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Towards an Intermedial Vegetal Ethics: Sumatra's Charismatic Titan Arum and the Spectacularization of Plant Being

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Abstract
Over the last decade, time-lapse videos of Sumatra's titan arum have attracted considerable interest on YouTube and other media-sharing platforms. Blooming unpredictably, the endangered plant has the tallest inflorescence and one of the largest tubers of any species in the world. Also known as corpse flower, titan arum emits a noxious odor when flowering. This article interrogates the ethics of botanical time-lapse through the example of titan arum. The analysis begins by situating the mediation of titan arum within the history of time-lapse. From the late-nineteenth century to the present, time-lapse has been regarded as a medium for decoding the enigmatic worlds of plants and engendering empathy for their lives. As a techno-utopianist intervention, time-lapse animates plants' otherwise imperceptible movements, disclosing their lively behaviors. Time-lapse, however, constructs creaturely plants by manipulating their temporalities and privileging their flowering parts over their biocultural embeddedness. Proposing an intermedial vegetal ethics of time-lapse, the article then draws upon critical plant studies, including Marder's notion of vegetal hetero-temporality, in conjunction with Hayles' concept of intermediation and Alaimo's trans-corporeal subjectivity. An intermedial ethics of time-lapse, as outlined in this article, attends to whole plants, resists the aestheticization of the vegetal body, narrativizes the heterogeneous temporalities of vegetal life, foregrounds in-situ conservation issues, and emphasizes the biocultural wholeness of plants, particularly the traditional relations between flora, Indigenous people, and local communities.

Keywords
botanical conservation, charismatic flora, critical plant studies, Indonesia, intermedial vegetal ethics, time-lapse cinematography, titan arum

As of January 2022, a time-lapse video of a titan arum, or corpse flower, blooming in a greenhouse in the U.S. state of Minnesota has garnered 9.8 million views on YouTube since its original upload in 2013 (Gustavus Adolphus College, "Perry the Corpse Flower"). Compressing the arum's complete 45-day flowering cycle into seven minutes, the recording visually narrates the metamorphosis of the endangered Sumatran plant—anthropomorphized in this instance as Perry T. Titan—from the emergence of its rounded tuber to the collapse of its inflorescence, or flower

cluster (Figure 1). Three years later, Perry T. Titan flowered again but this time over the course of twenty-six days—a botanical event spectacularized in a two-minute time-lapse sequence from 2016 (Gustavus Adolphus College, "Perry the Corpse Flower") (Figure 2). Similarly, a YouTube video of the species blossoming in an Illinois greenhouse for the first time in eleven years has attracted almost two million views to date (Chicago Botanic Garden) (Figure 3). Rendering the arum's protracted flowering perceptible to viewers, these short films construct the plant as animal-like or "creaturely," a term invoked frequently in the field of critical animal studies (for example, Pick). By accelerating vegetal temporality, time-lapse endows the plant with a kinetic capacity comparable to humans, animals, reptiles, and other mobile organisms. What's more, the popularity of botanical time-lapse signifies the ongoing public enchantment with the "visceral and spectacular appeal" (Meeker and Szabari 33) of plants such as titan arum as well as the moving image technologies that aim to render their enigmatic lives transparent (Williamson 50).

Figure 1. Perry the Corpse Flower Full Bloom Cycle 2013. Gustavus Adolphus College. *YouTube*. https://www.youtube.com/watch?v=Cz4gi8mhBvw.

Figure 2. Perry the Corpse Flower Full Bloom Cycle 2016. Gustavus Adolphus College. *YouTube*. https://www.youtube.com/watch?v=_Epdns3bTtY.

Figure 3. Corpse Flower Time-Lapse Video 2016. Chicago Botanic Garden. *YouTube*. https://www.youtube.com/watch?v=PSMKcE5XbAQ.

Regarded as "one of the most prominent plants in the plant kingdom," titan arum (*Amorphophallus titanum*) is a quintessential example of charismatic megaflora (Lobin et al. 69).

Restricted to the rainforests of western Sumatra, Indonesia, the arum bears the tallest inflorescence and one of the largest tubers of any known plant (Barthlott and Lobin). Both optically captivating and sensuously engrossing—for humans and non-humans, though of course in differing ways—the corpse flower attracts pollinators with a carrion-like odor, which has become its compelling olfactory hallmark. In 1878, naturalist Odoardo Beccari first delivered *A. titanum* seeds, collected in Sumatra, to gardens in England and Italy. The first flowering of a titan arum in a greenhouse, however, took place eleven years later at Royal Botanic Gardens, Kew. In fact, during the 100-year-period between 1889 and 1989, only twenty-one documented arum flowerings occurred in greenhouses around the world. The infrequency of flowering underscores how the plant's unpredictable nature has heightened its public allure since the late-nineteenth-century translocation of its seeds from Sumatran rainforests. According to the International Union for Conservation of Nature, "the unpredictability, rarity, and brevity of the blooming […] add to the species' enigma" (IUCN, "Use and Trade Information" para. 4). Of both scientific and popular interest, the gigantic blossom remains "a magnet for visitors of all age groups" (Lobin et al. 83) yet, in contemporary digital contexts, has become an aestheticized object of increasing fascination for users of YouTube, Flickr, Facebook, and other media-sharing platforms where technological intervention makes legible the plant's creatureliness within a time-frame accessible to the human spectator.

