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Susan McHugh

University of New England, smchugh@une.edu

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Flora, Not Fauna: GM Culture and Agriculture

Susan McHugh

Genetically modified (GM) food plants, particularly those modified to produce *Bacillus thuringiensis* toxins (Bt), are currently the most controversial and common transgenic organisms,¹ but in the US, which is the largest producer of these and other biotech crops, consumers have a hard time recognizing their difference from conventional foods.² Produced through the same monocrop methods and consumed in the same heavily processed meals that comprise the American diet, GM food plants like Bt corn and soy are now milled and mixed with (and thereby have come to pass for) their conventional counterparts, quietly becoming part of the everyday life of mass consumption. However inadvertently, film and fiction may be contributing to this process, for even narratives critical of the new economic structures of globalization focus on the rare GM animal³ in a world in which markets for GM plants and plant products grow astronomically every year, a trend that suggests a broader representational problem: why do animals (and not plants) loom large in the transgenic imaginary while plants (and not animals) have become the medium of daily encounters with transgenic organisms?

From this perspective, flora and fauna mark either end of a spectrum of genetic narrative potential, characterized at one extreme by adversarial relationships with genetically hybrid animals and, at the other, by often unwitting intimacies with so-called genetically enhanced versions of plants. Breaking out of this narrative mold requires profound shifts in theoretical constructs of cross-species relations, some of which are beginning to take shape in critical animal studies. Historically companionable human-animal relations such as those between people and pet dogs stand as models of multiply-embodied genetic prehistories for many more species, for instance, of the antigenically related viruses that cause human measles and canine distemper. As Donna Haraway has recently argued, this kind of everyday “companion-

ion species" relationship serves as a paramount figure for the genetic plurality and heterogeneity inherent in species life, inevitably altered but not necessarily imperiled by genetic modification.

Given the virulence of the GM animal narrative strain, however, I want to suggest that flora, not fauna, may prove the most effective means of asserting Haraway's point that "transgenics are not the enemy"⁴ because even relations with pet dogs are framed in terms of the GM animal menace. To date, the stories of prominent pet canines at the center of multi-million-dollar studies in genetics and genomics all too readily fit the popular and negative transgenic narrative pattern by featuring singular animal figures of monstrous excess (usually couched in the eugenic rhetoric of breed), including biomedical entrepreneur J. Craig Venter's standard poodle, Shadow, whose genome draft (the first of a canine) was made public in 2003, and the pet mutt named Missy, whose cloning is the inspiration for the now defunct company Genetic Savings & Clone, which in 2004 became the first viable commercial pet cloning service. For many years my research has focused on animal narratives, so I know that stories of cross-species intimacies can and do serve as powerful sources of social critique, even transformation. But because the popular narratives of genetic manipulation so often use a recognizable kind of animal as a figure of the hybrid social world of genetically modified organisms (GMOs) populated today by multiple plant, animal, and chimerical forms, animal representation also provides a powerful mechanism for affirming the status quo.

What gets lost in the focus on a particular cross-species relationship is how images of transgenics as good/bad seeds develop in relation to the commercialization of GMOs, a process that, in practice, increasingly appears to affect social webs that include many more relations across species than researchers initially consider. Leaving aside the possibility that other transgenic organisms are evolving from these human-created varieties,⁵ it is apparent that patented agricultural GMOs are shaping people's lives even as they become part of them. While the ethical and ecological implications of these effects and intrusions are only beginning to unfold, their narrative sources seem clearer in structures focused on the individual instead of the cross-species contexts that have been complicated by the introduction of transgenic organisms. So, what follows here takes a different tack to chart a parallel course: just as Haraway has shifted the object-choice in her research from cyborg to dog,⁶ I will focus not on animals but plants, similarly turning away from the spectacular fantasies of resurrected dinosaurs and cloned dogs toward stories of more mundane interactions in order

to argue that the process of representing transgenic plants—particularly through post-commercialization stories in which these organisms are in widespread use as food products—needs to foreground engagements across deeply mixed communities of humans and other species.

The challenge for literary and, more broadly, cultural studies, as I see it, is to think about GM plants for the practical reason that they are at present more involved in our lives than transgenic animals. Even more importantly, thinking about plants can tell us more about the textual processes whereby animals and not plants have become attractive for telling stories about transgenics. In laying bare the shared contexts of modification, such narratives might also point to the ways in which genetic modification shapes and reflects companion species relations, suggesting further the broader relevance of narrative analysis to research in genetic science. Theorizing the radical differences constituted by transgenic plant life is part of the struggle, but so too is coming to terms with the histories (even prehistories) of plant, human, and other animal mutualisms that mutate in and around biotech crops. Ruth Ozeki's 2003 novel, *All Over Creation*, a transgenic plant fiction, appears to take on this representational challenge by bringing together cross-species metaphorical and structural relationships in a narrative of one historically significant GM crop plant. Although at key moments the story turns to animal forms, suggesting how plants remain overshadowed by animals in the mainstream stories of GM technology, the novel overall suggests that plants can be catalysts for new ideas about GMOs and the problems they engender.

All Over Creation closely follows the commercial introduction and unprecedented, rapid recall of biotech giant Monsanto Company's NewLeaf brand potatoes, the first bioengineered Bt crop plant to be marketed.⁷ Like all Bt plants, this potato was modified to include a gene sequence from a soil bacterium whose spores contain a protein that releases a fatal toxin when it breaks down in the gut of insects in the Chrysomelidae beetle family, including the Colorado potato beetle (*Leptinotarsa decemlineata*), the pest posing the greatest threat of insect damage to US potato crops. These Bt potatoes were sold as seed to farmers across the US from 1995 through 2001, when Monsanto made the singular decision to "quietly mothball" this innovative product.⁸ So far, NewLeaf is the only GM crop plant to be taken off the market. One problem was that farmers balked at the high price of these strictly licensed seed potatoes, so they never gained more than five per cent of the American potato market. But another key factor in their demise was direct requests from potato buyers for major commercial food proces-

sors that their farmers not plant NewLeafs. Fearing that even association with GM food safety debates would harm their popular brands, McDonald's and Frito-Lay were among many companies that spurred a vote of no confidence in the gene-altered potatoes.⁹ Monsanto's control over the stories of this lucrative crop seemed suddenly less certain than its control over the crop itself. Ozeki's novel develops this complexity through a narrative web of interconnected stories around a parallel product, the fictional company Cynaco's NuLife potatoes.

All Over Creation also uses potatoes to tell genetic stories of American fertility, broadly writ, focusing on a family potato farm in Idaho that was once owned by aging, white Lloyd Fuller and his Japanese war bride Momoko. But as the novel begins, the farm is signed over to their neighbors, the Quinns. The form of the narrative, crafted in part as a conversation with a preexisting text—*The Harvest of the Years* (1927) by Luther Burbank, described in the novel as the autobiography of “the Father of the Modern Potato”¹⁰—becomes more complicated by the introduction of a dizzying array of perspectives along with no easy answers about how to change American food habits. Less clearly than it weaves together the interpersonal struggles of its characters, the intertext here points readers to the genetic and social significance of the humble spud. Incorporating multiple layers of involvement and embellishing aspects of history, the novel shows how problems like homogeneity affect both the genes of food plants and the varied social groups meeting in a global marketplace. It tells the tale of how Bt potatoes became groundbreaking (in the broadest sense) by drawing different human reproductive and political stories—including those of farmers, organic activists, fast food workers, public relations (PR) specialists, and perhaps most importantly, teachers—together with stories of potatoes' multifarious reproductive and cross-cultural significances. More than just reflecting the current state of GM agriculture, the network of narratives at the core of *All Over Creation* uses these plants to challenge conventional approaches to genetics, including the forms through which we as humans identify others and ourselves.

