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Microphysiologies of Desire

> I now proceed to a demonstration of the fact that whatever be the mechanism by which they are brought about, these plant responses are physiological in their character.
>
> —JAGADISH CHANDRA BOSE

> Compared to most animals, plant movement is slow; it occurs via growth processes and benefits accrue due to maintenance of connections between sister ramets. . . . Ramets remain connected via stolons or rhizomes for variable lengths of time and these connections allow for the transport of nutrients and hormones between the mother and daughter ramets.
>
> —ERICA WATERS AND MAXINE WATSON

Thanks to the entanglements of more than three decades of feminist critiques of science anchored in feminist health activism, feminist theory, and feminist philosophy of science, and more recent work taking place under the mantles of feminist materialisms and posthumanist ethics, there appears to be a particularly rich opportunity at this moment to think about feminism, molecular biology, and matter along more molecular lines of questioning. Why am I interested in biophilosophies of becoming that create minoritarian projects, deterritorializing gestures, and micropolitical sensibilities at the interstices of molecular biology and feminism? Biophilosophies of becoming can change how we perceive and encounter the world around us and, furthermore, can be used to support practice-oriented feminist STS approaches in the lab. As a feminist scientist, I have always been deeply curious about the relationships that form

between the knower and what is to become the known. I have also been curious as to how, as feminist scientists, we are to proceed with our scientific inquiries once we start paying more attention to these relationships. Put differently, my time in the lab has made me curious about developing an *ethics of matter*.

I begin this chapter with a quote from an experimental account made by Jagadish Chandra Bose (1858–1937). Bose was a Bengali scientist who conducted his life's work as a colonial subject under British rule in India.[1] He pioneered investigations of radiowaves, microwaves, and even gave the first public demonstration of the existence of electromagnetic waves in 1895, managing to use electromagnetic waves to ring a faraway bell and even fire a pistol.[2] Bose, who can be described as the first biophysicist in our modern understanding of the term, used electrical signals to explore and trouble the limits of what we consider to be a life, or a living form. His scientific findings are fascinating, as are the instruments he designed to measure what he called "response" in animal tissues, plants, and metals. Two aspects of Bose's work spark particular interest for me as they relate to the project of using biophilosophies of becoming to decolonize and reframe dominant relations and modes of knowing in both feminism and science.

The first aspect is that despite having invented wireless telegraphy and the technology that led to the radio two years before Guglielmo Marconi took credit for the invention, Bose was adamantly against the idea of patenting and therefore chose not to lay such claims to ownership over his pioneering research. Instead, he was interested in the processes of discovery and apparently regarded the idea of patenting his scientific findings for monetary profit with a fair amount of disdain.[3] I am interested in this proprietary tension that people often raise when discussing Bose and his contributions to science, and what it might also have to say about Bose's alignment with a particular ontology of the natural world as well as his anticolonial stances within that world that might have informed his ethical relations to matter as a scientist. In addition to being a pioneering scientist, Bose belonged to the Brahmo Samaj, a Hindu reform movement that rejected polytheism, denounced the caste system, and played an important cultural role in the Bengal Renaissance. A key tenet of Brahmoism includes an understanding of god as being both infinite and singular, both immanent and transcendent, and one who is present

in everything from fire and water, to plants and trees. Another key principle, specifically in reference to love, is that the reform movement asks its followers to respect all of creation.[4] It is quite possible that these principles also informed Bose's ethical approaches to studying and learning from the natural world.

The second aspect of Bose's work that I draw from involves his use of electrical activity as the measure of a *physiological response* in plants, metals, and animal tissue. His definition of the physiological properties of response and what constituted a "response" versus a simple "reaction" in nonhumans and nonorganic life were contested during his lifetime. More than a century later, scientists are returning to Bose's research to reevaluate the categorical distinctions we have drawn between humans, nonhumans, organic and inorganic life. Bose was the first scientist who convincingly argued that plants not only have a nervous system of their own but that they also have the ability to feel pain.[5] He demonstrated that the physiological ability to respond extends beyond the human to not only animals, plants, and microorganisms but even to rocks, metals, minerals, elements, and anything else capable of experiencing sensitivity to external stimuli. I am drawn to the ontology and ethics that Bose's approach presents and wish to use his claim of a physiology of response in this chapter to start reimagining our own feminist encounters with biology.

Despite many traditions of thought that have defined desire as a lack or as a negative concept, the abilities to respond, to act, and to react are also qualities that can be used to describe the notion of desire. Desire is what motivates us to reach out toward, grow closer to, and in some cases even touch the other. As Elizabeth Grosz has explained, drawing from Gilles Deleuze and Félix Guattari's attempts to provide alternatives to dominant psychoanalytic interpretations, desire can be understood otherwise. "Instead of understanding desire as a lack or a hole in being," she states, "desire is understood by Deleuze—again following Spinoza and Nietzsche—as immanent, as positive and productive, a fundamental full and creative relation. Desire is what produces, what makes things, forges connections, creates relations, produces machinic alignments . . . desire is an actualization, a series of practices, action, production, bringing together components, making machines, making reality."[6]

Bose's research on the physiology of response in plants helps me to better understand Deleuze and Guattari's idea of the micropolitics of

desire, Grosz's work on feminist becomings, Donna Haraway's call to making kin, and Rosi Braidotti's posthumanist ethics. Following a transplanted line of flight from Bose's physiology of response, I put forward *microphysiologies of desire* as an *applied ethics of matter*. Microphysiologies of desire can be thought of as practices of encounter for feminists, feminist scientists, and scientist feminists.[7] They are a way to describe the naturecultural, as well as a strategy to proceed forward in our encounters with other humans, nonhuman animals, plants, bacteria, and inorganic others that comprise the naturecultural. Microphysiologies of desire serve as the material and semiotic nervous system of biophilosophies of becoming, extending beyond a single body and connecting the knower to what is to become the known. They put into practice and apply the ontological lessons drawn from biophilosophies of becoming by (1) cultivating an openness to nonhuman becomings and changefulness; (2) making connections through kinship and hylozoism; and (3) creating movement by way of univocity and immanence. Feminist philosophers and feminist STS scholars have been thinking about microphysiologies of desire in various ways, under various names, for decades. This chapter attempts to gather together these practices of encounter, not with the intention of creating one unified microphysiology of desire, but rather to show the rich and diverse ways that developing an ethics of matter has been at the heart of so many feminist desires.

Generative Desires

While revisiting her doctoral work on morning glories and color variation, Banu Subramaniam weaves together complex genealogies of evolutionary biology, eugenics, and invasive plants through feminist critiques of science, storytelling, and fiction.[8] Subramaniam poses the question, "How does one study the naturecultural world?"[9] She offers plant thigmatropism as a model mechanism, stating:

> An academy with separate and distinct disciplines has carved knowledge production into unique objects of studies and methodologies, obscuring the teeming life between the worlds of natures and cultures. . . . Inspired by the touch-sensitive thigmatropic tendrils of morning glories, which allow the plants to scale large objects and burrow into narrow crevices,

> I narrate tales of morning glories through the curious and adventurous tendrils of naturecultural storytelling.[10]

Derived from the Greek root "thigma," which means "to touch," thigmatropism describes the ability of plants to sense and respond to changes in surface conditions when they come in contact with another object.[11] Subramaniam uses thigmatropism as her methodology for conducting interdisciplinary work. Inspired by similar tendrillic tendencies, but following more closely the immanent and stolonic extensions thrown out by crabgrass, this chapter develops a cartography for molecular feminisms.

