

Biophilosophies of Becoming

The molecule's journey backward to Love is made by a very circuitous path. That path leads through the process of opening one by one the passages of its composing principles. By passages is meant channels of communication and sympathy with the main laws and vibrations of the working of the universe. The first step the molecule takes, in this return-journey, is by opening the passage of one principle, the sense of feeling, and becoming a blade of grass.

—BABA PREMANANDA BHARATI

Every time I walk on grass I feel sorry because I know the grass is screaming at me. . . . Basically everything is one. There is no way in which you draw a line between things.

—BARBARA MCCLINTOCK

In the world's audience hall, the simple blade of grass sits on the same carpet with the sunbeam and the stars of midnight. Thus my songs share their seats in the heart of the world with the music of the clouds and forests.

—RABINDRANATH TAGORE

Becoming a blade of grass is perhaps an odd place to begin the task of developing an interdisciplinary project. Add to that the vision of screaming grass and the idea of a blade of grass sitting on a carpet in a hall as an audience member, and now there may be sound reason to flip back to the cover of this book and reread its title. Indeed, it is *Molecular Feminisms: Biology, Becomings, and Life in the Lab*. Starting this chapter by thinking

about blades of grass that grow under our feet, or grass that grows on carefully manicured lawns if you happen to live in a concrete jungle, might appear at first to have very little to do with either molecular biology or feminism, let alone theories and practices in and out of the lab. However, the space where these matters all meet has everything to do with how we think about, and approach, the blade of grass.

Those of us who have had intimate access to grass—whether in our backyards, public parks, savannahs, or in actual grasslands—may be able to recall the smell of freshly cut grass or the feeling of cool blades under our feet. Perhaps you can remember sitting on a soft bed of grass while watching a faraway sunset. Some of us may even recall pulling out handfuls of grass only to find a shallow mess of tangled roots growing together. Alternatively, the thought of grass may conjure for you less idyllic reflections and instead raise concerns regarding the threat of deforestation, the development of genetically modified grass to provide even green turfs for playing golf, images of overly trimmed and herbicide-treated lawns that have been produced at high environmental costs simply for the benefit of human notions of “natural” beauty, or perhaps even remind one of old colonial English gardens and ornamental grasses that were planted and pruned outside of England in order to “civilize” supposedly backward and barbaric lands. Each and every one of these reflections is valid.

What the chapter epigraphs would have us consider, however, is that perhaps our thoughts on grass—whether we are pleased by its presence or not—may not just be about contemplating its role as a silent backdrop to our outdoor excursions, or considering the historical and political factors that go behind our enjoyment of picturesque green vistas. Rather, the epigraphs suggest that the thought of *becoming a blade of grass* or getting closer to grass is more about acknowledging the desires, voice, and status of grass. They raise the question of how we as humans act toward and respond to something as simple as grass, and ultimately how we might orient ourselves to a more diverse range of matters that constitute our own bodies, lives, and the world around us.

While taking pause to consider our relationship with grass, we may be inclined to start by ruminating on our own human status compared to that of grass and our grand place among all of nature’s organisms and elements. The organisms and elements of nature referred to here include

nonhuman animals, plant life, microorganisms, molecules, and even those rocks, minerals, and inorganic matters all around us that have been deemed inanimate or nonliving. By beginning with a blade of grass—or better yet, with molecules that love and that work toward becoming a blade of grass, with grass that has the capability to scream, or with a blade of grass that holds equal footing with the sunbeams and stars—we may be prompted to go even further and pose some difficult questions regarding not only the nature of our human encounters with the environment but also questions regarding the nature of nature itself.

We might, for instance, start to consider more seriously the possibility that the world is perceived and actualized not only by humans but also by nonhuman beings, organic and inorganic, animate and inanimate, living and nonliving. We might begin to pay more attention to and give more credit to the intricate and perhaps even imperceptible forces that push and pull, or desires that are enacted or expressed by nonhuman organisms, molecules, and elements, which undoubtedly contribute to the building up and breaking down of our universe. We might begin to consider more carefully the assemblages and entangled subjectivities that are bound to form between those who claim to observe this nature (never innocently) and those objects in nature, which are being observed (never passively). We may further start to question the limitations of what has come to constitute the human subject as an “autonomous agent” in a liberal humanist sense in our societies, who through a series of moral and legal codes has been given the right to either observe or the choice to be observed. We may start to wonder how our need for defining such a unified subject has undoubtedly resulted in the articulation of those who have come to constitute that subject’s “other,” both human and otherwise.

Where these questions regarding the nature and status of humans, human others, nonhuman others, subjects, objects, knowers, and the to-be-known lead us, is precisely where the disciplines of philosophy and science have always met and where they have also promptly become entangled. Some may argue that the boundaries between philosophy and science have never been clear. It is precisely at those spaces of unclear boundaries and entanglements between philosophy and science where feminist, post-colonial, and decolonial scholars have dedicated a great deal of their creativity over the past few decades through their analytical, theoretical,

organizational, and material contributions. They have long known the high stakes involved in the not-so-simple acts of observing nature and producing knowledge. Many have pointed out that not all knowledge systems are considered equal and that in some dominant traditions of philosophy and science, not everyone is considered capable of being a knower, even when the knowledge that is produced relates directly to their own lives and experiences.