The stories of GM potatoes in fact and fiction begin in the US, but they do not end there. Mitigating any claims of organic activist victory, globalization has assured a new life for potatoes like the NewLeafs. While these Bt potatoes have been removed, for now, from the American food chain, subsequent promotions and protests of Monsanto's GM potatoes in India show how genetically altered crops are being retooled for relocation to developing nations, even through food donations alleged to be instances of dumping.¹¹ Similarly, Ozeki ends her fiction of

the NuLifes' short US shelf life by underscoring their indefinite future overseas. Propelled by a PR spin emphasizing the dubious "human health benefits of GE [genetically engineered] crops, like Golden Rice" (344), Cynaco withdraws its NuLifes from American markets with plans to plant them in the test fields of developing nations.

Underscoring this uncertain fate, *All Over Creation* concludes with the suggestion that, once released, Bt potatoes persist in social networks because their story is not controlled by professional scientists and other traditional intellectuals (who are conspicuously absent from this fiction) but influenced by dilettante teachers, who are by and large what Stuart Hall once termed "organic intellectuals," in both the literal and Gramscian sense.¹² That is, the most powerful critique of transgenic food production is imagined here as coming not from those whose job it is to know the most about genetic science, but from those who have taken it upon themselves to learn more than traditional intellectuals as well as to be responsible for "transmitting [...] that knowledge to those who do not belong, professionally, in the intellectual class."¹³ As commodities, GM plants are positioned to enhance the power of corporate and educational institutions over consumers, but as texts they can assist the organic intellectual (who is also an organic activist in Ozeki's novel) to show how their meanings are also produced and functioning among groups outside the intellectual elite.

Connecting GM plants to human social problems in this complex way proves no easy task for this novel, and the context in which information about GMOs is transferred often proves as important as the information itself. For example, an early scene depicts Geek, a former software engineer turned organic activist, explaining how GM agriculture poses serious threats to global biodiversity while walking around a mall stoned with his new friend Frank, an orphaned foster kid, high-school dropout, and McDonald's janitor. Frank eats conventional junk food and ogles girls, all the while struggling to follow Geek's explanation of what Frank should know and why he should care about transgenics. Because they get high before their conversation turns to GMOs, the scene is rife with misunderstandings, and the trivial and funny elements conflict with the serious content of the conversation, creating some confusion. Readers may wonder whether they are meant to laugh at or identify with Frank's ignorance, and the fact that the scene unfolds from Frank's perspective further undermines sympathy for Geek (who is, after all, geeky) as an organic intellectual. But the discomfiting aspects of this scene also transform the use of GM plants to bridge the intellectual disparity between the two classes represented

by these characters into a subtle commentary on the mixed cultural effects of genetic fictions. Predominant and polarized attitudes about GMOs may have emerged from the tensions across political activism, corporate conditions, and academic institutions, but today they are also intricately tied to American consumer experiences that have become as blasé as eating fast food at a shopping mall. Even more than the content of Frank and Geek's conversation, the context in which that conversation takes place does not invite questions about how daily choices have come to concern GMOs, let alone about the relationship of largely uninformed decision-making processes to the didacticism that more generally has come to shape genetic discourses. The complexities of this kind of "organic" tutelage become even more apparent as the novel connects it more clearly to GM plants in the global context of what Foucault terms "biopower,"¹⁴ and it is in this aspect that the novel most clearly takes up the challenge of creating the conditions for its alignment with a "minor literature," as developed by Gilles Deleuze and Félix Guattari, of genetics, an alignment I will return to near the end of this essay.

Juggling multiple opinions across and within its many characters, the novel as a whole shows how decisions about using Bt potatoes are indelibly linked to global belief systems, especially stories of technological and biological creation. Less clearly, it also positions potatoes metaphorically to show how individuals in the novel use them to understand their own identities, an approach that develops in tension with the attempt to represent mixed species populations whose complex interactions are irrevocably altered by the introduction of GMOs. In the novel, homogeneity threatens the central human population's continued "creation." In response to this threat, Ozeki offers glimpses of heterogeneous groups that appear initially on the fringes of the novel's central social network. Interactions among the novel's social groups—including plants and insects—become the means by which the novel models the more challenging notion that GM technologies are rooted in profoundly shifting, heterogeneous communities whose stories conflict, converge, and continue with Bt potatoes. Particularly through its direct engagement with the rich histories of potatoes, *All Over Creation* casts the social repercussions of a Bt version of Americans' favorite vegetable into a wider context than the GM food safety debates of recent years. The mixed cultural histories of these peculiar tubers make Ozeki's uses of them as structural models all the more prescient.

Potato Effects

A New World native and the main food of ancient Andean peoples, potatoes have a long, convoluted relationship with human cultivation that became increasingly volatile as they moved northward via European contact. The first Westerners to encounter these tubers, Spanish Conquistadors, at first did not eat potatoes but instead used them to manipulate Andean peoples, whose culture over thousands of years had grown to depend on *chuño*, a freeze-dried preparation of potatoes, for food. To enslave these Native American peoples, the Spanish seized their potato stores and meted out rations as rewards for work, presaging the history of European and later global industrialism and its connection to slavery. But, in the process, the Europeans learned to eat potatoes, too, setting in motion historical forces that would eventually lead to the genetic modification technologies embodied by the NewLeafs/NuLifes.

First brought to Europe from South America in the sixteenth century, potatoes initially were planted as rare ornamentals by Europeans, but by the eighteenth century, their high nutritional value as well as low space and tillage requirements appealed to the needs of burgeoning populations, and they soon challenged traditional field crops like oats and wheat as the staple of choice across cultures. Consequently, these tubers from another continent became part and parcel of European nations, even an enduring marker of postcolonial conditions, although their early use (and consequent stigma) as pig feed colored what were often strikingly different, nationally specific patterns of cultural integration. For instance, in Ireland the potato gained acceptance first from the poorest landowners, who used their small plots to raise potatoes to fatten pigs, which they then sold for cash, laying the groundwork for an export and later subsistence economy that proved fatal during the Great (fungal) Blight plaguing nineteenth-century Europe. But in France, the potato was first embraced by social reformers, chief among them Antoine Augustine Parmentier, who learned to appreciate the potato's merits as human food while held prisoner by the Prussians during the Seven Years War and subsequently worked to promote them within the governments of Louis XV and the Revolution.¹⁵ Potatoes' minimal cooking requirements, combined with their exceptional protein, starch, and vitamin contents, sealed their fate in terms of biopower: with the rise of the industrial revolution, potatoes became integrated into poor people's diets, then institutionalized through urban phenomena like baked potato carts and, later, chippers, and now, omnipresent in multinational fast-food chain restaurants.

Charting post-contact European population growth, historians still debate whether the potato directly caused massive social problems, an oddly anthropomorphizing assumption that eclipses complex colonial and biological conditions, for instance, of the Irish famines of the mid-nineteenth century. An image like Vincent Van Gogh's iconic painting *The Potato Eaters* (1885) appears to justify this kind of logic by providing a conventional, if stark, illustration of the identification of degraded, dirty, working people living underground with this root vegetable as their sole foodstuff. But the painting's value as social critique relies on a shared understanding of the ideological conditions that structure these immediate relationships. Read in the context of biopower, the conditions suggested by the painting came about not just because individuals chose to grow, buy, and eat potatoes but, more complexly, because human populations fed on potatoes outgrew agricultural sustainability and thereby became integral parts of a process in which potatoes formed the basis of manufacturing and later service economies. The poor miners who are *The Potato Eaters* depend on this meal to be affordable and easily prepared, relations that illuminate the potato's continuing centrality to the diets of Europeans as they relocated worldwide.

By the beginning of the twenty-first century, global production, distribution, and consumption of potatoes grew exponentially and so, too, their importance to biopower. What is not so clear is what happens to non-target populations in this process. While a new emphasis on biopower threatens to displace what Foucault called "anatomo-politics" based on disciplining discrete bodies (or beings), it also fosters "biopolitics" based on proliferating social forms (or becomings) in emerging models of globalization.¹⁶ From this perspective, potatoes' historic influence in worldwide population shifts central to industrialization would seem to mandate the development of their GM versions. At the same time, it scripts an uncertain fate in their export to so-called developing nations like India that spites those who seek authority over this process.

