. In fact, one of the great sources of harm in these industries is that, while particular personnel and entire companies can leave, the industrial site remains for the people to whom promises were made and then broken.[41]

Some social scientists and other social critics have been wary of disaggregating the corporate form, preferring instead to portray them as homogeneous actors motivated by profit maximization—*homo economicus* in institutional form. This may be because more distributed understandings of corporate personhood make it difficult to hold them accountable for harm.[42] But disaggregating the corporation is a crucial step for analyzing "the messiness and hard work involved in making, translating, suturing, converting, and linking diverse capitalist projects . . . that enable capitalism to appear totalizing and coherent."[43] Feminist anthropologists show that the social relations of what we call "capitalism" are generated out of divergent life projects, not inexorable logics.[44]

Thus rather than presume that "capitalism" drives engineers to privilege profit at whatever social and environmental cost, this book investigates how engineers' invocations of shareholder value or appeals to the business case are intertwined with their efforts to craft themselves as ethical persons, chiefly by reconciling personal, professional, and corporate accountabilities. Engineers are key, if often overlooked, actors whose work sustains corporate forms and, in the process, shapes their accountabilities to multiple publics.

WHY ENGINEERS?

As the philosopher Carl Mitcham writes, "Engineering is everywhere, but not everywhere recognized."[45] Engineers help set mining and oil and gas activity into motion, and the reverberations of their decisions and designs—and the

assumptions and desires built into them—echo beyond their own tenure at a company or even their own lifetime (figure 1.3).[46] Jon A. Leydens and Juan C. Lucena highlight the importance of engineers to questions of social justice, arguing that "engineers design, build, and operate complex and imposing systems, capable of influencing the lives of millions of people, as well as the allocation of resources (e.g., water, energy), opportunities (e.g., access to work and commerce), risks and harms (e.g., flooding, nuclear disasters, groundwater contamination), and how different social groups receive these differently."[47] One of the great paradoxes is that, although the infrastructures they design, build, and maintain exert a great influence the everyday lives and potential futures of people around the world, engineers themselves are also particularly situated actors, whose educational opportunities and work settings place constraints on what they learn, know, and do.

Engineers' place in anthropology is relatively small but growing, primarily due to increased interest in infrastructure.[48] The mining and oil and

Figure 1.3
Overlooking the Nevada Twin Creeks mine. Photo courtesy Nevada Bureau of Land Management.

gas industries, for example, are most often studied from the perspective of the people who organize to address their harms for vulnerable populations and environments.[49] Anthropological research that does include ethnographic attention to engineers and engineering vividly demonstrates the politics, exclusions, and harms embedded in infrastructure otherwise cloaked in the banners of neutrality and progress, from the politics of dams, pipelines, roads, and electricity markets to the flow—and lack thereof—of water.[50] Fabiana Li's research examines the role of engineering knowledge in mining-related controversies in Peru, including how the structural conditions of engineers' employment shape their ability to bring social and environmental concerns into their professional practice. She also shows that engineers and local campesinos differently understand phenomena such as water quality.[51] Martin Espig and Kim de Rijke call attention to the differences between how engineers and the people who live closest to coal seam gas production understand risk and uncertainty.[52] David Kneas shows how a junior mining company constructed geological assessments of copper mineralization in Ecuador to sell the "potential and possibility" of a copper resource to be mined, forming part of a much longer history of the contested creation of geological knowledge about the subsoil.[53] David McDermott Hughes also ethnographically demonstrates, through fieldwork in Trinidad and Tobago, how graphical representations construct oil resources and reserves.[54]

The relative dearth of "inside the fence" studies of these industries is partially due to the power of corporations to control access to production sites and headquarters. The social scientists who have been able to conduct research inside mining and oil companies or with their personnel have focused on externally-facing groups, generating rich research critical of CSR. Dinah Rajak's pioneering study of the mining multinational Anglo American documents and theorizes how CSR extends the moral authority of corporations. She found that CSR practitioners brought deeply held personal passions of "doing good" to their work of "empowering" the subjects of their programs but ultimately reinscribed coercive gift relationships with them that inspired "deference and dependence rather than autonomy and empowerment."[55] Welker's study of Newmont CSR personnel shows that

they enacted the company to different ends—as a "pot of money" versus a "set of skills"—as they attempted to ameliorate the harms created by mining activities.[56] Douglas Rogers argues that the practice of CSR during the postsocialist oil boom in Russia's Perm region produced an "interpenetration of corporation and state" and remade the region through widespread cultural projects that played on the materiality of oil and gas and their attendant infrastructure.[57] John R. Owen and Deanna Kemp have conducted perhaps the most extensive research inside mining companies from their positions as researchers at the University of Queensland's Sustainable Minerals Institute. Working "inside the fence" allows them to show how efforts at sustainable community development can be undermined by grounding calls for social responsibility inside the business case for the social license to operate; to document how CSR practitioners experience marginalization inside corporate structures that leave them out of major decision making; and to identify voices for change inside companies that are "holding ground against the narrow business case view of the world."[58]

EMPATHY AND ETHNOGRAPHY

The focus on CSR and community relations personnel in these "inside the fence" social studies of mining and oil and gas industries reveals something deeper about the lack of attention to engineers in these literatures. The CSR and community relations personnel can be interpreted as valiantly trying to ameliorate or prevent the environmental and social effects of these industries.[59] This perceived quality may make them more appealing research subjects for social scientists, especially ethnographers. Ethnographic research methods invite empathy, fostering a "well-rehearsed disciplinary ideal of ethnographic encounters suffused with mutuality."[60] This mutuality may lead anthropologists to be wary of representing their interlocutors in a negative light, a phenomenon Sherry Ortner terms "ethnographic refusal."[61]

This ethnographic ideal of mutuality sits awkwardly beside the "hermeneutics of suspicion" demanded by social science in general and critical studies of capitalism in particular.[62] In this mode, we document the failures,

the contradictions, and the betrayals of high ideals. The stark injustices engendered by late capitalism and climate change seem to demand such suspicion, especially when studying elites. When I was presenting my research to fellow academics, for example, many insinuated or outright asserted that my obligation as an anthropologist studying the mining and oil and gas industries was to pull back the curtain and expose the "true" ill intentions of industry personnel that were hidden by corporate greenwash. This approach ironically celebrates academic criticality though reconfirming common tropes about corporations and the people who enact them. As Welker writes:

> By making the profit-maximizing corporation the central protagonist, we perform our criticality in opposition to a corporate actor while disengaging "it" from the human and nonhuman agents involved in enacting and contesting corporations and their responsibilities. . . . The political satisfaction afforded by the performance comes at an ethnographic and epistemological cost, severing corporations from the ordinary materials, human practices, ethics, and sentiments (such as desire, fear, shame, pride, jealousy, and hope) that sustain them.[63]

Turning empathetic relationships and shared histories of encounter into "research" that travels beyond them and engages in cultural critique presents particular challenges for anthropologists who research highly politicized and polarizing topics. The few who study "up" may choose to forgo ideals of mutuality from the start.[64] Hughes, for example, vociferously argues that the unprecedented global threat of climate change merits judging petroleum engineers and scientists as "in the wrong." Because of their complicity in climate change, he proclaims, they and their industry should be consigned "to an ash heap, worthy of condescension and worse" and "should go extinct."[65] Most others choose to conduct research with the people and in the places that experience harm. In these cases, anthropologists can amplify, contextualize, and theorize their interlocutors' experiences to critique political, economic, cultural, and other structures of power alongside them.

In contrast to romantic ideals of mutuality, the structural position of many engineers as dutiful employees of major corporations and government agencies can make them, in the eyes of others, unsympathetic ethnographic subjects. Through their formal education and work experiences,

engineers are socialized into professional worldviews that are animated by particular—if unstated—goals and assumptions about that world, what "progress" entails, and how it can be achieved. This has meant that in "most theorists' conceptions, engineers were the embodiment of the military-industrial complex: conformist organization men in the system that stood to be torn down."[66] Indeed, engineers' centrality to highly problematic development schemes, from high modernist state-led projects[67] to those seeking local community empowerment,[68] has seeded critiques of them as "hypersubjects"[69] who relentlessly pursue profit and efficiency. As Penny Harvey and Hannah Knox write in their ethnography of roads in Peru, "From such scenarios it is not difficult to see why the engineer, as modern expert, emerges as the villain in the critical social sciences."[70]

Such black-and-white ethical judgments hinder us from understanding how the very ethical commitments held by engineers nonetheless can help sustain the corporate forms they struggle within and against. The book follows María Puig de la Bellacasa in approaching the ethical as an everyday doing that "connects the personal to the collective" and grounds "ethical obligation in concrete relationalities in the making rather than on moral norms."[71] This approach does not necessitate a "postcritical" stance, justifying engineers' activities or evacuating our own moral and political commitments as researchers.[72] These ethical doings are inherently political, as they enable and are enabled by processes that unevenly distribute risks and benefits, harms and rewards.[73] As Ballestero cautions, technoscientific tools "quietly determine the limits of the possible by both narrowing down certain options and opening the possibility of creating different, and maybe better, worlds."[74] But understanding how people themselves judge the rightness and wrongness of the thoughts, activities, and relationships that make up their lives, Mette High and I argue, provides a crucial first step to better understanding our interlocutors—and the industries they help set into motion—so that we can then engage in more generative debate about possible futures.[75]

Taking seriously the everyday lives of engineers, for example, allows us (1) to trace how infrastructures, products, and processes come into being through those engineers' own moral projects and then (2) to use that knowledge to ask critical questions about the possibilities and limitations

of making natural resource production more responsive to the concerns of a variety of publics. What is the nature of accountability in technoscientific organizations defined by divisions of labor? How do engineers embody and detach from the corporate forms employing them? How does the context of engineers' work position them to ask—or avoid asking—big, self-critical questions about the industries their work supports? What prompts engineers to step outside the limitations of their positionality, subjectivity, and expertise to seek out other forms of knowledge?[76] How can we chart more sustainable resource futures while acknowledging both the collective nature of the challenges we have inherited and our differential abilities and responsibilities to address them? How can that process be responsive to the distributed nature of industry insiders' work, without that acknowledgment becoming an excuse for the evacuation of responsibility? Finally, how can academics nurture the knowledge practices and professional ideals that would be necessary to open up more imaginative possibilities surrounding resource production, consumption, reuse, and waste?