My challenge in writing this chapter is to develop the project of molecular feminisms by learning from the capabilities of the stoloniferous plant. In the chapter epigraph, Erica Waters and Maxine Watson explain that stoloniferous plants such as strawberry plants grow both as a clonal colony (genet) that shares the same genetic material and also as individuals (ramets) that work together within this colony. Applying optimal foraging theory to plant growth, they explain that plants must be able to "sense, interpret, and respond to environmental signals."[12] For stoloniferous plants that grow by making aboveground connections in particular, apparently the "detection of differences in red/far-red ratios via phytochromes and other photoreceptors induces plant *morphological responses* such as enhanced elongation rates."[13] The morphological responses initiated by stolons therefore contribute to ramet growth across generations, from mother ramet to daughter ramet.

Accordingly, microphysiologies of desire aim to extend across and contribute to the growth of generations of feminist scholarship that have examined ontological and ethical approaches to matter. This does not mean that critical analysis of previous work becomes impossible or that tensions and disagreements between the work are overlooked. Rather a purposeful effort is made to avoid the tired and predictable Oedipal tendencies found throughout most scholarly traditions that would have us believe that theoretical progress can only occur by dismissing or discrediting previous forms of scholarship. Thus, instead of declaring the arrival of a "new" feminist approach to science, biology, the body, or a new ethics of matter by turning away from "older" work in feminist STS, feminist theory, or feminist materialisms, I use microphysiologies of desire to uncover lines of flight made possible by these previous engagements.

Similarly, Iris van der Tuin has articulated a need for moving away from our habits of characterizing a single and central lineage of feminist thought to thinking across generations. She advocates for generational feminisms with the suggestion that we use "jumping generations" as a feminist methodology. "The methodology of jumping generations," van der Tuin states, "changes the parameters of generational feminism and enables the abandonment of a feminist center, takes advantage of running on multiple and transversal tracks, and stimulates channeling one's energies and desires to seeking commonalities in difference and useful coalitions vis-à-vis current day problems. This is helpful for feminist politics in academia, art, and activism because it allows us to act on lessons learned from equality and difference feminisms when we discuss issues of representation."[14]

In my own research in molecular biology and reproductive neuroendocrinology, the act of bringing forward decades of feminist STS work on science, biologies, and matter through a generative lens has been crucial. These bodies of work directly motivated and challenged me to enter into a molecular biology and neuroscience wet lab in the first place. In the lab I participated in scientific projects where it was my responsibility to ask questions about the presence and mechanisms of androgen, estrogen, and melatonin receptors in gonadotropin releasing hormone (GnRH) neurons. I asked my scientific questions while keeping an eye to what it was that feminists wanted to know and change about *how* biological and reproductive physiology research was being conducted at the molecular level. For example, in *The Woman in the Body: A Cultural Analysis of Reproduction*, feminist anthropologist Emily Martin shared her research on the metaphors most commonly used in scientific and medical literatures to describe the processes of menstruation, birth, and menopause.[15] Martin provided evidence of gendered and hierarchical language being used to describe the cellular and molecular processes of reproduction mediated by the hypothalamic-pituitary-gonadal (HPG) axis in mammals. She argued that not only was this language being used to describe scientific results, but that the very design of scientific experiments on female and male reproductive physiology was influenced by these gendered and hierarchical paradigms. Her analysis, and the work of many other feminists invested in reproductive and social justice, led me to a lab where I had the opportunity to search for paradigm-shifting scientific evidence and create alternate modes of approaching the study of reproductive neuroendocrinology.[16]

Conducting scientific work in a lab was how I was able to practice my feminism, and I am very grateful for the generational support that led me there.

If you have ever watched stolonic grass grow, you know that there is no center from which the single blades emerge. Rather, runners crisscross on the surface of the soil, interrupting and integrating into already established patches. With the strategies of jumping generations and stolonic growth in mind, this chapter highlights those approaches that could be of most use to the feminist scientist who wishes to think about their encounters with the world through the scientific practices of biology. The idea of molecular feminisms itself is of course a direct take on difference feminisms. As I have stated, and as van der Tuin notes, difference feminisms and equality feminisms need not be at odds; they can work together. Just as a stolon can develop both horizontal shoots as well as vertical shoots that grow out of nodes, molecular projects are not in opposition to molar projects. In fact, van der Tuin's methodology of "jumping generations" draws out the generative capacity of thinking about the molar and molecular together through a generational lens. We can, for instance, connect the methodology of jumping generations itself to a rich genealogy of feminist philosophical work that includes Braidotti's theory of *transpositions* and Chela Sandoval's idea of *split consciousness*.[17] Both of these may in turn be connected to Barbara McClintock's scientific discovery of *transposons* or "jumping genes" in molecular genetics.[18]

Multiple generations of feminist materialist thinkers have made it possible for feminist scientists to consider questions of ontology and ethics more closely while seeing scientific research as a means of practicing their feminism. Following cues from such feminist STS scholars as Karen Barad, Patti Lather, Isabelle Stengers, and Haraway, and by drawing from the collaborative works of Deleuze and Guattari, as well as Keller and McClintock, the remainder of this chapter explores microphysiologies of desire that address the relationship between the knower and the to-be-known. Using the concepts of agential realism and intra-actions, getting lost, cosmopolitics, becoming-with, and a feeling for the organism, I present several different theoretical tools that feminists have already developed to think about an ethics of matter.

The chapter ends with my own idea of "feeling *around* for the organism," which I hope speaks to feminist scientists in the natural sciences and

helps put together a shared vocabulary between feminism and molecular biology. What is perhaps slightly different about my argument, compared to past feminist STS projects, is my emphasis on the point that ontology and ethics are coetaneous and that learning *how to see the world* has always also been about learning *how to encounter* that world. My experiences of working directly with DNA, proteins, cells, cultured cell lines, bacteria, animals, chemicals, radiation, and machines in the lab taught me this crucial lesson about ontology and ethics. That is why while turning to the onto-ethical aspects of molecular feminisms, I focus on the importance of creating practice-oriented feminist STS approaches. I call upon those encounters that the feminist scientist must have with the everyday materials, tools, customs, languages, and theories of science. Reflecting upon these encounters makes it possible to think differently in the sciences and in many cases prompts us to pursue less explored lines of flight in feminist theory and politics.

Nonlinear Desires

Over the past several decades, the field of feminist STS has proliferated, producing rich feminist critiques of specific sciences and recuperating theories from the sciences for feminist ends. From the outset, feminists have pursued multiple theoretical approaches to thinking about science, ranging from "feminist theory of science," "feminist theory in science," "feminist theory out of science," and most recently "science out of feminist theory."[19] Feminists from different disciplinary and activist traditions have contributed *theoretically* to feminist STS, and as the editors of the special issue of the journal *differences* dedicated to "feminist theory out of science" suggest, everything we know and do is already "theory all the way down."[20] Undoubtedly, there are many ways to organize the impressive range of theoretical work that falls within the scope of feminist STS. Entangled in various productive ways *with* science, these intersecting but divergent feminist orientations have raised a host of questions about the nature of scientific knowledge production.

Distinguishing itself from metaphysics, religion, and superstition, "modern" science is often characterized as a knowledge-making practice that is rational, objective, empirical, experimental, and evidence-based.