Joining meat as the other staple of European-American diets from the earliest days of the republic, potatoes retrospectively appear inseparable from US national identity. And, as the chain-restaurant French fry has become the destination of the vast majority of the world's potato harvest, this "totem vegetable of modernity" has gained a new international role in representing the pervasiveness of contemporary US consumer culture abroad.¹⁷ Less predictably, through associations with the histories of white western imperialism, certain people come

to identify (and to be identified) with potatoes.¹⁸ Ozeki's characters, for example, illustrate patterns of racialization through associations and dissociations with them.

Chubby, white Idaho farmgirl Cass is cast always as the potato in the annual grade-school Thanksgiving Day pageant, unlike her Japanese-American friend Yumi, who "never liked potatoes much" but instead "preferred rice," exhibiting a dis-identification that "in a state of spuds, was tantamount to treason" (4). Elaborating the strained friendship of these Anglo and Asian characters who define themselves and each other in relation to potatoes and rice, respectively, *All Over Creation* invokes cultural histories of food to examine the social dynamics of one of the most surprising (if not most celebrated) results of this vegetable love. As in her first novel, *My Year of Meats*, Ozeki examines intersections of food production and human reproduction, only here through transgenic modification in plants, a topic that is perhaps even more conspicuously absent than animal slaughter in contemporary American literature and popular culture.

The potato's polymorphous reproductive system makes this vegetable an ideal metaphor for the variety of reproductive techniques and child-rearing situations that shape human life in Ozeki's novel and more generally, in the twenty-first century. Its eyes (buds) make the potato a rhizome, a decentered network connected and propagated through tubers. Cutting up potatoes and sowing pieces with eyes that grow new plants is the typical way of cultivating them. Farmers rely on this cheap and relatively simple method of cloning potatoes to ensure consistency in their crops, for "potatoes, like human children, are wildly heterozygous" (57). But this procedure is not fail-safe.

Potatoes themselves jeopardize the genetic homogeneity of clones through an uncommon phenomenon known as "bud sporting," in which one (or a cluster) of a potato's several eyes mutates to create a plant that is genetically and often visually different from others of the same variety, even its parent and siblings. While bud sporting is uncommon, it has been long documented by naturalists including Charles Darwin, who noted several instances from observation of color differences in buds.¹⁹ Through the nineteenth century, before the "Mendelian forces" behind these seemingly contradictory processes became better understood, the overwhelming preference for cloned fields set the stage for the drama of potato agriculture, which collapsed in tragedy with the Blight.²⁰ In direct response to this failure and its devastating effects, particularly for the people of Ireland, agriculturalists promoted genetic science to cultivate disease- and pest-resistant varieties, an approach that appears to have culminated in the NewLeafs.

The most prevalent variety of potato today, however, was created through other means. Yet another way in which potatoes manifest their own vast genetic diversity is by reproducing sexually through their flowers, which in rare instances can create seed balls. For hundreds (perhaps thousands) of years nearly all of the new varieties were produced through this “true seed.”²¹ Plant developer Luther Burbank discovered one famous seed ball on his farm in 1872, and the agricultural and more broadly cultural effects of what Burbank chose to do with it provides the pretext for Ozeki’s novel. Burbank planted all of the seeds from the ball, then selected two, seedlings “that were amazing, valuable, and a distinct type” from the then-popular Old Rose variety with which he started.²² From these two, he developed what has become the most popular cultivated potato, the Russet Burbank—popularly known now as *the Idaho*—which has proven so consistent in length and so tasty when fried that it set the fast-food standard of “the three-inch golden french fry” (246) for which it is used today by restaurant chains worldwide in “record tonnage.”²³ The problems of the vast monocrop farms that supply these ever-increasing demands have been compounded exponentially by their focus on a single variety of potato, and Ozeki’s novel uses a Bt version of the Russet Burbank to show how it contributes to the far more pervasive dangers of homogeneity to culture and agriculture.

The Idaho’s success has put devastating demands on potato suppliers to pursue not simply monocrop farming but much more dangerously mono-variety farming. At the same time that the rapid growth of fast-food chains in the last quarter of the twentieth century led to an unprecedented potato boom narrowly focused on the Russet Burbank, it exacerbated the problem of insect infestation of crops, specifically the Colorado potato beetle, which moved from small, remote areas in its native Rocky Mountains through potato fields all the way to the Atlantic coast in a twenty-year period at the end of the nineteenth century,²⁴ and along with the Idaho potato, reached record numbers in the 1970s. Rail transport seems the most likely reason for the beetle’s initial rapid spread, but what secured its role in international history were the vast, uniform potato fields grown to supply the needs of poor urban workers, for whom this cheap, filling, and nutritious vegetable has become an increasingly standardized mainstay. Chemical poisons like lead arsenate (the Bordeaux mixture) and later dichloro-diphenyl-trichloroethane (DDT) became standard means of combating this insect infestation and, however unintentionally, of poisoning ecosystems as well.

These chemical inputs have narrowed already slim profit margins and made farm work even more dangerous, yet cash-poor independent growers like those depicted in *All Over Creation* see few alternatives to using them. For the novel's young potato farmers, Will and Cass Quinn, who wonder whether their own infertility stems from lifelong agricultural chemical exposure, planting GM potatoes appears to be a technological solution to the problems plaguing production, especially because the cost of the fictional NuLifes (unlike that of the actual NewLeafs) does not seem prohibitive. They first learn about them from a direct-mail brochure that presents Bt potatoes as a panacea for farmers short on time and money. In it, Cynaco claims that NuLifes require less application of toxic pesticides, promising lower labor and overall investment costs and less immediate chemical exposure, along with higher crop yields.

Cynaco's appeal to agricultural sensibilities, not science, sounds too good to be true, and it is. Evolutionary models indicate that wide-scale cultivation of GM crops will foster the development of toxin-resistant insects, in the long run negating any short-term gains.²⁵ But the lure of Cynaco's GroundUp-ready NuLifes, which, like Monsanto's RoundUp-ready seed lines, are genetically modified to tolerate exposure to a powerful patented herbicide, proves irresistible to the Quinns, who, like many economically endangered, independent US farmers, were tempted to try GMOs in their fields after sale prices for crops hit all-time lows in the mid-1990s.²⁶ Most of the corn, soy, and canola crops grown in the US have become GM in the past decade, but potatoes suggest a different story.

If, as the novel insists, "resistance is fertile!" (416), then one man's potatoes all the more readily prove another's poison. Cynaco's promises sound all too familiar to the Quinns' elderly neighbor Lloyd Fuller, from whom they purchased their farm. Lloyd is a former potato farmer relegated by illness to part-time work in promoting the small-time seed company that his wife Momoko started in her garden. His personal history, particularly his longtime hero-worship of Burbank, begins to account for his suspicion that, despite corporate chemical interests' desire to make chemical input "junkies" of farmers in the vast monoculture developing around the Russet Burbank (146), "deep down, they [the farmers] know" the truth. His bible is Burbank's *The Harvest of the Years*, in which the famous potato's story is situated as a mere stepping stone (a few pages amid a few hundred) to the author's main concern with documenting the pursuit of a lifelong goal that led him to work with many more plants, namely, "dignifying the word

'hybrid.'"²⁷ In part because Lloyd's long career as a potato farmer is necessarily different from the varied experiences of Burbank, who called himself a "plant developer" (as distinct from both agricultural scientist and farmer), Lloyd struggles hard to uphold this ideal.

In the early days of the seed company, the "diversity" of Momoko's garden makes her husband, until then a lifelong monoculturalist, nervous (111), and perhaps with good reason. Their neighbors complain that the garden attracts potato-damaging insects, thus contaminating their soil and threatening their crops. But working with Momoko in her deeply mixed and constantly mutating garden wins Lloyd over by providing him with the opportunity to become a latter-day Burbank, similarly exchanging vigorous plant specimens with clients all over the world. In the process, these clients become an ever-expanding, sympathetic audience for Lloyd's extension of his idol's critique of genetically homogenizing and deterministic ideologies, though working from a potato farm at the end of the twentieth century presents Lloyd with more vigorous opposition than Burbank might have experienced. In open letters that echo Burbank's own missives to seed customers, Lloyd upholds the same Mendelian values of diversity and selection, against insidiously propagating institutions of homogeneity, symbolized for him by transgenics like the NuLifes.