This article situates popular online videos of flowering titan arums within the 130-plus-year history of botanical time-lapse and the broader tradition of "plant cinematography" (Petterson 90). Since the advent of time-lapse itself, filmmakers, critics, and conservationists, on the whole, have affirmed its ecological value as a technology engendering insight into plants' otherwise inscrutable lives (for example, Donaldson; Pillsbury; Trewavas). In contrast, applying current thinking in the field of critical plant studies, this article calls into question the ethics of botanical time-lapse through a focus on time and, more precisely, on "plant-time" as the temporality specific to vegetal life (Marder; Ryan 163–189). The distortion of plant-time, I argue, underlies the animalization of the arum as a visual spectacle in conventional time-lapse cinematography. Through the reconfiguration of vegetal temporality, time-lapse extracts—and abstracts—the arum from its complex ecological and cultural networks. Moreover, the hypersexualized fixation on the gigantism of the florescence obscures the arum body as an integrated material-temporal whole. Consequently, time-lapse risks eliding the ecological urgencies impacting the *in-situ* conservation of titan arum and, in neocolonial terms, threatens to obscure the long-standing interconnections

between Indigenous Indonesians and endemic Sumatran flora that are essential to ensuring the plant's future in the wild. In response to this multi-dimensional critique of botanical time-lapse, the article proposes an *intermedial vegetal ethics* predicated on plant temporalities, corporealities, and relationalities. Rather than animalizing plants, the ethical framework outlined here aims to preserve traces of the otherliness of vegetal life in media representations.

"To Instill a Love For Them": Historical Views of Botanical Time-Lapse Ethics

Throughout its history, time-lapse film has been utopianized as an innocuous yet persuasive mechanism for enhancing human-flora relations, engendering ethical attitudes towards plants, and promoting botanical conservation imperatives. Beginning in the late 1800s, cinematographic developments facilitated new insights into the mystery of botanical life yet, at the same time, galvanized broad public interest in plants and the moving image (Gaycken, "The Secret Life"; *Devices*; Petterson; Tosi; Williamson). In response to the rising popularity of time-lapse cinema in the early-twentieth century, historian Leonard Donaldson asserted in 1912 that "the plant is no longer a kind of half inanimate being, but stands revealed" (100). For Donaldson and other commentators of the era, through time-lapse intervention, the opaque lives of plants are rendered lucid through the acceleration of flowering, fruiting, seeding, and other life cycle events. Like Donaldson a century before him, botanist Anthony Trewavas suggests that time-lapse counters the dominant cultural view of vegetal life as static by "speeding up of plant movements, bringing them into *a time frame familiar to us*" (13, emphasis added). Rendering the plant familiar, time-lapse discloses "some quite extraordinary behaviour" that, in the absence of the technology, would remain unappreciated or unknown (Trewavas 13). Anthropomorphizing vegetal temporality—imposing a human perceptual frame on protracted plant processes—time-lapse enables audiences to cultivate empathy for plants and gain insights into their strangely *inhuman* modes of being: "Since plants do not possess a nervous system, a different timescale of life is to be expected" (Trewavas 77).

The prevailing view of time-lapse as generative of vegetal ethics figures into contemporary works of plant cinematography, notably *Kingdom of Plants* (Williams), written and presented by David Attenborough. Filmed over a year at Royal Botanic Gardens, Kew, the television documentary comprises three episodes—"Life in the Wet Zone," "Solving the Secrets," and "Survival"—with a prominent ethics of plants informing, for instance, its narration of the

Millennium Seed Bank, the largest ex-situ botanical conservation program in history. Episode 2 concludes dramatically with the flowering of a titan arum condensed into a two-minute segment accompanied by the ultrasonic sounds of plant growth—of the pointed bud pushing steadily up through the soil and the spire-like spadix unfurling suddenly from the center of the inflorescence. As a botanical marvel, charismatic titan arum, for Attenborough, is "one of the most astonishing of blooms" (in Williams 00.44.42–00.44.45). Concerned with unravelling the paradox of vegetal existence, *Kingdom of Plants* combines time-lapse with advances in infrared, microcinematography, and other novel imaging techniques. A review of the series in *The Guardian* lavishes praise on time-lapse as a means to unveil the creatureliness of plants:

> It's only when you speed them up that they reveal their true nature, as competitive and aggressive as any Dutch polar bear. They jostle and fight for light and space. Creepers reach out creepily for something to grab hold of, like blind creatures, triffids. (Wollaston para. 5)

Like "blind creatures," plants are "competitive" and "aggressive"—they jostle, fight, reach, and grab. Despite the jocular tone of the above excerpt, the animalization of flora reinforces a pervasive cultural rhetoric constructing botanical life as creaturely and, moreover, locating plantness—the particular essence of vegetal being—in quasi-animalistic desire. Similarly, throughout his narration, Attenborough praises cinematographic innovation as a translational medium for revealing plants' "bizarre and beautiful truths" (in Williams 00.00.10–00.00.13). With its triumphalist overtones, *Kingdom of Plants* reinscribes the culturally engrained presumption that technology will eventually decrypt the covert language of plants. Cracking the code of vegetal ontology can be accomplished, in part, through the temporal manipulation of plant processes that, in actuality, extend rhizomatically into heterogeneous timescapes—vegetal, fungal, geological, biospheric, and cosmic.

Notwithstanding its techno-chic, *Kingdom of Plants* can be read as a recent incarnation of plant cinematography that sits within the traditions of popular science and environmental documentary films (Duvall; Petterson; Williamson). In the 1890s, researchers began to hone time-lapse and related scientific visualization methods. Of note is cinematographer Oskar Messter's one-minute sequence of flowers blooming and wilting over twenty-four hours. The film's reconfiguration of vegetal temporality allowed early viewers to apprehend "movements too slow to be appreciated by the human eye" (Tosi 39). Also during this time, Wilhelm Pfeffer began

applying advances in cinematography to plant physiology research. Between 1898 and 1900, he produced time-lapse studies of flowering cycles and stem movements in response to gravity. His three-minute "Cinematographic Studies Carried Out On Impatiens, Vicia, Tulipa, Mimosa, and Desmodium" (released in 1940, produced in 1900), opens with a potted *Impatiens glanduligera* positioned horizontally then gradually curving its stem to achieve an upright position, a phenomenon known as geotropism. In the early 1900s, moreover, Frank Percy Smith further popularized time-lapse with *The Birth of a Flower* (1910), *From Bud to Blossom* (1910), *The Germination of Plants* (1911), and other short scientific films. The mesmerizing nature of Smith's blossoms lies in their animal-like movements. *The Birth of a Flower*, for instance, opens with a time-lapse of two hyacinths that actually bloomed over three days. The petals of one hyacinth flare outward ebulliently while those of the second remain contracted. In later scenes, crocus, tulip, and other flowers burgeon and irrupt in sunlight. As also evident in popular time-lapse depictions of arum titan, classical music heightens the hypnotic ambience of scenes.

The time-lapse productions of Smith, Pfeffer, and Messter demonstrate how image technologies advanced both scientific knowledge and public appreciation of plants during the late-nineteenth and early-twentieth centuries. A vegetal ethics, however, emerges more conspicuously in the cinematography of Arthur Pillsbury. In 1912, Pillsbury began producing and exhibiting time-lapse images of Yosemite National Park wildflowers in an effort to bolster their conservation. Concerned with the decline of local species, such as the Washington lily endemic to western North America, he recognized the potential of time-lapse to engender broad ethical regard for flora. His book *Picturing Miracles of Plant and Animal Life* (1937) provides an invaluable perspective on botanical time-lapse as an ethical intervention:

> One of the first reactions of seeing a reel of flowers growing and opening was *to instill a love for them*, a realization of their life struggles so similar to ours, and a wish to do something to stop the ruthless destruction of them which was fast causing them to become extinct. At that time no attempts were made to protect the flowers in any National Park, but soon enough agitation was started to show the necessity for it. (Pillsbury 25, emphasis added)

By bringing protracted botanical processes into the human temporal purview, moving images prompt identification with plants as animate personae. Time-lapse, for Pillsbury, nurtures affective connections based on notions of fellowship, kinship, suffering, and mourning. Cinematographic

intervention as such flattens the alienating hierarchy between life forms that underlies anthropocentrism: “To know the flowers as you pass by is like meeting fellow human beings, to know their habits like meeting a friend and to know their innermost secrets like meeting a long lost brother or sister” (Pillsbury 62). In short, the representation of plants as creaturely in time-lapse films makes them more readily identifiable as worthy of ethical regard.