Celebrating the capacity to discover the truth through systematic observation, hypothesis formulation, rigorous hypothesis testing, and falsification, the scientific method purportedly frees individual knowers from the taint of idiosyncrasy, bias, prejudice, particularity, and sociocultural values. As an interdisciplinary field that draws concepts and analytic categories from anthropology, cultural studies, economics, feminist theory, history, philosophy, political science, and sociology, feminist STS recognizes the importance and value of scientific inquiry but seeks to move beyond these characterizations to think about science as a social practice. Investigating how science works through its historical emergence, and the social, economic, and political dimensions of institutionalized science, feminist STS has illuminated how social values permeate the varied practices, processes, and products of scientific research. Building upon a core tenet of the field of science and technology studies, feminist STS has further illuminated the co-construction of science and society.

The field designations "feminist STS" and "feminist science studies" are often used interchangeably in the literature, and to complicate matters even further, feminist STS is also often referred to as "feminist technoscience studies." To many, these different designations have come to mean the same thing, and they do share a great deal of similarities in their disciplinary underpinnings and analytical frameworks. For example, all share common formative departure points such as critiques of positivism and pure objectivity. They all draw important theoretical insights into the body, biology, medicine and technology by reaching out to multiple sources of knowers and users. Scholars identifying with any one of these field names have responded to feminist, queer, intersex, and trans theory's interrogations of sex, gender, and difference. In fact, long aware of the limits of mainstream feminism's engagement with the concepts of sex and gender, both feminist science studies and feminist STS scholars have cultivated different sets of analytical tools. Also, rather than positioning race, class, sexuality, and disability as intersectional additives to a theoretical mainframe of sex and gender analysis, questions regarding the body, matter, materiality, difference, and nature in these fields have been articulated through much broader frameworks.[21] These frameworks have been attentive, as Murphy has summarized, to transnational processes of colonialism and postcolonialism, neoliberal capitalist practices of production,

consumption, and commodification, and particularly in the US context, women's social justice movements that situated emerging reproductive and genetic technologies in relation to histories of slavery and eugenics.[22] Through a healthy feedback mechanism, many of these theoretical insights are now informing and reconfiguring key concepts that have typically been found in more canonized bodies of US- and European-based second-wave feminist thought.

However, the designations of feminist STS and feminist science studies indicate slightly different theoretical approaches and histories of disciplinary engagements that feminists have used to address questions regarding the role and impact of science and technology in our lives. From early work on the history of women in science, the persistent underrepresentation of women across STEM fields, and androcentrism in scientific discourses, the body of scholarship known as feminist science studies has paid particular attention to illuminating those practices in science that have led to the devaluation, marginalization, and exclusion of individuals based on such factors as gender, race, class, sexuality, disability, and colonialism. Rejecting the notion that these modes of exclusion are extraneous to science, feminist science studies scholars have sought to demonstrate that exclusionary practices are constitutive of particular scientific endeavors and that certain sciences have played crucial roles in consolidating constructions of women, people of color, the economic underclasses, the colonized, and the disabled as inferior and therefore less worthy of respect than elite property-owning white men. These studies have argued that in marked contrast to their claims of value-neutrality, various sciences have helped produce, sustain, and justify social inequalities and systems of domination. Much of this work was informed by commitments to creating socially just frameworks for conducting science.

Where feminist science studies can be noted for developing highly nuanced epistemological and methodological critiques of science, feminist STS scholars have drawn our attention to and emphasized the coconstruction of science and society. Some feminist STS scholars have received their disciplinary training in the relatively new field of science and technology studies (STS) itself. STS draws primarily from historical and sociological studies of science and is mainly interested in delineating the relationships between scientific knowledge, technological systems, and society. Key contributions from actor-network theory developed in the

sociology of science, from feminists scholars such as Lucy Suchman and Judy Wajcman who examined our relationships with technology, and from Haraway's figuration of the cyborg, helped form the field of *feminist STS* which has flourished into a larger umbrella term since the early 1990s.[23] With an emphasis on working with the sciences while also creating interdisciplinary dialogs, feminist STS has become a multidisciplinary field drawing from a various number of areas including feminist theory, black feminist theory, queer theory, disability studies, postcolonial studies, and STS (just to name a few). Commonly recognized analytical frameworks operational within feminist STS include (1) acknowledging the co-construction of science and society; (2) questioning the authority of science; (3) interrogating traditional definitions of scientific objectivity; (4) connecting feminist interventions in the sciences to community-based participatory projects and/or social justice movements; and (5) promoting practice-oriented approaches for knowledge production.

By highlighting these distinctions between feminist science studies and feminist STS, I want to be clear that it is not my intention to produce a narrative of increasing theoretical complexity or disciplinary progress. Nor is it my aim to dismiss the distinct interventions made possible by these approaches in an effort to produce one unified mode of inquiry. As Jutta Weber explained, regarding the development of the field of feminist technoscience over a decade ago, "the problem is how to write a non-linear and complex historiography of theories and practical engagements, as well as the artifacts of science and technology. It might help to avoid linear stories of feminist theory by reflecting not only on the epistemological and ontological framework of earlier approaches, but also by rethinking these frameworks in the light of contemporary sociopolitical developments as well as prevailing technological practices, artifacts, and material cultures."[24] In addition to reflecting on ontological and epistemological frameworks, developing new critiques of science and technology by pointing out essentialist assumptions, problematizing the use of binary categories, and questioning linear logic, some feminist STS scholars who are scientists use their training in the "hard" scientific disciplines to expose the "prevailing technological practices, artifacts, and material cultures" of science.[25] What I see as a standout feature of this scholarship is the attempt to develop interdisciplinary alliances and practice-oriented approaches in feminist STS.[26]

Posthumanist Desires

In this book I consider the capacities of life in the lab, ranging from bacteria, *in vitro* cell lines, and minimal genome organisms, to ask what it is that we as humans can learn from our exchanges with nonhuman actants. While thinking with these actants, as Weber suggests, I want to rethink previous feminist ontological and epistemological gestures in light of "contemporary sociopolitical developments" and "prevailing technological practices, artifacts, and material cultures."[27] The contemporary sociopolitical developments in which I am most interested include not only feminist, postcolonial, and decolonial projects but also posthumanist projects that aim to disrupt liberal humanist aspirations of autonomy and individualism.

The term "posthumanism" has come to describe several different schools of thought. The bodies of critical posthumanist work that I am referring to here are the discourses that developed through feminist theory, literary criticism, and cultural theory in the late 1990s. As Francesca Ferrando has suggested, this particular tradition of posthumanism brings with it an "awareness of the limits of previous anthropocentric and humanistic assumptions."[28] Describing key elements of this particular school of posthumanism, Ferrando states:

> Posthumanism is often defined as a post-humanism and a post-anthropocentrism: it is "post" to the concept of the human and to the historical occurrence of humanism, both based, as we have previously seen, on hierarchical social constructs and human-centric assumptions. Speciesism has turned into an integral aspect of the posthuman critical approach. The posthuman overcoming of human primacy, though, is not to be replaced with other types of primacies (such as the one of the machines). Posthumanism can be seen as a post-exclusivism: an empirical philosophy of mediation which offers a reconciliation of existence in its broadest significations.[29]

Although posthumanism allows me to think with nonhuman actants such as bacteria in order to question liberal humanistic narratives of productivity and progress made possible through autonomy and individualism, I do

not wish to turn to this philosophical movement in order to ignore the human. It is not my intention to focus my inquiry on decontextualized artifacts of material cultures and thereby disembody these actants from their deep entanglements with human lives whose own conditions have been organized by systematic and institutionalized exclusions based on race, class, gender, and more. Haraway has criticized the term "posthumanism" on this very basis, claiming that it encourages the tendency of decontextualization. Instead, she has forwarded her concept of companion species as one that better captures the ontological and ethical entanglements that take place between humans and nonhumans.[30]