Like Burbank, Lloyd is neither a Luddite nor a eugenicist. For instance, in one letter, he argues in favor of introducing exotic plant varieties by noting that all the major food crops in the US today (potatoes included) are not native to North America but descended of "immigrant[s]" like most American citizens (67). But, just as Burbank finds problems in applying his planting principles to human politics, the unpredictability that Lloyd learns to prize as the product of promiscuous plant life proves harder for him to manage in the human world. Aimed at small-scale seed buyers, his rhetoric also attracts a vegetarian organic activist group, the Seeds of Resistance,²⁸ who find in his letters an unlikely source of inspiration. Following Cynaco's NuLifes, the Seeds, led by Geek and including Frank, come to Lloyd's farm in Idaho, a scene they read through urban consumer culture as "Mr. Potato Head's cloning ground, his place of origin" (107). With their communal life aboard the Spudnik, an RV converted to run on biodiesel, and their radically organic politics, the Seeds bring to potato country a whole new set of possibilities for the family farmers.

Along with staging consciousness-raising public events, the Seeds eventually enlist Lloyd's help both in creating a seed bank with Momoko's business and in staging a protest in which some of

the Quinns' Bt potatoes are destroyed, sparking family frictions long smoldering on the farm. Bringing these problems even closer to home, Ozeki explicitly connects the polymorphous perversity of potato breeding with human fertility through Lloyd's less harmonious interactions with his own biracial daughter Yumi, who arrives shortly before the Seeds to introduce her multiracial—or, as Momoko calls them, “all mixed up”—children to their grandfather before he dies (118). Allowing for multiple perspectives on potatoes in agriculture and their connections to other significant aspects of human life, Ozeki's potato-like structure most clearly becomes a mechanism through which nonhierarchical notions of genetic relatedness and narrative that might revolutionize transgenic representation begin to take shape.

While the novel positions potatoes metaphorically to show how individuals use them to understand their own identity conflicts—more clearly, wild child Yumi's sense of alienation from her Idaho home, and girl-next-door Cass's sense of being too firmly rooted there—this approach does not secure the essential humanity of “mixed-up” individuals so much as it opens up a context in which human problems intersect in multiple ways with those of others, not the least of which are the Bt potatoes. Lines of descent, in people no less than potatoes, may be sites of confusion and conflict, but as this story grows outward through lateral connections, transgenics appear not so much an alien invasion or product of/for salvation as a means of/for rethinking structures of relatedness, even among humans. The point of the novel, then, is not to assert a single, true meaning but to represent a struggle over the many meanings for GMOs, and in this way its form proves significant. Adopting a potato-like structure, *All Over Creation* shifts the burden onto readers to develop nonhierarchical notions of identity and narrative in order to make sense of how cross-species relationships shape our ideas of and interactions with transgenics. With a form that thus enhances its content, *All Over Creation* eschews a typical taproot structure that might trace a family tree in favor of a more indirect rhizome or “subterranean stem”²⁹ through the decentered network of social relationships that converge on the farm.

Cross-generational family dramas give way to less predictable stories of shared concerns about cultural and agricultural reproduction, in which people find rhizomatic connections to others with very different backgrounds. The broader implications of this structure might begin to explain why, from the very start, the novel splits perspectives between Cass and Yumi, introducing them as two Idaho women raised on neighboring potato farms who meet again as adults, and

then connects their immediate family problems to global issues like international adoption, war, and of course, GM agriculture. Moreover, the structural shift from representatives of families now sharing one farm to a wider network of people with more indirect ties to the land allows these characters to grow beyond the good/bad seed roles of their girlhood.

Augmenting the split in perspectives of Yumi and Cass, the novel's narrators soon include two unrelated men who remain strangers to each other but, in different ways, become intimately involved with the women. One is Frank, the disaffected fast-food-worker-turned-Seed, whose child with the Québécoise Seed named Charmey eventually is adopted by Cass and Will. The other is Elliot Rhodes, a former local high-school teacher who molested Yumi when she was his student, then abandoned her after a back-alley abortion. Elliot returns to the town after she does in his work as a PR representative for Cynaco. Suggesting again the importance of context, the family farm that is the primary backdrop of their interactions provides not so much a final destination or centralizing location as a clearinghouse or spawning ground for possible relationships. The lateral connections across these two characters' otherwise limited perspectives ground the novel's sharpest critique of the GMO status quo, for these men also illustrate the organic intellectual's influence and its limits. If, as I suggested earlier, Frank's development shows how Geek's tutelage propagates information-sharing and informed action among those with no professional interest in transgenics, then the seemingly endless deceptions of Elliot (ever a corrupt teacher), which lead to his personal and professional ruin, set him beyond the pale of organic community. Even before these conclusions become plain, the structures through which they develop undermine the top-down model of power within which Elliot operates. Although Frank and Elliot may be tied to Cass and Yumi, respectively, through human reproductive acts and their failings, the novel insists that their more lasting and influential ties to one another form laterally, not through lines of descent.

More than family ties, friendship emerges as the structure whereby people begin to acknowledge symbiotic relationships with each other and even with other species. Eventually befriending both the Fullers and the Quinns, the Seeds create an alternative structure to Cynaco's multinational corporate control of patented GM seeds by reinventing Lloyd and Momoko's company as a web-based, cooperatively maintained bank of freely exchanged organic seeds. This nonprofit solution—specifically to the problem of “terminator” technology, the patent-friendly genetic

modification that prevents plants from producing viable seeds—looks promising, even if it relies precariously on self-regulation. Yet this anti-GM-plant alliance is based in part on familiar appeals to animal stories such as *Jurassic Park*.

In order to establish connections across various human communities, the Seeds strategically invoke the cross-species relations underpinning environmental critiques of GM plant introductions as social phenomena. At one level this promises a more complex understanding of the Bt potato story, recasting transgenic crop plants as created directly in response to the transcontinental movements not only of individually significant (or target) plant species, even varieties like the Russet Burbank, but also of their accompanying symbiots, even parasites like the Colorado potato beetle. From this perspective, the story of the Bt potato recasts the human amid shifting “minicommunities” of a variety of other species attached to them through varying relationships.³⁰ Because this multi-species view works in part to link animals and transgenics in demonizing rhetorics, however, *All Over Creation* at another level illustrates how GM concerns have become most commonly understood as limited to people and animals, not plants.

Perhaps the most telling scene focusing on animals depicts Cass absentmindedly disrupting Colorado potato beetle reproduction, using her hands to squash larvae and interrupt adults mating in the Quinns’ field of NuLifes, while listening to Will and Geek debate the merits of Bt use in organic and GM farming. Surrounded by transgenic plants growing for commercial use, she methodically, if unselfconsciously, acts out the unspoken common ground of their agricultural ideas: that commercial potato farming, whether organic or so-called conventional, entails total war against insect invaders. Cast in the “othering” mold of movie-monster animals and perceived as absolute enemies, it may be impossible to imagine such insects moving along with people and potatoes into greener (yet, strictly speaking for all of them, non-native) pastures. This kind of characterization ultimately overshadows the more complicated cross-species history of technological transfer, without which Colorado potato beetles might never have come into contact with Russet Burbank potatoes and have become so integrated with human populations as to inspire the development of Bt versions. Sharing the willful short-sightedness of conventional farmers, the organic intellectual in this scene exhibits a strangely internalized limit, a failure of imagination modeled after predominant patterns of transgenic representation. Although *All Over Creation* stops short of explicitly addressing the more familiar image of animal menace in

transgenic contexts, the assumptions structuring this part of the book point to ways in which GM representations all too conveniently lend themselves to containment strategies. Indeed, the novel's more deliberate study of the specific challenges of GM plants against the very different kind of animal representation seen in most mainstream GMO stories makes this point all the more plain.