This is the historical context of the time-lapse sequences of titan arum that circulate in the popular imagining of monstrous, unusual, yet charismatic flora today. Informed by an ethics of plants, Pillsbury’s technical innovations would influence the post-War growth of time-lapse cinema, for instance, through the work of John Ott as well as Walt Disney’s popular nature documentary *Secrets of Life* (Algar) from 1956. The miracle of plant life became indissociable from the miracle of image technologies, signifying the intertwined trajectories of botany and cinema during this period (Gaycken). What’s more, in terms of plant horror, Natania Meeker and Antónia Szabari observe that “the cinematic image becomes the emblem of both the strangeness of the vegetal and its fascinating-because-formless power over us” (43). Despite the uncanny fascination with plant life that it inspires, time-lapse has not been without its detractors. For instance, during the first half of the twentieth century, French author Sidonie-Gabrielle Colette critiqued time-lapse for its intrusive fixation on divulging vegetal secrets. An avid viewer of instructional scientific cinema, she expressed “revulsion at the way in which these films seem to denaturalize the plant—removing us from the poetry of the flower (for instance) to place us in the world of a disfigured and monstrous vegetality” (Meeker and Szabari 139). Indeed, an aspect of the denaturalization of the plant is the disfigurement of its temporality. Most plants—aside for touch-me-nots and others with animalistic movements—attain creaturehood through the reconstitution of their timescapes through cinematographic intercession. Echoing Colette, contemporary botanist Francis Hallé critiques time-lapse for its engrained anthropomorphism “that impedes our seeing beyond our own time scale” (104). Is it possible, then, to envision a biocentric or, even, *phytocentric* mode of time-lapse that recognizes—and works in conjunction with—vegetal temporality as a *plexity*? Can botanical time-lapse become a more nuanced medium of vegetal ethics?

Embracing Plant-Time as Hetero-Temporality: Towards an Intermedial Vegetal Ethics

This is not to say that time-lapse recordings of plants, including YouTube videos of titan arum, inherently lack an ethical anchoring. On the contrary, in his films and writings, Pillsbury delineates a vegetal ethics of radical relationality between plantkind and humankind, between plants and non-plants. He conceptualizes time-lapse as a novel mechanism for exposing the liveliness of plants and, consequently, for placing them in spheres of ethical concern. In particular, time-lapse facilitates heightened attentiveness predicated on human-vegetal commiseration and other shared affective states in which *our* suffering is also *theirs*—and vice versa. To grant humans access to the temporal topographies of plants, however, time-lapse manipulates plant-time and, to an extent, asserts techno-imperialist control over vegetal being. Critiquing time-lapse and proposing new ethically-inflected alternatives, therefore, must begin with the phenomenon of time and, more specifically, with the recognition of vegetal temporality as integral to engendering plant ethics in mediated digital environments. This section enlarges the ethical adumbrations of Pillsbury through the concept of *intermedial vegetal ethics*. The mode adumbrated here brings the vibrant bodies of media (films) into dialogical interchange with the lively bodies of non-humans (plants and others) while embracing—rather than obfuscating and manipulating—the hetero-temporality of plants themselves. In positing this model, albeit briefly, the discussion draws upon developments in the burgeoning field of critical plant studies—particularly vegetal ethics and temporality—in conjunction with N. Katherine Hayles' concept of intermediation and Stacy Alaimo's theory of trans-corporeal subjectivity.

Over the last decade, critical plant studies (CPS) has taken shape through the work of Michael Marder, Jeffrey T. Nealon, and diverse plant-minded scholars (see, for instance, Chang; Gagliano, Ryan and Vieira; Meeker and Szabari "From the Century of the Pods"; *Radical Botany*; Ryan; Trewavas). In general, CPS problematizes the traditional Western characterization of plants—herbs, shrubs, trees, and other green life forms—as passive, sessile, and silent; as the mute photosynthetic backdrops to human affairs. For the most part, established paradigms such as ethnobotany, economic botany, and ethnopharmacology frame plants in narrow utilitarian terms as foods, medicines, fibers, dyes, materials, ornaments, and decorations. In contrast, CPS advocates a transdisciplinary approach to plants as intelligent, conscious, and capable subjects—as volitional agents in themselves rather than "half inanimate" (Donaldson 100) beings to be manipulated for our desires, including our need for aesthetic gratification. Towards this end, CPS

integrates perspectives from the plant sciences, social sciences, literary studies, philosophy, art, history, and other intellectual domains. To date, though, the field has yet to engage, to a significant degree, with ecomedia studies in order to appraise the representation of plants in traditional and social media, although publications in this area are gradually beginning to appear (e.g., Janzen; Meeker and Szabari). The gap between ecomedia studies, on the one hand, and critical plant studies, on the other, is evident in analyses of ecomedia ethics, notably Pat Brereton's *Environmental Ethics and Film*, which references plant life merely a handful of times in passing. Unlike the prevailing zoocentrism of the environmental turn in the humanities, CPS focuses on urgent ethical issues pertaining to vegetal life such as the genetic engineering of seeds (Karafyllis) and the possibility that plants experience pain (Hamilton and McBrayer). Although intelligence, consciousness, and sentience remain contested topics in the field, scholars have forwarded models of vegetal ethics, for instance, through the concept of flourishing in which a plant strives to achieve a good life on its own terms and should be allowed to do so without undue human interference (Kallhoff).