METHODS

The book focuses on engineers who worked in the mining and oil and gas industries. Even within this relatively small professional network, there were noticeable differences in how they thought about and practiced social responsibility. Some of them created institutional change by integrating questions of social responsibility inside engineering decision making. A few dismissed terms such as *social license to operate* or *corporate social responsibility* as fads that should be managed by "social" people such as anthropologists like myself, leaving engineers to do their rightful work of technical problem solving and innovation.[77] The majority found themselves somewhere between those two extremes, recognizing the importance of public perception and identifying some ways that their engineering work articulated with improving it, without taking on broad institutional change as their own mission. While all these engineers expressed a range of opinions about their personal and professional obligations to address public

concerns about their industries, they each had to account for their actions to multiple publics, from critics of their industries to friends, family, and the occasional anthropologist who was curious about their work and life.[78]

My research project—including the interviews, conversations, and fieldwork forming the basis of it—constituted one of the sites in which engineers practiced accountability to people outside their profession and their industries. In some cases my requests for interviews fit neatly within a company's efforts to expand its outreach and personalize the corporation by encouraging employees to open up and talk with people outside of the industry. This underscores that "ethnographic methods hold potential for plying into corporations' own self-representations."[79] Reflecting on how individuals and teams of personnel respond to research projects provides a window through which to study practices of corporate self-representation and accountability making. For example, the issue of company personnel restricting access to corporate spaces sheds light on how companies manage boundaries and self-representation, as "methodological obstacles" constitute "important knowledge about corporations."[80] In my own project, when my key contacts at a company suggested that I interview particular employees, that selection revealed much about what kinds of engineering and CSR practices they would like to circulate externally.

This project required rethinking traditional expectations for research methodologies, as "the collapsed roles of participant, observer, critic, employee, and colleague collide with one another."[81] During the focused period of research for this book (2014–2020), I engaged in activities that could be labeled *participant observation*, the hallmark of ethnographic research. I toured mines and well pads and accompanied engineers on their public engagement activities, such as the "science fair" community meetings hosted by oil and gas operators in Colorado (see chapter 4). I was able to participate in one corporate training event in which external affairs supervisors taught engineers how to respond to media requests that might damage their employer's reputation.

But *participant observation* does not capture how I have lived and breathed these topics since 2012 by virtue of my position as a professor at

the Colorado School of Mines, an engineering and applied science university with long-standing and deep relationships with the mining and energy industries. Whereas the term *participant observation* conjures up activities that are distinct and cordoned off from one's "regular" academic or personal life, navigating an engineering and applied science university as an anthropologist made every day feel like a research day, requiring careful listening in order to understand my surroundings. When I participated in meetings, town halls, campus events, and alumni activities, it was with engineers and applied scientists, many of whom worked in the industries I was studying. When I attended the semiannual career fair, one of the school's most significant rites of passage, it meant talking with Mines graduates who were staffing the booths of more than 150 companies, most of whom had direct or indirect ties to the mining and oil and gas industries. When I taught courses, my students either aspired to work in those industries or were deliberately seeking work outside of them. I attended and organized campus lectures by engineers from industry as well as academia, including a lecture series specifically dedicated to CSR and engineering. I collaborated each semester with engineering professors across campus to integrate critical assessments of CSR into their own courses. I also led the social science research agenda for an industry-sponsored research center on water and unconventional energy, which provided opportunities to visit corporate headquarters and supervise research on public perceptions of fracking in Colorado.[82]

Yet, as Hugh Gusterson insightfully writes, "Participant observation is a research technique that does not travel well up the social structure."[83] Cultures of expertise inside corporations can be especially difficult to access, particularly when they are the target of external critique.[84] When regularized access was not possible in the study of Norwegian oil companies, for example, the research team developed methodological strategies characterized by "a high degree of personal flexibility, more semi-structured interviews than participation, non-continuous involvement with our interlocutors, mapping infrastructures of extensive geographical extent or opaque character, being present at or attending activities that involve alternative forms of socialites (social media, websites, documents, Skype-meetings, etc.), and even creatively designing situations [to] interact with and observe company representatives."[85]

My research also required creative research methodologies. I relied heavily on interviews, like other anthropologists studying relative elites, perhaps because "cultures of expertise are usually socially privileged, quasi-sovereign, often able to restrict ethnographic access, to monitor the acquisition and subsequent circulation of their expert knowledge, and even, if they are so inclined, to police ethnographic and theoretical content."[86] Nicole Smith and I formally interviewed around seventy-five engineers and those who worked with them, such as landmen (who negotiate lease agreements with mineral and surface owners), community relations practitioners, and lawyers.[87] The engineers came from different disciplinary backgrounds, spanning environmental, chemical, civil, and geological engineering, in addition to mining and petroleum engineering.[88] Though I did not formally interview any former students for this project, some of them did introduce me to their colleagues and supervisors. For example, I was able to interview about a dozen engineers and other personnel at one of Colorado's largest oil and gas operators after a student from my CSR course introduced me to a fellow alum he admired during an internship the prior summer. The Mines alumni network was valuable given the uniquely influential position the university plays in both the mining industry and the oil and gas industry.

Conferences became a generative research site, given that they are key "theaters of virtue"[89] in which executives and employees enact corporate forms while they generate and debate knowledge and "best practices" for a variety of activities, including CSR.[90] Conferences are spaces in which the people who work in these industries constitute themselves as a profession, sharing knowledge and nurturing professional and personal relationships over shared meals and drinks. I regularly attended conferences of the primary professional associations associated with mining and oil and gas activity. In addition to attending panels and social events, I actively participated by presenting my own research. This provided opportunities for receiving feedback from engineers and CSR practitioners as I was interpreting my data and crafting my conclusions, as well as for meeting more people to interview for the research itself.

As part of my larger collaborative work building CSR as a space of inquiry at Mines, I helped create an alumni interest group focused on social

responsibility. For those who joined, the alumni group seemed to appeal to them as a new and meaningful way to connect back with their alma mater. Multiple generations of these alumni described their undergraduate years as being devoid of the kinds of social responsibility questions that interested them as students or came to occupy a place of great importance in their careers. They became visibly energized with the opportunity to participate in the life of the school once more. Some became participants in my research project, while others gave class lectures, judged student projects, and attended social events focused on social responsibility and engineering. These activities, coupled with my own teaching and mentoring at Mines, made my project one of "critical participation" in which I was thinking and working inside some of the social arenas I was studying.[91]

Even with these varied methodological tools and social relationships, I do not claim to present an all-encompassing treatise on engineers and accountability in corporate settings. I primarily interviewed people who had stayed in industry and made some peace with it, not those who chose to leave. I was also not able to "sit among" engineers as they did their work,[92] gleaning insights into their lives based on the small but significant details of how they arranged their desks and working days that are possible only through long-term, embedded fieldwork in offices.[93] Rather, my ethnographic practice revolved around deep listening to engineers and their colleagues as they thought through their work and lives with an interlocutor who was nonetheless at arm's length from them. What my interlocutors did share with me puts the things they did not share in sharp relief, creating a "negative space" that is present in its absence.[94]

One of the questions I was frequently asked by other anthropologists was how I could tell that my interlocutors were not simply feeding me a corporate line during our time together. How, they asked, could I tell that I was getting "real" data rather than a sanitized version of their thoughts and experiences suitable for public consumption? This line of reasoning makes assumptions about what good ethnographic data is. It privileges the desire to "reach behind the curtains" to access "backstage" interactions and to catch employees breaking rank to criticize corporate discourses.[95] The team studying Norwegian energy companies wisely observe that such

confessionals are also a commonplace technique through which corporate forms admit failure and commit to doing better: "Even those moments of apparent spontaneous confessional, breaking ranks from the corporate line to admit failures of responsibility, impotence and frustration at the impending existential crisis of climate change for example, have become part of the ritual of public performance on the CSR/sustainability circuit."[96] Moreover, as I show in chapter 4, these assumptions about "good data" seem to hinge on notions of agency that privilege resistance rather than other ways of being in the world. Rather than interpreting my ethnographic data on a scale of authenticity according to how much an interlocutor was willing to criticize his or her employer or industry, I interpret all of these interactions as sites in which they were engaging in practices of accountability.

OUTLINE OF THE BOOK

The chapters that follow trace the practices of accountability through which engineers made sense of their work in the mining and oil and gas industries, to themselves and to their others.[97] While I sometimes group together engineers who worked in mining and petroleum, I also take care to separate them when their experiences differ. The different materialities of these industries matter for the "corporate social technologies" they develop.[98] For example, though petroleum engineer Aaron turned to mining cases to help him understand and manage the fracking controversies in Colorado, he also recognized the differences between those two industries for what a social license to operate might mean. Whereas mining was spatially intensive, oil and gas development was spatially extensive, sprawling over networks of roads and highways and interspersed with ranches and suburban developments. Whereas mines could operate for decades, the most intrusive periods of oil and gas development surrounded drilling and completions (the post-drilling process of making a well ready for production, which can include fracturing).

