Imagine the following scenario . . .

The alarm clock is beeping, and John's eyes creak open, landing on the book he was reading the night before: *A Man's Guide to Producing Healthy Sperm*. He and his wife, Jen, have been trying for months to have a baby, and they are both doing all they can to improve their chances. Rolling out of bed, he hops in the shower, keeping the water lukewarm to avoid cooking his sperm. He brushes his teeth with a natural toothpaste he is using to avoid excess exposure to chemicals. Throwing on a shirt and pair of pants he washed with a new detergent stripped of all dyes and scents, he and Jen say their goodbyes and head off for the day.

As John makes his way through the morning commute, he notices a billboard warning passersby about the pernicious effects of aging sperm. Next to an hourglass trickling sand, boldface type cautions men about the male biological clock. Feeling a twinge of anxiety because he waited until his late thirties to have children, he rushes on to work. Soon it is lunch: time to take his pill. Fumbling with the childproof top, John notes the ubiquitous red warning label: “Men: Do not take this medication if you might conceive a child in the next three months.” Worried how it might affect the baby he and Jen hope to have, John had called his doctor, who
advised him to continue with the medication because it was so crucial for John’s own health.

After eating a superfood sandwich of avocado and organic cheese, John munches on blueberries and flips through a men’s health magazine someone left behind. Skimming the feature article on how guys can grow strong sperm, he reads that sperm take about three months to mature in the male body. Not only that, nearly everything a man does during that time can damage these cells: eating unhealthy food, drinking alcohol, taking drugs, coming into contact with chemicals at work or home, and so on. And from his own reading, John already knows that damaged sperm can lead to miscarriage, birth defects, and even childhood illnesses. Back at his desk, the afternoon passes quickly, and one of his friends stops in to see about a drink after work. He joins the happy hour crew but opts for juice, thinking about all the times he has seen the standard-issue government label on beer bottles, warning that excessive alcohol consumption can damage sperm. John does not want to take any chances.

Not only is John not real, the world I have just described does not exist. Men going about their daily lives are not subject to endless advice about their sperm. They do not encounter books and billboards and warning labels about how their health might affect their children’s health. And even when they do contemplate becoming a father, men do not experience anxiety about every last morsel they eat or product they consume.

But they could. In recent years, biomedical researchers have been amassing evidence that the health of men’s bodies—including factors such as their age, behaviors, and toxic exposures—can affect sperm and in turn their children’s health.¹ The headline of one front-page story in the New York Times announced “Father’s Age Is Linked to Risk of Autism and Schizophrenia,” and some physicians now argue that men too have a biological clock.² Health websites have begun posting basic information about how to produce “healthy sperm,” encouraging men to eat right, quit smoking, avoid alcohol and drugs, and maintain a healthy weight.³ The “news” here is that it is not just women’s bodies that affect reproductive outcomes. Indeed, many of the warnings women receive about
pregnancy—regarding their age, watching what they eat and drink, and avoiding chemicals—also appear to apply to men, particularly during the ten weeks it takes sperm to grow inside their bodies.

Now that scientists are learning just how important men’s health is for reproductive outcomes, the question is, What took so long? After all, researchers spent more than a century scrutinizing every tiny aspect of women’s lives for potential effects on children’s health. Gynecology was one of the first specialties to emerge during the first major wave of medical specialization at the end of the nineteenth century, and professional associations, medical journals, and clinics all devoted to the “diseases of women” soon followed. Today, women are encouraged to schedule regular visits to have their reproductive organs examined, and public health campaigns remind them of their constantly ticking biological clocks. Women who are pregnant or planning to become so are bombarded with information about what to ingest and how to behave. They hear advice from friends and relatives, receive long lists of dos and don’ts from clinicians, and see warning labels pasted on medicines and alcoholic beverages. In contrast, there is still no cohesive medical specialty devoted solely to men’s reproductive health, no recommendations that men have their reproductive organs examined regularly, no public health campaigns about the male biological clock, and no government labels warning men about the toxic effects of alcohol and drugs on sperm.