Butterfly Effects

Monarch butterflies enter Ozeki's novel and other transgenic agriculture narratives as the premier constituents of ecological microcommunities overlooked by genetic science. Five years after GM food products were approved for agricultural use in the US, a paper summarizing a lab study of Monarch butterfly larvae killed by eating one particular Bt corn variety (known as Event 176) that drifted onto milkweed (this insect's only food) set off a firestorm of public and scientific controversy about the unpredicted environmental effects of transgenic plants.³¹ Now a primary "symbol of the anti-GM food movement,"³² the Monarch also strangely demonstrates what in systems theory is called the Butterfly Effect. This concept, attributed to meteorologist Edward Lorenz and since applied to predict biological populations, figures the propensity of a system to be sensitive to initial conditions through the image of a butterfly, whose wing-flap at one end of the world eventually becomes a catastrophic wind at another. Lorenz's model provides a way of beginning to understand how this seemingly insignificant insect has come to have such a powerful effect on public perceptions of GM crop plants.

Following optic traditions whereby charismatic megafauna (typically large and furry mammals) have become silent spokesmodels for ecological awareness along with countless other kinds of advertising campaigns, Monarch butterflies—comparatively big, brightly colored, and common American insects—now are used as similarly charismatic microfauna in popular criticism of scientific and agribusiness interests in GM technologies. As a rallying point of organic activism, the Monarch butterfly now inspires a single-minded championing of the cause against all things transgenic, a polarized vision of organic victims versus their transgenic killers that belies less easily observable (let alone understandable) changes already consequent to GM-integrated microcommunities in US farm fields.³³ The Monarch butterfly is economically innocuous to potato and other farmers not dependent on cross-pollination, in

pointed contrast to crop-damaging insects like Colorado potato beetles, but in the US especially, the Monarch is considered familiar and pretty, some say the “unofficial national insect.”³⁴ Sensitivity to the cultural conditions dominated by images of transgenics as monsters makes it predictable that Ozeki’s fictional characters will appeal to tenderness for this icon of nature’s freedom and fragility: they will see it as a figure for “natural” alternatives and for the profound consequences of organic relations (and of course their conceptions) of such victim/killer turns in transgenic stories.

In one scene, Ozeki’s novel offers insight into why the Monarch butterfly persists as a metaphor for the cultural representation of agricultural transgenics gone awry. In order to stage a big anti-GM-crop, teach-in event (which culminates in the partial destruction of the Quinns’ NuLife field) that will bring the Fullers’ seed company customers and others to the family farm, the Seeds use a *New York Times* summary of the Monarch study to persuade Lloyd to support their actions. Weak from the illness that soon kills him, Lloyd musters his strength to express horror when shown the article: “‘Oh, no!’ he said. ‘Not the *butterflies!*’” (266). As Lloyd’s reaction indicates, this kind of Butterfly Effect begins with human identification with a single (kind of) animal and results in a new iconic value. Lloyd’s kind of individual gut reaction, sparked by the initial study of transgenic-pollen-fed Monarchs, has produced a sweeping effect of inspiring care about the so-called organic, even at the expense of understanding how the concept “organic” has been fundamentally changed by widespread GM crop implementation.

By the point at which Monarch butterflies enter *All Over Creation*, Lloyd may be too tired and sick to articulate clearly the age-old story of agriculture as an ongoing intervention into plant genetic material to create a hedge against crop failure and especially insect pests. The contrast of his surge of fellow-feeling for the Monarch butterfly and the unequivocal animosity toward the Colorado potato beetle, however, points to the more lasting effect of the Monarch’s dying wing-flap, namely how the imbricate, localized histories of potato farmers, plants, and bugs can get blown away by more generic representations in transgenic fiction. In this quiet way, the novel illuminates how GMO debates become popularized even as their terms become severely limited. The intense focus on an aesthetically appealing animal, dramatically and directly poisoned by Bt corn, scripts a story that activists and scientists alike use to simplify—and, as Lloyd’s reaction suggests, oversimplify—the revolutionary transformations of specific populations

and species histories in each and every GM crop plant. That is, the popular anti-GM position taking wing with the perceived threat to Monarch butterflies creates a simple narrative of a “pretty” insect being killed by an “evil” transgenic, a narrative that gains visibility and power at the expense of the highly complex (re)organization of situated knowledges that arguably script real, everyday transgenic agriculture practices. Though less clearly, the nonlinear form of *All Over Creation* promises a different sort of model. In this model, the specificity of the relationships created (and ignored) by the creation and introduction of transgenics becomes unintelligible in terms of linear narratives, whether of triumphant progress or disastrous hubris. In Ozeki’s form of nonlinear representation, it is impossible to understand how the one insect (the Monarch butterfly) can become an inspiration for protesting GM plants without acknowledging the other (the Colorado potato beetle) as a cause of GM creation. Linked with humans through transgenics in a broadly mixed social landscape, these alignments of different animal species also stake out an ambiguous role for GM plants as alternately threatening and improving the quality of human life. And here the importance of narrative analysis for genetic science seems most clear.

Until recently, especially among scientists, emphasis on linear/hierarchic stories has obscured the co-evolving operations of lateral/horizontal gene transfer.³⁵ Bud sporting in potatoes may be one intraspecies example of lateral gene transfer, but insertions of bacterial DNA in the human genome suggest that, though uncommon, it is not unprecedented for such phenomena to occur across species lines as well. Although knowledge of the spreading influence of genes has changed in this major way, they remain overshadowed by familial stories of transmission between generations. Entirely different narrative structures like Ozeki’s rhizomatic potato stories are necessary for charting these emerging methods of communicating and influencing genetic development within generations and even across species lines. Without such stories, there can be no meaningful debate of the basic conditions of transgenic crop commercialization, which proceeds rapidly in spite of the fact that little is known about the long-term effects on consumers, ecosystems, or even the plants themselves. In light of emerging knowledge, tales like that of the dead butterflies seem far too fixed and visible to represent the evolving consequences of commercial transgenics.

More disturbing, perhaps, is the concern that, among plants, phenomena like bud sporting and even cross-species horizontal transfers

may be far more prevalent than has been assumed until now in GM agricultural research.³⁶ This suggests yet another possibility for why stories of Bt potatoes remain peculiarly silent about horizontal movements of genetic materials among their non-GM relatives: the relations engendered by non-hereditary gene transfers exceed the conventional terms, models, even names for relatedness. The convergences of potato and human stories in *All Over Creation* might then be understood as illustrating how this reticence has to do with the structures of stories, how the ordinary ways of describing potatoes (parents/children of the “true seeds”) so readily echo filial human narratives, or familial stories of transmission from old to new generations. Yet it is precisely lateral narrative structures that are necessary for communicating emerging scientific narratives of genetic development outside the genetic model of heredity, not to mention these knowledges of gene transfers as happening far beyond the control of scientists, especially now that farmers and consumers are regularly interacting with GM crop plants. Although the story’s overt content may avoid the issues of lateral gene transfers in potatoes, the rhizomatic form of Ozeki’s novel nonetheless models a way into more meaningful debate of the basic, localized conditions of any given transgenic crop’s commercialization and perhaps more importantly, a way of clarifying how such phenomena are proceeding rapidly in spite of the fact that little is known about their long-term effects.

Ozeki’s approach in retelling these rhizomatic movements would seem an ideal way of developing how biopower may characterize globalization as a paradigm but does not merely serve the totalizing visions (or hierarchic and linear aesthetics of control) assumed in the notion of a new global village.³⁷ It could follow, then, that potatoes’ historic influence in the worldwide population shifts central to industrialization does not narrowly culminate in the development of their GM versions, but aligns many in imbricate and evolving transgenic relations. This model allows for no “innocent” positions, no moral high ground for humans definitively siding with butterflies in the name of the organic. Instead it reveals a vast array of spaces within which such organisms negotiate their complementarities with GMOs.