Chapter 2 provides an overview of the competing accountabilities that give rise to engineers' everyday practices. I suggest that the ethic of material provisioning and the social license to operate figure so strongly in how engineers understand their industries, their own work, and their collective

responsibilities to the public because they seem to promise a reconciliation of the accountabilities engineers feel to their profession, to their corporate employers and clients, to the public, and to themselves.

Chapter 3 shows how engineers-turned-lawyers developed the concept of the social license to operate in order to shape questions about the accountability of natural resource production to be about *how* to mine responsibly, not whether to mine at all. By translating murky questions of public perception into questions about profitability, they were able to raise the stature and legitimacy of social and environmental concerns that had otherwise been peripheral to engineering practice and decision making. Yet as they opened up mining to greater public participation, they channeled it in ways that ultimately shored up the power of the company for which they worked.

Chapter 4 investigates the distributed agencies that characterize the corporate form, focusing on how engineers navigated their participation in an extended corporate "person." They did not encounter corporations solely as external entities that bore down on them. Rather, they moved between "enacting" corporate forms and distancing themselves from them.[99] This approach offers a new framework for thinking about engineers' agencies in the context of corporate work, going beyond the dominant ones that either condemn them for being conformists or celebrate them for being whistleblowers.

Chapter 5 theorizes the porous corporate form through the liminality of engineering consultants. I suggest that the professional autonomy desired by the consultants involved a narrowing of the publics, companies, and infrastructures for which they would be held accountable. While the language of choice used by the consultants to narrate their careers highlighted their own agency, they frequently found themselves hamstrung by their status as external "recommenders" for the projects. This liminal status ultimately served as a legitimizing device for the companies contracting them: consultants were widely perceived as being more "objective" and "independent" than the companies, even though in practice they remained financially dependent on those companies for their livelihoods.

Chapter 6 theorizes engineering pragmatism by analyzing engineers' practices of listening alongside their efforts to design industrial infrastructure

that was responsive to public concerns. Faced with competing accountabilities, they tried to create industrial systems that minimized risk while providing financial gain for local people, as well as their employers. I argue that, while this practice of public accountability financially benefited some parts of the public while allowing companies to maintain or expand their reach, its focus on "actionable feedback" foreclosed broader questions about industrial development.

Chapter 7 concludes by returning to the questions of agency and accountability, reform and transformation, that weave through each of the earlier chapters. I make a case for developing new aspirations for engineers' accountability to help us collectively chart more sustainable resource futures. While the book proposes that we understand the accountability of technoscientific corporations through understanding the agencies of the people who constitute them, the epilogue explores how we might *alter* the accountability of technoscientific corporations by altering the agencies of the people who constitute them. There I also reflect on my own critical participation in engineering education, so readers curious about how my biography and institutional location influenced this research project should begin reading there.

Bibliography

PRIMARY SOURCES

Art Biddle personal archives, Golden, Colorado.

Crested Butte Mountain Heritage Museum, Crested Butte, Colorado.

Stan Dempsey personal archives, Golden, Colorado.

Mt. Emmons Mining Project collection, Leslie J. Savage Library, Western Colorado University, Gunnison, Colorado.

SECONDARY SOURCES

Abu-Lughod, Lila. "Can There Be a Feminist Ethnography?" *Women and Performance: A Journal of Feminist Theory* 5, no. 1 (1990): 7–27.

Ahearn, Laura M. "Language and Agency." *Annual Review of Anthropology* 30 (2001): 109–137.

Alder, Ken. *Engineering the Revolution: Arms and Enlightenment in France, 1763–1815*. Chicago: University of Chicago Press, 1997.

Anand, Nikhil, Akhil Gupta, and Hannah Appel. "Introduction: Temporality, Politics, and the Promise of Infrastructure. In *The Promise of Infrastructure*, edited by Nikhil Anand, Akhil Gupta, and Hannah Appel, 1–38. Durham, NC: Duke University Press Books, 2018.

Anand, Nikhil, Akhil Gupta, and Hannah Appel, eds. *The Promise of Infrastructure*. Durham, NC: Duke University Press, 2018.

Appadurai, Arjun. "Mediants, Materiality, Normativity." *Public Culture* 27, no. 2 (2015): 221–237. https://doi.org/10.1215/08992363-2841832.

Appel, Hannah. "Conclusion: Energy Ethics and Ethical Worlds." *Journal of the Royal Anthropological Institute* 25, no. S1 (2019): 177–190. https://doi.org/10.1111/1467-9655.13021.

Appel, Hannah. *The Licit Life of Capitalism: US Oil in Equatorial Guinea*. Durham, NC: Duke University Press, 2019.

Appel, Hannah. "Offshore Work: Oil, Modularity, and the How of Capitalism in Equatorial Guinea." *American Ethnologist* 39, no. 4 (2012): 692–709. https://doi.org/10.1111/j.1548-1425 .2012.01389.x.

Appel, Hannah. "To Critique or Not to Critique? That Is (Perhaps Not) the Question. . . ." *Journal of Business Anthropology* 8, no. 1 (2019): 1–6.

Appel, Hannah. "Walls and White Elephants: Oil Extraction, Responsibility, and Infrastructural Violence in Equatorial Guinea." *Ethnography* 13, no. 4 (2012): 439–465. https://doi.org /10.1177/1466138111435741.

Argenti, Nicolas, and Daniel M. Knight. "Sun, Wind, and the Rebirth of Extractive Economies: Renewable Energy Investment and Metanarratives of Crisis in Greece." *Journal of the Royal Anthropological Institute* 21, no. 4 (2015): 781–802. https://doi.org/10.1111/1467-9655.12287.

Auld, Graeme, Steven Bernstein, and Benjamin Cashore. "The New Corporate Social Responsibility." *Annual Review of Environment and Resources* 33 (2008): 413–435.

Bakker, Karen, and Gavin Bridge. "Material Worlds? Resource Geographies and the 'Matter of Nature.'" *Progress in Human Geography* 30, no. 1 (2006): 5–27.

Ballestero, Andrea. *A Future History of Water*. Durham, NC: Duke University Press Books, 2019.

Barandiarán, Javiera. *Science and Environment in Chile: The Politics of Expert Advice in a Neoliberal Democracy*. Cambridge, MA: MIT Press, 2018.

Barley, Stephen R., and Gideon Kunda. *Gurus, Hired Guns, and Warm Bodies: Itinerant Experts in a Knowledge Economy*. Princeton, NJ: Princeton University Press, 2006.

Barnes, Jessica. *Cultivating the Nile: The Everyday Politics of Water in Egypt*. Durham, NC: Duke University Press, 2014.

Barry, Andrew. *Material Politics: Disputes along the Pipeline*. Malden, MA: Wiley-Blackwell, 2013.

Benson, Peter. "El Campo: Faciality and Structural Violence in Farm Labor Camps." *Cultural Anthropology* 23, no. 4 (2008): 589–629.

Benson, Peter, and Stuart Kirsch. "Capitalism and the Politics of Resignation." *Current Anthropology* 51, no. 4 (2010): 459–486.

Berlant, Lauren, and Kathleen Stewart. *The Hundreds*. Durham, NC: Duke University Press, 2019.

Berry, Evan. *Devoted to Nature: The Religious Roots of American Environmentalism.* Berkeley: University of California Press, 2015.

Biddle, Art, Richard C. Livermore, and Adam Poe. "AMAX Inc and the Colorado Joint Review Process." New York: Center for Public Resources, September 1981.

Biersack, Aletta. " Reimagining Political Ecology: Culture/Power/History/Nature." In *Reimagining Political Ecology*, edited by Aletta Biersack and James B. Greenberg, 3–42. Durham, NC: Duke University Press, 2006.

Blowfield, Michael, and Jedrzej G. Frynas. "Setting New Agendas: Critical Perspectives on Corporate Social Responsibility in the Developing World." *International Affairs* 81, no. 3 (2005): 499–513.

Boas, Franz. "The Methods of Ethnology." *American Anthropologist* 22, no. 4 (1920): 311–321. https://doi.org/10.1525/aa.1920.22.4.02a00020.

Bourdieu, Pierre. *Outline of a Theory of Practice*. Cambridge: Cambridge University Press, 1977.

Boutilier, Robert, and Ian Thomson. *The Social License: The Story of the San Cristobal Mine*. New York: Routledge, 2018.

Bowker, Geoffrey. "Sustainable Knowledge Infrastructures." In *The Promise of Infrastructure*, edited by Nikhil Anand, Akhil Gupta, and Hannah Appel, 203–222. Durham, NC: Duke University Press, 2018.

Boyer, Dominic. "Infrastructure, Potential Energy, Revolution." In *The Promise of Infrastructure*, edited by Nikhil Anand, Akhil Gupta, and Hannah Appel, 223–244. Durham, NC: Duke University Press, 2018.

Boyer, Dominic. "Thinking through the Anthropology of Experts." *Anthropology in Action* 15, no. 2 (2008): 38–46. https://doi.org/10.3167/aia.2008.150204.

Bridge, Gavin, "Excavating Nature: Environmental Narratives and Discursive Regulation in the Mining Industry." In *An Unruly World? Globalization, Governance, and Geography*, edited by A. Herod, G. Tuathail, and S. Roberts, 219–243. New York: Routledge.

Browne, John. *Make, Think, Imagine: Engineering the Future of Civilization*. New York: Pegasus Books, 2019.