Feminist, postcolonial, and decolonial scholars have pointed out the cost of coming to know the world if this knowledge is sought and obtained only, or primarily through, the limited scope of “modern” or what is often referred to as “Western” traditions of philosophical and scientific inquiry.¹ These traditions of philosophy and science, which are generally traced back to the era of the classical Greek philosophers Plato (428–348 BC) and Aristotle (384–322 BC) and the European Renaissance (the fourteenth through the seventeenth centuries), are defined by a metaphysics that made very clear distinctions between the inferior ontological status of raw matter compared to the superiority of that entity which had the capability of moving from raw matter to assuming a form. Plato treated the body as a mere vessel for the soul.² This distinction operates in Cartesian dualisms that further separated “man” from nature and the mind from the body.³ This transcendent distinction and relationship between form and matter, or the soul and the body, made its way into the Enlightenment (the seventeenth through the eighteenth centuries). Ultimately, this metaphysical framework of divisions, distinctions, and discontinuity has led us to the many philosophical and scientific approaches that we are taught and that we observe today, particularly in public and private institutions of higher learning. In addition to seeing the world through the lenses of discontinuity, transcendence, and dualisms, these approaches have been further limited, as some philosophers and historians of science have argued, by their epistemic reliance on reductionism and claims of achieving aperspectival objectivity.⁴

Feminist, postcolonial, and decolonial scholars have argued that these traditions in philosophy and science can be further characterized by the liberal humanist principles that reside at their core.⁵ They have suggested that this form of humanism has led to the creation of hierarchies of being, where greater or lesser values are placed on different lives (including human) and expressions of being. Such dominant philosophical and scientific traditions are built upon the problematic belief that there is a

singular and easily discernable positive teleology of thought and progress that is somehow unique to the West, and that this entity, “the West,” is derived from a history and materiality that is distinct from and superior to “non-Western” thought and cultures.⁶ These scholars are critical of the colonial and imperial-inflected definitions of what has come to constitute modern philosophical and scientific thought versus the so-called uncivilized or “premodern” traditions of knowledge production.⁷

Together, the disciplines of both philosophy and science, as perceived in “the West,” have come to form a legacy whose modes of inquiry and knowledge production have, as a default, continued to place at its center of analysis what Audre Lorde theorized as the “mythical norm.”⁸ Defined by Lorde as “white, thin, male, young, heterosexual, christian and financially secure,” this mythical norm occupies a position of privilege, or what Simone de Beauvoir called out as holding positions of both a positive and neutral subjectivity.⁹ It is from this view of the mythical norm and the subject position of positivity and neutrality that current and dominant traditions of philosophy and science have developed their systems of seeing, naming, and defining the world.

In turn, the questions and answers derived from the ontological, epistemological, methodological, and ethical frameworks made possible within this dominant metaphysical tradition have been written into our textbooks. These frameworks have provided the language, ideas, and experiments for how we can come to know the world and how we are to orient ourselves toward the multitude of others that inhabit this world. As Claire Colebrook has stated, “the way we think, speak, desire and see the world is itself political; it produces relations, effects, and organizes our bodies.”¹⁰ If this is indeed the case, that how we see the world is political to the point of organizing our bodies, then something as simple as how we see and think about a blade of grass may matter a great deal to how we see and think about molecular biology, feminism, and where the two meet. If we want to reflect on how it is that we have come to know the world, we must also consider which questions have been asked about the bodies and biologies around and within us, why they have been asked, how they have been asked, and by whom. Much may be at stake in how we orient ourselves toward supposedly simple matters, and ultimately there could be much to gain if we follow through with the questions and answers that grow out of these encounters.

What Can Grass Do?

What can we learn to know if we begin our inquiries by thinking with the blade of grass? It may be of little to no surprise to agrostologists and serious gardener-types out there that in a Carl Linnaeus-inspired taxonomical world, grass has been classified as belonging to the kingdom Plantae, the division Anthophyta (flowering seed plants), the class Monocotyledons (embryos with one seed leaf), and if we keep going down the taxonomical ladder even further, into approximately 11,369 accepted different species according to the Kew Royal Botanic Gardens's online database aptly called GrassBase.¹¹ Although grass taxonomy, and the practices of naming varieties of grass and identifying the properties of what grass *is*, is itself a vast and productive field of analysis, this book focuses on a set of questions that can be applied not only to our knowledge of grass but also to feminism and molecular biology.

As the chapter epigraphs prompt us to ask, how does an organism such as a blade of grass happen? How does a blade of grass extend or retract itself through time and space? What does grass require in order to change, develop, grow, and perish? How does grass react to being touched and how does grass express desire? By turning to the abilities of grass, we can begin to think about matter and molecules not only through classificatory or representational terms but also through the question of *what they can do*. What can we learn from the abilities of creeping grasses to spread not only by developing new shoots that emerge from nodes on underground stems (rhizomes) but in some cases also by developing horizontal stems that grow above ground (stolons)? Posing this line of questioning is not only possible but has in fact become imminently relevant to the field of feminist STS and to a project such as the present one.

Rather than asking what counts as grass, defining what grass actually is only in terms of its chemical properties and physical structures, or using the traditional and dominant philosophical and scientific practices of naming, identifying, and placing various forms of grass into neat categories by pointing out what it lacks compared to other organisms and differentiating it from what it is not, this chapter takes a molecular approach to asking what matter, molecules, bodies, and organisms such as grass can do and are capable of doing. By taking a molecular approach to biological matter, bodies, and nature, I follow a line of questioning that is generally

less explored in both feminist theory and molecular biology—one that pursues ideas of becoming more than being, movement more than stasis, change more than fixity, and intensities more than identities or essences in biology. This pursuit brings forward what might loosely be referred to as *biophilosophies of becoming*. This is not to say that there isn't any value to organizing our knowledge of grass and other biological matters along the principles of being, stasis, fixed subjectivities, stable identities. As scientists and philosophers, however, we are already familiar with the kinds of knowledge that can be gained by viewing the world through this dominant lens or more organized terms. We know, for example, that the chemical elements of grass include carbon, oxygen, nitrogen, phosphorus, and hydrogen, and that the enzyme chlorophyll enables the process of photosynthesis in grass. This knowledge is important, and the ontological frameworks and questions that motivate us to gain this knowledge are also important. There is no denying that scientific and social progress has been made and can continue to be made through the practices of naming and working with fixed identities.