The movements of GM potatoes from laboratories to supermarket shelves—more decisively, from commercial fields to televised protests during the Seeds’ ultimate educational event—indicate how some of the unruly contexts for resistance open up even as the dreams of their corporate spin doctors like Elliot seem to take shape. And the instabilities assumed in such structures explain further why the novel’s

penultimate image of the seed bank, an image of a singular, wired or virtual village firmly rooted in one family's Idaho potato farm, remains on shaky ground. As GM potatoes, along with the insects, fade into the background by the novel's end, the book's narrators come together as virtual-village people (with the exception of Elliot, whose legacy as corrupt teacher apparently means that he must be the negative example, pointedly shut out of the group), connected through non-hereditary ties.

Even in human terms, these alinear or affiliative relational structures complicate the novel's overall message that reckoning with the lived conditions of GM plants involves more than being responsible scientists or informed consumers: it requires becoming sympathetic community members. Control of GMOs is a foregone conclusion, even in the organic stewardship project of the web-based organic seed bank apparently modeled after freeshare software communities. Precisely because the novel suggests that this freeshare solution may not work—contrasting such “neat little stories” with the paradoxes of intimacies that require one “to accept the responsibility and forego the control,” that is, “to love without expectation” (409–10)—this story of Bt potatoes comes to a conclusion that eludes the typical transgenic tale, suggesting further that the abandonment of dominating stories may be the aspect of plants that brings renewed relevance to a literary tradition that enriches as it redeploys genomic discourses.

Not substituted by but vibrating within GM stories, these deployments point to minor practices of genetics as a major language in moments that allow politics to trump individual concerns and the radical force of narrative literature as a collective enunciation to overpower the attempts of a single perspective or voice to control the transgenic story. These iterations call into question not only how genetics make possible social as well as biological forms, but also how these forms connect to the political immediacy of companion species models, thereby suggesting some ways in which narrative forms like novels may challenge as well as disseminate genetic discourses. In contrast to stories that use the celebrated “language of DNA” to decode or validate existing ways of thinking about the self and society, these minor practices promise a means of negotiating and redefining social relations, especially adaptations to mixed social worlds, in terms of genetics.

Toward a Minor Literature of Transgenics

As opposed to minority or popular literatures, formulated as additions or supplements to a fixed canon, Deleuze and Guattari propose the more fluid concept of “minor literature” to account for how “minor practices of a major language” become a means wherein literary representation alters the conditions of collective life. “Minor” in this conception does not designate any specific (that is, “minority”) literature, but rather points to the radical potential within all literatures to rewrite the disciplinary structures of power.³⁸ Such a concept begins to explain why the customary practice of using the language of DNA scientifically to identify or distinguish any individual/species/genome contributes to the social isolation of genetic transgressives in popular fictions as well as why the narrative form of Ozeki’s novel points toward a more affiliative sense of relatedness among people, if not quite to plants and insects.

While literary studies of plants admittedly are rare and theories of them still more precious, as early as Nathaniel Hawthorne’s 1844 story “Rappaccini’s Daughter” plant genetics have been used as the scene of a morality play that casts the scientist/creator’s hubris as tragic, but the daughter/creation’s poisonous-plant threat to humanity as monstrous. Following the Western tradition of imagining human transgressors in bestial relations as women,³⁹ humanlike plants, along with plant-human hybrids are figured as noxious female forces weeded out by rational men. Comic hero Batman’s adversary Poison Ivy may be an obvious example of how this tradition continues, but it is buttressed by ongoing narrative patterns of depicting flowers and fruits as the dangerous, “female” parts of humanoid plants. Persisting through remakes of films like *The Day of the Triffids* (1962, 1981), *Attack of the Killer Tomatoes* (1978, 1990), and *Invasion of the Body Snatchers* (1956, 1978, 1993), “green animal” narratives downplay important differences between animal and plant life, qualities such as immobility, chemical communication, longevity, and perhaps most importantly widespread hermaphroditism.⁴⁰ Modeled instead after the castrating mothers of Freudian family romance, plants in this narrative tradition reflect the often polarized politics of human gender and sex identity, at the expense of the complex and often symbiotic relationships through which species co-evolve.

The problems of seeing GM plants in this way stem from more general difficulties with representing plants as plants, rather than as individuals in human terms, and the genetic conditions of biopower

promise a context that defers to this kind of reduction. Photosynthesis, the ability to transform light to food, makes all animal populations dependent on plants, which reciprocally require our assistance with such activities as cross-pollinating, fertilizing, and planting. From this wide-angle, cross-species genetic perspective, as Geek, in Ozeki's novel, says, it becomes possible to imagine that our role as human beings is to "service their DNA" in relationships shaped in part by "human appetites and desires" (124) as well as, I would add, the appetites and desires of a myriad of other species, even perhaps the plants themselves. Approaching evolutionary narrative as collected and collective stories of many species struggling together situates GM technologies as not just another agricultural option but more profoundly as a set of historical changes affecting vital relationships within and across species, as a matter of global biopolitics and not just individual politics of diversity.

The images of plants, insects, and humans living together, however uneasily, in *All Over Creation* thus offers a startling break from the mainstream pattern of representing not just plants, but also GMOs. Typical in the GM vein are the *Jurassic Park* narratives, which with fine precision (in Michael Crichton's novels) and at great expense (in Steven Spielberg's films) represent their central transgenic chimeras—hybrid reptile-amphibians—as revived or "cloned" dinosaurs, dangerous animals ready to kill and eat people. Instead of provoking readers to contemplate the radically different threats and promises such creatures could pose, these transgenic fictions return to what has become a peculiar sort of fast-food fiction, the stock science horror story of super-sized dangerous animals overcome by exceptionally heroic human individuals. Consumers of this kind of transgenic narrative certainly get a consistent product, especially now that filmmakers have begun to simply translate nuclear nightmare animal fictions like *Godzilla* from the 1950s into the terms of contemporary genetic science. But, some plant fictions paralleling these animal stories complicate this Cold War transcoding between rival scientific discourses of the twentieth century.

In this parallel tradition, some comics of the 1960s and 70s create precedents for the kind of literary shift that Ozeki's novel indicates by painting in the broadest strokes how plant narratives ground another (though less obvious) tradition of relating genetics and nuclear science. First appearing in 1962, anti-hero *Spiderman*, along with *The Hulk*, traces one pattern of combining animals, men, and radiation to create a dark vision of Cold War science, while in 1963, the introduction of the character Plantman (who stimulates plants to do his evil

bidding) in *Strange Tales* and later *X-Men* suggests the possibility of combining plants, men, and chemicals. As markers of this split, such characters perhaps reflect the pivotal cultural moment they enter, for 1962 was also the year of the initial publication of *Silent Spring*, Rachael Carson's bestselling scientific indictment of the chemical industry, credited with inspiring the banning of DDT. In later comic representations of especially plant hybridity, this kind of ecological sensibility further complicates the isolated individual premise of the radioactive-hero and bad-plant-guy narratives. The two most successful examples of ecological comics, *Swamp Thing* and *Man-Thing*, first were issued in 1951 and 1971 respectively and feature plant-human hybrids evolving through their respective narratives to become stewards of their swamps, and even, in the case of *Man-Thing*, "all realities." Neither evil nor female, these humanoid plants are mutants deeply rooted in their immediate contexts, and as such remain unavailable for simple translation to the genetic and genomic narratives of conventional Hollywood cinema. What makes these stories so fragile is their positioning of the human as a connective node within (not, like Plantman, a manipulator above and beyond) multi-species communities, namely the microcommunities of their swamps.