Brueckner, Martin, and Marian Eabrasu. "Pinning Down the Social License to Operate (SLO): The Problem of Normative Complexity." *Resources Policy* 59 (2018): 217–226. https://doi.org/10.1016/j.resourpol.2018.07.004.

Buch, Elana. "Senses of Care: Embodying Inequality and Sustaining Personhood in the Home Care of Older Adults in Chicago." *American Ethnologist* 40, no. 4 (2013): 637–650.

Butler, Judith. *Gender Trouble: Feminism and the Subversion of Identity*. New York: Routledge, 1990.

Cahn, Robert. *Footprints on the Planet: A Search for an Environmental Ethic*. New York: Universe Books, 1978.

Callon, Michel. "Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay." In *Power, Action, and Belief: A New Sociology of Knowledge*, edited by John Law, 196–233. London: Routledge and Kegan Paul, 1986.

Callon, Michel, Pierre Lascoumes, and Yannick Barthe, eds. *Acting in an Uncertain World*, translated by Graham Burchell. Cambridge, MA: MIT Press, 2011.

Canney, Nathan, and Angela Bielefeldt. "A Framework for the Development of Social Responsibility in Engineers." *International Journal of Engineering Education* 31 (2015): 414–424.

271   *Bibliography*

Carrier, James G., ed. *After the Crisis: Anthropological Thought, Neoliberalism, and the Aftermath*. New York: Routledge, 2016.

Carsten, Janet, Sophie Day, and Charles Stafford. "Introduction: Reason and Passion: The Parallel Worlds of Ethnography and Biography." *Social Anthropology* 26, no. 1 (2018): 5–14. https://doi.org/10.1111/1469-8676.12490.

Catalano, George D. "Engineering Ethics: Peace, Justice, and the Earth." *Synthesis Lectures on Engineers, Technology, and Society* 1, no. 1 (2006): 1–80. https://doi.org/10.2200/S00039ED1V01Y200606ETS001.

Cech, Erin A. "Culture of Disengagement in Engineering Education?" *Science, Technology, and Human Values* 39, no. 1 (2014): 42–72. https://doi.org/10.1177/0162243913504305.

Certeau, Michel de. *The Practice of Everyday Life*. Berkeley: University of California Press, 1984.

Chakrabarty, Dipesh. "The Climate of History: Four Theses." *Critical Inquiry* 35, no. 2 (2009): 197–222. https://doi.org/10.1086/596640.

Chapman, Chelsea. "Multinatural Resources: Ontologies of Energy and the Politics of Inevitability in Alaska." In *Cultures of Energy: Power, Practices, Technologies*, edited by Sarah Strauss, Stephanie Rupp, and Thomas Love, 96–109. Walnut Creek, CA: Left Coast Press, 2013.

Cloud, Dana L. "Corporate Social Responsibility as Oxymoron: Universalization and Exploitation at Boeing." In *The Debate over Corporate Social Responsibility*, edited by Steve May, George Cheney, and Juliet Roper, 219–231. Oxford: Oxford University Press, 2007.

Colby, Anne, and William M. Sullivan. "Ethics Teaching in Undergraduate Engineering Education." *Journal of Engineering Education* 97, no. 3 (2008): 327–338.

Collier, Paul, and Glen Ireland. "Shared-Use Mining Infrastructure: Why It Matters and How to Achieve It." *Development Policy Review* 36, no. 1 (2018): 51–68. https://doi.org/10.1111/dpr.12231.

Conley, John M., and Cynthia A. Williams. "Engage, Embed, and Embellish: Theory versus Practice in the Corporate Social Responsibility Movement." *Journal of Corporation Law* 31, no. 1 (2005): 1–38.

Cronon, William. "The Trouble with Wilderness; Or, Getting Back to the Wrong Nature." In *Uncommon Ground: Toward Reinventing Nature*, 69–90. New York: Norton, 1995.

Cross, Jamie. "Detachment as a Corporate Ethic: Materializing CSR in the Diamond Supply Chain." *Focaal* 2011, no. 60 (2011): 34–46. https://doi.org/10.3167/fcl.2011.600104.

Cumming, Daniel G. "Black Gold, White Power: Mapping Oil, Real Estate, and Racial Segregation in the Los Angeles Basin, 1900–1939." *Engaging Science, Technology, and Society* 4 (2018): 85–110. https://doi.org/10.17351/ests2018.212.

Dahlgren, Kari. "Digging Deeper: Precarious Futures in Two Australian Coal Mining Towns." PhD diss., London School of Economics, 2019.

Davis, Michael. "Professional Autonomy: A Framework for Empirical Research." *Business Ethics Quarterly* 6, no. 4 (1996): 441–460.

Davis, Rachel and Daniel Franks. *Costs of Company-Community Conflict in the Extractive Sector. Corporate Social Responsibility Initiative Report.* Cambridge, MA: John F. Kennedy School of Government, Harvard University, 2014. Avaailable online http://www.hks.harvard.edu/m-rcbg /CSRI/research/Costs%20of%20Conflict_Davis%20%20Franks.pdf.

Delborne, Jason A., Adam E. Kokotovich, and Jeantine E. Lunshof. "Social License and Synthetic Biology: The Trouble with Mining Terms." *Journal of Responsible Innovation* 7, no. 3 (2020): 280–297. https://doi.org/10.1080/23299460.2020.1738023.

Dolan, Catherine, and Dinah Rajak. "Introduction: Ethnographies of Corporate Ethicizing." *Focaal* 60 (2011): 3–8.

Dougherty, Michael L. "Boom Times for Technocrats? How Environmental Consulting Companies Shape Mining Governance." *Extractive Industries and Society* 6, no. 2 (2019): 443–454. https://doi.org/10.1016/j.exis.2019.01.007.

Downey, Gary Lee. "Are Engineers Losing Control of Technology? From 'Problem Solving' to 'Problem Definition and Solution' in Engineering Education." *Chemical Engineering Research and Design* 83, no. 6 (2005): 583–595. https://doi.org/10.1205/cherd.05095.

Downey, Gary Lee. "Critical Participation: Inflecting Dominant Knowledge Practices through STS." In *Making and Doing: Activating STS through Knowledge Expression and Travel*, edited by Gary Lee Downey and Teun Zuiderent-Jerak, 219–243. Cambridge, MA: MIT Press, 2021.

Downey, Gary Lee. "The Engineering Cultures Syllabus as Formation Narrative: Critical Participation in Engineering Education through Problem Definition." *University of St. Thomas Law Journal* 5, no. 2 (2011): 428–456.

Downey, Gary Lee. "Low Cost, Mass Use: American Engineers and the Metrics of Progress." *History and Technology* 23, no. 3 (2007): 289–308. https://doi.org/10.1080/07341510701300387.

Downey, Gary Lee. *The Machine in Me: An Anthropologist Sits among Computer Engineers*. New York: Routledge, 1998.

Downey, Gary Lee. "PDS: Engineering as Problem Definition and Solution." In *International Perspectives on Engineering Education*, edited by Steen Hyldgaard Christensen, Christelle Didier, Andrew Jamison, Martin Meganck, Carl Mitcham, and Byron Newberry, 435–455. Cham: Springer, 2015. https://doi.org/10.1007/978-3-319-16169-3_21.

Downey, Gary Lee. "What Is Engineering Studies For? Dominant Practices and Scalable Scholarship." *Engineering Studies* 1, no. 1 (2009): 55–76. https://doi.org/10.1080/19378620902786499.

Downey, Gary, and Juan Lucena. "Engineering Selves: Hiring into a Contested Field of Education." In *Cyborgs and Citadels: Anthropological Interventions in Emerging Sciences and Technologies*, edited by Gary Lee Downey and Joseph Dumit, 117–142. Santa Fe, NM: School of American Research Press, 1997.

Eagleton, Terry. *Ideology: An Introduction*. New York: Verso, 1991.

Edwards, Richard C. *Contested Terrain: The Transformation of the Workplace in the Twentieth Century*. New York: Basic Books, 1979.

Engineering and Mining Journal. "Openness, Cooperation—Keys to the AMAX Environmental Program." September 1972, 1–5.

Espig, Martin, and Kim de Rijke. "Unconventional Gas Developments and the Politics of Risk and Knowledge in Australia." *Energy Research and Social Science*, 20 (2016): 82–90. https://doi.org/10.1016/j.erss.2016.06.001.

Faulkner, Wendy. "'Nuts and Bolts and People': Gender-Troubled Engineering Identities." *Social Studies of Science* 37, no. 3 (2007): 331–356.

Ferguson, James. *The Anti-politics Machine: Development, Depoliticization, and Bureaucratic Power in Lesotho*. Minneapolis: University of Minnesota Press, 1990.

Ferguson, James. *Global Shadows: Africa in the Neoliberal World Order*. Durham, NC: Duke University Press, 2006.

Ferry, Elizabeth Emma, and Mandana E. Limbert. *Timely Assets: The Politics of Resources and Their Temporalities*. Santa Fe, NM: School for Advanced Research Press, 2008.

Folch, Christine. *Hydropolitics: The Itaipu Dam, Sovereignty, and the Engineering of Modern South America*. Princeton, NJ: Princeton University Press, 2019.

Forsythe, Diana. *Studying Those Who Study Us: An Anthropologist in the World of Artificial Intelligence*, edited by David Hess. Palo Alto, CA: Stanford University Press, 2002.

Fortun, Kim. *Advocacy after Bhopal: Environmentalism, Disaster, New Global Orders*. Chicago: University of Chicago Press, 2001.