Explaining the importance of developing posthumanist ethics within gender studies, Cecilia Åsberg has turned to the field of animal studies. She motions to a body of work that has turned from anthropocentrism to the "integration of both human and non-human natures." Åsberg explains the need for developing such a "reciprocal ontology," drawing from both Haraway's companion species and Barad's concept of intra-action.[31] "Rather the ethical turn in this field [gender studies] is in the materialist wake of poststructuralist theory an attempt to recognize the other," Åsberg states. "Posthumanist ethics, entangled with onto-epistemologies of worldly 'intra-actions' (Barad), emerge as efforts to respect and meet well with, even extend care to, others while acknowledging that *we may not know* the other and what the best kind of care would be."[32]

My own experiences in molecular biology research have brought to light the need for such a reciprocal ontology, raising questions not only regarding the nature of existence and questions of being, becoming, and difference, but also how questions about our relationship with the physical and biological matters of the natural world can be articulated within the context of scientific inquiry. The reason for bringing together these critical discourses is that they have helped me, and I believe that they can help other feminist scientists who work with animals, cell cultures, or other nonhuman actants, to think through the ontological and ethical entanglements that occur at the level of the lab bench. For the feminist scientist, working in the lab matters. This in turn requires developing microphysiologies of desire that allow us to meet the other in the lab well, whomever or whatever that other may be, while acknowledging that we may *never completely know* that other.

Practice-Oriented Desires

In the 1989 pivotal feminist science studies anthology *Feminism and Science*, edited by Nancy Tuana, feminist scholars trained in philosophy, biology, and physics came together to discuss the intricate relationships between women, feminist theory, and science. Articles highlighted discordant views on the interventions in science that were made possible by feminist theory as well as the purpose and scope of feminist science studies (as it was referred to in the special two-volume issue of the journal of *Hypatia: A Journal of Feminist Philosophy*, from which the anthology was formed). In addition to providing an overview of feminist scholarship in the sciences at the time, Sue Rosser wrote in the anthology, "More feminists in science are needed to further explore science and its relationships to women and feminism in order to change traditional science to a feminist science."[33] Although other scholars in the same collection cautioned against the idea of a "feminist science" as such, Rosser's vision of changing traditional science to the promise of a feminist science provides a useful point of departure for thinking not only about the complex issues involved at the intersections of sex, gender, women, feminism, and science but also the need to develop practice-oriented approaches for those feminists who wanted to change the sciences from within.[34]

Rosser makes a clear distinction between the terms "women" and "feminism" that relates directly to my own argument regarding the project of thinking about feminist STS through both molar and molecular modes of politics. Although I am interested in developing a project in molecular feminisms, the argument I make does not aim to dismiss molar projects, such as those described by Rosser, that are aimed at exploring the absence or presence of women in science or "science and its relationships to women."[35] In fact, foregrounding the "women" question in science in epistemological terms has been very productive for the philosophical interrogation of science and knowledge production.[36] Rosser's own catalogue included feminist influences on pedagogical and curricular transformations in science, the history and professional status of women in science, feminist critiques of science, feminist theory of science, and even what she called the development of a "feminine" science.[37] Her additional call, however—the one that motions us toward exploring science and its relationship to feminism—is precisely where *microphysiologies of desire* can take us.

My interest in exploring microphysiologies of desire is directly related to the fact that I am indeed one of those "feminists in science" who, as Rosser challenged, did go ahead to "further explore science and its relationship to women and feminism."[38] By placing myself within the sciences, I faced both the challenge and opportunity of having my feminism tested and extended into less familiar areas of feminist thought. My experience has been stolonic in that my growth as a feminist STS scholar, much like crabgrass, has depended entirely on my ability to reach out and make intimate connections with less familiar modes of thinking. As a result of these connections, I have ended up here with my current molecular project. While this project is not opposed to liberal or equality feminisms that foreground "women in science" or "pipeline"-related questions, it does not immediately contribute to these inquiries. Rather, the promise of a "feminist science" for me has meant following the unexpected turns and outgrowths that result from the experience of becoming a feminist scientist. This path has led me directly to probe the relationship between feminism and science through minor literatures and less familiar means.

In an editorial written for the journal *Bioethical Inquiry*, Catherine Mills explained that the dearth of continental philosophy in the area of bioethics can be attributed to the fact that "recent continental philosophy has been more concerned with ontological questions than normative ones."[39] Arguing that the strict separation between questions of ontology and normative resolutions is neither correct nor useful, she also states that "continental philosophy is often criticized, if not derided, for a perceived failure to provide normatively clear guidelines about 'what should be done.'"[40] Although I agree with Mills that there need not be a strict distinction between ontological presuppositions and normative resolutions, I think that by placing a little more emphasis on the "what should be done" part of the equation, we can begin to invite more feminist scientists into this important conversation. Indeed, it would be incredibly useful for the feminist scientist in the natural sciences if a more concerted effort was made to connect interests in ontology, ethics, matter, and materiality with the everyday, nitty-gritty practices in the lab.

When a feminist scientist actually finds herself in front of a lab bench, she may be motivated to ask difficult questions that typically would not have been raised in her traditional scientific training. A likely place that her feminist research practices will first lead her are to questions that

deeply interrogate the idea of who can be a knower and what can be known. More explicitly, how should she approach the object of study? How should she treat this object of study that is the other? What should she make of biological and statistical differences that emerge in the measurement of this other? How will these differences influence her understanding of subjectivity? Alternatively, the feminist scientist working in the lab may find that similar questions of ontological and ethical significance may begin to emerge as a direct result of her repetitive and ritualized performances of the scientific method. As a result of their attempts to know and to "discipline" the body, biology, and matter through scientific experimentation, many scientists (feminist or not) are dealing head-on with questions of ontology and ethics that are similar to those being raised within continental philosophy and feminist STS. With their hands-on experiences of working with live organisms and dealing with the difficulty of experimental reproducibility, biologists are accustomed to witnessing the fluidity, vulnerability, and unfixed "nature" of life.[41]

Adding to Mills's argument, I suggest that these ontological queries can in fact emerge from close encounters with the mundane or everyday techniques and tools that the feminist scientist requires in order to conduct experiments. In my own analyses of neuroscience, reproductive biology, and molecular biology research, for instance, I have been interested in how biological molecules and organisms are brought forward in the lab. Drawing from such theories as standpoint theory, situated knowledges, agential realism, and the methodology of the oppressed, I have called for feminist scientists who are working in the lab to examine the ideologies behind dominant representations of biological molecules and organisms and ask, Why not otherwise?[42] I have stressed the importance of bridging these ontological and ethical discussions with scientific practices. This is precisely "what can be done" in feminist STS.[43] As Michelle Murphy has reminded us in *Seizing the Means of Reproduction: Entanglements of Feminism, Health, and Technoscience*, multiple generations of feminist health practitioners and health advocates, starting in the late 1960s, have already used practice-oriented approaches to think about the body and biology differently. For example, by creating women's health clinics, designing their own tools for conducting vaginal exams, and producing pamphlets with anatomical details and methods for self-care, these

feminists have devised their own ways of thinking about reproductive health and biology and went as far as to produce innovative forms of scientific knowledge.[44] Feminist health advocates show us every day that it is possible to simultaneously think with biology, work with matter, interpret data, and enact our feminist politics. They show us the importance of knowing what to critique and what to use from traditional scientific experiments and literatures. The scientific knowledge they have created continues to shape our understandings of female anatomy and reproductive health today.[45]

For the feminist scientist working in the natural sciences, ontological, ethical, and critical posthumanist concerns are always present, even if not clearly articulated as such. Ontological queries produced in the lab can very quickly become entangled with ethical queries related to one's research design. These entanglements might be traced back to the very beginning of one's inquiry, even before arriving at a hypothesis. Through the design of a research methodology, one must consider how to approach the encounter with what it is that one wishes to know. Driven by a molecular desire to position the knower in the same critical plane as that which becomes known, I will now flesh out a shared vocabulary for an ethics of matter that can be used in the laboratory setting of the natural sciences.