The contexts of critical plant studies, in general, and plant ethics, in particular, underscore the need to devise *time-plex* forms of time-lapse. But what is plant-time? And how can time-lapse visualization move towards an intermedial vegetal ethics that embraces the plant body as a material-temporal interdependency? While plant-time has been the subject of some in-depth theoretical treatment in critical plant studies (e.g., Heckendorn Cook; Marder 93–117; Ryan 163–189), the concept has received significantly less attention than vegetal agency, subjectivity, language, aesthetics, and justice. Nonetheless, botanical life is inherently time-plex—constituted by multiple interacting temporalities that resist the imperialist conception of time as a monolithic formation progressing in a linear fashion from past to future (Wood). Consider, as a case in point, how trees accommodate heterogeneous timescales concurrently as their green shoots emerge and old limbs die back within a single perceptual frame. Whereas flowers increase spatially, other tree parts dehisce and decay, awaiting the *timely* moment when ecological conditions become favorable. From the human temporal outlook, botanical events transpire slowly; from day to day—or even year to year—a plant may seem to be doing nothing at all. Following their own temporal cadences, nonetheless, plants undergo continuous transformation. Seeing the plant body as "a loose alliance of multiple temporalities of growth," Marder posits the idea of "vegetal hetero-temporality" (104). Closely linked to the *slow-to-us* metamorphosis of vegetal life, plant-time as

hetero-temporality recognizes "cycles of vegetal growth (the budding and shedding of foliage, the opening and closing of a flower)" (Marder 113). The challenge for an intermedial vegetal ethics is to conceptualize plant-time in terms of hetero-temporality and, in this way, to engage more wholly with "vegetal vitality" (Meeker and Szabari, "From the Century of the Pods" 40).

An intermedial vegetal ethics moves beyond a focus on cinematographic depictions of plants as spectacular, creaturely, and monstrous towards a realization of media and plants as vibrant bodies in dynamic interchange. In her essay "Intermediation: The Pursuit of a Vision," N. Katherine Hayles invokes anthropologist Nicholas Gessler's concept of *intermediation* to denote an emergent pattern represented in a medium that, in turn, generates another emergent pattern in a new medium. The result is a multitiered system, or dynamic heterarchy, based on feedback and feedforward loops: "Distinguished by their degree of complexity, different levels continuously in-form and mutually determine each other" (Hayles 100). Hayles provides the example of a mother's body forming a fetus while, in response, the fetus reciprocally re-forms the maternal body. Embodied processes occur synergistically through the interaction of "partners in a dynamic heterarchy bound together by intermediating dynamics" (Hayles 101). Emphasizing the corporeal-temporal complexities that emerge in the contact zones between agents—human and non-human, animate and inanimate—intermediation is germane to formulating new ethical modes of botanical time-lapse. Understood as media, plants and moving images alike are "bound together in complex physical, psychological, economic, and social formations" characterized by recursive feedback and feedforward loops (Hayles 101). Consequently, an intermedial vegetal ethics arises at the conjunction of continuously in-forming agents, reciprocally lending shape to one another. As the organic (plant) and digital (film) interlace, hetero-temporality materializes as an emergent quality of manifold interacting agents.

In this way, an intermedial vegetal ethics counters the dominating, enframing, disclosing, decoding, and denaturalizing of plants by the moving image. Rather than humanizing vegetal being—speeding up plant processes, particularly flowering, in order to construct creaturely beings worthy of ethical consideration—plants and film become co-engendering, mutually-determining actants in emergent media ecologies. The framework proposed here heralds the possibility of a trans-corporeal ethics between digital media and organic life. Although referring neither to vegetal nor media bodies in particular, Stacy Alaimo postulates the idea of *trans-corporeal subjectivity* "in which bodies extend into places and places deeply affect bodies […] The exposed subject is

always already penetrated by substances and forces that can never be properly accounted for—ethics and politics must proceed from there" (5). Human bodies are enmeshed *with*—and *within*—animals, plants, microorganisms, habitats, ecologies, topographies, atmospheres, and, arguably, media landscapes. Human and plant bodies are in perpetual interchange with organic and inorganic elements; media is thus inherently an embodied ecology. For the trans-corporeal subject—human, zoological, botanical, filmic, cinematographic, and otherwise—"ethics and politics are always here and now, practiced through and within fraught, tangled materialities" (Alaimo 7). Extending Alaimo's work on new materialist embodiment, an intermedial vegetal ethics proceeds from these "tangled materialities"—these human-plant-film corporealities—and "emerges from a sense of fleshy permeability" (Alaimo 78). The ethical terms outlined here resituate the time-lapsed flower in its biocultural milieux, including its relations to people, plants, and places—indeed, the focus of the next section, returning to the case of titan arum.