Foucault, Michel. *The History of Sexuality*. Vol. 1. New York: Vintage, 1978.

Franks, Daniel. *Mountain Movers: Mining, Sustainability, and the Agents of Change.* New York: Routledge, 2015.

Franks, Daniel M., Rachel Davis, Anthony J. Bebbington, Saleem H. Ali, Deanna Kemp, and Martin Scurrah. "Conflict Translates Environmental and Social Risk into Business Costs." *Proceedings of the National Academy of Sciences* 111, no. 21 (2014): 7576–7581. https://doi.org/10.1073/pnas.1405135111.

Frynas, Jedrzej George. "Political Instability and Business: Focus on Shell in Nigeria." *Third World Quarterly* 19, no. 3 (1998): 457–478.

Funtowicz, Silvio O., and Jerome R. Ravetz, "Science for the Post-normal Age." *Futures* 25, no. 7 (1993): 739–755. https://doi.org/10.1016/0016-3287(93)90022-L.

Gardner, Katy. *Discordant Development: Global Capitalism and the Struggle for Connection in Bangladesh*. London: Pluto Press, 2012.

Gardner, Katy, Zahir Ahmed, Fatema Bashir, and Masud Rana. "Elusive Partnerships: Gas Extraction and CSR in Bangladesh." *Resources Policy* 37, no. 2 (2012): 168–174. https://doi.org/10.1016/j.resourpol.2012.01.001.

Geertz, Clifford. "Thick Description: Toward an Interpretive Theory of Culture." In *The Interpretation of Cultures: Selected Essays*, 3–30. New York: Basic Books, 1973.

Gehman, Joel, Lianne M. Lefsrud, and Stewart Fast. "Social License to Operate: Legitimacy by Another Name?" *Canadian Public Administration* 60, no. 2 (2017): 293–317. https://doi.org/10.1111/capa.12218.

Giddens, Anthony. *Central Problems in Social Theory: Action, Structure and Contradiction in Social Analysis*. Berkeley: University of California Press, 1979.

Gilbert, Paul Robert, and Jessica Sklair. "Introduction: Ethnographic Engagements with Global Elites." *Focaal* 2018, no. 81 (2018): 1–15. https://doi.org/10.3167/fcl.2018.810101.

Gilberthorpe, Emma, and Glenn Banks. "Development on Whose Terms? CSR Discourse and Social Realities in Papua New Guinea's Extractive Industries Sector." *Resources Policy* 37, no. 2 (2012): 185–193. https://doi.org/10.1016/j.resourpol.2011.09.005.

Goldman, Steven L. "Why We Need a Philosophy of Engineering: A Work in Progress." *Interdisciplinary Science Reviews* 29, no. 2 (2004): 163–176. https://doi.org/10.1179/030801804225012572.

Gottlieb, Robert. *Forcing the Spring: The Transformation of the American Environmental Movement*. Rev. ed. Washington, DC: Island Press, 2005.

Graeber, David. *Toward an Anthropological Theory of Value: The False Coin of Our Own Dreams*. New York: Palgrave, 2001.

Gusterson, Hugh. *Nuclear Rites: A Weapons Laboratory at the End of the Cold War*. Berkeley: University of California Press, 1996.

Haggerty, Julia H., Adrianne C. Kroepsch, Kathryn Bills Walsh, Kristin K. Smith, and David W. Bowen. "Geographies of Impact and the Impacts of Geography: Unconventional Oil and Gas in the American West." *Extractive Industries and Society* 5, no. 4 (2018): 619–633. https://doi.org/10.1016/j.exis.2018.07.002.

Haraway, Donna. *Modest Witness@Second Millennium. FemaleMan Meets OncoMouse: Feminism and Technoscience*. New York: Routledge, 1997.

Harvey, Penny, and Hannah Knox. *Roads: An Anthropology of Infrastructure and Expertise*. Ithaca, NY: Cornell University Press, 2015.

Harvey, Penelope, and Hannah Knox. "Virtuous Detachments in Engineering Practice—On the Ethics of (Not) Making a Difference." In *Detachment: Essays on the Limits of Relational Thinking*, edited by Thomas Yarrow, Matei Candea, Catherine Trundle, and Joanna Cook, 58–78. Manchester: Manchester University Press, 2015.

Hawken, Paul, Amory Lovins, and L. Hunter Lovins. *Natural Capitalism: Creating the Next Industrial Revolution*. New York: US Green Building Council, 2000.

Hébert, Karen. "Chronicle of a Disaster Foretold: Scientific Risk Assessment, Public Participation, and the Politics of Imperilment in Bristol Bay, Alaska." *Journal of the Royal Anthropological Institute* 22, no. S1 (2016): 108–126. https://doi.org/10.1111/1467-9655.12396.

Herkert, Joseph R. "Future Directions in Engineering Ethics Research: Microethics, Macroethics, and the Role of Professional Societies." *Science and Engineering Ethics* 7, no. 3 (2001): 403–414. https://doi.org/10.1007/s11948-001-0062-2.

High, Mette M. *Fear and Fortune: Spirit Worlds and Emerging Economies in the Mongolian Gold Rush*. Ithaca, NY: Cornell University Press.

High, Mette M. "Projects of Devotion: Energy Exploration and Moral Ambition in the Cosmoeconomy of Oil and Gas in the Western United States." *Journal of the Royal Anthropological Institute* 25, no. S1 (2019): 29–46. https://doi.org/10.1111/1467-9655.13013.

High, Mette M., and Jessica M. Smith. "Introduction: The Ethical Constitution of Energy Dilemmas." *Journal of the Royal Anthropological Institute* 25, no. S1 (2019): 9–28. https://doi.org/10.1111/1467-9655.13012.

Ho, Karen. *Liquidated: An Ethnography of Wall Street*. Durham, NC: Duke University Press, 2009.

Hochschild, Arlie Russell. *Strangers in Their Own Land: Anger and Mourning on the American Right*. New York: New Press, 2016.

Hoffman, Andrew. *From Heresy to Dogma: An Institutional History of Corporate Environmentalism*. Expanded ed. Palo Alto, CA: Stanford University Press, 2001.

Hommels, Anique. *Unbuilding Cities: Obduracy in Urban Sociotechnical Change*. Cambridge, MA: MIT Press, 2008.

Horowitz, Leah S., and Michael Watts, eds. *Grassroots Environmental Governance: Community Engagements with Industry*. New York: Routledge, 2016.

Howe, Cymene. *Ecologics: Wind and Power in the Anthropocene*. Durham, NC: Duke University Press, 2019.

Huber, Matthew T. *Lifeblood: Oil, Freedom, and the Forces of Capital*. Minneapolis: University of Minnesota Press, 2013.

Hughes, David McDermott. *Energy without Conscience: Oil, Climate Change, and Complicity*. Durham, NC: Duke University Press Books, 2017.

Jacka, Jerry K. *Alchemy in the Rain Forest: Politics, Ecology, and Resilience in a New Guinea Mining Area*. Durham, NC: Duke University Press, 2015.

Jacka, Jerry K. "The Anthropology of Mining: The Social and Environmental Impacts of Resource Extraction in the Mineral Age." *Annual Review of Anthropology* 47 (2018), 61–77.

Jacquet, Jeffrey B. "Review of Risks to Communities from Shale Energy Development." *Environmental Science and Technology* 48, no. 15 (2014): 8321–8333. https://doi.org/10.1021/es404647x.

Jalbert, Kirk, Abby J. Kinchy, and Simona L. Perry. "Civil Society Research and Marcellus Shale Natural Gas Development: Results of a Survey of Volunteer Water Monitoring Organizations." *Journal of Environmental Studies and Sciences* 4, no. 1 (2014): 78–86. https://doi.org/10.1007/s13412-013-0155-7.

Jenkins, Philip. *Decade of Nightmares: The End of the Sixties and the Making of Eighties America*. New York: Oxford University Press, 2008.

Jobson, Ryan Cecil. "Dead Labor: On Racial Capital and Fossil Capital." In *Histories of Racial Capitalism*, edited by Destin Jenkins and Justin Leroy, 215–230. New York: Columbia University Press, 2021.

Johnson, Deborah. "Rethinking the Social Responsibilities of Engineers as a Form of Accountability." In *Philosophy and Engineering: Exploring Boundaries, Expanding Connections*, edited by Diane P. Michelfelder, Brian Newberry, and Qin Zhu, 85–98. New York: Springer, 2017.

Journal of Metals. "The Henderson Mine/Mill/Concentrator: Fifty Million Pounds of Molybdenum per Year from a Successful Experiment in Ecology." October 1977, 9–12.

Kaiser, David. *How the Hippies Saved Physics: Science, Counterculture, and the Quantum Revival*. New York: Norton, 2012.

Kaiser, David, and W. Patrick McCray, eds. *Groovy Science: Knowledge, Innovation, and American Counterculture*. Chicago: University of Chicago Press, 2016.

Karwat, Darshan M. A. "Self-Reflection for Activist Engineering." *Science and Engineering Ethics* 26, no. 3 (2020): 1329–1352. https://doi.org/10.1007/s11948-019-00150-y.

Kelty, Christopher. *The Participant: A Century of Participation in Four Stories*. Chicago: University of Chicago Press, 2020.

Kelty, Christopher. "Responsibility: McKeon and Ricoeur." Anthropology of the Contemporary Research Collaboratory, working paper no. 12, May 2008. http://evols.library.manoa.hawaii.edu/handle/10524/1625.

Kinchy, Abby. "Citizen Science and Democracy: Participatory Water Monitoring in the Marcellus Shale Fracking Boom." *Science as Culture* 26, no. 1 (2017): 88–110. https://doi.org/10.1080/09505431.2016.1223113.