By becoming a molecular biologist, however, I learned firsthand that arriving at a valid hypothesis requires a great deal of open-mindedness and, at times, what one might even call ontological flexibility.¹² One had to either learn to put aside their questions regarding the nature of being, or learn how to think about the nature of being and what one was bringing forth, as a direct result of their experimentation. By working with material actants such as genes, hormones, receptors, signal transduction proteins, bacteria, and *in vitro* cell cultures derived from transgenic mice, I came to question my own ontological assumptions and was ushered into orienting my thinking in terms of processes and becomings. Through my own research in molecular biology I came to appreciate what Natasha Myers has described as “excitable ontologies.”¹³ I am intrigued by the possibility of moving feminist politics and feminist STS projects even further into molecular modes of thought by developing biophilosophies of becoming that treat biology in terms of an event and molecular biology in terms of processes.

Why use the term “biophilosophy” and not “philosophy of biology” to describe this project at the intersections of molecular biology, feminism, and philosophy?¹⁴ Although the philosophy of biology dates back to the early twentieth century and is well established as a discipline, Sahotra

Sarkar has argued, and I agree, that there has been a dearth of philosophical engagement with molecular biology itself. His own work is a rich genealogy of the missing history of philosophy in molecular biology, particularly the role of reductionism and the central dogma in molecular biology.¹⁵ Sarkar suggests, however, that despite the discovery of the structure of DNA in the early 1950s, and the vast growth and impact of molecular biology research, “philosophical interest in molecular biology declined in the late 1970s and 1980s when, with few exceptions, philosophers of biology focused only on evolutionary biology and, within evolutionary biology, on the problem of identifying units of selection.”¹⁶

Sarkar makes the case that by turning its attention to evolutionary theory, much of philosophy of biology is out of touch with contemporary biology, including molecular biology, let alone a field such as synthetic biology (discussed in chapter 5).¹⁷ Instead, the philosophy of biology generally engages with a different set of questions. Paul Griffiths has summarized the three types of inquiries that fall under philosophy of biology: addressing general theses in the philosophy of science through the context of biology, subjecting conceptual puzzles within biology to philosophical analysis, and “appeal[ing] to biology to support positions on traditional philosophical topics, such as ethics or epistemology.”¹⁸ Philosophy of biology has much to offer, but for the particular project I am developing here, traditional analytical approaches do not bring me immediately to questions I would like to pose.

Although there is a great deal of overlap, a distinction can be drawn between *philosophy of biology* and *biophilosophy*. Spyridon Koutroufinis has suggested that the borders between philosophy of biology and biophilosophy often shift, but some primary features can be used to distinguish the them. Whereas philosophy of biology turns to a materialism that stems from a mechanistic ontology and “metaphysical principles of classical physics, . . . in a version that is expanded to include the idea of dynamical systems, which include the theories of complexity, self-organization, and chaos,” he suggests that contemporary biophilosophy holds a process-metaphysical perspective and takes into account “notions of matter and causality that have long been established within quantum physics.”¹⁹ Biophilosophy is also open to liberal naturalism, which according to Koutroufinis “allows mental states, such as phenomenal qualities, as aspects

of natural entities and ascribes ontological relevance to abstract, modal, moral, and intentional entities.”²⁰

The biophilosophy I wish to explore here emerges at a moment within feminist STS, which due primarily to the work of Karen Barad can also be said to reflect a process-metaphysical perspective that engages with questions of matter and causality after quantum physics. It is also deeply influenced by feminist philosophical interrogations of subjectivity, found in the writings of Donna Haraway (whose work has been connected to Alfred North Whitehead’s processual metaphysics), Elizabeth Grosz (whose work turns to Henri Bergson’s emphasis on duration and time), and Rosi Braidotti (whose work elaborates Gilles Deleuze’s ideas on nomadology).²¹ These combined trajectories of feminist and materialist inquiry have led me to think more about feminist engagements with process ontology as well as recent interests in process ontologies for contemporary biology.²² A feminist philosophy of biology has much to offer, but the biophilosophy that I am interested in articulating relies less on approaches of subjectivism found in feminist STS and more on those projects that frame the properties or qualities of becoming, movement, change, and intensities of matters and bodies in biology, in terms of process and events.²³

Returning to the question of what grass can do allows us to think about organisms and molecules not as pre-given forms with fixed attributes, but instead, what the biophilosophy of Deleuze might encourage us to discern, as nonhuman becomings. Deleuze’s biophilosophy is an ethical one, aimed at thinking beyond the human and, as some have argued, making way for a new metaphysics.²⁴ In our case, we may think of grass not as a fixed and passive entity, but rather as an event or what Deleuze and Guattari refer to as “haecceity”—that is, as a dynamic interaction between organisms and elements, one that experiences and expresses time and duration, has emergent properties, and is capable of change.²⁵ Drawing from the philosophical works of John Duns Scotus (1266–1308), Baruch Spinoza (1632–1677), and Henri Bergson (1859–1941), Deleuze and Guattari express *becoming* as that continual process of change and flux through which difference is produced.²⁶ This difference is positive and not defined through lack. It is through the production of a continuous difference that life simultaneously emerges, is sustained, and gets dissolved. Discussing the influence of Spinoza and Bergson on Deleuze’s biophilosophy, Keith Ansell

Pearson explains that what Deleuze believes is that “what a body can do is never something fixed and determined but is always implicated in a ‘creative evolution.’”²⁷ Ansell Pearson suggests that what Deleuze is faced with in thinking through difference and becoming is the development of a complex ontology, one in which we are “compelled to think an ethics of matter itself.”²⁸ I return to this question of the ethics of matter more closely in the following chapters.

