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Milton's Plant Eyes:
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Abstract: This essay turns to minimal cognition, a theoretical extension of embodied cognition, to argue for plant sentience in John Milton's *Paradise Lost*. Milton imagines plants as minimally cognitive beings within an affective ecosystem, where they readily enter into the epic poem's complex circuits of desire with appetites of their own. Specifically, the essay claims that botanical cognition arises at the convergence of two seventeenth-century philosophical systems: the first, Milton's materialist monism, and the second, Paracelsian medicine, which purports a plant's therapeutic effect on a human body part sharing morphological resemblance. The essay concludes that Milton's eroticization of similitude enables a new *sensus communis* where cognition is subtler and where nonhuman desire engenders alternate forms of ecologic communality.

Keywords: early modern literature, cognitive science, embodied cognition, plant studies, eco-criticism, queer theory

Whereas Charles Darwin devoted his early career primarily to geological study and to the collection of data that would eventually serve as the basis for *On the Origin of Species*, his later work turned to the subject of plants. With his son Francis, the elder Darwin published one of his final studies, *The Power of Movement in Plants*, which makes the controversial claim that plants behave as do the lower animals. Specifically, the Darwins argue for what science now calls the root-brain hypothesis, the postulation that a brain-like organ located in the anterior pole of the plant body controls growth and tropism. This underground brain, or *phytocerebrum*, acts cognitively insofar as it senses its environment and conveys information to other parts of the plant; that is, in their words, "it transmits an influence to the upper adjoining part, causing it to bend."¹ Plant neurobiologists have recently taken up *The Power of Movement in Plants* as a corrective to the Aristotelian concept of plants as automatically or passively nutritive.² Whereas classical animals possess appetite, locomotion, and sensation—in addition to these, humans are endowed with reason—plants are limited to nutrition, mere absorption for the primal sake of reproduction. To the contrary, the Darwins unearth cognitive organisms highly sensitive to their environments, capable of detecting and responding to stimuli, and equipped with brain-like organs that regulate behavior. Plants are, at the very least, minimally cognitive.

Adapted from theories of embodied cognition, minimal cognition has gained traction in the cognitive sciences not only as a critique of anthropocentric and brain-bound models of

cognition but also as a more expansive approach to understanding the sensorimotor capacities of what the early modern naturalist Thomas Moffett identified as “lesser living creatures,” those species inhabiting the lower rungs of the Great Chain of Being.³ As a neurobiological concept, minimal cognition initially described the ways in which *neuralia*—a clade of animals at the margins of nervous systems—interact with their environments, sense their surroundings, and behave accordingly.⁴ Minimal cognition was, at its core, an ecological theory insofar as it attempted to account for the sensory relationships that a “simple” animal makes within a larger ecosystem. Paco Calvo Garzón and Fred Keijzer, however, lament that the wider field has not yet taken up minimal cognition to study plant life: “Up to now, plants have not received much attention within embodied cognition. Most of those working in the field have employed a default assumption that intelligence is at a minimum an animal thing that was best caught in studies with free-moving agents ... while excluding sessile plants.”⁵ They recommend extending minimal cognition to plants because plants meet the elementary requirements of cognition; that is, metabolic organization based on “[m]anipulating the extra-organismal environment” as a “biological strategy” for survival.⁶ This more inclusive model of cognition allows for the expansion (or perhaps even reconfiguration) of what Aristotle describes as the *sensus communis*, the “common sense,” where sensation is shared across species and where the commons (from the Greek *koinos*) becomes a more thoughtful commonplace, a cognitive ecology shaped by humans and nonhumans alike.⁷

Darwin’s root-brain hypothesis postulates similitude between animals and plants, a relationship anticipated by early moderns who, following Aristotle, may have thought of plants as rooted animals. Even John Milton, in his description of the earth’s creation in *Paradise Lost*, imagines animals as botanical: a stag with his “branching head,” the behemoth and sheep “[a]s plants” rising “out of the ground” (7.456, 470-73).⁸ In this essay, it is my contention that Milton not only imagines plants as minimally cognitive beings but also situates them in an affective ecology whereby they enter the into the poem’s circuits of desire with appetites of their very own. Specifically, by turning to the medicinal theories of Paracelsus, I claim that early modern

humans and plants shared a historically particular form of intimacy predicated on anatomical resemblance, which Milton eroticizes and radicalizes as ontologically identical yet hierarchized materiality. What we find in Milton's epic is the intelligent coextension of botanic matter. As plants incite desire with their wooden bodies, silken blooms, and sweet fruit flesh so too do they become desirous, their seeds quietly yearning for their own plots. Cross-species similitude in *Paradise Lost* enables a new *sensus communis* where cognition is subtler, perhaps less legible to the mammalian cortex, and where nonhuman vagaries of desire foster alternate conceptions of ecologic communality. All begin at the root.

Not unlike scientists following in the footsteps of Darwin, the philosopher Michael Marder pursues a theory of plant thinking that is non-ideational, non-imagistic, and divorced from the logics of the mammalian brain and central nervous system, what, he suggests, are effects of evolutionary engineering that “[offered] a novel solution to the old problem of life, which had been already raised, differently, in the very ontology of plants.”⁹ That is to say that plants followed an alternate and ancient evolutionary path, divergent from cerebrated organisms, by acquiring distinct bodily technologies to manage the requirements of life. Marder argues that plants possess “non-conscious intentionality” intrinsic to the very matter of their being, materialized by their chlorophyllous anatomies, and made manifest by their tropistic behaviors: “[T]he non-conscious life of plants is a kind of ‘thinking before thinking,’ an inventiveness independent from instinctual adaptation and from formal intelligence alike.”¹⁰ Whereas the cognitive sciences, especially those invested in theories of embodied cognition, might support such a claim (and Marder acknowledges that “biology abounds in examples of ‘informational retrieval’ by plants”), I suggest that Milton's epic provides poetic instances of plant thinking, not only in plants that appear cognitive—which they are—but also the ways in which plants refuse subjective and identitarian forms of knowing.¹¹ *Paradise Lost*, while conversant with science, extends a critique of identity on its own literary terms by depicting thinking plants alongside thinking humans—the very first on earth, Adam and Eve—who dwell in the shade of a particularly dangerous tree.

The root-brain in *Paradise Lost* grounds the figure of a flowering plant that allegorizes Milton's philosophical monism:

So from the root
 Springs lighter the green stalk, from thence the leaves
 More airy, last the bright consummate flower
 Spirits odorous breathes: flowers and their fruit
 Man's nourishment, by gradual scale sublimed
 To vital spirits aspire, to animal,
 To intellectual, give both life and sense,
 Fancy and understanding. (5.479-85)

As Milton re-inscribes the primacy of the Great Chain of Being along the plant's vertical ascent from root to stalk to flower, so too does he incorporate plant life into "one first matter all," the primordial element animating the entire monist cosmos (5.472). What's more is that the plant seems to display "non-conscious intentionality," to borrow Marder's term, in its noble aspiration to vital spirituality. Plant matter, "flowers and their fruit," serve "[m]an's nourishment" and, in doing so, enable not only life but also life's complex intellectual processes: "sense, / Fancy and understanding." In this way, the root materially functions as the root-brain of Milton's cognitive ecology; that is to say, both human and animal cognition begin with the plant's desire for sublimity. Ken Hiltner reminds us in his book-length study that mind and ecology are inseparable in *Paradise Lost* and that "Milton's much-noted rejection" of Descartes' mind-body split is also a rejection of "mind-place" dualism.¹²

The following example from Book 9, I argue, illustrates Milton's take on "plant thinking." Eve makes herself vulnerable to Satan's wiles in her dogged insistence to tend to the garden alone, a daily task she had previously undertaken in the protective custody of Adam. Together, they had tended to the garden's excessive and unruly plants, "over-woody" and overreaching, requiring "hands to check" the "fruitless embraces" of their non-procreative conjugations. Seeking to rectify these childless relationships, the first couple officiated botanical

marriages—“they led the vine / To wed the elm”—a georgic trope borrowed from both classical and contemporary sources.¹³ On this day, however, Eve goes at it alone, so “from her husband’s hand her hand / Soft she withdrew” (9.385-6). Detecting an opportunity for mischief, Satan searches for her in the garden:

Veiled in a cloud of fragrance, where she stood,
 Half spied, so thick the roses bushing round
 About her glowed, oft stopping to support
 Each flower of slender stalk, whose head though gay
 Carnation, purple, azure, or specked with gold,
 Hung drooping unsustained, them she upstays
 Gently with myrtle band, mindless the while. (9.425-31)

As Eve ties up sagging stalks weighed down by heavy blossoms with twine woven of myrtle, Milton curiously characterizes her as “mindless.” The term registers the prosaic nature of her horticultural labor, nearly automatic gestures conveyed through neural pathways so deeply inscribed that they require minimal effort to accomplish. Mindlessness in the garden is habitual, on the cusp of involuntary. However, “mindless” may also refer to a more literal state of having no mind. To not mind is to forsake worry, to forgive a sleight, and to surrender a second thought. Such colloquialism might imply Eve’s ignorance of her eventual deception by a fallen angel in disguise, or it could, more cynically, foreshadow Eve’s propensity to not mind—that is, to deliberately disobey—God’s frugivorous prohibition, a transgression that warrants cosmic consequences.

To be clear, I do not mean to suggest that Eve is brainless or that she lacks a neural body innervating her paradisiacal ecology. Eve’s mindlessness is an event of the assemblage: the contact of brain, body, and plant in which the boundaries of each become less definite. Milton’s sensorial language thickens the poetic line with ponderous aromas and rosy clusters that obscure Eve’s human form, at least partially, so that Satan only halfway spies her. In Milton’s biological haze—what amounts to a literary act of Renaissance *sfumato*—Eve performs the heliotropic

function of the plant's sensorimotor system, lifting blooms to the sky just as a stalk naturally twists toward the sun. Eve thinks like a plant.

In the *Metaphysics*, Aristotle raises the question, "If one has no belief of anything, but is equally [*homoios*] thinking and not thinking, how would one differ from a plant?"¹⁴ Implicit to Aristotle's question is the assumption that plants are as thoughtless as they are faithless. Marder answers back:

A human being equal (*homoios*) to a plant is one who is equally (*homoios*) thinking and not thinking ... The human who thinks like a plant literally becomes a plant, since the destruction of classical *logos* annihilates the thing that distinguishes us from other living beings ... To be fair, a vegetable-like person is not one who no longer thinks but ... one who thinks without following the prescriptions of formal logic and therefore, in some sense, without thinking.¹⁵

"Mindless" Eve becomes-plant in the rhizomatic sense as she joins the earth's photosynthetic mechanism. Mindlessness is not non-cognitive. It is the momentary forgetting of the self-constituted subject and an openness to the nonhuman dynamisms of the text's ecology.

With a "sidelong" approach through the fallen leaves of the ground cover, Satan attempts to grab Eve's attention. Again, Eve "mind[s] not," preferring instead to continue her work:

So varied he, and of his tortuous train
Curled many a wanton wreath in sight of Eve,
To lure her eyes; she busied heard the sound
Of rustling leaves, but minded not. (9.516-9)

A tropology of entanglement persists from the poem's earlier books as Satan's "wanton" coils echo Eve's "wanton ringlets" of hair (4.306). Eve ignores the serpent's cues, assuming nothing out of the ordinary (9.519-21). That is until the reptile speaks. Perplexed by his linguistic facility, she questions:

What may this mean? Language of man pronounced
By tongue of brute, and human sense expressed?

The first at least of these I thought denied
 To beasts, whom God on their creation-day
 Created mute to all articulate sound. (9.553-7)

Animals, like plants, were brought forth by God without voice and without a rational soul, the requisite markers of human exceptionalism. Satan replies that he too was once like “other beasts that graze / The trodden herb,” only minimally intelligent, “of abject thoughts and low” (9.571-2). He remembers climbing the Tree of Knowledge, coiling upward and around its trunk toward the heavy fruit. From atop, he instigated a hierarchy of consumption: “All other beasts that saw, with like desire / Longing and envying stood, but could not reach” (9.592-3). Those unable to access the fruit resigned in their dumb envy. His intellectual ascent, he promises Eve, was attained by “tasting those fair apples”:

Ere long I might perceive
 Strange alteration in me, to degree
 Of reason and inward powers, and speech
 Wanted not long, though to this shape retained. (9.598-601)

With cognition incongruous to his shape, the serpent persuasively verbalizes the fruit’s virtues. Most readers recognize Satan as the text’s primary tempter—Milton describes him as “[t]he tempter all impassioned”—but the plant itself plays an equal part in Eve’s seduction (9.678). Milton’s fruit is desirable, *but it is also desirous*, exercising the non-subjective desire of plants to enter into relation with other species.

In *The Botany of Desire*, Michael Pollan argues that it is the plant’s genetic imperative to cleverly manipulate not only humans but also other non-plant species to propagate its genetic code. The gardener, who seeds, tends, and harvests her yield, is no different from the insect, seduced by the flower to transfer its pollen. Pollan comes to this realization not in Milton’s garden but in his own, while pondering the “knobby charms” of potatoes: “All these plants, which I’d always regarded as the objects of my desire, were also, I realized, subjects acting on me, getting me to do things for them they couldn’t do for themselves.”¹⁶ Shifting power relations,

even those beneath the level of consciousness, inhere in the encounter. “We automatically think of domestication as something we do to other species,” Pollan writes, “but it makes just as much sense to think of it as something certain plants and animals have done to us, a clever evolutionary strategy for advancing their own interests.”¹⁷ It might be argued then that Adam and Eve’s labor in the garden, as a reciprocal form of domestication, is compelled not only by God—“fill the earth, subdue it, and throughout dominion hold,” he commands—but also by plants, the unconscious yet nonetheless intentional work of plants to remake the human (7.531-2).

Pollan’s first chapter takes a “pomocentric” approach to account for the sociobiological history of apples. Western cultural, literary, and religious traditions represent the fateful fruit from the Tree of Knowledge as an apple. Milton refers to it as such not only in *Paradise Lost* but also decades earlier in the *Areopagitica*, where he writes, “It was from out the rind of one apple tasted that the knowledge of good and evil, as two twins cleaving together, leaped forth into the world.”¹⁸ The bible, however, never identifies the fruit as an apple. Pollan too doubts its biblical provenance because “that part of the world is generally too hot for apples.”¹⁹ This “mistake,” he argues, serves as evidence of “the apple’s gift for insinuating itself into every sort of human environment, even, apparently, a biblical one.” This “gift” is part and parcel of the apple’s appeal to the senses, the ways in which it materializes desire in its sweet flesh, turning intentionality outward with its ruddy sheen and crisp scent wafting through the air. Like a ventriloquist, the fruit of good and evil speaks its sweetness through the figure of the serpent:

I chanced
 A goodly tree far distant to behold
 Loaden with fruit of fairest colours mixed,
 Ruddy and gold: I nearer drew to gaze;
 When from the boughs a savoury odour blown,
 Grateful to appetite, more pleased my sense. (9, 575-80)

Satan narrates his own entrapment by the plant’s sensuous wiles, drawn first through the eyes by its Petrarchan coloration and then through the ophidian vomeronasal system by its delectable

aroma: “hunger and thirst at once, / Powerful persuaders, quickened at the scent / Of that alluring fruit” (9.586-9).²⁰ As the fruit intensifies its seduction of Satan’s senses, he likens its scent to that of another plant, “smell of sweetest fennel,” and then to the ambrosial yield of a lactating ruminant, “the teats / Of ewe or goat dropping with milk” (9.581-2).²¹ Pollan assumes that “our first experience of sweetness comes with our mother’s milk,” but Milton circumvents this infantile experience at the breast by having Eve arrive into the world not at her mother’s breast but at Adam’s.²² “Sweetness,” Pollan continues, “has proved to be a force in evolution ... [I]n exchange for [the fruit’s] fructose,” nature’s crystalline form of energy, “the animals provide the seeds with transportation, allowing the plant to extend its range. As parties to this grand coevolutionary bargain, animals with the strongest predilection for sweetness and plants offering the biggest, sweetest fruits prospered together.” The apple is built to arouse the appetites of its seed bearers, and Eve becomes the greatest of all.