Kirsch, Stuart. *Mining Capitalism: The Relationship between Corporations and Their Critics*. Berkeley, CA: University of California Press, 2014.

Kirsch, Stuart. *Reverse Anthropology: Indigenous Analysis of Social and Environmental Relations in New Guinea*. Stanford, CA: Stanford University Press, 2006.

Kirsch, Stuart. "Sustainable Mining." *Dialectical Anthropology* 34 (2010): 87–93.

Kneas, David. "Emergence and Aftermath: The (Un)Becoming of Resources and Identities in Northwestern Ecuador." *American Anthropologist* 120, no. 4 (2018): 752–764. https://doi.org/10.1111/aman.13150.

Kneas, David. "From Dearth to El Dorado: Andean Nature, Plate Tectonics, and the Ontologies of Ecuadorian Resource Wealth." *Engaging Science, Technology, and Society* 4 (2018): 131–154. https://doi.org/10.17351/ests2018.214.

Kneas, David. "Subsoil Abundance and Surface Absence: A Junior Mining Company and Its Performance of Prognosis in Northwestern Ecuador." *Journal of the Royal Anthropological Institute* 22, no. S1 (2016): 67–86. https://doi.org/10.1111/1467-9655.12394.

Knight, Peter. *Profits and Principles—Does There Have to Be a Choice?* (The Shell Report). London: Shell International, 1998.

Kroepsch, Adrianne. "Horizontal Drilling, Changing Patterns of Extraction, and Piecemeal Participation: Urban Hydrocarbon Governance in Colorado." *Energy Policy* 120 (2018): 469–480. https://doi.org/10.1016/j.enpol.2018.04.074.

Kroepsch, Adrianne. "New Rig on the Block: Spatial Policy Discourse and the New Suburban Geography of Energy Production on Colorado's Front Range." *Environmental Communication* 10, no. 3 (2016): 337–351. https://doi.org/10.1080/17524032.2015.1127852.

Kuipers, J. R., et al. "Comparison of Predicted and Actual Water Quality at Hardrock Mines: The Reliability of Predictions in Environmental Impact Statements." Washington, DC: Earthworks, 2006.

Kunda, Gideon. *Engineering Culture: Control and Commitment in a High-Tech Corporation*. Rev. ed. Philadelphia: Temple University Press, 2006.

Kusserow, Adrie Suzanne. "De-homogenizing American Individualism: Socializing Hard and Soft Individualism in Manhattan and Queens." *Ethos* 27, no. 2 (1999): 210–234.

Laidlaw, James. "Ethics." In *A Companion to the Anthropology of Religion*, edited by Janice Boddy and Michael Lambek, 169–188. Chichester, UK: Wiley, 2013.

Lamb, Sarah. "The Making and Unmaking of Persons: Notes on Aging and Gender in North India." *Ethos* 25, no. 3 (1997): 279–302.

Latour, Bruno. *Reassembling the Social: An Introduction to Actor-Network Theory*. Oxford: Oxford University Press, 2005.

Latour, Bruno. *We Have Never Been Modern*, translated by Catherine Porter. Cambridge, MA: Harvard University Press, 1993.

Latour, Bruno. "Why Has Critique Run Out of Steam? From Matters of Fact to Matters of Concern." *Critical Inquiry* 30, no. 2 (2004): 225–248. https://doi.org/10.1086/421123.

Layton, Edwin T., Jr. *The Revolt of the Engineers: Social Responsibility and the American Engineering Profession*. Baltimore: Johns Hopkins University Press, 1986.

LeCain, Timothy J. *Mass Destruction: The Men and Giant Mines That Wired America and Scarred the Planet*. New Brunswick, NJ: Rutgers University Press, 2009.

Leydens, Jon A., and Juan C. Lucena. *Engineering Justice: Transforming Engineering Education and Practice*. Hoboken, NJ: Wiley-IEEE Press, 2017.

Li, Fabiana. "Documenting Accountability: Environmental Impact Assessment in a Peruvian Mining Project." *PoLAR: Political and Legal Anthropology Review* 32, no. 2 (2009): 218–236.

Li, Fabiana. "Engineering Responsibility: Environmental Mitigation and the Limits of Commensuration in a Chilean Mining Project." *Focaal* 60 (2011): 61–73.

Li, Fabiana. *Unearthing Conflict: Corporate Mining, Activism, and Expertise in Peru*. Durham, NC: Duke University Press, 2015.

Livesey, Sharon M., and Kate Kearins. "Transparent and Caring Corporations? A Study of Sustainability Reports by the Body Shop and Royal Dutch/Shell." *Organization and Environment* 15, no. 3 (2002): 233–258.

Love, Thomas, and Anna Garwood. "Electrifying Transitions: Power and Culture in Rural Cajamarca, Peru." In *Cultures of Energy: Power, Practices, Technologies*, edited by Sarah Strauss, Stephanie Rupp, and Thomas Love, 147–163. Walnut Creek, CA: Left Coast Press, 2013.

Lucena, Juan C. *Defending the Nation: U.S. Policymaking to Create Scientists and Engineers from Sputnik to the "War against Terrorism."* Lanham, MA: University Press of America, 2005.

Lucena, Juan C. "Engineers and Community: How Sustainable Engineering Depends on Engineers' Views of People." In *Handbook of Sustainable Engineering*, edited by Joanne Kauffman and Kun-Mo Lee, 793–815. Dordrecht: Springer Netherlands, 2013. https://doi.org/10.1007/978-1-4020-8939-8_51.

Lucena, Juan, Jen Schneider, and Jon A. Leydens. "Engineering and Sustainable Community Development." *Synthesis Lectures on Engineers, Technology, and Society* 5, no. 1 (2010): 1–230.

Mahmood, Saba. *Politics of Piety: The Islamic Revival and the Feminist Subject*. Princeton, NJ: Princeton University Press, 2005.

Marchand, Roland. *Creating the Corporate Soul: The Rise of Public Relations and Corporate Imagery in American Big Business*. Berkeley: University of California Press, 1998.

Mathews, Andrew S., and Jessica Barnes. "Prognosis: Visions of Environmental Futures." *Journal of the Royal Anthropological Institute* 22, no. S1 (2016): 9–26. https://doi.org/10.1111/1467-9655.12391.

Mauss, Marcel. "A Category of the Human Mind: The Notion of Person, the Notion of Self." In *The Category of the Person: Anthropology, Philosophy, History*, edited by Michael Carrithers, Steven Collins, and Steven Lukes, 1–23. London: Routledge and Kegan Paul, 1979.

Mcintosh, Janet. "Personhood, Self, and Individual." In *The International Encyclopedia of Anthropology*, 4583–4591. American Cancer Society, 2018. https://doi.org/10.1002/9781118924396.wbiea1576.

McNeil, Bryan T. *Combating Mountaintop Removal: New Directions in the Fight against Big Coal*. Urbana: University of Illinois Press, 2011.

Meiksins, Peter. "The 'Revolt of the Engineers' Reconsidered." *Technology and Culture* 29, no. 2 (1988): 219–246. https://doi.org/10.2307/3105524.

Meiksins, Peter, and Chris Smith. "Why American Engineers Aren't Unionized: A Comparative Perspective." *Theory and Society* 22, no. 1 (1993): 57–97. https://doi.org/10.1007/BF00993448.

Meiksins, Peter F., and James M. Watson. "Professional Autonomy and Organizational Constraint: The Case of Engineers." *Sociological Quarterly* 30, no. 4 (1989): 561–685.

Meiksins, Peter, and Peter Whalley. *Putting Work in Its Place: A Quiet Revolution*. Ithaca, NY: Cornell University Press, 2002.

Metze, Tamara. "Framing the Future of Fracking: Discursive Lock-in or Energy Degrowth in the Netherlands?" *Journal of Cleaner Production* 197 (2018): 1737–1745. https://doi.org/10.1016/j.jclepro.2017.04.158.

Miller, George A. "Professionals in Bureaucracy: Alienation among Industrial Scientists and Engineers." *American Sociological Review* 32, no. 5 (1967): 755–768. https://doi.org/10.2307/2092023.

Miller, Gloria E. "Frontier Masculinity in the Oil Industry: The Experience of Women Engineers." *Gender, Work, and Organization* 11, no. 1 (2004): 47–73.

Minteer, Ben. "Pragmatism, Piety, and Environmental Ethics." *Worldviews: Global Religions, Culture, and Ecology* 12, no. 2–3 (2008): 179–196. https://doi.org/10.1163/156853508X359976.

Mitcham, Carl. "A Historico-Ethical Perspective on Engineering Education: From Use and Convenience to Policy Engagement." *Engineering Studies* 1, no. 1 (2009): 35–53. https://doi.org/10.1080/19378620902725166.

Mitcham, Carl. *Steps toward a Philosophy of Engineering*. Lanham, MD: Rowman and Littlefield, 2019.

Mitcham, Carl. "The True Grand Challenge for Engineering: Self-Knowledge." *Issues in Science and Technology* 31, no. 1 (2014). https://issues.org/perspectives-the-true-grand-challenge-for-engineering-self-knowledge/.

Mitcham, Carl, and Nan Wang. "From Engineering Ethics to Engineering Politics." In *Engineering Identities, Epistemologies, and Values*, edited by Steen Hyldgaard Christensen, Christelle Didier, Andrew Jamison, Martin Meganck, Carl Mitcham, and Byron Newberry, 307–324. Cham: Springer, 2015. https://doi.org/10.1007/978-3-319-16172-3_17.