The lack of medical attention to men’s reproductive health is particularly surprising given the claim that, for twentieth-century medical researchers, male bodies served as the “standard” body. Beginning in the 1960s, activists in the women’s health movement pointed to the lack of women in clinical trials and argued that medical research on middle-aged White men could not simply be generalized to other demographic groups, such as women and racial minorities. Federal agencies, such as the National Institutes of Health and the Food and Drug Administration, responded to this critique in the 1990s by issuing requirements that women and people of color be systematically included in biomedical research and clinical trials. Taken together, then, there is a disjuncture between the historical centrality of men’s bodies to medical research and inattention to how the health of those bodies matters for reproduction. There is a puzzle here: If the male body is standard, how is so little known about its contributions to reproductive outcomes?
This book examines how cultural ideas about gender led to a missing science, that of men’s reproductive health. I build on social scientific theories of medical specialization, gendered bodies, and knowledge-making to analyze how this gap in biomedical knowledge came to be, and I examine its social, clinical, and policy consequences. In the first part of the book, I use a wide range of historical materials dating to the mid-1800s to excavate the making of non-knowledge about men’s reproductive bodies. Following a longue-durée look at the relationship between medical specialization and knowledge-making, part 2 of the book zooms in on the topic of paternal effects, the emerging science of how men’s age, behaviors, and exposures can affect reproductive outcomes. Using paternal effects as a case to examine what happens when knowledge about men’s reproductive health goes from unmade to made, I scrutinize reporting in the news media and pronouncements from health officials to assess whether this new knowledge is being circulated among the broader public. Then, turning to the general public, the last part of the book is based on interviews with individual men and women, which reveal how the historical lack of attention to men’s reproductive health profoundly shapes contemporary beliefs about reproduction. In short, this book offers an explanation for why John’s world does not exist. In the Conclusion, I reflect on what it would mean to try to bring it to life.

The Politics of Reproduction

Dictionary definitions of reproduction routinely refer to the biological process of generating offspring. Scholars in the social sciences take a different approach, arguing that reproduction is not only fundamentally biological but also fundamentally social. In their classic article on the politics of reproduction, the anthropologists Faye Ginsburg and Rayna Rapp argue that no aspect of reproduction “is a universal or unified experience, nor can such phenomena be understood apart from the larger social context that frames them.” By social context, they mean the power of nations, markets, sciences, religions, social movements, cultural norms, and social inequalities to influence reproduction at every level, from individual experiences to state policies.
Following Ginsburg and Rapp’s crystallization of the field, there was an outpouring of research on topics such as pregnancy and birth, contraception and abortion, and infertility and assisted reproductive technologies, such as surrogacy, in vitro fertilization (IVF), and egg and sperm donation. Yet, while many of these processes involve men at some point and to some degree, most social scientific analyses of reproduction limit their focus to women. In a comprehensive review of the literature, I argue that this has resulted in an implicit conceptualization of reproduction as something that occurs in women’s bodies. Even Ginsburg and Rapp specify women, writing that “no aspect of women’s reproduction is a universal or unified experience.” I excerpted their definition in such a way as to make it more broad, to emphasize the importance of encompassing men in research on reproduction.

One of the core goals of this book is to begin sketching answers to some of the unasked questions about the politics of men’s reproduction: How do scientists and clinicians and states and markets approach the topic of men’s reproduction? What is the relationship between cultural norms of masculinity and understandings of the male reproductive body? How do social inequalities—such as those around gender, race, class, and sexuality—affect men’s experiences of reproduction?

**Gendered Bodies and Medical Knowledge**

Within the broad rubric of men and reproduction, my focus in this book is on men’s reproductive health. To construct an analytic framework, I bring together social scientific theories of gendered bodies with recent developments in historical inquiry about the making of non-knowledge. A second core goal of this book is to use the case of men’s reproductive health to retheorize the relationship between gender and medical knowledge-making.

**Sex/Gender**

Since the mid-twentieth century, gender scholars have grappled with how best to conceptualize the relationship between bodies and societies. Indeed, they are part of a broader academic debate about just what is encapsulated in that tiny slash between phrases like sex/gender, nature/
nurture, and genes/environment. In 1975, the anthropologist Gayle Rubin published an influential conceptualization of sex/gender, delineating the biological attributes of males and females (sex) from the cultural processes associated with masculinity and femininity (gender). Using this distinction, gender scholars offered numerous demonstrations of how the cultural construction of femininity and masculinity produced inequalities in various realms of social life, such as families and schools, workplaces, and the law. At the same time, scholars of race developed the crucial insight that gender cannot be studied in isolation; it “intersects” with cultural processes around other social categories, including race, class, and sexuality.