She at last confronts the forbidden fruit, its full botanic powers on display (9.632, 679). In Genesis, the fruit merely appeals to Eve’s vision—it is described as “pleasant to the eyes” (Genesis 3:6)—but in Milton’s revision, it enjoins each of her five senses:

Fixed on the fruit she gazed, which to behold
 Might tempt alone, and in her ears the sound
 Yet rung of [Satan’s] persuasive words ...
 And waked
 An eager appetite, raised by the smell
 So savoury of the fruit, which with desire,
 Inclined now grown to touch or taste
 Solicited her longing eye. (9.735-7; 739-43)

The double spondee—“she plucked, she ate”— consummates the seduction. The *ménage a trois* of plant, animal, and human—fruit, serpent, and Eve—simultaneously ratifies yet confounds Aristotle’s tripartite ontology, portending an ecology of desire co-shaped by the conscious and unconscious appetites of both fully cognitive and minimally cognitive organisms (9.781).

Furthermore, what Eve hopes is medicine, “Here grows the cure of all, this fruit divine,” proves to be poison (9.776). Within the core of the apple is what Pollan identifies as a pentagram—an unholy geometry in modern occultism—of “five small chambers arrayed in a perfectly symmetrical starburst. Each of the chambers holds a seed ... contain[ing] a small quantity of cyanide, probably a defense the apple evolved to discourage animals from biting into them.”²³ The forbidden apple’s promise of heightened cognition, of giving voice to the mute, reason to the animal, is ultimately embittered by the sinfulness of its seed.

At the heart of the poem’s cognitive interplay is an abiding similitude between humans and plants, a relation that generates intensely affective experiences of desire, prohibition, and repudiation both inside and outside of Eden, before and after the Fall. To account for these, the latter half of this essay joins queer readings of Milton’s epic to the history of early modern medicine—namely, Paracelsian pharmacology—to show how cross-species interactions are conceptually structured, in part, on a principle of anatomical similitude, one which, perhaps surprisingly, evokes the prospect of homosexuality.

Arguing for homosexuality in Milton, much less in the early modern period, is well-trodden turf with most debates centering on Milton’s intimate friendship with Charles Diodati, whom he met as a schoolboy while attending St. Paul’s and for whom he composed the elegy *Epitaphium Damonis*.²⁴ That’s not to mention those critics who still shake their heads and point to the much-cited moment in *The History of Sexuality*, where Michel Foucault tells us that the figure of the homosexual only became a distinct “species” or “personage” simultaneous with nineteenth-century medical and psychological discourses on sex, to prove that homosexuality did not exist in early modern England.²⁵ Attempting to undo what has been taken as Foucault’s historiographical dogmatism, Eve Kosofsky Sedgwick interrogates the epistemic shift between “before homosexuality” and “after homosexuality,” arguing instead for the “coexistence of different models” of sexuality that complicate the notion of a single narrative and an easy break.²⁶ Following suit, in “Queering History,” Jonathan Goldberg and Madhavi Menon wonder what it might mean to do a “homohistory”; that is, to conceive of history not in terms of difference but

of similarity and to question why “we apprehend the past” as synonymous with alterity.²⁷ A homohistory does not require historicizing homosexuality as an identitarian category but rather demands attending to the indefinability of homosexuality and thereby “expanding the possibilities of the nonhetero, with all its connotations of sameness, similarity.”²⁸ Even for Foucault, the homosexual as a modern construct was indefinable and never fully knowable: “a life form, and a morphology, with an indiscreet anatomy and possibly a mysterious physiology.”²⁹

The question of anatomy—that is, bodies and the arrangements of their parts—is of critical significance to the ontology and epistemology of the homosexual. A sexed body geared by its propensity toward other bodies with homologous parts not only *makes* the homosexual but makes the homosexual *knowable* in the first place. The “homo” of “homosexuality,” meaning “same” in Greek, denotes this desire for sameness. That is to say, on a fundamental level, the concept of homosexuality relies on sexed bodies with specific bodily configurations (however discursively and materially produced), desiring other bodies with congruent configurations. Approaching homosexuality in terms of form and materiality, as opposed to identity or politics, allows us to consider eroticism across ontological borders—human, animal, plant, mineral, thing—sharing morphological equivalency. Foucault's analysis of homosexuality is decidedly anthropocentric. Perhaps rightly so, but I echo Karen Barad's critique that “Foucault's genealogical analysis focuses on the production of human bodies, to the exclusion of nonhuman bodies whose constitution he takes for granted.”³⁰ If homosexuality is, even at least partially, a phenomenon of shared morphology, then is it unthinkable that desire might be imbedded in materiality? In the corresponding flesh of humans and nonhumans?

In *The Seeds of Things*, Goldberg turns Milton's materialism toward Lucretian atomism in an effort to “track signs of male desirability and of male-male desire in Milton ... by locating it in the angels of *Paradise Lost*, who, in their ability to eat and make love, are embodiments of Milton's monism.”³¹ Goldberg makes two interventions consequential to an ecological reading of *Paradise Lost*: the first in identifying possibilities for cross-species homoeroticism, especially in Adam's friendship with the archangel Raphael, and the second in structuring Milton's

materialism not only on a philosophy of ontological sameness but also in terms of *homo-ness* to show that “sexual desire is not incompatible with philosophical monism.” Toward the first, he directs us to homoerotically charged moments of eating shared between Adam and Raphael in which erotic similes turn edible and thereafter digestible. Adam says to the angel:

For while I sit with thee, I seem in heaven,
 And sweeter thy discourse is to my ear
 Than fruits of palm-tree ...
 They satiate, and soon fill,
 Though pleasant, but thy words with grace divine
 Imbued, bring to their sweetness no satiety. (8. 210-2, 14-6)

Saccharine tropes temporarily satisfy but ultimately fail to quench Adam’s appetite for angelic conversation, a mutual circulation of discourse and desire within “an organic cosmos living by means of a metabolic process that is not merely analogized when described as eating.”³² Goldberg reminds us that, for Milton, “knowledge is as food,” to which I would add that food is also botanic, a fact that holds true for the eventual fall. In Adam and Raphael’s exchange, Goldberg observes the necessarily unequal interactions across ontological boundaries, “[They] may both be male, but one is angel and the other is not: the specter of cross-species desire is thus present as a division within male gender as firm as that which separates male and female.”³³ The firmness of that division is what’s at stake. How wide are the gaps between gender, between species, between human and angel and plant, “if earth / be the shadow of heaven, and things therein / Each to other like” (5.574-6)?