Mitchell, Timothy. *Rule of Experts: Egypt, Techno-politics, Modernity*. Berkeley: University of California Press, 2002.

Mody, Cyrus. *The Squares: US Physical and Engineering Scientists in the Long 1970s.* Cambridge, MA: MIT Press, 2021.

Mol, Annemarie. *The Body Multiple: Ontology in Medical Practice*. Durham, NC: Duke University Press, 2002.

Morrison, John. *The Social License: How to Keep Your Organization Legitimate*. London: Palgrave Macmillan, 2014.

Müftüoglu, Ingrid Birce, Ståle Knudsen, Ragnhild Freng Dale, Oda Eiken, Dinah Rajak, and Siri Lange. "Rethinking Access: Key Methodological Challenges in Studying Energy Companies." *Energy Research and Social Science* 45 (2018): 250–257. https://doi.org/10.1016/j.erss.2018.07.019.

Munoz, Jose-Maria, and Philip Burnham. "Subcontracting as Corporate Social Responsibility in the Chad-Cameroon Pipeline Project." In *The Anthropology of Corporate Social Responsibility*, edited by Catherine Dolan and Dinah Rajak, 152–178. Oxford: Berghahn Books, 2016.

Murphy, Patrick E. "Corporate Social Responsiveness: An Evolution." *University of Michigan Business Review* 30, no. 6 (1978): 19–25, 30.

Nader, Laura. "Controlling Processes: Tracing the Dynamic Components of Power." *Current Anthropology* 38, no. 5 (1997): 711–737.

Nieusma, Dean. "Analyzing Context by Design: Engineering Education Reform via Social-Technical Integration." In *International Perspectives on Engineering Education*, edited by S.

Christensen, C. Didier, A. Jamison, M. Meganck, C. Mitcham, and B. Newberry, 415–434. Cham: Springer, 2015. https://doi.org/10.1007/978-3-319-16169-3_20.

Nieusma, Dean. "Conducting the Instrumentalists: A Framework for Engineering Liberal Education." *Engineering Studies* 7, no. 2–3 (2015): 159–163. https://doi.org/10.1080/19378629 .2015.1085060.

Nixon, Rob. *Slow Violence and the Environmentalism of the Poor*. Cambridge, MA: Harvard University Press, 2011.

Noble, David F. *America by Design: Science, Technology, and the Rise of Corporate Capitalism*. Oxford: Oxford University Press, 1977.

Norman, W., and C. MacDonald. "Getting to the Bottom of 'Triple Bottom Line.'" *Business Ethics Quarterly* 14, no. 2: (2004): 243–262.

Ortner, Sherry. "Resistance and the Problem of Ethnographic Refusal." *Comparative Study of Society and History* 37, no. 1 (1995): 173–193.

Ortner, Sherry. "Theory in Anthropology since the Sixties." *Comparative Studies in Society and History* 26 (1984): 126–166.

Ottinger, Gwen. *Refining Expertise How Responsible Engineers Subvert Environmental Justice Challenges*. New York: New York University Press, 2013.

Owen, John. "Social License and the Fear of Mineras Interruptus." *Geoforum* 77 (2016): 102–105. https://doi.org/10.1016/j.geoforum.2016.10.014.

Owen, John R., and Deanna Kemp. *Extractive Relations: Countervailing Power and the Global Mining Industry*. New York: Routledge, 2017.

Owen, John R., and Deanna Kemp. "Social Licence and Mining: A Critical Perspective." *Resources Policy* 38, no. 1 (2013): 29–35. https://doi.org/10.1016/j.resourpol.2012.06.016.

Özden-Schilling, Canay. "The Infrastructure of Markets: From Electric Power to Electronic Data: Infrastructure of Markets." *Economic Anthropology* 3, no. 1 (2016): 68–80. https://doi.org /10.1002/sea2.12045.

Paxton, Jonijane. "Experiment in Ecology: AMAX/Henderson Meeting the Environmental Challenges." *Editorial Alert* (1974): 1–8.

Phadke, Roopali. "Green Energy Futures: Responsible Mining on Minnesota's Iron Range." *Energy Research and Social Science* 35 (2018): 163–173. https://doi.org/10.1016/j.erss.2017.10.036.

Porter, Michael E., and Mark R. Kramer. "Creating Shared Value." *Harvard Business Review*, January-February 2011. https://hbr.org/2011/01/the-big-idea-creating-shared-value.

Priest, Tyler. *The Offshore Imperative: Shell Oil's Search for Petroleum in Postwar America*. College Station: Texas A&M University Press, 2009.

Prno, Jason, and D. Scott Slocombe. "Exploring the Origins of 'Social License to Operate' in the Mining Sector: Perspectives from Governance and Sustainability Theories." *Resources Policy* 37, no. 3 (2012): 346–357. https://doi.org/10.1016/j.resourpol.2012.04.002.

Puig de la Bellacasa, María. "Ethical Doings in Naturecultures." *Ethics, Place, and Environment* 13, no. 2 (2010): 151–169. https://doi.org/10.1080/13668791003778834.

Rajak, Dinah. *In Good Company: An Anatomy of Corporate Social Responsibility*. Palo Alto, CA: Stanford University Press, 2011.

Rajak, Dinah. "Theatres of Virtue: Collaboration, Consensus, and the Social Life of Corporate Social Responsibility." *Focaal* 60 (2011): 9–20.

Reddy, Elizabeth. "Measuring Like an Engineer: Engineers Entangle Seismicity, Technologies, and Professional Identities in Mexico." Paper presented at the American Anthropological Association annual conference, Vancouver, 2019.

Richardson, Tanya, and Gisa Weszkalnys. "Introduction: Resource Materialities." *Anthropological Quarterly* 87, no. 1 (2014): 5–30. https://doi.org/10.1353/anq.2014.0007.

Riles, Annelise. "Too Big to Fail." In *Recasting Anthropological Knowledge: Inspiration and Social Science*, edited by Jeanette Edwards and Maja Petrovic-Steger, 31–48. Cambridge: Cambridge University Press, 2011.

Riley, Donna. "Engineering and Social Justice." *Synthesis Lectures on Engineers, Technology, and Society* 3, no. 1 (2008): 1–152. https://doi.org/10.2200/S00117ED1V01Y200805ETS007.

Rogers, Douglas. *The Depths of Russia: Oil, Power, and Culture after Socialism*. Ithaca, NY: Cornell University Press, 2015.

Rogers, Douglas. "The Materiality of the Corporation: Oil, Gas, and Corporate Social Technologies in the Remaking of a Russian Region." *American Ethnologist* 39, no. 2 (2012): 284–296.

Rolston, Jessica Smith. *Mining Coal and Undermining Gender: Rhythms of Work and Family in the American West*. New Brunswick, NJ: Rutgers University Press, 2014.

Rolston, Jessica Smith. "Turning Protesters into Monitors: Appraising Critical Collaboration in the Mining Industry." *Society and Natural Resources* 28, no. 2 (2015): 165–179. https://doi.org/10.1080/08941920.2014.945063.

Rose, Nikolas. *The Politics of Life Itself: Biomedicine, Power, and Subjectivity in the Twenty-First Century*. Princeton, NJ: Princeton University Press, 2007.

Rulifson, Greg, and Angela R. Bielefeldt. "Evolution of Students' Varied Conceptualizations about Socially Responsible Engineering: A Four Year Longitudinal Study." *Science and Engineering Ethics* 25 (2019): 939–974. https://doi.org/10.1007/s11948-018-0042-4.

Rulifson, Greg, and Angela Bielefeldt. "Motivations to Leave Engineering: Through a Lens of Social Responsibility." *Engineering Studies* 9, no. 3 (2017): 222–248. https://doi.org/10.1080/19378629.2017.1397159.

Sawyer, Suzana. *Crude Chronicles: Indigenous Politics, Multinational Oil, and Neoliberalism in Ecuador*. Durham, NC: Duke University Press, 2004.

Scheper-Hughes, Nancy. "Ire in Ireland." *Ethnography* 1, no. 1 (2000): 117–140.

Scott, James. *Seeing like a State: How Certain Schemes to Improve the Human Condition Have Failed*. New Haven, CT: Yale University Press, 1998.

Seely, Bruce. "Research, Engineering, and Science in American Engineering Colleges: 1900–1960." *Technology and Culture* 34, no. 2 (1993): 344–386. https://doi.org/10.2307/3106540.

Shever, Elana. "Engendering the Company: Corporate Personhood and the 'Face' of an Oil Company in Metropolitan Buenos Aires." *PoLAR: Political and Legal Anthropology Review* 33, no. 1 (2010): 26–46. https://doi.org/10.1111/j.1555-2934.2010.01091.x.

Shotwell, Alexis. *Against Purity: Living Ethically in Compromised Times*: Minneapolis: University of Minnesota Press, 2016.

Smith, Jessica M. "Boom to Bust, Ashes to (Coal) Dust: The Contested Ethics of Energy Exchanges in a Declining US Coal Market." *Journal of the Royal Anthropological Institute* 25, no. S1 (2019): 91–107. https://doi.org/10.1111/1467-9655.13016.

Smith, Jessica M. "The Ethics of Material Provisioning: Insiders' Views of Work in the Extractive Industries." *Extractive Industries and Society* 6, no. 3 (2019): 807–814. https://doi.org/10.1016/j.exis.2019.05.014.

Smith, Jessica M. "From Corporate Social Responsibility to Creating Shared Value: Contesting Responsibilization and the Mining Industry." In *Competing Responsibilities: The Ethics and Politics of Contemporary Life*, edited by Susanna Trnka and Catherine Trundle, 118–132. Durham, NC: Duke University Press, 2018.