So far, at least, interest lags in transgenic remakes of comic plant narratives like *Swamp Thing*, perhaps because these characters, although green animals in form, represent and even directly engage in the struggle to maintain deeply mixed ecological communities; they are in this respect anathema to the mono-crop and mono-variety conditions that have brought GM plants to widespread commercial use. Contrasted with the spectacular stories that position transgenic animals as charismatic megafauna, transgenic plants may seem like "dull minor-flora" but their actual movements point instead to the most immediate ways in which GMOs currently affect human and other lives and, what is more, to how we can begin to get a handle on these developments. The trick, as Ozeki's novel suggests, is to let plants grow beyond the image of green animals, and so begin to learn to read them, in Haraway's terms, as irreducibly companion species. What needs to be sustained and developed more broadly from this narrative tradition are the ways in which plants become actors in their own stories, social agents actively involved, along with human beings and others, in shaping their worlds. Such a tradition clearly has a long way to go in the mainstream.

For many reasons, transgenic plants will remain "dull minor-flora" to American consumers, but their depiction alongside humans as later-

ally connected rhizomes suggests how GMOs more generally, and Bt potatoes in particular, could threaten the very terms of singular human being in ways that the mutant animal narratives seem calculated to contain. Consequently, such representations provide models whereby researchers of science and literature alike can begin to get a handle on how transgenics like GM crop plants participate in the ongoing and radical restructuring of companion species, even those of human beings. The need for this kind of representational leap is perhaps why a transgenic *Swamp Thing*, however spectacular, has yet to emerge, let alone to subsume stories of GM plants within those of animals. Although it remains possible to redevelop the heroic central character from steward of his particular environment to aspiring or absolute controller of the world, this sort of streamlining would negate his defining feature, his primary commitment to the task of representing the radically different relations across genomes that are proliferating through but never entirely reducible to human conceits, transgenic or otherwise. One last example of Ozeki's depictions of the organic intellectual's activism on the commercial front lines might clarify how this broader literary development hinges on a heightened awareness of the dual role of representation (aesthetically delineating and politically standing) for transgenic relations. This scene, more than any other in the novel, serves as a model whereby others might come to appreciate how GM plants in mainstream culture already have become actors in their own stories, social agents actively involved along with human beings and others in shaping acceptance of everyday transgenic conditions.

Tactical simulation, the ability to resemble another species, is not only a characteristic of adaptation and survival but also an example of how plants actively (though subtly) become involved in everyday transgenic negotiations. The Seeds' initial grocery-store protest in *All Over Creation* illustrates this point by showing how the same technique whereby GM crops simulate or disguise familiar foods, a key part of corporate strategies to distribute them quietly to consumers under long established brand names, also appeals tactically to organic activists. Geek, dressed as Mr. Potato Head in a carefully orchestrated action, performs tactical simulations while revealing to his audience of unwitting supermarket shoppers the hybrid infusion of "bug poison" and French fries that is now possible in a processed potato (92), an infusion that may already be present in the frozen fries and other packages of potatoes they are about to buy. Indicating how well this kind of protest works, the once innocuous potatoes and potato products seem not just like a bad idea in principle but, more importantly, like a bad choice

to consumers, who suddenly shrink back with horror from what now appear monstrous intruders in their shopping carts. Geek's act thus parades multiple layers of simulation (potato as toy, icon, agricultural and scientific ideal) to demonstrate to fictional shoppers and to fiction readers how the responsibilities of creating and acting on different social constructions of plants as food and poison, natural produce and industrial product, are shared by many groups, including readers, who are, conceivably, shoppers.

Depending on how readers process this kind of deliberate redeployment of genetic discourses, one could argue that *All Over Creation* offers no simple moral about genetic technologies and their relations to genomic shifts, but more importantly opens up the social contexts in which genomic discourses along with GM plants as representational structures may be rising in importance but never operating completely as instruments of control. The GM potato in fiction as in fact comes to us through lab testing and corporate patenting. But the multiplicity of actors involved in its postcommercialization stories suggest that it is not (and perhaps never could be) simply dictated by these origins. Complicating the top-down model of human control assumed in the corporate tales of Monsanto's NewLeafs, the rich social landscape Ozeki creates for Cynaco's NuLifes as well as the landscapes created by other participants in the minor literature sketched here argue that transgenic stories are not determined by, so much as dynamically engaged with social contexts, with people and plants, as ordinary as shoppers and as extraordinary as choreographed grassroots activists "digging" potatoes at the supermarket.

Thus, *All Over Creation's* rhizomatic stories of Bt potatoes begin to help clarify that, as these and other GM plants move around the world, they affect not just individuals but more broadly become integrated into communities, altering and extending long histories and biopolitics of companion species relations. Stories of creatures as monstrous Frankenfoods and scientific saviors alike fail to account not only for the local contingencies of any particular species' introduction but also for the ways in which knowledge no less than structure changes along with species boundaries. Flora, not fauna, can give us more than more accurate reflections of or predictions for transgenic science: they can help us to acknowledge and value the many ways in which we already are relating to others within and across genomes.

NOTES

1. This use of “transgenic organism” to refer to genetically modified agricultural food products is itself controversial, and in adopting it here I draw from Donna Haraway’s discussion of the Flavr Savr brand tomato, in *Modest_Witness_@_Second_Millennium.Femaleman© Meets Oncomouse™: Feminism and Technoscience*.

2. Committee on Environmental Impacts Associated with Commercialization of Transgenic Plants, *Effects of Transgenic Plants*, 221.

3. See Ringel, “Genetic Experimentation: Mad Scientists and the Beast,” 64, and Schaal, “Genomics and Biotechnology in Agriculture,” 109.

4. Haraway, *The Companion Species Manifesto: Dogs, People, and Significant Otherness*, 11.

5. Scientific claims about the “escape” of modified genes from cultivated to wild plant relatives remain hotly debated. Editors of *Nature* published and, in a rare move, quickly retracted one such study, in which David Quist and Ignacio H. Chapela claimed to detect the markers of altered genes moving across generations within native corn and its uncultivated relatives in the Mexican state Oaxaca, a region that is part of the presumed ancestral origin of this plant and the “global center” of its genetic diversity (Dalton, “Transgenic Corn Found Growing in Mexico,” 337). Quist and Chapela conclude their article with a call for long-term studies that similarly trace “the gene flow from hybrids to traditional landraces in the centers of origin and diversity of crop plants” (“Transgenic DNA Introgressed into Traditional Maize Landraces in Oaxaca, Mexico,” 542), but the scandal surrounding *Nature’s* retraction along with the threats of such studies to commercial GM production make such projects difficult at this time, to say the least. Also, the illegal planting of transgenic seeds already contaminates possible scientific controls.

6. Haraway, *The Companion Species Manifesto: Dogs, People, and Significant Otherness*, 149ff.

7. Just a few corporate giants control nearly all of the market in genetically manipulated seeds (Brac de la Perrière and Seuret, *Brave New Seeds: The Threat of GM Crops to Farmers*, 11). Among them, Monsanto has become “the biotech frontrunner” by aggressively developing agricultural GMOs (Haraway, *Modest_Witness_@_Second_Millennium.Femaleman© Meets Oncomouse™: Feminism and Technoscience*, 291, n.64), and consequently the primary target of biotech protest, as Ozeki’s treatment indicates.

8. Kilman, Scott, “Monsanto Co. Shelves Seed that Turned Out to Be a Dud of a Spud.”

9. Kilman, “Monsanto’s Biotech Spud Is Being Pulled From the Fryer at Fast-Food Chain.”

10. Ozeki, *All Over Creation*, 56. Subsequent references are cited parenthetically in the text.

11. On the GM potato debate in India and its relation to the “golden rice hoax,” see Shiva and Jafri, “India: Facts, Lies, and GM Potatoes.” International aid controversies following the European Union’s initial (now rescinded) ban on the importation of GM food suggest how such strategies follow the multinational-corporate party line of aggressive dissemination favored by US policy. See also Weiss, who shows how, especially in 2002, such policies came under widespread scrutiny when drought-stricken Zimbabwe refused US food donations (already refused by the EU) because donors could not guarantee that the shipments did not mix conventional with gene-altered seed corn. Facing mass starvation aggravated by political oppression, Zimbabweans also had to consider the long-term consequences of accepting this kind of donation, especially for their positioning in a global economy. If donated transgenic seeds were planted instead of eaten, the resulting contamination (exacerbated in Bt corn by wide-ranging pollen drifts) from these plants could compromise this largely agricultural nation’s ability to return to its once brisk trade in agricultural export to Europe.