Toward the second intervention Goldberg locates in Milton’s monism what he refers to as “homo-materialism,” a philosophical principle characterizing a literary universe where a single material substance animates all earthly and heavenly bodies.³⁴ In an endnote, he elaborates, “I mean to allude to the argument that [Leo] Bersani has been making lately about a homo-ness that extends beyond sexual matters to a broader sense of worldly connectedness based in sameness.”³⁵ Bersani, one of the major thinkers with whom Goldberg converses in *The Seeds of Things*, has

moved from the psychoanalytically inflected self-shattering of sex in his earlier work to a more recent interest in what he describes as “correspondences of forms within a universal solidarity of being.”³⁶ In “Sociality & Sexuality,” Bersani claims that “[a]ll love is, in a sense, homoerotic.”³⁷ An impossible, if not at least baffling statement on its surface, Bersani insists that “[e]ven in the love between a man and a woman, each partner rejoices in finding himself, or herself, in the other,” a concept he later develops as “impersonal narcissism” in conversation with Adam Phillips in *Intimacies*.³⁸ Bersani takes seriously Foucault’s call for “new relational modes” by rediscovering a sort of specular love in *The Symposium* and *Phaedra* where a “lover narcissistically loves the image of his own universal individuation that he implants in the boy he loves, but he is implanting more of what his beloved is, more of the type of being they already share.”³⁹ Impersonal narcissism requires, in effect, that the subject love an idealized yet distorted version of the self possessed by the other—a phenomenon of both sameness and difference “in which the very opposition ... becomes irrelevant as a structuring category of being.”⁴⁰

In “Unworking Milton: Steps to a Georgics of the Mind,” Steven Swarbrick follows a similar critical genealogy to help us understand that the “other” in this “relational field” is not necessarily human nor is it, as I argue, necessarily celebrated, especially in Milton’s Ovidian rewriting of the Narcissus myth.⁴¹ Eve remembers her lakeside sexual awakening:

I thither went
 With unexperienced thought, and laid me down
 On the green bank, to look into the clear
 Smooth lake, that to me seemed another sky.
 As I bent down to look, just opposite,
 A shape within the water gleam appeared
 Bending to look on me, I started back,
 It started back, but pleased I soon returned,
 Pleased it returned as soon with answering looks
 Of sympathy and love. (4.457-65)

What Eve sees in the water is the natural effect of ecologic assemblage: a dynamic relay of liquid and air, body and image, a startled withdrawal and then curious return to the water's edge, compelled by the specular interactions of the environment. Eve's "I" doubly becomes "it," and "it" (notably not Eve) answers with "sympathy and love." I read this scene of narcissism not so different from Eve's seduction by the fruit: yet another materialist actualization of desire that crosses ontological boundaries by concentrating affective density in figures of non-humanity. What Swarbrick describes as "a material composite of sound and light, a sonorous, 'watery image'" is also the reverberation of the human against the inhuman, an event where similitude might easily become undone by a wayward ripple or errant shaft of sunlight.⁴² What is at first foreign to Eve on the water's reflective surface becomes familiar, a sympathetic figure that reliably returns and amplifies her expressions of love.

This moment in particular has experienced many returns in queer criticism on *Paradise Lost*. For example, in "Adam and Eve and the Failure of Heterosexuality," Will Stockton argues that straight sex is doomed to fail because neither man nor woman is capable of achieving gratification with the other.⁴³ Postlapsarian Adam fantasizes about a "masculine" world "without feminine," one without Eve—"O why did God ... create at last / This novelty on earth, this fair defect / Of nature? ... Or find some other way to generate / Mankind?" (10.888; 90-2, 94-5)—begging instead for a fellow, who Stockton jokingly names "Steve." Eve, on the other hand, enacts her own stubbornness to heterosexuality by originally preferring her own reflection to Adam, whom she finds "less fair ... [t]han that smooth wat'ry image" (4.478, 80). James Holstun reads her reluctance to Adam as evidence of her natural lesbianism.⁴⁴ Nostalgic for how she once "pined with vain desire" for her own "shape," Eve laments God's correction of her narcissistic error by redirecting her sexuality to its properly gendered object (4.466). This alternate route, however, is a mere heterotized version of her lakeside narcissism. Adam is her original and she his image. "He / Whose image thou art, him thou shalt enjoy," God commands (4.471-2). Her reflection is a visual iteration of a sameness that joins her to him and, consequently, them to the universe. Reproduction too is a multiplication of similitude: "To him shalt bear / Multitudes like

thy self" (4.473-4). The primacy of heterosexuality in Milton's epic is diminished by an originary desire for similitude that proliferates seemingly *ad infinitum*.

Difference too in *Paradise Lost* is an effect of materiality, occurring in degrees and forms "of substance":

One almighty is, from whom
 All things proceed, and up to him return,
 If not depraved from good, created all
 Such to perfection, one first matter all
 Indued with various forms, various degrees
 Of substance, and in things that live, of life. (5.469-74)

Even gender difference is, in part, a phenomenon of material sameness as Eve herself is culled from Adam's torso: "Manlike, but different sex, so lovely fair" (8.471). God shapes Eve not just from her husband's bone but from the very matter that composes the cosmos. Milton's description of Eve as "manlike" masculinizes only insofar as it characterizes shared corporeality. **Even** in their darkest hour, Adam's materialist promise to Eve echoes marriage vows, "Flesh of flesh / Bone of my bone thou art, and from thy state / Mine never shall be parted" (9. 914-6). Homo-materialism avows shared materiality between genders as well as across species. The point is made most vividly in Raphael's narration of angelic intercourse, which Goldberg insists is "undeniably homo": "Whatever pure thou in the body enjoy'st ... we enjoy / In eminence" (8.622-4). Raphael proceeds to describe the supernal concoction, "Total they mix, union of pure with pure / Desiring," ignoring impediments "of membrane, joint, or limb" (8.627-8, 625). Hierarchized angelic order dissolves in unimpeded, virtually egalitarian ecstasy. Foucault might call angelic sex an "event," which "is neither substance, nor accident, nor quality nor process; events are not corporeal. And yet, an event is certainly not immaterial; it takes effect, becomes effect, always on the level of materiality" (231). Divine coitus as non-procreative sex, Goldberg sharply observes, finds its counterpart not only in prelapsarian sex—Adam and Eve do **no** reproduce until *after* the fall—but also in the "sex lives of plants in Eden whose exuberance

includes ‘fruitless embraces.’”⁴⁵ Goldberg’s angelic intervention is also an invitation to ponder the desires of other nonhumans—specifically, plants—and the ways in which same sex desire transgresses the species border in *Paradise Lost*.

Plant sexuality is more so an invention of the eighteenth century than of the Renaissance; however, eighteenth-century discoveries in botany were spurred by the cultural and scientific demands of the previous century. In *Nature’s Body*, Londa Schiebinger informs us that during “the seventeenth century, academic botanists began to break their ties with medical practitioners”—the herbalists, physicians, and naturalists of the sixteenth century—and instead approached the “[n]ew plant materials from the voyages of discovery and the new colonies” coming into Europe for the very first time.⁴⁶ The number of plants known to Europeans quadrupled in number between 1550 and 1700. With such a massive influx, “emphasis on classification turned from medical application to more general and theoretical issues of pure taxonomy,” finding ways to organize a constantly growing amount of information. One way to do this, at least for the father of modern taxonomy, was to mobilize human tropes of sex and gender into scientific discourses of classification. In *Systema naturae* (1735), Carl Linnaeus developed a system of organization, popularly known as binomial nomenclature, based on sexual difference and in which certain anatomical parts of plants correspond with either male or female human genitalia. His taxonomical method, Schiebinger tells us, “though focused on reproductive organs, ... did not capture fundamental sexual functions.”⁴⁷ Instead, like his early modern predecessors, who saw their own bodies reflected in the anatomies of plants, “it focused on purely morphological features.” For example, the stamen, the pollen-containing anther, corresponds to the male penis, while the pistil corresponds to the female ovary. Linnaeus’ approach, however, was not entirely new; he borrowed such representations from early modern notions of anatomical analogy. He was likely familiar with Philemon Holland’s 1601 translation of Pliny’s *Natural History*, which includes a description of a species of male frankincense, so named for its resemblance to human testes, as well Joseph Pitton de Tournefort’s 1609 standardization of the term pistil (*pistile* in French) to classify the ovary of the flower.⁴⁸ The ways

in which eighteenth-century botanists mapped human sexuality onto plants find their antecedents in early modern discourses of medicine and natural history.