Resonating with Bharati, McClintock, and Tagore, in Deleuze and Guattari’s *A Thousand Plateaus*, the authors use philosophies of becoming to motion us away from a dominant metaphysical tradition that has led us to believe that not only is there “a distinction between different orders of being” but that humans (albeit some more than others) are definitively and qualitatively separate from all other forms of life on Earth.²⁹ This tradition is marked by dualisms that work to separate “intelligibility and sensibility, doer and deed, Being and beings, condition and conditioned, [and] Creator and creation.”³⁰ Perceiving our reality and existence in this way has given us the idea that humans are far superior to all other matters and forms in nature, and the supposed right to hold dominion over that nature. Bharati, McClintock, Tagore as well as Deleuze and Guattari suggest a different orientation, one that is both ontological and ethical. They present an alternate framework for perceiving our status as humans, and by doing so, force us to reevaluate our place in the world among nonhuman others. Instead of setting ourselves high above and far apart from the other organic and inorganic elements of our physical surroundings, they ask that we attempt to reduce this distance and get closer to such organisms as grass—an organism that grows under our feet and is quite literally “below” us. Rather than turning to a hierarchical chain of being marked by superiority and transcendence, the reorientation to the universe that Deleuze and Guattari promote is one of *univocity* and *immanence*. This reorientation requires moving away from the ideas of humans as ideal and autonomous subjects, and replacing our belief in a “great chain of being” with an understanding of the world that instead acknowledges the univocity of being.

The univocity of being put forward is not meant to suggest that everything is the same, or part of the “One” in some onto-theological sense; rather, as Brent Adkins has suggested, everything exists on a continuous and ontologically single field.³¹ Deleuze and Guattari use the phrase

“pluralism = monism” to make room for difference and the arrival of the new within this ontological univocity.³² As Adkins explains:

Dualisms create exclusive disjunctions, or biunivocal relations between terms. What Deleuze and Guattari are proposing is an *inclusive* disjunction by which we “arrive at the magic formula we all seek—PLURALISM = MONISM” (*Thousand Plateaus* 20). . . . The monism arrived at here, though, is not an Eleatic stasis in which movement is an illusion. It is the monism of the continuity thesis, the monism of univocity. The claim is not that ontology is a monotonous sameness, but that everything exists in exactly the same way. There is no dualism of form and content that must then be related by analogy. There is no transcendence, only immanence. All assemblages are arrayed on the same plane. The formula (pluralism = monism) is magic precisely because it allows for the creation of the new.³³

Therefore, it should be understood that the *ontological univocity* of beings does not mean the erasure of difference. It also does not mean a dismissal of the distributive effects of power. This is a common misinterpretation of Deleuzian philosophy. Of course, we as humans are in many ways different from grass, and from mountains, rivers, and fields of corn, and for that matter from each other. However, is it possible to think about these differences without automatically assigning values on these differences? Are we as humans so very removed from other organic species and inorganic elements that we cannot see or feel a continuity with or connection to nonhuman others? The question perhaps is not whether or not differences exist between humans, animals, plants, water, inorganic elements, and more, but how we think about these differences. Do we choose to see these differences as positive differences, ones that are not understood through their lack or through their otherness from some transcendent figure or object? Do we choose to see these differences as differences in degree, or as differences in kind? By turning to the idea of ontological univocity, I am not interested in disregarding embodied experiences. Nor am I arguing for the equivalent but independent status of all objects through the lens of an object-oriented ontology or speculative realism. Rather, my intention is to see how the idea of ontological univocity can be used to emphasize our intimate moments of encounter with difference

and to alter our treatments of these differences both inside and outside of the lab.

The remaining chapters are invested in exploring what biophilosophies of becoming can do for feminism, for molecular biology, and for the space where the two can meet. They deal with those theories, research designs, and techniques that are already present in both feminism and molecular biology that can help us to think about matter and bodies in terms of flux, motion, and capabilities. They consider more closely those approaches to knowing that can guide us in our encounters with other matters and bodies in the lab. The intention is to extend what becomes possible for both feminism and molecular biology if we think more about the capacities for change that exists in all aspects and expressions of matter, and the precise nature of our encounters with that matter.

I am not in any way invested in dismissing the knowledge that we have gained thus far, either through feminism or molecular biology, that relies on a logic of being, on a metaphysics belonging to the era of classical physics, or on mechanistic ontologies for that matter. I am not invested in discrediting the scientific method or scientific practices of gathering empirical evidence. I am, however, interested in exploring what new knowledges we can produce by thinking in terms of process and events through ontological univocity. More specifically, I want to consider carefully a biophilosophy of becoming that is highlighted by the qualities of (1) changefulness and nonhuman becomings, (2) kinship and hylozoism, and (3) univocity and immanence. These qualities are discussed in more detail below. In the chapters that follow, these qualities are further characterized through biological actants including bacteria, plasmids, *in vitro* cell lines, and minimal genome organisms.

Postcolonial and Decolonial Haecceities and the Project of Reframing

I am fully aware of the hesitation that may lie for many scholars in turning to Deleuzian concepts such as univocity and immanence, and particularly the fear of obscuring or “flattening out” identities, politics, and the effects of power that can come with the use of such concepts. This is why I am purposeful throughout *Molecular Feminisms* about placing these philosophical concepts into conversation with the ideas of anticolonial

figures, and recent work in postcolonial and decolonial studies. The aim is to ensure some level of contextual accountability to this ontological and ethical framework. Of course, it must be understood that there is no singular or fixed context as such that can be said to define any given event. Just as matter, an event, or even the meaning of a text cannot be fixed, so too is true for context. Having said this, there is no point tiptoeing around my reason behind developing biophilosophies of becoming. Put simply, it is to learn how to deterritorialize or decolonize our thought by reframing dominant relations and practices found in both in feminism and in science.