Imaging Titan Arum Anew: From *Anthocentrism* to *Phytocentrism*

An intermedial vegetal ethics reframes botanical time-lapse as a trans-corporeal media ecology in which the *poiesis* of the plant intergrades dynamically with the *poiesis* of the moving image. For the moving image to become heterarchical, in Hayles' terms, then botanical time-lapse should reorient towards assemblages of plant-non-plant subjects continuously in-forming each other in processes of mutual becoming and generative *co-poiesis*. As an agent in the ecology of time-lapse, the plant imparts its temporal-somatic registers to the form of the media itself. As argued so far, however, the ethics of botanical time-lapse are complicated by the distortion of the endemic temporalities of vegetal life and the imposition of a human timeframe narrowly constructing the plant as a subject of ethical concern vis-à-vis its creatureliness—its approximation of animal behavior. The turn from temporal-somatic reductionism to plant-time as a hetero-temporality requires nuanced modes of time-lapse that engage the whole plant within biocultural contexts including in-situ conservation urgencies. This shift from *antho*centrism to *phyto*centrism—from hypersexualized fixation on the flower, especially evident in the case of arum titan, to ethical concern for the plant in its totality—acknowledges the innate liveliness of vegetal life beyond the disclosive function of imaging technologies. To summarize, then, botanical time-lapse underlain by an intermedial vegetal ethics would: (i) attend to the trans-corporeality of the whole plant enmeshed with(*in*) human and other-than-human somatic networks; (ii) resist the *antho*centric

aestheticization of the vegetal body; (iii) attempt to represent the multiple convergent temporalities of the plant within its environment; (iv) engender appreciation of botanical processes in terms of organismic co-poiesis—of beings becoming together; (v) foreground *in-situ* conservation concerns to balance the conventional focus of time-lapse on the ex-situ institutions of greenhouses and related neocolonial apparatuses; and, furthermore, (vi) decolonize time-lapse by emphasizing the bioculturality of plant species, including traditional biocultural relations between flora, Indigenous people, and local communities.

The fifth and sixth points deserve elaboration particularly with respect to Sumatra's titan arum. An intermedial vegetal ethics enables critical perspectives on the colonialist underpinnings of time-lapse and other moving image technologies. To be certain, the growth of botanical time-lapse during the late 1800s and early 1900s was propelled by the global circulation of seeds and other plant materials from colonized territories to European and American centers. Imperial institutions such as Royal Botanic Gardens, Kew aimed to collect, curate, cultivate, and showcase plant species from every corner of the planet—a far-reaching objective made possible by the colonization of Indonesia, Malaysia, the Philippines, and other botanically diverse Southeast Asian nations (McCracken; Schiebinger). Through utopianized images of flowering and other plant processes accelerated for visual consumption and extracting the plant from its biocultural milieu, time-lapse risks recolonizing flora. In contrast, botanical films that position human-plant relations at the center of narratives counter the colonizing impetus of image technologies. An example is *Our Botanical Biosphere* (Edois), a ten-part documentary providing a heterarchical counterpoint to the time-lapse films of Attenborough, Pillsbury, Smith, and others. The film demonstrates that an intermedial vegetal ethics—as a postcolonial intervention—provokes renewed awareness of the heterogeneous cultural histories of plants apart from their scientific, technological, aesthetic, and utilitarian values. In this example, the moving image narrativizes the intertwined stories of vegetal life—Indigenous, local, affective, conservation-focused, and others—facilitating the passing of traditional botanical knowledge to viewers. Rather than fixating on the miraculous ability of time-lapse to disclose vegetal being by distorting plant-time, *Our Botanical Biosphere* narrativizes whole plants and human interactions with them over intersecting temporal topographies.