Schiebinger identifies “two levels in the sexual politics of early modern botany,” the first being “the *implicit* use of gender to structure botanical taxonomy” and the second,” the *explicit* use of human sexual metaphors to introduce notions of plant reproduction into botanical literature.”⁵⁰ Linnaeus not only sexes plants in terms of functional similitude to human genitalia but also conscripts botanical reproduction into what Adrienne Rich calls “compulsory heterosexuality.”⁵⁰ He describes in *Praeludia sponsaliorum plantarum* how plants perform heterosexual rituals of courtship:

The flowers' leaves ... serve as bridal beds which the Creator has so gloriously arranged, adorned with such noble bed curtains, and perfumed with many soft scents the bride-groom with his bride might there celebrate their nuptials so much the greater solemnity. When now the bed is so prepared, it is time for the bridegroom to embrace his beloved bride and offer her his gifts.⁵¹

Reading his descriptions of botanical reproduction, one might easily forget that Linnaeus is writing about plants and not humans. The casualties of heteronormative anthropomorphism, plants, for Linnaeus are highly erotic creatures, who not only have sex with one another but do so within the cultural directives of marriage. These botanical marriages, however, were always already queer, not only the ways in which plant reproduction crosses with that of humans, but also because flowers pose an interesting morphological problem; they possess both male and female sex organs. They are hermaphroditic. The theory of sexual dimorphism unravels against a floral body that unites the male with the female, the masculine with the feminine, the bridegroom and his bride within its virescent anatomy, in turn, problematizing categories of “natural sex.” Sexual difference as well as gender difference is represented as a division within the figure of the plant itself, which, for Linnaeus, is not the other of the human but that which becomes more humanlike via collection, observation, and classification.

Paradise Lost is a veritable herbarium of plants: medicinal herbs, flowers, and fruit that

take effect not according to a logic of sexual dimorphism but vis-à-vis a theory of anatomical resemblance. After the Fall, the archangel Michael restores Adam's lost eyesight with a common herbal remedy:

Michael from Adam's eyes the film removed
Which false fruit that promised clearer sight
Had bred; then purged with euphrasy and rue
The visual nerve, for he had much to see. (9.411-5)

“Euphrasy,” popularly known as “eyebright” but referred to by taxonomists as *Euphrasia officinalis*, is a botanical genus comprising hundreds of varieties of flowering plants indigenous to the dry heaths and pastures of Europe, Asia, and North America. Because of its distinct morphology but mostly for its pharmacological potency, several European species of eyebright quite literally “caught the eye” of sixteenth and seventeenth-century naturalists. Early modern herbals, including John Gerard's *Generall Historie of Plants*, declare the flower to serve as “a most sovereign remedie” for eye diseases: “Eye-bright ... taketh away all hurts from the eyes, comforteth the memorie, and cleareth the sight, if halfe a spoonful be taken euery morning.”⁵² Folkloric medicine believed eyebright to brighten eyes dimmed by sickness. These days, physicians might agree. Medical research indicates that eyebright effectively treats eye infections, notably conjunctivitis, which produces a viscous, mucoid film over the eye's exterior surface and which sometimes impairs vision.⁵³ Eyebright reduces the severity of these symptoms. Although the findings of these studies give credence to Michael's medicine, this is not to say that Milton's Adam is afflicted by conjunctivitis. (In fact, he is afflicted by something much, much worse—the wrath of God and expulsion from Paradise.) My intention is not to retrospectively diagnose. Rather, I am arguing for the ways in which Milton's literary text intercepts the mythos of early modern folk medicine, while simultaneously entangling the molecularities of homeopathic pharmacology. Taking my cue from conjunctivitis, that is, *conjunctivus* from the Latin *conjugere*, meaning “to join together,” my aim throughout this essay has been to show how

Milton produces “joinings” across species, cognitive as well as horticultural graftings between humans and plants in intimate proximity.

Herbals were popular texts during the early modern period. In a recent essay, Elaine Leong demonstrates their cultural centrality as vernacular sources for domestic medicine.⁵⁴ The massive compendiums contain pictorial representations of plants alongside explanations of their medicinal properties, appearance, and seasonal growth patterns. Because these manuals were so widely available during the seventeenth century, Milton, who suffered from glaucoma and eventual blindness, was likely familiar not only with eyebright and its therapeutic virtues but also with the wider discourse of herbal medicine. James Patrick McHenry goes so far to suggest that he was probably an “expert on the subject,” citing Milton’s prose piece, “Of Education,” in which he espouses learning natural histories of ... plants” and inheriting “the helpful experiences of ... gardeners.”⁵⁵ We also know from Milton’s epistolary correspondence that he sought a cure for his waning vision. In a 1654 letter to Leonard Philaras, he requests medical advice from the Parisian oculist, Thévenot, hoping that “he can diagnose the causes and symptoms of the disease.”⁵⁶ In the same year that Milton met Philaras, Nicholas Culpeper, an up-and-coming herbalist, published a well-known pharmacopeia, which stated that eyebright “helpeth all infirmities of the Eyes that caus dimness of Sight,” deriving its botanical potency “under the sign of Leo.”⁵⁷ Eyebright’s appearance as a pharmaceutical in *Paradise Lost* evinces Milton’s familiarity with homeopathy. He may have even attempted botanical remedies on his own weakening eyes as he exhausted possibilities for a cure.

While Culpeper attributes eyebright’s curative power to the seasons and stars, molecular biology locates the flower’s power in its abundant antioxidants. Antioxidants are molecules that inhibit oxidation, a chemical process of electron transference, which may result in cell or tissue damage. Eyebright’s antioxidants inhabit the plant’s cell walls and possess salubrious binding properties that protect the body and its corollary parts against viruses, inflammation, and allergens, including those that afflict the eyes. Milton, however, did not know about antioxidants. Nor did he have access to the modes of scientific knowledge, technology, and discovery through

which acutely modern epistemologies of bodies are produced. Instead, early moderns relied on a quasi-religious, scientific theory of embodiment known as the Doctrine of Signatures and for—what they thought was—good reason.

The intellectual seeds for the Doctrine of Signatures were first planted by Paracelsus during the sixteenth century. Working as a physician, astrologer, and naturalist on the continent, Paracelsus developed a philosophy that combined Christian Neoplatonism, as revived by Marsilio Ficino and Pico della Mirandola of the Florentine Academy, with the late medieval alchemical tradition. F. David Hoeniger characterizes his metaphysics as “a vitalist interpretation of the universe, which postulates that everything in creation is alive and interacts, ... the earth with its minerals, the air with its winds and clouds, and the planet.”⁸⁸ Indeed, in *The Matter of Revolution*, John Rogers argues that Milton’s materialism arises not from Lucretian atomism but from Paracelsian cosmography, “Milton, like a number of midcentury vitalists, claims affinity with a philosophy of matter derived ultimately from ... [t]he theories of the microcosm developed by Paracelsus ... that linked man and the universe in a self-contained cosmic economy of interflux and exchange.”⁸⁹ According to Paracelsus, all of the world’s beings were marked by arcane signatures revealing their divinely ordained functions in the world. These signatures were not mere signs—that is, inert, passive, or mute objects onto which meanings were inscribed—but rather, they incarnated a complex, cosmographical material-semiology. Signatures were materialized in the tissues, joints, and sinews of the earth’s heterogeneous bodies. They manifest as shapes, odors, colors, and textures. Although Paracelsian signatures were naturally exteriorized, these embodied hieroglyphs were cryptic and sometimes difficult to decipher. Early modern naturalists were charged with the task of “reading” these somatic marks and discerning their usefulness to humans.