Postcolonial, decolonial, and indigenous studies scholars have taught me the importance of considering the broader context of knowledge-making practices that come with a given philosophical concept or ontological gesture. They have taught me that one way to “decolonize relations and practices” is to give voice to a diverse range of knowledge bases in order to produce new ontological accounts.³⁴ In this way, concerns regarding the context of an event can also become opportunities to think about social justice. For instance, as decolonial frameworks, both feminist and postcolonial STS argue that “Western modern technosciences tend to distribute their benefits primarily to already well-resourced groups and their costs to economically and politically vulnerable groups.”³⁵ Both fields also prioritize the concerns of those who have been marginalized or are considered “other” by the global North, calling attention to issues involving, but not limited to, the “environment, development, corporatization, and militarism.”³⁶

Sandra Harding explains that decolonial perspectives simultaneously allow for the “disunity of science” as well as “scientific pluralism.”³⁷ In the case of Latin America, she states, “Latin American decolonial theory has been shaped by liberation theology, dependency theory, Paulo Freire’s work, the distinctive history in Latin America (LA) of development in the context of persisting underdevelopment, and by chaotic recent economic and political histories in many of these countries. Different national histories have included different practices of inequality.”³⁸ She writes that decolonial theory emphasizes the importance of “knowledge that is otherwise,” where the term “otherwise” is understood as “an alternative to both neoliberal and Marxian understandings of democracy, anti-colonialism, modernity, tradition, capitalism, ontology, epistemology, and positivism.”³⁹

Similarly, Laura Foster sees the decolonial approach as “a set of research processes (and political practices) that seek to change the hegemonic ordering of knowledge production.”⁴⁰ In her work on the hoodia plant, patents, and indigenous knowledge in South Africa, for instance, Foster sees the decolonial perspective as an important tool in the “project of reframing.”⁴¹

Therefore, although some may consider it odd to bring Deleuzian thought together with postcolonial and decolonial perspectives to develop biophilosophies of becoming, my collaboration with postcolonial and decolonial STS scholars over the years has taught me several important lessons regarding the benefits of developing interdisciplinary encounters. Simone Bignall and Paul Patton, for instance, remind us that in her famous essay “Can the Subaltern Speak?” Gayatri Chakravorty Spivak points to Deleuze (as well as Foucault) as “being guilty of a Eurocentrism that fails to acknowledge how such ‘speech’ must be presented within the privileged structures of Western epistemology and representation in order to be comprehended or perceived as sensible.”⁴² Yet many postcolonial scholars believe that there is still some value to putting postcolonial theory into conversation with Deleuzian thought. For instance, Bignall and Patton attempt to draw some parallels between Deleuze’s philosophical work and themes in postcolonial studies, including shared “comments about the imperialism of normative Western forms of Oedipal subjectivity; movements of de/reterritorialization describing a conceptual politics of capture and relative liberation; creation of hybrid and migratory forms of selfhood through relational processes of becoming, and of course [the idea of] nomads and their relation to the ‘war-machines’ that embody acts of resistance against the imperial ‘state-form.’”⁴³ Closely related to the project at hand, Bignall and Patton see the value of Deleuzian concepts such as that of “minoritarian subjectivities and minor languages that introduce a deconstructive ‘stuttering’ into majoritarian identities, discourses and literary forms” for postcolonial work.⁴⁴

Similarly, in reference to Deleuze and Guattari’s theories such as becoming and the body without organs (BwO) and their relationship to postcolonial theory and feminism, Sushmita Chatterjee explains that the “theory is often seen as extremely Eurocentric and elitist in celebrating the ability to play at will. What does ‘dismantling the self’ mean for postcolonial subjects? Couldn’t it be another insidious power ruse to distort

the agency of subjects already dismantled through the politics of colonialism?"⁴⁵ However, like Bignall and Patton, Chatterjee also comments on the possible utility of these concepts in creating interdisciplinary conversations. "While recognizing these shortcomings," she writes, "it is also important to discern Deleuze's utility for postcolonial studies where this theory can be of great help to conceptualize minoritarian becomings, think about imaginative possibilities, and move beyond different limitations that colonize worlds and lives. . . . For postcolonial feminism, the 'politics of becoming' can work actively to decolonize relations and practices."⁴⁶

The imaginative possibilities that Deleuzian thought brings to postcolonial theory (and vice versa, I suggest) is highlighted further by Rey Chow. Resonating with my own reason behind turning to Deleuze to work toward a biology that feminists desire, in a recent collection of essays Chow suggests that "following Deleuze's lead" would be "eminently logical for scholars to embark on an affirmative postcolonial studies, one that is less anxiously preoccupied with the mechanisms and apparatuses of European exclusion, perhaps, and more substantively engaged with the transformative potential" that concepts such as "becoming, deterritorialization, assemblages, multiplicities, affects, virtualities, bodies without organs, nomads, the rhizome, and so forth" have to offer.⁴⁷ Using what she calls "Deleuze's method," Chow admits to a certain utopianism in Deleuze's work, but she also suggests that this utopianism can be used by postcolonial studies to inspire liberatory thought. Thus, as I put forward biophilosophies of becoming for feminism and molecular biology, it is crucial for me that this philosophical approach attend to questions of context and work to decolonize certain established relations and practices. As I motion us toward molecular feminisms and biophilosophies of becoming, and ask us to consider biological organisms in terms of events, the question to remember is, How do we also consider the context of any such given event?

It is precisely the context of an event that Deleuze and Guattari are referring to by using the concept of "haecceity." This concept attends to the specificity and individuality of any given event. "There is a mode of individuation very different from that of a person, subject, thing, or substance," they state. "We reserve the name haecceity for it. A season, a winter, a summer, an hour, a date have a perfect individuality lacking nothing, even though this individuality is different from that of a thing

or a subject. They are haecceities in the sense that they consist entirely of relations of movement and rest between molecules or particles, capacities to affect and be affected.”⁴⁸ One way to understand a haecceity, and what makes any given event unique, is to think about things in terms of their ratios of motion and rest (what Deleuze and Guattari call longitude) as well as their intensities and affective qualities (what Deleuze and Guattari call latitude). The vast multiplicities of possible latitudes and longitudes contribute to the singularity of an event.