Indeterminacy in the Lab

As I outlined earlier, microphysiologies of desire are feminist practices of encounter. They help us articulate an applied ethics of matter and develop strategies for moving forward in our scientific work. Although we can begin to flesh out many such strategies, I would like to start with those that cultivate an openness to nonhuman becomings and the capacity for changefulness. In *Meeting the Universe Halfway*, Karen Barad advances ontological discussions in feminist theory by drawing from the physical and natural sciences. Through her knowledge of quantum physics, she invites us to reexamine and reformulate our current feminist theoretical treatments of matter and reality. In her introduction she shares the short story of an exchange between the quantum physicists Niels Bohr and Werner Heisenberg, leaving us with a powerful ontological lesson. Barad writes:

> For Bohr, what is at issue is *not* that we cannot *know* both the position and momentum of a particle simultaneously (as Heisenberg initially argued), but rather that particles do not *have* determinate values of position and momentum simultaneously. . . . In essence, Bohr is making a point about the nature of reality, not merely our knowledge of it. What he is doing is calling into question an entire tradition in the history of Western metaphysics: the belief that the world is populated with individual things with their own independent sets of determinate properties. The lesson that Bohr takes from quantum physics is very deep and profound: there aren't little things wandering aimlessly in the void that possess the complete set of properties that Newtonian physics assumes (e.g., position and momentum); rather, there is something fundamental about the nature of measurement interactions such that, given a particular measuring apparatus, certain properties become determinate, while others are specifically excluded. Which properties become determinate is not governed by the desires or will of the experimenter but rather by the specificity of the experimental apparatus.[46]

Extending this idea, we might start to recognize that the matters we study as biologists, for example, or that we attempt to define and then regulate, do not preexist. In fact, "we" as we tend to define ourselves as scientists and knowers also may not preexist but rather, as Barad suggests, participate in the "mutual constitution of entangled agencies." What becomes "determinate" or known is a result of the specific interactions of an apparatus. What constitutes the apparatus includes a range of players, including the knower, the tools of measurement, and discursive practices. Barad defines this mutual entanglement as an "intra-action." Intra-action addresses the question "What can we do?" Specifically, Barad would have us orient ourselves to an ontological and ethical framework that assumes indeterminacy and asks that we as scientists become accountable for "the material nature of practices and how they come to matter."[47]

Indeterminacy and accountability both play roles in the making of any phenomena and describes Barad's concept of agential realism. "In my agential realist account," she explains, "scientific practices do not reveal what is already there; rather, what is 'disclosed' is the effect of the intra-active engagements of our participation with/in and as part of the world's differential becoming. . . . What is made manifest through technoscientific

practices is an expression of the objective existence of particular material phenomena. . . . Objectivity is a matter of accountability for what materializes, for what comes to be. It matters which cuts are enacted: different cuts enact different materialized becomings."[48] Barad's idea of the "agential cut" might be thought of as an event, or what I have described using Deleuze and Guattari's term: a haecceity. This cut allows for a "resolution of the ontological indeterminacy" and the "condition for the possibility of objectivity."[49]

To better illustrate the usefulness of Barad's feminist practice of encounter, I would like to share a very interesting case of indeterminacy accompanied by accountability in molecular biology research. A few years ago, Linda Buck stirred up a storm of controversy when she retracted the findings from one of her own groundbreaking scientific works published in the highly acclaimed scientific journal *Nature*. Embedded within this controversy were deeper questions related to issues of ontology, epistemology, ethics, and the nature of discursive practices. Buck, who studies the olfactory systems in mammals and the mechanisms involved in odor and pheromone sensing, shared the 2004 Nobel Prize in Physiology or Medicine with Richard Axel. Working as a postdoctoral fellow in Axel's lab in the 1980s, Buck successfully managed to identify a family of more than a thousand genes that code for odor receptors.[50] She has since spent a very productive scientific career mapping out the neurological and molecular basis of olfaction. Her work has revealed the interaction between olfaction and reproduction at the neuromolecular level.[51] Of her many scientific accomplishments, Buck and her colleagues are known for utilizing molecular visualization techniques such as genetic tracing methods to better understand the neural circuits involved in the regulation of the olfactory system. Using transneuronal tracers, Buck and colleagues have shown that gonadotropin-releasing hormone (GnRH) neurons "receive pheromone signals from both odor and pheromone relays in the brain" and that "feedback loops are evident whereby GnRH neurons could influence both odor and pheromone processing."[52] Her lab was the first to have engineered transgenic mice in which GnRH neurons also expressed the transneuronal tracer barley-lectin (BL) and green fluorescent protein (GFP). By performing immunostaining of brain sections derived from these mice, Buck has been able to visually map the neural circuits of GnRH neurons.

The controversy that emerged surrounding the scientific work involved Buck's research on the visualization of signaling from specific odorant receptors to specific clusters of neurons in the olfactory cortex.[53] In the March 2008 retraction of the original paper, Buck and her colleagues stated: "During efforts to replicate and extend this work, we have been unable to reproduce the reported findings. Moreover, we have found inconsistencies between some of the figures and data published in the paper and the original data. We have therefore lost confidence in the reported conclusions. We regret any adverse consequences that may have resulted from the paper's publication."[54] One of the reasons this retraction is so interesting and caused such a stir is that the retraction came from a Nobel Prize winner. Also, the retraction statement goes on to reveal that the actual experiments that were put into question were not done at the hands of Buck herself, but rather by one of the two primary authors of the article, who was a former postdoctoral fellow in her lab. In scientific circles the retraction of an article from a prestigious journal always makes for sensational news. Commenting on the retraction, the article "How to Read a Retraction" posted in the science blog *Drug Monkey* suggested how strange it was to see an "author contribution" list in the retraction statement—a list that did not exist in the original article and one that outlines the exact contributions of each scientist.[55] Basically, the "author contribution" information reveals that the postdoc's work was under question, and the postdoc was being made to take the fall for the faulty research.

How can this event be read? The question is not so much what Buck should have done differently, but what we can see and know differently as a result of this event. It is possible that the postdoc somehow fudged the results. From an agential realist account, however, we would also have to ask what effects or events have been disclosed as a result of the intra-actives engagements of Buck, her other scientific colleagues, the retraction statement, and of course, the odorant receptors and neurons of the olfactory cortex.[56] It would appear that prior to November 2001, the intra-actions that had formed up until that point had resulted in a lack of scientific knowledge regarding the neural mechanisms of olfaction in mammals. In fact, until Buck's original work in the 1980s, the odorant receptors themselves (as we have come to know them) did not even exist. After November 2001, upon the publication of their findings in the journal *Nature*, Buck and colleagues, as well as the entire scientific community

that supports a system of peer-review, faced yet another shift in the ontological status of these receptors. New intra-actions between scientists, mice, the transneuronal tracer barley-lectin, and visualization techniques disclosed a novel biological relation, one of signaling between olfactory receptors and neurons. After March 2008, however, this knowledge was once again put into question and a formal retraction published in a scientific journal, thereby in a way "dematerializing" that biological relationship which had come to be. How can we as scientists become more open to such nonhuman becomings and to such capacities for changefulness?