Plant signatures were especially important during this time. The Doctrine of Signatures claimed that the morphology of a plant corresponds to its therapeutic effect on a part of the human body sharing similar features. For instance, the leaf of *Hepatica acutiloba*, otherwise known as liverwort, is shaped like a liver and, therefore, might be used to treat liver disease. Or,

to borrow an example from William Cole's *The Art of Simpling*:

The kernel [of a walnut] hath the very figure of the Brain, and therefore it is very profitable for the Brain, and resists poysons; for if the Kernel be bruised, and moystned with quintessence of Wine, and laid upon a Crown of the Head, it comforts the brain and head mightily.⁶⁰

Simply put, form fits function. The outward characteristics of plants determine their curative value. The same applies to Milton's eyebright. The zygomorphic structure of its flower—the bilateral symmetry of the floral plane—produces morphological analogy between the blossom and the human eye. Coles elaborates, “The purple and yellow spots and stripes which are upon the flowers of the Eyebright doth very much resemble the diseases of the eye, as bloodshot, etc., by which signature it hath been found out that this herb is effectual for the curing of the same.”⁶¹ Because the plant *looks* like an infected eye, it was believed to heal an infected eye. The Paracelsian, homeopathic method of *similia similibus curantur* (“like cures like”) diverged from the prevailing Galenic, allopathic method of *contraria contrariis curantur* (“opposite cures opposite”). The Doctrine of Signatures purported sameness to be more therapeutic and “sovereign” than difference.⁶²

Not everyone, however, was convinced by the Doctrine of Signatures. In 1691, John Ray, a prominent natural historian, insisted that the Doctrine of Signatures was “rather fancied by men than designed by Nature.”⁶³ Today, some scientists echo this sentiment, deriding the Doctrine of Signatures as a quaint, blindfolded theory from days of yore. Bradley Bennett, for example, describes it as “primitive superstition” and a “much maligned theory” that was “primarily a symbolic device used to transfer information especially in preliterate societies.”⁶⁴ To me, whether the Doctrine of Signatures is empirically “right” or “wrong” is neither here nor there. As part of what Goldberg and Menon call a homohistory, the theory provides a conceptual framework in which plants became desirable for their own attributes: the seductive geometries of their leafy bodies, the odors of their dripping blossoms, and the unseen powers of their chemical compounds. By generating anatomical resemblances between humans and plants, early moderns

inspired a form of cross-species intimacy that, by its very nature, evokes homosexuality: the “fancy” for the shape and proportion of one’s own body in the body of another.

In light of this reading, I want to return to Foucault and provisionally propose the recursivity of homosexuality or, at the very least, the latency of cross-species homoeroticism in one of his earlier texts, *The Order of Things*, by suggesting that homo-desire was never an exclusively human phenomenon. He tells us that, during the early modern period, “resemblance” played a vital role in productions of Western knowledge, “The universe was folded in upon itself: the earth echoing the sky, faces seeing themselves reflected in the stars, and plants holding within their stems the secrets that were of use to man.”⁶⁵ The heterogeneous bodies of the world shared a “mutual attraction for one another,” not because of their difference but because of their similarity. These resemblances were made legible by signatures—nature's embodied semiology—and linked humans to their nonhuman counterparts in a cosmographical desire for sameness. The word was made flesh, and the flesh was made word through the universe's involuted material-semioticity. Humans saw themselves in the signatures of plants and were, therefore, drawn to them. They recognized their eyes in flowers, their hearts in leaves, and their veins in the fibers radiating through the earth's botanical anatomies. Through what we might consider desubjectifying affect, Foucault argues that sympathy is this natural impulse toward sameness:

Sympathy is an instance of the *Same* so strong and so insistent that it will not rest content to be merely one of the forms of likeness; it has the dangerous power of *assimilating*, of rendering things identical to one another, of mingling them, of causing their individuality to disappear—and thus of rendering them foreign to what they were before. Sympathy transforms. It alters.⁶⁶

As a counterpoint, Foucault explains that complete and utter implosion into sameness is prevented by sympathy's twin, antipathy, which “encloses species within their impenetrable difference.”⁶⁷ The balancing act between sympathy and antipathy ensures that resemblances exist without the total integration of discrete, singular bodies. Foucault's account of sympathy relies on

an episteme of analogy which, in *The Order of Things*, is proper to a particular historical epoch in the history of representation and which limits desire for sameness to nothing more than mere similarity. Milton, on the other hand, radicalizes sympathy into a more ontological as well as a more cognitive understanding of affective materiality. Plant matter acquires affective density not only through its morphological equivalency to humans but also through the minimally cognitive possibilities of mindlessness.

The premise of minimal cognition in the garden is further widened by the research of biologist Daniel Chamovitz, who openly and admittedly risks anthropomorphism by arguing for botanical sympathetic systems that are distinctly not nervous but that nonetheless correspond to the five human senses. In *What a Plant Knows*, he writes:

Plants don't have a central nervous system; a plant doesn't have a brain that coordinates information for its entire body. Yet different parts of a plant are intimately connected, and information regarding light, chemicals in the air, and temperature is constantly exchanged between roots and leaves, flowers and stems, to yield a plant that is optimized for its environment. We can't equate human behavior to the ways in which plants function in their worlds, but I ask that you humor me while I use terminology ... that is usually reserved for human experience.⁶⁸

Chamovitz' contention that plants can see—"plants monitor their visible environment all the time," he writes—advances yet another mode of human-plant resemblance that, unlike the Doctrine of Signatures, privileges function over form.⁶⁹ In *The Power of Movement in Plants*, the Darwins allege the existence of not only root brains but also plant eyes, light sensitive structures imbedded in the plant's stem that determine the direction in which it bends.⁷⁰ Plants, like humans, are able to detect light, transfer that stimulus to other parts of their bodies, and then respond accordingly. Both also possess photoreceptors, specialized cells evolutionarily configured to capture photons (particles representing a quantum of light). While plants possess photoreceptors unique to plants and humans possess photoreceptors unique to mammals, resemblance might be

detected further down the neurobiological chain at the level of the molecule. “Plant and human photoreceptors,” Chamovitz observes, “are similar in that they all consist of a protein connected to a chemical dye that absorbs the light.”⁷¹ Might desire for cross-species similitude lead to the tangled tertiary structures of proteins? Where the micro-processes of light detection fold and unfold similitude and difference across cellular membranes?

Eyebright may have looked like a human eye to early modern naturalists and, by such shape, proved its medicinal virtue, but while it was able to cure Adam’s ailing vision in *Paradise Lost*, it couldn’t save Milton’s. Blindness, it is worth noting, is also a botanic affliction, affecting plants in two distinct ways. The first is anatomical. A plant is structurally “blind” if it lacks buds or flowers. The second is sensory. “Blind” plants are unable to perceive light. Plants grown in darkness tend to grow longer and spindlier as they search for a light source. Chamovitz uses the term to refer to mutant species genetically engineered to *not* sense light or certain colors in the light spectrum.⁷² It is by such engineering that scientists were able to learn that plants possess roughly double the photoreceptors of humans and that, while plants do not “see” in images as animals do, they are able to perceive minute variations in color. Plants use this information to coordinate rest, photosynthesis, and germination. By genetically “turning off” the expression of certain photoreceptors, science effectively blinds plants to specific colors of light.

However, early modern plants, unlike these blinded mutants, were meant to see and to be seen, not only by humans in the pages of herbals and in the beds of gardens, but also by seed-bearing animals that alight upon their protuberances for sustenance, reproduction, and survival. Even through the lens of the microscope, Nehemiah Grew revealed for the very first time botanical cellular structures in his 1682 *Anatomy of Plants*. “As imaging systems in their own right,” Swarbrick asserts, plants are “evolutionarily adapted” to “[train] human perception.”⁷³ Joanna Picciotto agrees that flowers in *Paradise Lost* are such imaging systems, serving as lenses or, rather, “floral spectacles” not for Adam and Eve but for Milton’s reader: “Milton literally makes flowers into spectacles ... [to] reform the ‘eyes’ planted in us ... to imagine ourselves—sexual creatures condemned to work—as paradisaical subjects.”⁷⁴ This is the moral prerogative of

flowers.

Be that as it may, plants are not mere tools designed to instrumentalize or compensate for human deficiency. These prescient pedagogues make use of their own sophisticated visual systems to see us, to sense our presence when nearby, and to bend our will to theirs. Chamovitz observes, “Plants see if you come near them; they know when you stand over them ... [and] see light in many ways and colors that we can only imagine.”⁵ What then might this mean for Milton’s Adam or for the poet himself to encounter an herb that likewise encounters him? Or for the forbidden fruit, suspended from the tree of knowledge in its seductive grace, to sense Eve’s inevitable approach, the shadow of her hand, the draw of her lips? The plant’s wiles are as deliberate as they are delicious.