While discussing the multiplicity of how Deleuze’s name itself has been taken up by so many postcolonial scholars, Réda Bensmaïa suggests that a haecceity allows us to ask specific questions about the events we are interested in analyzing such as, “What century are we in? What wave is sweeping us along? What history?” and “What new visibilities are possible after the postcolony?”⁴⁹ Bensmaïa makes the case that the concept of the haecceity helps us to simultaneously identify and name the “singularities which characterize forces, events, movements and moving objects, winds and typhoons” but also equally name a “period of time.”⁵⁰ In this way we can come to see that the postcolonial as well as the decolonial are not only haecceities in and of themselves in the sense that they name a period of time, but also strategic approaches that we can use to identify and name some specific singularities that define an event. Postcolonial and decolonial haecceities make it possible to think about events in relation to specific dominant practices of knowledge production, particularly in relation to institutions that have in the past, and in some cases, still continue to support imperialism and colonialism.

For instance, in relation to postcolonial and decolonial STS, Itty Abraham suggests that “postcolonial techno-science[,] as a field of enquiry that crosses geopolitical boundaries as it tracks flows, circuits of scientists, knowledges, machines, and techniques[,] is a critical way of thinking about science and technology.”⁵¹ Abraham points out, however, that the emphasis that has been placed on the situatedness or the “local” within postcolonial STS (and within feminist STS, I argue) is often misunderstood. “When the postcolonial as a mode of analysis is linked to a fixed site of irreducible knowledge claims,” he states, “it articulates an ontology that ties knowledge to location as a singular and essential quality of place.”⁵² Therefore, rather than using the postcolonial or the decolonial to mean the study of institutions and knowledge-making practices belonging

to a specific location that was once or is still colonized, I use the terms more broadly. Such scholars as Itty Abraham, Suman Seth, Warwick Anderson, Sandra Harding, Vandana Shiva, Kavita Philip, Michelle Murphy, Gabrielle Hecht, Banu Subramaniam, Laura Foster, Kim TallBear, Anne Pollock, Amit Prasad, Kaushik Sunder Rajan, and more have shown that incorporating a postcolonial, decolonial, feminist, or indigenous STS analysis means reflecting on the situatedness and specificity of technology-mediated events, including biological events, in terms of capital, labor, time, geography, and scale—all of which can be examined through social institutions.⁵³

Although the following is by no means a comprehensive list, recent work in postcolonial and decolonial STS emphasizes that scientific practices and technological interventions should be contextualized in a various number of ways, including an analysis of (1) transnational processes of colonialism and imperialism; (2) capitalist practices of production, consumption, and commodification; (3) gendered and raced labor of production and reproduction and the abstraction of this labor; (4) neoliberal forms of individualism and imperialism; and (5) technological impacts on global as well as local scales. Each of these approaches keeps an eye on the different elements that contribute to the specificity of an event while also developing a broad scope of analysis. These approaches have taught me to remember the situatedness of any given becoming and to remember that our understanding of biological and technological events is always connected to specific practices of knowledge production.

Changefulness and Nonhuman Becomings

Baba Bharati's epigraph at the beginning of the chapter speaks of the journey a molecule must initially make by becoming a blade of grass in order to find its place back to love. Here, what Bharati means by "love" is in fact the Lord Krishna himself, from whose bosom it is believed the universe was formed and to whose bosom all matter and forms are longing to return. Bharati (1868–1914) was a Hindu missionary who came to the United States to spread Krishna Chaitanya consciousness and Gaudiya Vaishnava theology. The quote is derived from the text *Sree Krishna: The Lord of Love*, written at the turn of the twentieth century.⁵⁴ The intention of the book, written as a Hindu theistic text in English by a colonial subject

of British India, was to share a Hindu story of the history of the universe, from its birth to its destruction, to an American audience.

It must be noted that some postmodern critiques of science and rationalism have recently been aligned with “Hindutva” or renewed Hindu nationalist movements that pay increased attention to “Vedic science” to establish Hindu moral superiority.⁵⁵ I highlight the work of Bharati here to show that the idea of ontological univocity, which works against any sense of moral superiority, is not unique to the “West” or to continental philosophy alone. In the introduction to Bharati’s text, he explains that the word “Krishna” in the ancient language of Sanskrit is derived from the root word “karsha,” which means “to draw.” Bharati explains: “Krishna means that which draws us to Itself; and what in the world draws us all more powerfully than Love? It is the ‘gravitation’ of the modern scientist. It is the one source and substance of all magnetism, of all attraction; and when that love is absolutely pure, its power to draw is absolute, too.”⁵⁶ It is not my intention to question what we know about gravity through modern science or simply replace what we have come to know about gravity through the practices of scientific experimentation or the disciplines of mathematics and physics with the term “love.” I am interested in what Bharati describes as the “draw” of love, and want to suggest that the attraction, magnetism, and pull toward something that occurs due to any form of longing may also be characterized in terms of desire.

Interestingly, it is this draw or desire that, according to this text, produces motion or movement in matter. Bharati explains: “All matter is changeful—matter is nothing but collected forms of change. Its seeming substance embodies but motion of change, so that its inmost attribute is changefulness.”⁵⁷ Due to this quality of changefulness, he notes, nothing that is living in the universe is finite, “not even a blade of grass, or the tiniest speck of earth.”⁵⁸ Bharati draws here not only from Hindu theology but also from scientific research and publications by the biophysicist Sir Jagadish Chandra Bose (whose work is discussed in more detail in chapter 2). Around the same time as the publication of Bharati’s text in 1904, Bose was conducting experiments on electromagnetic waves, radiowaves, and plant behavioral biology. His experiments troubled the distinctions between the living and nonliving and suggested that the capacity to respond to a stimulus was not only present in humans and animal tissues but also in plants, metals, and other “nonliving” entities.⁵⁹ Drawing on

these findings, Bharati extended the definition of what counts as living and therefore what has the capacity to express desire, changefulness, and movement, far beyond the human.