From a traditional perspective of scientific method and objectivity, it is hard to say what happened, and perhaps pointing a finger at the postdoc seemed like the easiest thing to do at the time. From the perspective of Barad's practice of encounter, however, we might suggest that the apparatus (that is, the combination of all the human, nonhuman, organic and inorganic actors and measuring devices that went into creating the examined phenomenon) changed and thus new agential cuts were enacted. Buck claims that she was no longer able to repeat the findings of this initial experiment in her lab. What is not readily known is that her lab moved from the time when the initial experiments were conducted. The results published in 2001 were based on work that her postdoc had done at the Howard Hughes Medical Institute at the Harvard Medical School in Boston. Buck tried to repeat the experiment, likely with a different postdoctoral fellow, a different generation of transgenic mice, and perhaps even a different water source to mix the chemical reagents needed for the experiment in her new lab in Seattle, at the Fred Hutchinson Cancer Research Center, University of Washington.

Following the theoretical insights of Barad's onto-epistemological framework, the "inconsistencies" that Buck refers to in the retraction statement can be read to imply much more than simply the faulty lab notes taken by a postdoc. Perhaps Buck's statement, in a way, also reveals the possibility for a new approach to dealing with biological matter. Through the appearance and disappearance of signals between olfactory receptors and specific neurons, we may be able to see a microphysiology of desire emerging from within the sciences—one that moves us from an ontology that treats what it encounters in biology as being fixed, to one of becoming that takes more seriously the ideas of fluidity, flux, and indeterminacy.

Becoming-With in the Lab

As some readers may anticipate, no chapter on developing feminist practices of encounter in the natural sciences would be complete without invoking the work of Donna Haraway. Her writing directs us toward those microphysiologies of desire that help us make connections through kinship and hylozoism. I am interested in bringing together and developing a vocabulary of ontological and ethical gestures that the feminist scientist might find useful in the lab. I am particularly interested in those microphysiologies of desire that help position the feminist scientist as a knower who operates in the same immanent plane as that which is to become the known. For some time, Haraway has turned her attention to the practices and effects of multispecies entanglements. In *Staying with the Trouble: Making Kin in the Chthulucene*, Haraway describes the significance of her concept of "staying with the trouble." She writes: "My multispecies storytelling is about recuperation in complex histories that are as full of dying as living, as full of endings, even genocides, as beginnings. In the face of unrelenting historically specific surplus suffering in companion species knottings, I am not interested in reconciliation or restoration, but I am deeply committed to the more modest possibilities of partial recuperation and getting on together. Call that staying with the trouble."[57]

In *When Species Meet*, Haraway developed this ongoing project on companion species relations. Throughout that book she expands on what thinking through companion species relationships could mean by asking two main questions: "(1) Whom and what do I touch when I touch my dog? and (2) How is 'becoming with' a practice of becoming worldly?"[58] Her interpretation of becoming-with begins with the idea that to respond is to show respect and that the practice of becoming-with works to "remove the fibers of the scientist's being."[59] To appreciate the idea of becoming-with as a feminist practice of encounter, Haraway paints a scenario of a scientist working within their discipline. Commenting on the work of primatologist Barbara Smuts, Haraway states:

> Trained in the conventions of objective science, Smuts had been advised to be as neutral as possible, to be like a rock, to be unavailable, so that eventually the baboons would go on about their business in nature as if data-collecting humankind were not present. Good scientists were those

> who, learning to be invisible themselves, could see the scene of nature close up, as if through a peephole. The scientists could query but not be queried. People could ask if baboons are or are not social subjects, or ask anything else for that matter, without any ontological risk either to themselves. . . . [I]f she really wanted to study something other than how human beings are in the way, if she was really interested in these baboons, Smuts had to enter into, not shun, a responsive relationship.[60]

Becoming-with informs how we as feminist scientists can start to think about experimentation, but goes one step further to disturb our ontological presuppositions of what in fact constitutes a knower and the to-be-known. As a relational ontology, becoming-with is clearly aligned with the concept of becoming. Haraway's work reads nicely together with a great deal of Deleuzian thinking. However, she is also quite vocal about distinguishing her concept of becoming-with from Deleuze and Guattari's use of becoming-animal, which she claims comes with a deep disdain for domesticated animals and, among other things, "incuriosity about animals."[61] Haraway places a different kind of emphasis on becoming by embedding it within companion species relations. "Becoming-with, not becoming, is the name of the game; becoming-with is how partners are, in Vinciane Despret's terms, rendered capable," she writes. "Ontologically heterogeneous partners become who and what they are in relational material-semiotic worlding. Natures, cultures, subjects, and objects do not preexist their intertwined worldings. Companion species are relentlessly becoming-with."[62]

"Worlding" is Haraway's way of communicating a particular kind of coming together, an enmeshment, or even a touch that becomes possible once we see life and all of its actants operating on an immanent plane. She explains:

> Instructed by Eva Hayward's fingery eyes, I remember that "becoming with" is "becoming worldly." *When Species Meet* strives to build attachment sites and tie sticky knots to bind intra-acting critters, including people, together in the kinds of response and regard that change the subject—and the object. Encounterings do not produce harmonious wholes, and smoothly preconstituted entities do not ever meet in the first place. Such things cannot touch, much less attach; there is no first place; and species, neither singular nor plural, demand another practice

> of reckoning. In the fashion of turtles (with their epibionts) on turtles all the way down, meetings make us who and what we are in the avid contact zones that are the world. Once "we" have met, we can never be "the same" again.[63]

Haraway's feminist practice of becoming-with involves giving up the idea of human exceptionalism. This is a key aspect of critical posthumanist projects as well. Haraway's ethical stance is guided quite emphatically by the desire and ability to touch and to be touched. It helps us work through the concepts of kinship and hylozoism and highlights an integral component of all microphysiologies of desire—namely, the ability to respond.

Getting Lost in the Lab

As one would perhaps anticipate, microphysiologies of desire can also create uncomfortable and complex encounters. They can motion us toward new lines of flight by way of univocity and immanence, but the outcomes are not always guaranteed to solve all of our problems. Yet through these difficult encounters, movement and change can occur. In *Getting Lost: Feminist Efforts toward a Double(d) Science*, Patti Lather theorizes "getting lost" as a feminist practice of encounter that also functions as a "fertile ontological space and ethical practice."[64] Lather's getting lost serves as a perfect example of how strict distinctions between ontology, ethics, epistemology, and methodology cannot easily be drawn. Lather articulates getting lost in the following way:

> At its heart, *Getting Lost* situates feminist methodology as a noninnocent arena in which to pursue questions of the conditions of science with/in the postmodern. Here we are disabused of much in articulating a place for science between an impossible certainty and an interminable deconstruction, a science of both reverence and mistrust, the science possible after our disappointments in science. Against tendencies toward the sort of successor regimes characteristic of what feminist philosopher of science, Sandra Harding (1991), terms triumphalist versions of science, this book asks how to keep feminist methodology open, alive, loose. . . . Given my interest in the science possible after the critique of science, my central argument is that there is plenty of future for feminist

> methodology if it can continue to put such "post" ideas to work in terms of what research means and does.[65]

Lather appreciates the importance of being able to work in a lab and continue to raise that pipette, despite our disappointments with science. This is indeed a crucial and challenging task for the feminist scientist. The list of disappointments is long and includes the distress caused by biological theories that have been used for deterministic ends and have contributed to the normalization of inequalities, the regret over biotechnologies that have caused environmental harm and have been produced at the cost of many lives, and the frustration that can come with positivism and the belief in pure objectivity. But obviously, if the feminist scientist is to continue in the lab, they must learn how to look beyond these disappointments and continue to navigate their steps—or as Lather puts it, learn to work within the "ruins."