In effect, though, social scientists treated the slash between sex/gender as a distinct line separating the realm of biology, with its chromosomes and gonads, from the realm of culture, with its ideas and meanings about the significance of biological sex differences. Starting in the 1990s, gender scholars began to raise concerns about focusing solely on the cultural side of the slash, noting that assumptions about biology were returning to “haunt” theories of gender inequality. Responding to these epistemological concerns, one empirical approach taken by gender scholars is to examine directly some of the biological processes previously understood as off limits. Exemplary is Emily Martin’s groundbreaking study of eggs and sperm, in which she analyzed how cultural norms of femininity and masculinity led to beliefs about passive eggs and aggressive sperm. She demonstrated how these beliefs influenced not only the questions that biomedical scientists asked in the laboratory but also portrayals of their research in medical textbooks. Likewise, historians documented the influence of cultural gender norms on the twentieth-century discoveries of “male” and “female” hormones and the X and Y chromosomes. In my first book, I too compared eggs and sperm, but in terms of how gendered norms influence the cultural and economic value of egg and sperm donors in a twenty-first-century medical market.

To underscore the irreducibility of sex and gender, of biology and society, Anne Fausto-Sterling suggested the metaphor of nesting dolls, which I adapted to illustrate reproduction as a biological and social process. The innermost doll represents bodily processes, such as those associated with genes, cells, and organs. The next larger dolls represent processes at
the level of the individual (identities, experiences, etc.) and then the interactional (family, friends, educators, employers, clinicians, etc.). Finally, the outermost doll represents historical, structural, and cultural processes, such as those associated with nations, economies, social movements, sciences, and the media. Importantly, a change in the shape of any one doll necessarily affects the shapes of all the other dolls. For example, cellular alterations can reverberate up to the level of institutional configurations and vice versa. As a result, the nesting-dolls metaphor allows for a visualization of how biological and social processes may be analytically distinguishable but are actually indissoluble.

Studies like the ones described above—about hormones, chromosomes, and gametes—document the interweaving of biological and social processes in particular areas of scientific research or in particular medical markets. For the most part, though, scholars writing in this tradition have focused on science that exists, on knowledge that has been produced, on markets that have been created. In this book, I take a different approach. By looking to a gap in biomedical knowledge, I analyze how and why knowledge about men’s contributions to reproductive outcomes mostly did not exist and was not produced (until recently). To do so, I turn to the interdisciplinary science studies literature, where scholars have begun asking questions about the relationship between knowledge and non-knowledge.

The Making of Non-knowledge

Just as gender scholars have worked to elucidate the relationship between bodies and societies, science studies scholars have been engaged in an analogous project on sciences and societies. Many of the historians and social scientists working on these issues cite Sheila Jasanoff’s conceptualization of “co-production,” finding it useful for thinking about how scientific processes and social processes each simultaneously produce one another. In short, neither science nor society is separable from nor reducible to the other.

But in recent decades, as science studies scholars offered more and more fine-grained analyses of scientific knowledge-making, it became clear that a new item needed to be added to the intellectual agenda: non-knowledge. As the historian Nancy Tuana puts it, “If we are to fully understand the
complex practices of knowledge production and the variety of features that account for why something is known, we must also understand the practices that account for not knowing, that is, for our lack of knowledge.\textsuperscript{20}

This epistemological endeavor has been assigned various labels, such as agnotology, undone science, and even ignorance studies.\textsuperscript{21}

While cracking the inevitable jokes about being experts in ignorance, researchers have quickly assembled a wide variety of case studies. To mention just a few: Charles Mills examines how “white ignorance” allows people to avoid knowledge about oppression; Naomi Oreskes and Erik Conway reveal how just a few scientists have sown doubt about the hazards of climate change or smoking tobacco; and Joanna Kempner and colleagues analyze how scientists avoid producing “forbidden knowledge” deemed too sensitive or dangerous.\textsuperscript{22}

As the number and kinds of non-knowledge identified by scholars have proliferated, so too have typologies designed to catalogue them. Particularly helpful is Jennifer Croissant’s framework, which enables rigorous comparisons across disparate cases of non-knowledge. With a close eye to the importance of social power in shaping processes around knowledge-making, she identifies five properties of ignorance:

1. \textit{Presence or absence} of knowledge, particularly in relation to uncertainty. Is it a known unknown that can be made more certain, perhaps with more data, or is it fundamentally uncertain?
2. \textit{Chronicity and time}, including the prospective and retrospective elements of identifying knowledge and non-knowledge. Is it not yet known, forgotten, obliterated?
3. \textit{Granularity}. Are specific facts or a broad domain of knowledge missing?
4. \textit{Scale} at which one can identify origins, causal processes, and consequences—from individual cognitive processes to cultural formations.
5. \textit{Intentionality}. Does the non-knowledge result from direct intent, such as fraud or censorship, or is it inadvertently or unconsciously produced?\textsuperscript{23}

I draw on this framework in posing specific empirical questions about the gap in biomedical knowledge regarding men’s reproductive health. What kind of non-knowledge is it? Is it truly an absence, or has knowledge been
produced and forgotten (or erased) over time? Are there just specific facts missing, or does it constitute a broad domain of knowledge that has been overlooked? What are the causes and consequences of non-knowledge about men’s reproductive health?

Crafting a New Theoretical Approach to Gender and Medical Knowledge-Making

Bringing together social scientific theories of gendered bodies and non-knowledge to study men’s reproductive health offers an opportunity to rethink existing approaches to gender and medicine. In this section, I describe how assumptions about the male as standard and the female as reproductive influenced the kinds of research questions asked by biomedical scientists and social scientists alike. As scholars began to point out asymmetries in the resulting knowledge, they focused primarily on medical knowledge about women, even as they made claims about gender. I argue that attending to this slippage and developing truly comparative analyses of women and men will make possible a new approach to the relationship between dualistic conceptions of gender and medical knowledge-making.

Standard Body : Male :: Reproductive Body : Female

Pick up any book by a historian or social scientist who studies gender and medicine, and you are likely to encounter one or both of the following claims: (1) biomedical scientists and clinicians positioned male bodies as standard while (2) they considered female bodies primarily in terms of reproduction. These divergent approaches to the human body are made possible in part by a cultural belief in sex as a dualism, as consisting of two non-overlapping categories: male and female. It is not just that they do not overlap; they are perceived to be opposites, as in the phrase “the opposite sex.” (See “Note on Terminology.”)

As Fausto-Sterling has noted, dualisms rarely remain separate but equal. Instead, they are typically imbued with a sense of hierarchy and are often associated with inequalities. Moreover, bodily hierarchies and inequalities are never just gendered; they are simultaneously raced,
Dualistic (or binary) conceptions of sex and gender have been challenged in recent years by intersex and trans scholars and activists, who offer a range of alternatives for thinking about gender and bodies, from spectrums to fluidity. However, during the period I discuss in this book, from the late nineteenth century to the early twenty-first century, medical researchers and individuals typically conceived of sex as dualistic, so I refer to “male bodies” and “men’s experiences.” A more precise rendering would be “bodies that society has historically defined as a particular kind of body—namely, male.” However, that is unwieldy to write every time, so I would kindly ask readers to keep this preamble in mind whenever I use the words male or men (or female or women). In the Conclusion, I return to these issues and consider how changing approaches to sex and gender might shift the conceptual ground on which reproductive knowledge is produced.