When Milton asks his muse to inwardly “there plant eyes” in Book 3, the word “plant” presents a textual crux:

So much the rather thou celestial light
Shine inward, and the mind through all her powers
Irradiate, there plant eyes, all mist from thence
Purge and disperse. (3.50-3)

One could read “plant” as a verb, the conventional reading, in which the blind poet covets prophetic inner sight like “Blind Thyramis and blind Maeonides / And Tiresias and Phineus prophets old” (3.35-6). That is, the poet asks his muse to grant him interior eyes so that he may “see and tell of things invisible to mortal sight” (3.54-5). The irradiated “celestial light” and the purging of “all mist” make such perspicacious vision possible. Eyebright achieves a similar effect for Adam after the fall, as Picciotto observes, “The purgative powers of ... herbs pierce into ‘the inmost seat of mental sight,’ forcing sensitive eyes to close; once again, the eye is dug into, so that it can start to dig.”⁶ The eye becomes a hole, a figure of depth and openness filled with nerves and tissue, roots and soil. Behind it might be a brain, but that is not certain. The verbal, “to plant,” denotes not only the act of digging but also the seeding and cultivation of terrain: the willful deposit of a germinating organism in a substrate that incubates and minerally

nurtures its growth. The eyes then are seeds that the muse plants in the intellectual matter of the poet's light-filled mind.

The alternate reading is to interpret “plant” as an adjective modifying “eyes”—not “there plant eyes,” a spatial directive, but rather “there *plant eyes*.” The logic of this reading is more opaque than the first but suggests that “plant eyes,” which might represent buds, flowers, or even a strange anthropomorphic hybrid, become surprisingly sensate in the luminescent topography of the author's brain. Milton's cognitive ecology in *Paradise Lost* urges us not only to know plants but also to know that plants know. We are not alone in the garden.

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¹ Charles Darwin, *The Power of Movement in Plants* (London: John Murray, 1880), p. 572.

² The very concept of plant neurobiology is controversial. A group of 36 botanists criticized the burgeoning field in the journal, *Trends in Plant Science*, arguing that, because plants lack brains, neurons, and synapses, “plant neurobiology” is nothing but a misnomer. Amedeo Alpi et. al., “Plant neurobiology: no brain, no gain,” *Trends in Plant Science* 12:4 (2007): pp. 135-136.

³ Thomas Moffett, *Insectorum sive minimorum animalium theatrum* in Edward Topsell, *The History of Four-footed Beasts and Serpents* (London: E. Cotes, 1658), p.889.

⁴ The neuralia include cnidaria, ctenophora, and bilateria, characterized by specialized neuronal systems in the absence of a central nervous system.

⁵ Paco Calvo Garzón and Fred Keijzer, “Plants: Adaptive Behavior, Root Brains and Minimal Cognition,” *Adaptive Behavior* 19:3 (2011): 155-171, quote on p. 162.

⁶ Garzón and Keijzer outline five requirements for cognition: “1. Metabolism provides a basic form of biochemical normativity for cognition. 2. Cognition proper (initially) consists of exploiting the spatiotemporal dispersal characteristic of metabolically relevant environmental features. 3. The spatiotemporal structure of the environment is accessed by free and reversible body movement enables by various sensorimotor organizations. 4. A basic sensorimotor organization operates online—being under direct stimulus control—but can be expanded to

include offline control structures. 5. Such a sensorimotor-based cognitive organization is a globally organized cohering unit, not a collection of individual stimulus-response relations.”

They note that plants adhere to the first tenets, while problematizing the latter three. Garzón and Keijzer, “Plants: Adaptive Behavior, Root Brains and Minimal Cognition” (above n. 5), p. 162

⁷ Aristotle, in *De Anima*, describes common sense as the means by which the mind converts sensory perception into objects to be apprehended. Aristotle, *De Anima (On the Soul)*, *The Complete Works of Aristotle, Volume One*, ed. J. Barnes, trans. J.A. Smith (Princeton: Princeton University Press, 1984), p. 715.

⁸ All quotations for *Paradise Lost* are taken from John Milton, *Paradise Lost, The Major Works*, eds. Stephen Orgel and Jonathan Goldberg (New York: Oxford University Press, 1991)

⁹ Michael Marder, *Plant Thinking: A Philosophy of Vegetal Life* (New York: Columbia University Press, 2013), pp. 156-157.

¹⁰ Marder, *Plant Thinking* (above n. 9), p.154.

¹¹ Marder, *Plant Thinking* (above n. 9), p.155.

¹² Ken Hilter, *Milton and Ecology* (Cambridge: Cambridge University Press, 2003), p. 4.

¹³ Virgil’s *Georgics* precedes Milton’s scene of rural labor. So too does Ovid’s account of Vertumnus and Pomona in the *Metamorphoses*, which uses the image of a vine climbing an elm to espouse the reciprocal benefits of marriage. Milton makes explicit the parallels between Eve and Pomona, comparing Eden to “Pomona’s arbor” and Eve’s departure from Adam to “Pomona[’s] when she fled Vertumnus,” (5. 377-8, 9. 394-5). Coincidentally, the myth of Vertumnus and Pomona proved a popular subject for Renaissance artists and writers in England as well as on the continent. Andrea Alciato’s woodcut of a vine and elm from his *Emblematum liber* (1531) found its way into Geoffrey Whitney’s *Choice of emblemes* (1586) accompanied by a short poem advocating the benefits of friendship in old age. On canvas, the vine and elm appeared in paintings by Francesco Melzi, Luca Giordano, and Gerbrand van den Eeckhout, but most curious is Giuseppe’s Arcimboldo’s portrait of Rudolf II as Vertumnus in which the face is composed entirely of fruits, vegetables, and flowers. Arcimboldo’s *Vertumnus* renders the human edible as it literalizes erotic metaphors conventionally reserved for feminine beauty.

¹⁴ Aristotle, *Metaphysics* qtd. in Marder, *Plant Thinking* (above n. 9), p.164.

¹⁵ Marder, *Plant Thinking* (above n. 9), pp.164-165.

¹⁶ Michael Pollan, *The Botany of Desire* (New York: Random House, 2002), p. xv.

¹⁷ Pollan, *The Botany of Desire*, (above n. 16), p. xvi.

¹⁸ Milton, *Areopagitica, The Major Works*, eds. Stephen Orgel and Jonathan Goldberg (New York: Oxford University Press, 1991), p. 247.

¹⁹ Pollan, *The Botany of Desire*, (above n. 16), p. 20.

²⁰ Redness and fairness are hallmarks of a Petrarchan color scheme adopted by early modern sonneteers and metaphysical poets.

²¹ Fennel, it’s worth noting for purposes that will become clearer later in the essay, was used by early modern physicians to treat diseases of the eye. See, for example, Walter Bailey’s (1529-1592) *The Brief Treatise Touching the Perseruacion of the Eie Sight* that was published in multiple editions between 1586 and 1673.

²² Pollan, *The Botany of Desire*, (above n. 16), p. 19.

²³ Pollan, *The Botany of Desire*, (above n. 16), p. 10.

²⁴ Goldberg covers this literature in “Milton’s Angels,” *The Seeds of Things: Theorizing Sexuality and Materiality in Renaissance Representations* (New York: Fordham University Press, 2009), pp. 179-209.

²⁵ Michel Foucault, *The History of Sexuality*, vol. 1, trans. Robert Hurley (New York: Vintage, 1990), p. 43.

²⁶ Eve Kosofsky Sedgwick, *Epistemology of the Closet* (Berkeley: University of California Press, 1990), p. 47.

²⁷ Goldberg and Madhavi Menon, “Queering History,” *PMLA* 120:5 (2005): 1608-1617, quote on p. 1609.