Smith, Jessica, and Federico Helfgott. "Flexibility or Exploitation? Corporate Social Responsibility and the Perils of Universalization." *Anthropology Today* 26, no. 3 (2010): 20–23.

Smith, Jessica M., and Juan C. Lucena. "Socially Responsible Engineering." In *Routledge Handbook of the Philosophy of Engineering*, edited by Diane P. Michelfelder and Neelke Doorn, 661–673. New York: Routledge, 2021.

Smith, Jessica M., Carrie J. McClelland, and Nicole M. Smith. "Engineering Students' Views of Corporate Social Responsibility: A Case Study from Petroleum Engineering." *Science and Engineering Ethics* 23, no. 6 (2017): 1775–1790.

Smith, Jessica Mary, Greg Rulifson, Courtney Stanton, Nicole M. Smith, Linda A. Battalora, Emily Sarver, Carrie J. McClelland, Rennie B. Kaunda, and Elizabeth Holley. "Counteracting the Social Responsibility Slump? Assessing Changes in Student Knowledge and Attitudes in Mining, Petroleum, and Electrical Engineering," Paper presented at the American Society for Engineering Education conference (virtual), 2020.

Smith, Jessica M., and Nicole M. Smith. "Engineering and the Politics of Commensuration in the Mining and Petroleum Industries." *Engaging Science, Technology, and Society* 4 (2018): 67–84. https://doi.org/10.17351/ests2018.211.

Smith, Jessica Mary, Nicole M. Smith, Greg Rulifson, Carrie J. McClelland, Linda A. Battalora, Emily A. Sarver, and Rennie B. Kaunda. "Student Learning about Engineering and Corporate Social Responsibility: A Comparison across Engineering and Liberal Arts Courses." Paper presented at 2018 ASEE Annual Conference and Exposition, Salt Lake City, UT, 2018. https://peer.asee.org/student-learning-about-engineering-and-corporate-social-responsibility-a-comparison-across-engineering-and-liberal-arts-courses.

Smith, Jessica M., and Abraham S. D. Tidwell. "The Everyday Lives of Energy Transitions: Contested Sociotechnical Imaginaries in the American West." *Social Studies of Science* 46, no. 3 (2016): 327–350. https://doi.org/10.1177/0306312716644534.

Smith, Karl. "From Dividual and Individual Selves to Porous Subjects." *Australian Journal of Anthropology* 23, no. 1 (2012): 50–64. https://doi.org/10.1111/j.1757-6547.2012.00167.x.

Smith, Nicole M., Jessica M. Smith, Linda A. Battalora, and Benjamin A. Teschner. "Industry–University Partnerships: Engineering Education and Corporate Social Responsibility." *Journal of Professional Issues in Engineering Education and Practice* 144, no. 3 (2018): 04018002. https://doi.org/10.1061/(ASCE)EI.1943-5541.0000367.

Smith, Nicole, Jessica M. Smith, Qin Zhu, and Carl Mitcham. "Enhancing Engineering Ethics: Role Ethics and Corporate Social Responsibility." Manuscript forthcoming, *Science and Engineering Ethics,* 2020.

Star, Susan Leigh. "This Is Not a Boundary Object: Reflections on the Origin of a Concept." *Science, Technology, and Human Values* 35, no. 5 (2010): 601–617. https://doi.org/10.1177/0162243910377624.

Star, Susan Leigh, and James R. Griesemer. "Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907–39." *Social Studies of Science* 19, no. 3 (1989): 387–420. https://doi.org/10.1177/030631289019003001.

Stein, Felix. *Work, Sleep, Repeat: The Abstract Labour of German Management Consultants*. London: Bloomsbury, 2019.

Strathern, Marilyn. *After Nature: English Kinship in the Late Twentieth Century*. Cambridge: Cambridge University Press, 1992.

Strathern, Marilyn. "Cutting the Network." *The Journal of the Royal Anthropological Institute* 2, no. 3 (1996): 517–535.

Strathern, Marilyn. *The Gender of the Gift: Problems with Women and Problems with Society in Melanesia*. Berkeley: University of California Press, 1988.

Strathern, Marilyn. "New Accountabilities: Anthropological Studies in Audit, Ethics and the Academy." In *Audit Culture: Anthropological Studies in Accountability, Ethics, and the Academy*, edited by Marilyn Strathern, 1–18. London: Routledge, 2000.

Tang, Xiofeng, and Dean Nieusma. "Contextualizing the Code: Ethical Support and Professional Interests in the Creation and Institutionalization of the 1974 IEEE Code of Ethics." *Engineering Studies* 9, no. 3 (2017): 166–194.

Thomson, Ian, and Robert Boutilier. "The Social Licence to Operate." In *SME Mining Engineering Handbook*, edited by Peter Darling, 1779–1796. Englewood, CO: Society for Mining, Metallurgy, and Exploration, 2011.

Trevelyan, James. *The Making of an Expert Engineer*. Boca Raton, FL: CRC Press, 2014.

Trnka, Susanna, and Catherine Trundle. "Introduction: Competing Responsibilities: Reckoning Personal Responsibility, Care for the Other, and the Social Contract in Contemporary Life."

Competing Responsibilities: The Ethics and Politics of Contemporary Life, edited by Susanna Trnka and Catherine Trundle, 1–25. Durham, NC: Duke University Press, 2017.

Watts, Michael. "Blood Oil: The Anatomy of a Petro-Insurgency in the Niger Delta." *Focaal* 2008, no. 52 (2008): 18–38. https://doi.org/10.3167/fcl.2008.520102.

Welker, Marina. "'Corporate Security Begins in the Community': Mining, the Corporate Social Responsibility Industry, and Environmental Advocacy in Indonesia." *Cultural Anthropology* 24, no. 1 (2009): 142–179.

Welker, Marina. *Enacting the Corporation: An American Mining Firm in Post-authoritarian Indonesia*. Berkeley: University of California Press, 2014.

Welker, Marina. "The Green Revolution's Ghost: Unruly Subjects of Participatory Development in Rural Indonesia." *American Ethnologist* 39, no. 2 (2012): 389–406.

Welker, Marina, Damani Partridge, and Rebecca Hardin. "Corporate Lives: New Perspectives on the Social Life of the Corporate Form; An Introduction to Supplement 3." *Current Anthropology* 52, no. S3 (2011): S3–S16.

Welker, Marina, and David Wood. "Shareholder Activism and Alienation." *Current Anthropology* 52, no. S3 (2011): S57–S69. https://doi.org/10.1086/656796.

Wellock, Thomas R. *Critical Masses: Opposition to Nuclear Power in California, 1958–1978*. Madison: University of Wisconsin Press, 1998.

Weszkalnys, Gisa. "Anticipating Oil: The Temporal Politics of a Disaster Yet to Come." *Sociological Review* 62 (2014): 211–335. https://doi.org/10.1111/1467-954X.12130.

Williams, Christine L., Kristine Kilanski, and Chandra Muller. "Corporate Diversity Programs and Gender Inequality in the Oil and Gas Industry." *Work and Occupations* 41, no. 4 (2014): 440–476. https://doi.org/10.1177/0730888414539172.

Williams, Christine L., Chandra Muller, and Kristine Kilanski. "Gendered Organizations in the New Economy." *Gender and Society* 26, no. 4 (2012): 549–573. https://doi.org/10.1177/0891243212445466.

Williamson, Bess. "Small-Scale Technology for the Developing World: Volunteers for International Technical Assistance, 1959–1971." *Comparative Technology Transfer and Society* 6, no. 3 (2008): 236–258. https://doi.org/10.1353/ctt.0.0019.

Willow, Anna J. *Understanding ExtrACTIVISM: Culture and Power in Natural Resource Disputes*. New York: Routledge, 2018.

Winner, Langdon. "Engineering Ethics and Political Imagination." In *Broad and Narrow Interpretations of Philosophy of Technology*, edited by Paul T. Durbin, 53–64. Dordrecht: Springer, 1990. https://doi.org/10.1007/978-94-009-0557-3_6.

Wisnioski, Matthew. *Engineers for Change: Competing Visions of Technology in 1960s America*. Cambridge, MA: MIT Press, 2012.

Wylie, Sara Ann. *Fractivism: Corporate Bodies and Chemical Bonds*. Durham, NC: Duke University Press, 2018.

Yarrow, Thomas. *Architects: Portraits of a Practice*. Ithaca, NY: Cornell University Press, 2019.

Yarrow, Thomas, Matei Candea, Catherine Trundle, and Joanna Cook. *Detachment: Essays on the Limits of Relational Thinking*. Oxford: Oxford University Press, 2015.

York, Emily. "Doing STS in STEM Spaces: Experiments in Critical Participation." *Engineering Studies* 10, no. 1 (2018): 66–84. https://doi.org/10.1080/19378629.2018.1447576.

Zhu, Qin. "Engineering Ethics Education, Ethical Leadership, and Confucian Ethics." *International Journal of Ethics Education* 3, no. 2 (2018): 169–179. https://doi.org/10.1007/s40889 -018-0054-6.

Zhu, Qin, and Brent K. Jesiek. "A Pragmatic Approach to Ethical Decision-Making in Engineering Practice: Characteristics, Evaluation Criteria, and Implications for Instruction and Assessment." *Science and Engineering Ethics* 23, no. 3 (2017): 663–679. https://doi.org/10.1007 /s11948-016-9826-6.

Zussman, Robert. *Mechanics of the Middle Class: Work and Politics among American Engineers*. Berkeley: University of California Press, 1985.