The feminist scientist must learn to take the dilemmas and disappointments with existing technological practices and look at them in a different light. As Lather suggests in the plateau of her book dedicated to working within the ruins: "In such a time and place, terms understood as no longer fulfilling their promise do not become useless. On the contrary, their very failures become provisional grounds, and new uses are derived. . . . To situate inquiry as a ruin/rune is to foreground the limits and necessary misfirings of a project, problematizing the researcher as 'the one who knows.'"[66] Lather continues: "In this move, the concept of ruins is not about an epistemological skepticism taken to defeatist extremes, but rather about a working of repetition and the play of difference as the only ground we have in moving toward new practices."[67] Like Barad, in this brief statement Lather raises both ontological concerns as well as the ethical issue of accountability for "the one who knows." If the feminist scientist is to take these concerns to heart, how does one actually learn how to work within the "ruins" of their discipline? This is perhaps not the easiest task to undertake, particularly in the natural sciences. "Getting lost," as Lather suggests, is about becoming at ease with the idea of uneasiness. Learning to live with uneasiness is indeed most crucial here, a sentiment echoed in Haraway's call for "staying with the trouble."[68] Lather would have the feminist scientist see the benefits of getting lost by learning how to live without absolute knowledge and by respecting the demand for complexity.[69]

It may be of some benefit to look back and consider again the story of Linda Buck—neuroscientist, Nobel Laureate, and retractor of a published scientific work. Are we now able to see how microphysiologies of desire can be used to read Buck's scientific work in a new light? Can we learn to see how Buck herself may have "foregrounded the limits and necessary misfirings" of her project?[70] Can we learn to read her retraction and response to the entire affair as an attempt to be "accountable to complexity?" Is Buck (who may or may not self-identify as a feminist scientist) showing us the importance of "getting lost"? By getting lost, the feminist scientist is also able to move toward previously unexplored encounters.

We now have some sense as to how the feminist scientist may go about enacting new agential cuts even if they have to use the traditional scientific techniques and tools that are readily available. The point may not be to create "new or better" methods, but rather to work within the dominant tradition—in this case the scientific method—and gain what fresh knowledge they can from accepting the loss that accompanies the use of this method. The dilemmas that will occur by working with the traditional technoscientific practices and tools in the natural sciences should not become paralyzing and their disappointments should not stop the feminist scientist from continuing to stand in front of a lab bench. Rather, the movement that will occur from getting lost in this place and posing the question "How do I proceed?" may bring with it a new ethical orientation toward matter. Drawing from the work of Deleuze and Guattari, Lather explains that "big band theories of social change have not served women well. Here, something begins to take shape, perhaps some new 'line of flight' (Deleuze and Guattari, 1987) where we are not so sure of ourselves and where we see this not knowing as our best chance for a *different sort of doing* in the name of feminist methodology."[71]

As a microphysiology of desire, at first glance "getting lost" may be disorienting to the feminist scientist. We are used to following clearly labeled flow charts and neatly organized protocols. Getting lost may seem counterintuitive, but it does address the question, What can we do? By getting lost, Lather states that one can neither claim to produce better knowledge than her nonfeminist peers nor be chasing after the ultimate "truth." After years of spending time in a lab, I too am drawn to those feminist practices of encounter that are open to new lines of flight and encourage different sorts of doing. Working along a similar line of flight,

I now move the feminist scientist from a plateau filled with disappointments, wounds, and loss to one with a different set of productive discomforts. I turn to the work of Isabelle Stengers, who suggests that we need to learn how to take risks in scientific inquiry and search for moments of joint perplexity with other (more traditional) scientists. Both Lather and Stengers develop frameworks for inquiry that elicit sensory experiences, but whereas Lather's getting lost is more closely aligned with Derridean deconstruction, taking risks and searching for joint perplexities are microphysiologies of desire that move us in the direction of Deleuze's ontological univocity and immanence.

Cosmopolitics in the Lab

We have to be willing to acknowledge that feminist scientists aren't the only ones in the lab who have the capacity to be disappointed. Regular scientists also face disappointment. Following cues from Stengers and her "ecology of practices," I am interested in expanding upon the question of how a feminist scientist might be able to work with instead of against the science and perhaps the scientists that have produced these disappointments.[72] As Stengers might suggest in response to this query: "The problem for each practice is how to foster their own force, make present what causes practitioners to think and feel and act. But it is a problem which may also produce an experimental togetherness among practices, a dynamics of pragmatic learning of what works and how. This is the kind of active, fostering 'milieu' that practices need in order to be able to answer challenges and experiment changes, that is, to unfold their own force. This is a social technology any diplomatic practice demands and depends upon."[73] To me, this suggests that feminist scientists need to go deep into the methods and protocols of their research projects and gain an intimate knowledge of the inner workings of their experimental setups. This intimate knowledge will give them the tools they need to take a risk and start asking different questions. The quote also suggests that by going deep into the practices of their specific science, the feminist scientist will also be able to produce a different kind of encounter with the scientists around them.

In *Power and Invention: Situating Science*, Stengers explains the importance of taking "risks" in order to move forward with scientific inquiry.[74] In this microphysiology of desire or feminist practice of encounter, one

has to take a risk in order to find those moments of experimental togetherness and joint perplexity that can be shared with other scientists. This concept of risk forms the basis of an ontological and ethical framework that Stengers refers to as cosmopolitics. In his foreword to Stengers's book, Bruno Latour expands the link between this notion of risk and Stengers's use of the term "cosmopolitics." He states, "There are constructions where neither the world nor the word, neither the cosmos nor the scientists take any risk. These are badly constructed propositions and should be weeded out of science and society. . . . On the other hand, there exist propositions where the world and the scientists are both at risk. Those are well constructed, that is, reality constructing, reality making, and they should be included in science and society; that is, they are CC [cosmopolitically correct], no matter how politically incorrect they may appear to be."[75]

Stengers's cosmopolitics adopts a notion of "risky constructivism," which, according to Latour, opens up what gets to count as scientific evidence in the first place.[76] This openness places cosmopolitics apart from those types of practices that either narrowly promote a kind of scientific imperialism or those that would dismiss the scientific method altogether. As Steven Shaviro has written in his scholarly blog *The Pinocchio Theory*: "She [Stengers] seeks, rather, through constructivism and the ecology of practices, to offer what might be called (following Deleuze) an entirely immanent critique, one that is situated within the very field of practices that it is seeking to change. . . . Stengers' vision, like Latour's, is radically democratic: science is not a transcending 'truth' but one of many 'interests' which constantly need to negotiate with one another. This can only happen if all the competing interests are taken seriously (not merely 'tolerated'), and actively able to intervene with and against one another."[77] The task for the feminist scientist is not to critique traditional scientific practices in order to dismiss them. Nor is it sufficient to simply learn how to tolerate such practices. Movement must be made from seeking to secure a position of transcendence and "truth" to one of immanent critique and "joint perplexity." This process may involve reorienting our encounters not only to biological matter and organisms in the lab but to the other scientists we find working around us.