classed, and sexualized. Indeed, there is a large body of research demonstrating how bodies that diverge from the White, male, heterosexual “standard” are marked as inherently pathologized. In the realm of reproduction, this pathologization has manifested in numerous state and clinical abuses of poor people and people of color, including forced and coercive sterilization. Women’s health activists have also made the argument that White male bodies served as the “standard” for biomedical researchers. While Steven Epstein has suggested this claim is not universally true of twentieth-century biomedicine, it does accurately describe some domains of research at particular times. One infamous example is the lack of biomedical knowledge about cardiovascular disease in women. Heart attacks were associated with stress, which was associated with masculinity and the workplace, and research on the symptoms and effects of heart disease was conducted primarily on male bodies. It was not until the past few decades that clinicians realized the symptoms of heart attacks manifest differently in women’s bodies. In my view, this is another example of a gap in knowledge created through systematic inattention, in this case to women’s bodies.
When biomedical researchers do study women’s bodies, they tend to focus on their reproductive capacity. Since the inception of modern-day medicine in the late nineteenth century, scientists and physicians sought to exert control over women’s reproduction, building large medical specialties around gynecology and obstetrics, inventing countless interventions during pregnancy and birth, developing new forms of female contraception, and using their political clout to influence abortion politics, sometimes to ban the procedure and other times to legalize it. When definitions of men’s reproductive health do appear, the topics are generally limited to “contraception, avoiding sexually transmitted diseases, and preserving fertility,” as on the National Institutes of Health website. Yet, there are still only two forms of male contraception: condoms and vasectomy. The male contraceptive pill remains a “technology-in-the-making” after more than a half century of efforts to develop it. Most fertility treatments are still directed at women’s bodies; one of the few exceptions is intracytoplasmic sperm injection (ICSI), which involves locating and injecting a single sperm into a single egg. However, the use of ICSI necessitates IVF, so women still have to undergo hormonal stimulation, an egg retrieval operation, and embryo transfer. Moreover, this abbreviated list of topics makes no mention of new knowledge about how men’s age and health prior to conception can affect reproductive outcomes. In short, men’s reproductive health is not really a topic either in medicine or politics.

Biomedical researchers are not the only ones who position men as standard and women as reproductive. Social scientists do the same. The voluminous literature on the politics of reproduction I mentioned above is devoted almost entirely to women’s experiences, whether in the realm of contraception and abortion, pregnancy, prenatal testing, or birth. It was not until recently that scholars even noticed the gap in social scientific knowledge about men and reproduction. Now there are a few studies on male contraception, male infertility, men’s experiences of birth, and sperm donation.

A large social scientific literature on masculinity does exist, but it is mostly concerned with issues of sexuality, identity, violence, and sport.
Indeed, men’s *sexuality*, including their sexual health, receives far more attention than their involvement in reproduction. In introductory texts on masculinity, there are numerous discussions of various aspects of men’s sexual practices and sexual identities but almost no mention of reproduction or even fatherhood. None of the twenty-two contributions in *The Masculinity Studies Reader* or thirty-two contributions in *Exploring Masculinities* explore these latter topics, reinforcing the notion that there is little connection between men and reproduction.

At this point, some readers may be thinking it makes sense that biomedical researchers and social scientists have focused on women’s bodies when studying reproduction, given that it is women who become pregnant and give birth. However, these kinds of biological explanations only go so far. It may make sense that there has been *more* attention to women, but it does not follow that there should be almost *no* attention to men. To illustrate, think back to the example of biomedical research on heart disease: it is not as though women did not have a heart that could become diseased. It was that the production of knowledge about heart disease was entangled in notions of male bodies and masculinity. Likewise, the production of knowledge about reproduction has been so enmeshed in beliefs about female bodies and femininity that questions about how male bodies might matter go unasked.

*Considering the Relationality of Claims about Gendered Bodies*

Suffice it to say that both claims—about the male as standard and the female as reproductive—are long-standing and deeply rooted. However, they appear to have developed as somewhat separate claims, which precludes seeing the subtle tensions that appear when they are placed alongside one another. For example, activists in the women’s health movement mobilize the trope of the standard body to argue that women are ignored by medical researchers. But they also contend that women’s reproductive bodies have been subjected to unending medical interventions. Women’s bodies cannot be both completely ignored and completely medicalized. Another tension, indeed, the central puzzle motivating this book, arises from the disjuncture between the idea of the male as
standard and yet largely unknown when it comes to reproduction. Men’s bodies cannot both be the standard object of medical research and virtually ignored.

Rather than continuing to repeat a distinct claim about male bodies and a distinct claim about female bodies, I suggest that both claims be considered simultaneously and perceived relationally. Both approaches are fundamentally about which kinds of bodies are understood as necessary for producing which kinds of knowledge. And placing side by side beliefs about the male as standard and the female as reproductive makes it possible to see how these approaches to the human body combine to produce consequential gaps in biomedical knowledge, such as about women’s heart attacks or men’s reproductive contributions.

To return to the notion of sex as a dualism, this is how and why the combining occurs. The content of one side of the binary has been defined by the content of the other side of the binary. Historically, in both biomedicine and the broader culture, people are categorized as either male or female. Their bodies are either standard or reproductive. The conceptual result can be summarized as the following:

If male bodies are standard, then female bodies are not.
If female bodies are reproductive, then male bodies are not.