12. Hall extends a construct initially developed by Antonio Gramsci in response to the limitations of marxist “grand theory” in order to account for the dis-ease of cultural studies scholars with traditional institutional practices of cultivating an elite and isolated class of intellectuals (“Cultural Studies and Its Theoretical Legacies,” 1902–03).

13. Hall, “Cultural Studies and Its Theoretical Legacies,” 1902–3.

14. This term first arises in Michel Foucault’s discussion of how sex becomes a “target of power organized around the management of life rather than the menace of death” when it is positioned at the pivot of two axes, individual bodily or “anatamo-politics” and species population or “bio-politics” (*The History of Sexuality, Volume 1: An Introduction*, 147). I am concerned here with developing this conjoined notion of “bio-politics,” the mechanism whereby species populations are likewise regulated by biopower, a force that, as he argues, brings the mechanisms of life itself into calculation and makes knowledge/power in turn the agent of transformation.

15. For a detailed history of the potato’s role in the colonial exploitation of Ireland, see Salaman’s *The History and Social Influence of the Potato*, 188–343. On Parmentier’s influence in changing French tastes in favor of potatoes, see Zuckerman, *The Potato: How the Humble Spud Rescued the Western World*, 81–83.

16. Whereas Foucault initially envisioned biopower as intersecting with disciplinary regimes (*The History of Sexuality, Volume 1: An Introduction*, 23–4), twenty years later Michael Hardt and Antonio Negri controversially chart a shift in this balance that grounds a new model of empire (or the society of control), which has emerged from the historical model of disciplinary society. In their analysis, this shift in favor of biopower, again a mechanism of not simply regulating interactions but more directly determining the conditions of life itself, characterizes the current paradigm of globalization (xv).

17. Mitchell, *The Last Dinosaur Book: The Life and Times of a Cultural Icon*, 80.

18. Accounting for why multinational fast-food corporations have begun costly potato-production schemes in unlikely places like China and Australia, Schlosser argues that they are part of a larger project to “diminish fears of American imperialism” (*Fast Food Nation: The Dark Side of the All-American Meal*, 230) and racial tension. Elaborating the latter, he cites “Den Fujita, the eccentric billionaire who brought McDonald’s to Japan” in the 1970s: “If we eat McDonald’s hamburgers and potatoes for a thousand years,’ Fujita once promised his countrymen, ‘we will become taller, our skin will become white, and our hair will be blonde” (231).

19. Gilbert, Barrus, and Dean, *The Potato*, 76.

20. Salaman, *Potato Varieties*, vii.

21. Salaman, *The History and Social Influence of the Potato*, 25.

22. Burbank, *The Harvest of the Years*, 14.

23. Zuckerman, *The Potato: How the Humble Spud Rescued the Western World*, 236.

24. Gilbert, Barrus, and Dean, *The Potato*, 170–171.

25. Transgenic implementation problems may negate even short-term gains. The US Environmental Protection Agency’s approval of Monsanto’s strain of Bt corn that targets a specific insect, the corn rootworm, heightens these concerns because this new variety “kills only about half the rootworm larvae,” leaving a large population in which “resistance is certain to rise” (Knight). Critics of transgenic-crop firms note how US farmers’ pattern of non-compliance with federal regulations that require them to plant non-GM refuges for insects promises to exacerbate this problem (Clarke).

26. Schlosser, *Fast Food Nation: The Dark Side of the All-American Meal*, 117.

27. Burbank, *The Harvest of the Years*, 46.

28. These Seeds of Resistance appear modeled after an organic activist group of the same name, whose members claimed responsibility for one of the earliest anti-transgenic crop actions, destroying GM corn plants growing in University of Maine test fields in 1999. See Marian Burros, “Eating Well: Genes Are Changed, but Not the Label.”

29. Deleuze and Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia*, 4.
30. Committee on Environmental Impacts Associated with Commercialization of Transgenic Plants, *Effects of Transgenic Plants*, 29.
31. *Ibid.*, 75. The now infamous article is J. Losey, L. Raynor, and M. E. Carter, "Transgenic Pollen Harms Monarch Larvae."
32. Shelton and Sears, "The Monarch Butterfly Controversy: Scientific Interpretations of a Phenomenon," 487.
33. See note 7 above.
34. Bingham, "Bees, Butterflies, and Bacteria: Biotechnology and the Politics of Nonhuman Friendship," 486.
35. Venter, "Whole-Genome Shotgun Sequencing," 52.
36. *Ibid.*, 52.
37. Hardt and Negri, *Empire*, 23–24.
38. Deleuze and Guattari, "From *Kafka: Toward a Minor Literature*," 1600.
39. Londa Schiebinger notes that in early modern accounts of apes, "it is invariably the male ape who forced himself on the human female" (95). Her account of the eighteenth-century European medical "interest in plant sexuality" also suggests that even earlier plants as well as animals served as key players in the materialization of a "new anatomy of sexual difference [that] buttressed the doctrines of sexual complementarity and republican motherhood, two of the ideologies that emerged as unrecognized girders of the emancipatory liberalism animating the American and French Revolutions" (38–39).
40. The term "green animals" was coined by computer scientist Paul Black to describe the current sci-fi pattern of representing plants.

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Susan McHugh is Assistant Professor of English at the University of New England. In addition to her book, *Dog* (2004), part of the *Animal* series from Reaktion Books, she has published several essays on scientific, literary, and visual media representations of animals in such journals as *Critical Inquiry* and *Camera Obscura*.

Robert Mitchell is an Assistant Professor in the Department of English, Affiliated Faculty in Women's Studies, and a member of the Faculty of the Institute of Genome Sciences and Policy at Duke University. His research focuses on Romantic-era intersections between science and literature, as well as contemporary relationships among biological materials, economics, and information processing technologies. His published work includes *Tissue Economies: Blood, Organs and Cell Lines in Late Capitalism* (Duke University Press, 2006), co-authored with Catherine Waldby, and he is co-editor of the book series *In Vivo: Cultural Mediations of Biomedical Science* (University of Washington Press).

Timothy Murray is Professor of Comparative Literature and English and Curator of the Rose Goldsen Archive of New Media Art, Cornell University. He is Co-curator of CTHEORY Multimedia, which published a special issue of internet art on genomics: "Tech Flesh: The Rise and Peril of the Human Genome Project." His books include *Digital Baroque: New Media Art and Cinematic Folds* (Minnesota, forthcoming), *Drama Trauma: Specters of Race and Sexuality in Performance, Video, and Art* (Routledge), *Like a Film: Ideological Fantasy on Screen, Camera, and Canvas* (Routledge), and he is the editor of *Mimesis, Masochism, and Mime: The Politics of Theatricality in Contemporary French Thought* (Michigan).

Heather Schell is an assistant professor and Deputy Director of First-Year Writing at the George Washington University, where she teaches courses on internet fan communities and the horror film. Her research explores cultural and scientific ideas about predation, most recently in a chapter on tigers and tiger hunger in Morse and Danahay's *Victorian Animal Dreams* (Ashgate Publishing Company).

Phillip Thurtle is an assistant professor in the Comparative History of Ideas Program and the History Department at the University of Washington. He has co-edited with Robert Mitchell (English, Duke University) the volumes *Data Made Flesh: Embodying Information* (Routledge, 2003) and *Semiotic Flesh: Information and the Human Body* (University of Washington Press, 2002). His latest book, entitled *The Emergence of Genetic Rationality: Space, Time, and Information Processing in American Biology, 1870–1920* (Seattle: University of Washington Press, 2007), documents the changes in experiences of space and time that allowed for the emergence of thinking in terms of genetics.

Stephanie S. Turner is Assistant Professor of English at the University of Houston-Downtown, where she directs the master's program in Professional

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