Drawing upon the same quote from Latour, Sarah Kember, who works at the intersections of artificial life, biology, and cyberfeminism, suggests

that "at the heart of Stengers's cosmopolitics is a philosophy in which scientific realism and social constructionism are not opposed."[78] This is similar to Barad's agential realism, which aims to move "beyond the well-worn debates that pit constructivism against realism."[79] However, Kember goes on to state that "Stengers advocates a philosophy in which the object, the thing, the world is recognized as having something to say for itself. It is about embracing the risk which is therefore posed to science and to the scientist."[80] This is perhaps where the microphysiologies of desire that we can draw from Barad and Stengers begin to part ways. Barad, for instance, would have us place an emphasis on the ontological, epistemological, and ethical implications of coming to know the world through phenomena, and also have us take account of our *responsibilities for* those mutually constituted others that we want to come to know. Stengers, while aware of the imbrications of human, nonhuman, and technological actors or actants in the world that we come to know through the sciences, motions us to also consider that the "thing in itself" has some sway in what comes to constitute an event, underscoring a different type of emphasis on relationality.

This ontological gesture made by Stengers occurs upon a more immanent plane and returns me to a point I raised earlier regarding the ontological presuppositions that have guided the majority of feminist STS inquiries into the relationship between the knower and the known. If, as Stengers believes, we are able to picture ourselves in a location of immanent critique, we might be able to see how microphysiologies of desire that rely on the concept of ontological univocity might guide our encounters between the knower and the to-be-known. This ontological stance shifts our ethical encounters toward the to-be-known slightly—from that of responsibility for the other to one of simply response. Following Stengers, we might say that in this plane of immanent critique and joint perplexity, all actants become partial knowers and that the real challenge is to learn how to respond to that other knower.

"Feeling Around" for the Organism

Having analyzed several feminist practices of encounter that explore the relationship between the knower and what is to become the known, I am interested in exploring how slightly different ontological stances might

influence an ethics of matter. What kind of an ethics of matter might come forward when we move away from ontological gestures that emphasize responsibility toward the other, and move instead toward those gestures that simply require the recognition of a response?

To address this, I turn to what Barbara McClintock described as her approach to science, an approach based on developing a "feeling for the organism."[81] McClintock made this comment while being interviewed by Evelyn Fox Keller. It is not my intention here to attempt to channel McClintock or to get to the "real" meaning behind her statement. Rather, I would like to end this chapter by exploring what this statement can mean for developing microphysiologies of desire. At its basis, McClintock's "feeling for the organism" is all about the relationship between the knower and the known. What I want to pursue further here is the uncertainty that remains over the precise nature of that relationship. Where does the emphasis fall? Is it a feeling *for* the organism, where the emphasis falls on the *for* in a type of benevolent affection toward, or is it a *feeling* for the organism, where the emphasis falls on the *feeling*, in a manner of stolonic or tendril-like extension? The distinction I am trying to make is subtle, but our attraction and possible ontological commitment to one meaning over another will have an impact on an ethics of matter that follows. I suggest that one type of feeling for the organism describes a molar or transcendent mode of encounter, while the other carries a more molecular or immanent approach. In the first scenario the feminist scientist may learn to develop a feeling *for* the organism. Her interaction with that organism, an organism that is no longer seen as an object simply available at her disposal, is reevaluated so as to accommodate a new ethical relationship of responsibility between that scientist and the organism. This is how she becomes accountable. In attempting to develop a feeling *for* that organism, she will have to ask herself what her ethical commitment is toward that *other* organism.

For instance, in her 2012 essay "On Touching—The Inhuman That Therefore I Am" and her 2007 book *Meeting the Universe Halfway*, Barad turns to the philosophical work of Emmanuel Levinas.[82] Levinas's ethics is generally understood as a study of intersubjectivity aligned with transcendence, existence, and the human other.[83] Barad reads Levinas through diffractive means and draws upon posthumanist ethics to propose that as an epistemological-ontological-ethical framework, her concept of agential

realism allows us to "turn our attention to our responsibilities not only for what we know but what may come to be."[84] She aims to reorient the relationship between the knower and what is to become the known, working toward an ethics of mattering. "We (but not only we humans) are always already responsible to others with whom or which we are entangled," she states, "not through conscious intent but through the various ontological entanglements that materiality entails. What is on the other side of the agential cut is not separate from us—agential separability is not individuation. Ethics is therefore not about right response to a radically exterior/ized other, but about responsibility and accountability for the lively relationalities of becoming of which we are a part."[85]

Barad makes clear that agential separability is not individuation and that our responsibility toward the other does not occur through conscious intent. She emphasizes the point that the other (nonhuman others included) is not seen as an exteriorized other, but rather as another within a relationship. Importantly, however, there is also a reconciliatory tone in the ethical response that Barad forwards, taking the form of accountability or responsibility toward that other—or what I argue might be interpreted as a molar feeling "for" that nonexteriorized other. Furthermore, this molar commitment may lend itself more easily to a mode of engagement that is moored in transcendence. As Grosz explains regarding ethics:

> Unlike Levinasian ethics, which is still modeled on a subject-to-object, self-to-other relation, the relation of a being respected in its autonomy and the other, as a necessarily independent autonomous being—the culmination and final flowering of a phenomenological notion of subject, Deleuze and Guattari in no way privilege the human, autonomous sovereign subject, or the independent other, and the bonds of communication and representation between them; they are concerned more with what psychoanalysis calls "partial objects," organs, processes, flows, which show no respect for the autonomy of the subject. Ethics is the sphere of judgments regarding the possibilities, and actuality of connections, arrangements, linkages, machines.[86]

Although I have emphasized the importance of recognizing that molar and molecular approaches always coexist, and in many cases need to work together, my interests in revisiting the idea of McClintock's feeling for the

organism is more aligned with thinking about ethics through this second, more molecular sphere of possibilities.

From a parallel site of play I would like to toggle the switch and move from a sense of responsibility moored in transcendence to an immanent sense of desire which is in search of a response—any response. I want to move to the idea of immanence and envision a molecular "feeling around" for the organism. I return to Bose's claim that both the living and the nonliving are capable of response and extend this immanent capability into a microphysiology of desire. At the start of this chapter, I turned to Grosz for her treatment of desire as immanent, positive, and productive. She defined desire as that which forges relations and creates connections. "Desire does not take for itself a particular object whose attainment it requires," she notes, "rather, it aims at nothing in particular above and beyond its own proliferation or self-expansion: it assembles things out of singularities; and it breaks down things, assemblages, into their singularities. . . . As production, desire does not provide blueprints, models, ideals or goals. Rather it experiments, it makes, it is fundamentally aleatory; it is bricolage."[87]

Where biophilosophies of becoming and microphysiologies of desire take us is precisely to *an ethics of matter where desire experiments*. Feeling around for the organism serves as an applied ethics of matter that brings together the qualities of changefulness and nonhuman becomings, kinship and hylozoism, and univocity and immanence. As a microphysiology of desire, "feeling around" resembles a stolonic searching in motion, a reaching toward and touching of an always unfixed and incompletely knowable other, in search of a response—any response. These responses can be good or bad, full of living or dying, but in no way are they reconciliatory. Thinking about our encounters in the lab through these qualities, we begin to see that a "feeling for the organism" can also be a "feeling around" for the organism. What is at stake here in developing this feminist practice of encounter is that different types of inquiries, experiments, and lines of flight become possible in the lab, depending on which applied ethics of matter we follow.

It is hard to know where such encounters will take us. In fact, developing practice-oriented feminist STS approaches for the natural sciences can feel a little bit like putting a love letter into a bottle and sending it out to sea. It is hard to predict if a fellow feminist scientist working away quietly

and diligently in a lab, without a connection to a broader feminist community, will ever find this letter, let alone pick it up and run with it. Over the past few years, however, I have been delighted to see the growing number of undergraduate double majors in women's studies and biology. It will no doubt be very exciting to watch as these feminists enter into labs and start feeling their way around.