This, I argue, is the basic conceptual process through which dualistic beliefs about “opposite” sexes have combined to shape knowledge-making, both in medicine and social science. This is why there are fully developed medical specialties devoted solely to women’s reproduction, while knowledge about men’s reproductive health is thin and scattered among disparate specialties. This is why historians and social scientists have thoroughly studied women’s experiences of reproduction and know almost nothing about men in this realm.

_Shifting the Focus from Women (or Men) to Gender_

So how is it that the “male as standard” and the “female as reproductive” evolved as two separate claims when one is clearly related to, and even predicated, on the other? Here, I suggest this is a specific instance of a broader
pattern: social scientific researchers claiming to be studying “gender” when they are actually studying only women or, less often, only men. The slippage between studying women and calling it gender has conceptual consequences and often results in empirical claims that cannot be substantiated and may even be flat-out wrong. Rather than just looking at one side of the binary or the other, I argue that shifting the analytical lens to gender, examining how this dualism has shaped medical knowledge-making and individual lives, enables a more thorough and precise theorization of the relationship between knowledge and bodies.

The first thing to notice about much of the literature on gender and medicine is that it is primarily composed of research on women and medicine. This pattern of studying women but calling it gender is not unique to the social scientific study of medicine. It is part of a broader historical legacy of the 1960s-era feminist movement and, in particular, the creation of “women’s studies” programs in academia. As leading universities opened their doors to women undergraduates in the mid-twentieth century and women began joining the faculty, professors began calling for specialized departments focused on women.

In newly developed courses, degree programs, speaker series, and conferences, women’s studies faculty sought to spotlight women’s voices and examine women’s experiences. Historians unearthed forgotten women scientists, English professors wrote about ignored women writers, and musicologists identified little-known women musicians. But as time passed, the focus on women raised new questions about the “unmarked category” of men and how the social organization of masculinity contributed to gender inequality. In response, women’s studies programs began inserting the term gender into their names, becoming Departments of Women’s and Gender Studies or simply Gender Studies.

Yet, even as academic programs and social scientific theorists shifted their attention from the category of woman to a more relational concept of gender, most of the empirical research on “gender” remained primarily about women. This is not to malign the profound contributions of classic studies on women’s bodily experiences and medical specialties such as gynecology. However, the focus on women in these studies means they are actually limited to offering conceptualizations of women and medical knowledge, not gender and medical knowledge.
The same is true of research focused solely on men, such as Cynthia Daniels’s *Exposing Men*, which brought early attention to the lack of biomedical research about men’s reproductive health. To explain this lack, she offers the concept of “reproductive masculinity,” which is defined as a set of cultural beliefs positioning men as invincible, secondary to reproduction, and far removed from the health problems of their children. However, inconsistencies emerge when one looks more closely at particular elements of this definition. For example, men are not always perceived as secondary to reproduction; sometimes they are seen as primary, such as when they are considered to be the active agents who “cause” pregnancy. At other times, men are understood as neither primary nor secondary, but equal to women, such as when people think in terms of genetic contributions to offspring as being fifty-fifty. And if men are perceived as far removed from the health problems of their children, how did biomedical researchers even begin to ask the questions that led to recent revelations about the effects of men’s age and bodily health on reproductive outcomes? Ultimately, Daniels’s portrayal of reproductive masculinity is too static, unable to account for variation in time and place. It is also, by definition, limited to a conceptualization of men and medical knowledge, not gender and medical knowledge.

It bears repeating that this research about women/medicine and men/medicine has led to important insights about the relationship between bodies and biomedical knowledge, and it is the foundation on which I am standing to write this book. But my approach diverges in that I want to shift the focus from women or men to gender, a shift that emphasizes the relational, the comparative, the processual. As R.W. Connell succinctly puts it, gender “is a process rather than a thing.” Studying women or men (or female or male, femininity or masculinity) means studying one thing, one category, one half of the binary without explicitly taking into account the other half. Studying gender means studying the dynamic processes through which women and men, male and female, masculinity and femininity, have been constructed in relation to one another over time. It allows for more than just pointing to the gap in knowledge about men’s reproductive health; it enables a broader question about how and why such gaps come to be. How is medical knowledge-making about men (as standard) related to medical knowledge-making about women (as reproductive)? How do these social and scientific processes combine to create consequential gaps in knowledge?