- ²⁸ Goldberg and Menon, “Queering History,” (above n. 27), p.1609.
- ²⁹ Foucault, History of Sexuality, (above n. 25), p. 43.
- ³⁰ Karen Barad, Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning (Durham: Duke University Press, 2007), p.169.
- ³¹ Goldberg, The Seeds of Things (above n. 24), p. 181.
- ³² Goldberg, The Seeds of Things (above n. 24), p. 190.
- ³³ Goldberg, The Seeds of Things (above n. 24), p. 192.
- ³⁴ Goldberg, The Seeds of Things (above n. 24), p. 187.
- ³⁵ Goldberg, The Seeds of Things (above n. 24), p. 242.
- ³⁶ Leo Bersani, “Psychoanalysis and the Aesthetic Subject,” Critical Inquiry 32:2 (2006): 161-174, quote on p. 164.
- ³⁷ Bersani, “Sociality and Sexuality,” Is the Rectum a Grave? and Other Essays (Chicago: University of Chicago Press, 2010), p. 118.
- ³⁸ Bersani, “Sociality and Sexuality” (above n. 37) and Bersani and Adam Phillips, Intimacies (Chicago: University of Chicago Press, 2008)
- ³⁹ Bersani and Phillips, Intimacies (above n. 38), pp. 72, 82.
- ⁴⁰ Bersani and Phillips, Intimacies (above n. 38), p. 86.
- ⁴¹ Steven Swarbrick, “Unworking Milton: Steps to a Georgics of the Mind,” postmedieval 7:1 (2016): 120-146, quote on p. 136.
- ⁴² Swarbrick, “Unworking Milton” (above n. 41), p. 135.
- ⁴³ Will Stockton, “Adam and Eve and the Failure of Heterosexuality,” Queer Renaissance Historiography: Backward Gaze, eds. Vin Nardizzi, Steven Guy-Bray, and Will Stockton (Burlington: Ashgate Publishing, 2009), pp. 207-227.
- ⁴⁴ James Holstun, “‘Will You Rent Our Ancient Love Asunder?’: Lesbian Elegy in Donne, Marvell, and Milton,” English Literary History 54.4 (1988): 835-867.
- ⁴⁵ Goldberg, The Seeds of Things (above n. 24), p. 195.
- ⁴⁶ Londa Schiebinger, Nature’s Body: Gender in the Making of Modern Science (New Brunswick: Rutgers University Press, 2008), p. 14.
- ⁴⁷ Schiebinger, Nature’s Body (above n. 46), p. 17.
- ⁴⁸ Pliny the Elder, Natural History, trans. H. Rackham (Cambridge: Harvard University Press, 1942), p. 45 and Schiebinger, Nature’s Body (above n. 46), p. 216.
- ⁴⁹ Schiebinger, Nature’s Body (above n. 46), p. 13.
- ⁵⁰ Adrienne Rich, “Compulsory Heterosexuality and Lesbian Existence,” Blood, Bread, and Poetry (New York: Norton, 1986), pp. 23-75.
- ⁵¹ Carl Linnaeus, Praeludia sponalorium plantarum (1729) qtd. in Schiebinger, Nature’s Body (above n. 46), pp. 22-23.
- ⁵² In the Accommodated Animal, Laurie Shannon points us to the notion of plant sovereignty in Philemon Holland’s 1601 English translation of Pliny’s Historia Naturalis. If a plant proves an effective remedy for a bodily malady, then it is deemed “sovereign.” See Laurie Shannon, The Accommodated Animal (Chicago: University of Chicago Press, 2013), p. 108 and John Gerard, An Herball and Generall Historie of Plants (London: John Norton, 1597), p. 663.
- ⁵³ Researchers tested three extracts of *E. officinalis* for “free radical scavenging activity” and “immunomodulatory effects,” finding that ethanol and ethyl acetate (and not heptane) prove effective at certain concentrations. See Roman Paduch et. al., “Assessment of Eyebright (*Euphrasia Officinalis* L.) Extract Activity in Relation to Human Corneal Cells Using In Vitro Tests,” Balkan Medical Journal 31:1 (2014): 29-36. Another study found that drops made from eyebright “can safely and effectively be used for various conjunctival conditions.” See Matthias Stoss et. al., “Prospective Cohort Trial of *Euphrasia* Single-Dose Eye Drops in Conjunctivitis,” The Journal of Alternative and Complementary Medicine 6:6 (2000): 499-508.
- ⁵⁴ Elaine Leong, “Herbals she peruseth: reading medicine in early modern England,” Renaissance Studies 28:4 (2014): 556-578.

- ⁵⁵ James Patrick McHenry, "A Milton Herbal," Milton Quarterly 30:2 (1996): 45-110, quote on p. 67 and Milton, "Of Education (above n. 8), p. 231.
- ⁵⁶ Milton, "To Leonard Philarus, 1654" (above n. 8) pp. 721-723.
- ⁵⁷ Nicholas Culpeper, The English Physician; or an Astrologo-physical Discourse of the Vulgar Herbs of this Natioun (London: Printed by William Bentley, 1652)
- ⁵⁸ F. David Hoeniger, Medicine and Shakespeare in the English Renaissance (Newark: University of Delaware Press, 1992), p. 119.
- ⁵⁹ John Rogers, The Matter of Revolution: Science, Poetry & Politics in the Age of Milton (Ithaca: Cornell University Press), p. 10.
- ⁶⁰ William Coles, The Art of Simpling; an Introduction to the Knowledge and Gathering of Plants (London: Printed by J.G. for Nash, 1656), p. 3.
- ⁶¹ Coles, The Art of Simpling (above n. 60), p. 46.
- ⁶² Galenic theory upholds that the human body is filled with four basic substances called humors, which are balanced in a healthy individual. The four humors are black bile, yellow bile, phlegm, and blood. All diseases result from an excess or deficiency of these humors. For example, if the body exhibits an excess of phlegm, a characteristically cold and moist humor, then it should be treated by a plant demonstrating hot and dry qualities in order to re-calibrate humoral equilibrium.
- ⁶³ John Ray, The Wisdome of God Manifested in the Works of the Creation (London: Printed for Samuel Smith, 1691), pp. 85-86.
- ⁶⁴ Bradley Bennett, "Doctrine of Signatures: An Explanation of the Medicinal Plant Discovery or Dissemination of Knowledge," Economic Botany 61:3 (2007): 246-255, quote on p. 246.
- ⁶⁵ Foucault, The Order of Things: An Archaeology of Human Sciences (New York: Vintage Books, 1994), p. 17.
- ⁶⁶ Foucault, Order of Things (above n. 65), p. 23.
- ⁶⁷ Foucault, Order of Things (above n. 65), p. 24.
- ⁶⁸ Daniel Chamovitz, What a Plant Knows: A Field Guide to the Senses (New York: Scientific American/Farrar, Straus and Giroux, 2012), p. 5.
- ⁶⁹ Chamovitz, What a Plant Knows (above n. 68), p. 9.
- ⁷⁰ Darwin, The Power of Movement in Plants (above n. 1), p. 566 and Chamovitz, What a Plant Knows (above n. 68), pp. 15-16.
- ⁷¹ Chamovitz, What a Plant Knows (above n. 68), p. 24.
- ⁷² Chamovitz, What a Plant Knows (above n. 68), pp. 20-23. Here, he cites the 1980s experiments of Maarten Koornneef in which scientists poisoned *Aravidopsis thaliana* to cause mutations in its DNA, in turn, producing seedlings that were blind to certain colors of light.
- ⁷³ Swarbrick, "Unworking Milton" (above n. 41), p. 123.
- ⁷⁴ Joanna Picciotto, Labors of Innocence in Early Modern England (Cambridge: Harvard University Press, 2010), 477.
- ⁷⁵ Chamovitz, What a Plant Knows (above n. 68), p. 9.
- ⁷⁶ Picciotto, Labors of Innocence (above n. 74), p. 487.