While explaining Deleuze's philosophy of becoming, Colebrook suggests that "becoming inhuman" is to understand that "life is the potential to differ"—a sentiment that fits nicely with Bharati's claim that "all matter is changeful."⁶⁰ "Becoming inhuman" resonates with Bharati's idea that in order to think about the history of the universe and the passing of time in new ways, we can think with the different temporalities and rhythms of grass. In fact, Colebrook argues that while developing a philosophy of becoming, Deleuze places a great deal of importance on different rhythms of temporality and scales of duration that are to be found in inhuman or nonhuman becomings. Colebrook states: "Deleuze seeks to expose an inhuman time that will open thought up to a future, a future that is no longer grounded on the unfolding of human history. . . . The history that Deleuze and Guattari compose in *A Thousand Plateaus* places human becoming alongside other planes of becoming. Within human life there are flows of varying speed and slowness—varying degrees of habit, memory, promising and desiring—while there are also the speeds and flows of non-human becomings (including animals, machines, molecules and languages)."⁶¹

In recent feminist and posthumanist projects, turning toward the nonhuman and decentering the human has been an important aspect of the critiques of anthropocentrism and the liberal humanist subject. In her most recent work, Elizabeth Grosz speaks to the role of the nonhuman and inhuman in our human endeavors. She writes:

Art, science, and technology are not frames we impose on matter and ideality but explorations and inventions through the framing that incorporeals provide for our ongoing explorations of matter. They are contingent, contested elaborations of the world's qualities and processes. Art, science, and technology, not to mention the creation of economic and political systems, do not impose themselves from the outside on brute matter . . . but are rather the elaborations, in potentially infinite directions, of trajectories, lines of development, that are already there, immanent, in the prehuman and nonhuman world. It is to the prehuman, the inhuman, the organic and the inorganic, that we

must direct our efforts, and which provide us with human ways to invent, to create ourselves and what comes beyond us.⁶²

What is important here, and what can be thought of as the first set of tendencies that contribute to a project on biophilosophies of becoming, is to realize that becomings, and the capacity for changefulness, should be extended beyond human bodies to other organic organisms such as animals and plants, and even to inorganic compounds, molecules, and matter itself.

Kinship and Hylozoism

Barbara McClintock's epigraph would also have us reconsider our orientation toward grass. I am particularly struck by her sentiment that grass has the capability to scream.⁶³ McClintock (1902–1992) was a biologist who won the Nobel Prize in Physiology or Medicine in 1983 for her discovery of transposons or “jumping genes”. She dedicated her life to studying the chromosomes of different species of maize starting in the 1930s and pioneered the field of cytogenetics.⁶⁴ McClintock biographer Evelyn Fox Keller has explained that developing a “feeling for the organism” was apparently a common refrain for McClintock while describing her own approach to scientific research. For me, this phrase of McClintock's has served as a refrain in my own efforts to develop feminist practices in the natural sciences that heighten our awareness of ethical engagements with what it is that we wish to know. McClintock's “feeling for the organism” returns us to the question of developing an ethics of matter, the broader implications of which are discussed in more detail in chapter 2. For now, however, I want to hone in on two points McClintock raises—namely, the ideas of kinship and hylozoism.

Interestingly, Keller downplays McClintock's claim that grass has the capability to scream, describing it as “an uncharacteristic lapse into hyperbole.”⁶⁵ In specific reference to McClintock's statement that she feels sorry for walking on grass, Keller states, “a bit of poetic license, perhaps, but McClintock is not a poet; she is a scientist.”⁶⁶ McClintock was obviously very attentive to the capabilities of nonhuman actants, and this willingness to describe the capabilities of grass using expressions commonly reserved for humans (such as screaming) should not be dismissed

as crude anthropomorphizing. I would argue that McClintock wants us to reorient ourselves in such a way so that we may learn to be with grass, and to listen to what grass has to say, sing, and scream despite our physical, emotional, intellectual differences or presumed distance as species. She wants us to be aware of the fact that we do harm to grass, but I don't think that this awareness is geared toward preventing us from walking on grass altogether. Rather, it is beckoning us to recognize a sense of kinship or *co-becoming*.

Donna Haraway has spent a great deal of time and effort thinking and writing about a similar sense of kinship, whether through her work on cyborgs or dogs or most recently by drawing our attention to chthonic critters (those that dwell in the underworld).⁶⁷ "If there is to be a multi-species ecojustice, which can also embrace diverse human people," Haraway states, "it is high time that feminists exercise leadership in imagination, theory, and action to unravel the ties of both genealogy and kin, and kin and species. . . . We need to make kin sym-chthonically, sym-poetically. Who and whatever we are, we need to make-with—become with, compose-with—the earth-bound."⁶⁸ A blade of grass may be about as earth-bound as it gets. It so happens that most species of grass grow either as rhizomes, with their roots joined in multiple networks just under the surface of the soil, or as stolons, with their roots growing as outwardly stretching veins running just along the surface of the ground. It turns out that making kin with grass, both sym-chthonically and sym-poetically, may not be such an odd place to begin after all.