An intermedial vegetal ethics also problematizes forms of botanical mediation that elide the circumstances imperiling the future of plants, such the corpse flower, in their natural habitats. To be certain, Indonesia has one of the highest deforestation rates in the world. Restricted to the

slopes of Sumatran rainforests, *A. titanum* is threatened by land clearance and habitat degradation in addition to declining numbers of rhinoceros hornbills (*Buceros rhinoceros*) and other organisms responsible for spreading its seeds (Yuzammi et al. 56–57). In 2018, the IUCN designated titan arum an endangered species with fewer than one-thousand mature individuals remaining in the wild and an overall dwindling population (IUCN). The plant's decline is largely the result of intensive land clearance in Sumatra, especially over the last three decades. Nearly half of the primary forests documented in 1990 were cleared or degraded by 2000 (Margono et al.). In 2010, seventy percent of Sumatran primary forests had already been converted for agro-industrial enterprises, especially oil palm production, significantly reducing botanical diversity and resulting in a patchwork of remnant ecosystems. Moreover, the five-hundred specimens in botanical gardens and private collections globally are too closely related, causing low genetic diversity that will likely render the plants more susceptible to diseases and other afflictions in the long-term (Johnson). Notwithstanding these factors—many of which have a (neo)colonialist provenance in global-capitalist commodity networks—some recent accounts of titan arum conservation place undue emphasis on local communities' role in the decline of the species (IUCN; Yuzammi et al.). As a case in point, the people of the Kepahiang Regency on Sumatra's south-west coast are said to harvest the plant for a sacred stone located in its petiole, or leaf stalk, which they believe will cure diseases and counteract the effects of poisoning. Other locals regard titan arum as antagonistic to human beings because its leaf stalk resembles a snake (Yuzammi et al. 56–57). These conservation studies, however, deflect ecological responsibility for the decline of titan arum in the wild, negating the vital contribution of Indigenous people to in-situ plant conservation (see, for example, Sillitoe).

Translocated from Sumatra, extracted from its traditional bioculturality, and subjected to the phallocentric mediation of its inflorescence, titan arum has been a subject of colonialism since the late-nineteenth century introduction of its seeds to Europe. Despite its commendable focus on ex-situ conservation, Royal Botanic Gardens, Kew—itself an innovator of botanical imaging technologies—has been instrumental to the imperial appropriation of plants such as the corpse flower. Published in the early 1900s—as time-lapse visualizations increasingly influenced popular Western understandings of flora from around the world—an article published by Kew enumerates the anatomical dimensions and flowering data of "the giant aroid of Sumatra" resident in their collections (Royal Botanic Gardens 374). The article's numerical inventory is interspersed with

visual and olfactory impressions of the creaturely arum: "By 2 p.m. [the inflorescence] was fully expanded, and emitted a nauseating stench" (Royal Botanic Gardens 375). Although limited to sight and smell, the brief narrative constructs the arum in strongly aesthetic terms, reinforcing the extraction of the aroid diasporan from its biocultural rootedness in Sumatra: "At its period of fullest development the plant presented a *handsome sight*, the reflexed inner surface of the spathe being of a dark chocolate-brown, and the spadix butter-yellow" (Royal Botanic Gardens 375, emphasis added). Prefiguring the centrality of time-lapse cinematography to *Kingdom of Plants* (Williams) and other contemporary films showcasing Kew's extensive holdings, the article features four black and white images that sequentially trace the titan arum blossoming in a greenhouse over the course of ten days. With this synoptic tableau, compressing arum-time into four images, the article frames the species as a decontextualized object—as an aesthetic spectacle and creaturely wonder emblematizing the institution's vast botanical collections procured from postcolonial societies such as Indonesia.

Like the "handsome" aroid flowering at Kew in the 1920s, Perry T. Titan, the charismatic plant persona of time-lapse YouTube videos, is also a subject of the vast commodity networks disseminating flora from their places of origin to conservation institutions in the Global North. The provenance of Perry T. Titan—as a seed acquired in Sumatra in the 1990s by an amateur American plant collector and then distributed to a North American greenhouse—represents a contemporary incarnation of the cosmopolitan natural history tradition of the Victorian era (Endersby). According to botanist Brian O'Brien:

> Back in the early '90s, there was a fellow named Jim Simon who was a physician who lived in San Francisco and he was very, very interested in plants. And unfortunately he's since passed on but he used to spend about half of each year traveling the world seeking out interesting plants. And at one point he decided that it would be good to start up a conservation project for the corpse flower. So he traveled to Sumatra, collected seeds, and then distributed them to institutions such as Gustavus [Adolphus College] that have the facilities to grow and preserve the plant. And so that's how we came to have this plant here. (Gustavus Adolphus College, "Perry II: The Second Installment" 00.00.10–00.00.15)

To be certain, time-lapse cinematography is implicated in the worldwide plant exchange systems delineated above by O'Brien in reference to Perry T. Titan's origins. These global networks have

historically privileged ex-situ institutional conservation and technological interventions over in-situ community-based approaches focused on collaboration with Indigenous stakeholders and local institutions in the places where plants originate.