However, McClintock's sentiment describes not only a sense of kinship between humans and grass but also a hylozoism that recognizes the capabilities of grass on an equal footing to those of humans. Hylozoism frames nonhuman forms, as well as matter that has yet to assume a form, as being active or "alive" in some way.⁶⁹ Rather than following the philosophical tradition of hylomorphism, where all matter is viewed as passive or inert until it assumes a pre-given form, through hylozoism one has to be willing to consider that all matter, even prior to the movement of this matter into any particular form or relation, has a self-sufficiency and the ability to exert some sort of push and pull on the universe.⁷⁰ For instance, the scientific discipline of taxonomy, which has named and divided grass into more than eleven thousand species, follows in the tradition of hylomorphism whereby clear distinctions are drawn between the subordinate

properties of “raw” matter compared to those of actualized or pre-given forms. As useful as it is for organizational purposes, taxonomy is ultimately a practice of drawing lines between raw matters and forms. Taxonomy must go even further by separating forms from each other that are deemed as being different in kind. It is a scientific system that has been utilized to not only differentiate humans from their natural world but to give different elements, organisms, and even some humans a lesser or subordinate status along a supposed great chain of being. This scientific system requires us to deny the capacities for change that exists in all matter and to rule out the ontological reliance any given entity has upon another.

Lastly, I am struck by McClintock’s claim that “basically everything is one,” which in other terms may be referring to the univocity of being.⁷¹ In my opinion, she is not trying to collapse, flatten, or disregard this difference. In fact, she spent her entire life analyzing the many different species of corn and learning the unique cytogenetic intricacies of each. This connection between the qualities of kinship and hylozoism led McClintock to develop a feeling for the kernels of corn that she studied; it is the ontological univocity articulated through these qualities that biophilosophies of becoming can bring forward.

Univocity and Immanence

Rabindranath Tagore’s epigraph encourages us to frame our relationship with the blade of grass in terms of a live potential, thereby blurring the lines that have typically been used to divide humans from their non-sentient and nonliving surroundings. Tagore (1861–1941) was a Bengali polymath who won the Nobel Prize in Literature in 1913. A writer, poet, musician, and artist, he held a deep regard for even the smallest murmurings that could be found in nature. Tagore established Visha Bharati University in Santiniketan, India, to put into practice an educational philosophy and pedagogy that brought to the fore the importance of one’s orientations toward nature. Tagore is noted for his profound sense of humanism, but this humanism was not the same as that humanism we think of today which holds at its center the modern liberal humanist subject. As Debashish Banerji has noted: “Tagore’s critical humanism, rooted in a pre-Enlightenment Indian canon, included properties which exceeded

the human, . . . we find a Tagore who, while including the freedom, justice, and poetry of the human, reached for identity beyond the human, a becoming-other, through affective empathy, an identification with existences beyond boundaries.”⁷²

Regardless of the religious or spiritual beliefs of Bharati, McClintock, or Tagore, we know that many organized religions such as Buddhism and Jainism would also have us consider the interconnectedness of the natural world more carefully. For example, in the case of Jainism, the principle of ahimsa provides its followers with a karmic impetus to do no harm to other life forms including animals, insects, plants, and microorganisms. However, all three thinkers highlighted here are pushing for an intimacy with grass that is not quite captured by a religious principle such as ahimsa. It seems that they are motioning us toward something other than a karmically-driven, nonviolent stance toward grass. Theirs is an ethics of encounter. Karen Barad has extended the onto-ethical relation to the ethico-onto-epistemological, marking the inseparability of ethics, ontology, and epistemology.⁷³ In later chapters we turn to the fact that none of these relations are without context, but for now let us remain within this onto-ethical plane. Given this starting point, the first onto-ethical maneuver we must deploy involves becoming more aware of changefulness and open to the capabilities of nonhuman others. Next, we must invite a sense of kinship and develop a more hylozoic view of the universe that recognizes the expression of certain capacities in all forms of matter. These capacities may not resemble our own, and of course these expressions will differ between animals, plants, and rocks. Recognizing these capacities brings us to the third set of qualities that contribute to biophilosophies of becoming: that of univocity and immanence.

The idea of ontological univocity would have us consider the differences that exist between humans and nonhuman others as existing on or even comprising an immanent plane of processes and becomings. In a traditional metaphysics characterized by hierarchical taxonomies and well-established orders of being, the gesture of bringing our human selves down to the level of an organism such as grass would undoubtedly be odd and may require knocking the illusions of our superior status down more than a notch or two. It is difficult from our vantage point as humans to summon such a sense of proximity to something as elemental as grass, let alone foster the ability to hear grass scream or acknowledge that grass can

listen to music, unless we are prepared to learn how to live and play on a more level, more equal, or, in other words, an immanent field. The idea of ontological univocity levels this playing field, which in turn is an ethical maneuver. For Spinoza, and philosophers that have followed in his tradition including Deleuze, it is hard to keep a clear division between ontology and ethics. For these philosophers, ontology is ethics—and both exist on an immanent plane. In other words, how we think about ontology, or the nature of being, is in itself a matter of ethics, and in our case, how we can start thinking about an ethics of matter. Together, immanence and the univocity of beings allows us to imagine what it means to think about grass and other nonhuman and inorganic matters that sit in an audience hall *with us* and have the capacity to appreciate the songs and music produced not only by humans but also those songs created by clouds and forests alike. Paying attention to what grass or other organic and inorganic matters perceive is an example of a Deleuzian transcendental empiricism or as Colebrook has described, Deleuze’s “inhuman philosophy.”⁷⁴

Becoming a blade of grass therefore is not about finding this organism’s place along a hierarchical ladder or evolutionary tree, or highlighting what properties or abilities grass lacks compared to humans and other organisms. Neither is it about impersonating or mimicking grass. Rather, becoming a blade of grass is a biophilosophy of becoming that involves thinking about the qualities of changefulness and nonhuman becomings, kinship and hylozoism, as well as univocity and immanence. It is about making connections to organisms and elements such as grass so that we might find new ways to reach out and new ways to respond to the world around us. It is about using strategies, or what I refer to in chapter 2 as *microphysiologies of desire*, to approach difference in the world—not through lack but rather through positive and productive senses. Ultimately, it is about breaking our all too comfortable habits and opening ourselves to the molecular.