In contrast, an intermedial vegetal ethics aims to recognize, in both the content and structure of mediation, the biocultural embeddedness of the species—the "fleshy permeability" between plants, humans, more-than-humans, land, ecologies, habitats, and bioregions (Alaimo 78). Conventional botanical time-lapse, nonetheless, manipulates the endemic temporalities of plants, accelerating their movements in order to render them creaturely and therefore worthy of ethical regard. Feedback from visitors to the Gustavus Adolphus College greenhouse in 2010 demonstrates the extent to which cinema and video-sharing platforms influence popular perceptions of flora as creaturely wonders yet, at the same time, isolate specimens from their relationalities and fixate anthocentrically on flowering parts rather than whole vegetal bodies. Some visitors revealed that their curiosity about Perry T. Titan was initially sparked by online time-lapse videos of the species flowering on YouTube, Facebook, and the college's website. Audience responses to the titan arum's rare blossoming indicate abiding public interest in the scientific marvel, uncanny gigantism, and animalistic scent of the plant but also demonstrate a lack of awareness of the formidable pressures facing the species in the wild. Many visitors wanted to experience firsthand the overpowering olfactory presence of the titan arum as a noxious vegetal creature. Invoking zoocentric figurations, some likened Perry T. Titan's smell to "rotting fish, feces, latrines, seawater, dirty seawater, roadkill, gutting a deer [and] cheese" (Gustavus Adolphus College, "Perry II: The Fourth Installment" 00.01.22–00.01.33). Another guest explained that the titan arum recalled "plants I saw in the movie *Avatar* but then I realized that this wasn't something that was just created on a computer. This was a real plant of nature" (Gustavus Adolphus College, "Perry II: The Fourth Installment" 00.04.11–00.04.22). In the above examples, the uncanny creatureliness of the plant takes prominence over its status as a vulnerable species limited to one-thousand individuals in the wild.

Conclusion: Vegetal-Cinematographic Bodies In-Becoming

Ex-situ conservation programs focused on titan arum propagation continue to increase in Europe, North America, and Australia, propelled partly by public fascination with the species aroused by time-lapse imagery of its massive inflorescence (see, for example, the Eden Project).

Approximately seventy gardens worldwide, mostly located in Europe and the United States, contain at least one titan arum specimen (BGCI). In comparison, in-situ conservation programs located in Sumatra and elsewhere in Indonesia appear relatively scarce. Potential exists, nevertheless, for international conservation bodies to partner with local institutions, such as Cibodas and Bogor Botanical Gardens in Java as well as Samosir, Solok, and Jambi Botanical Gardens in Sumatra, to integrate ex-situ propagation techniques with in-situ methods for preserving titan arum habitat while engaging local communities in botanical conservation and sustainable ecotourism. A biocultural model, boosting public awareness of plant conservation, has been developed for the corpse lily (*Rafflesia arnoldii*), native to Sumatran and Bornean rainforests, and known for displaying the largest individual flower in the world. Since 2013, for instance, Festival Bumi Rafflesia (Earth Rafflesia Festival) has been held in Sumatra's Bengkulu Province to showcase the region's unique flora, promote rainforest conservation, and foreground the cultural diversity of local ethnic groups (Permana).

Integrated conservation, educational, and tourist programs could also be devised for titan arum. Susan Pell, deputy executive director of the U.S. Botanic Garden, comments that "I sort of think of the corpse flower as the panda of the plant world [and as a] spokesperson for the importance of conserving all of our biodiversity, and certainly in the plant world" (qtd. in Johnson para. 28). Pell likens charismatic titan arum to a universally-recognizable icon of animal conservation. Although zoologizing the plant, her statement confers agency to the corpse flower as a spokes(-plant-)person for the conservation of ecosystems *and* specimens. What is clear is that the mediation of megaflora, such as titan arum, should aim to foreground their ecological connectivities and temporal entanglements. Yet, by its very nature, botanical time-lapse distorts the endemic times of plants, figuring them as creaturely, overly focusing on their reproductive anatomies, and, in many cases, eliding their conservation exigencies. Although time-lapse has been characterized historically as a means "to instill a love for them" (Pillsbury 25) and "reveal their true nature" (Wollaston 5), its ethical foundations are destabilized by the techno-utopianist enframing of plants as hypersexualized aesthetic objects. Invoking developments in critical plant studies and, specifically, plant ethics, this article has posited an intermedial vegetal ethics as a trans-corporeal intervention for engendering bioculturally-nuanced modes of time-lapse that preserve the embodied otherliness—the non-creatureliness—of plants including their specific temporal, material, and relational heterarchies.

Considering the myriad factors threatening titan arum and many other plant species in the wild, what, then, are some possible future directions for botanical time-lapse? Rather than dominating plants by manipulating their timescales and anthropomorphizing their behaviors, time-lapse informed by an intermedial vegetal ethics offers a foundation for collaboratively working with the innate capacities of flora for movement, behavior, communication, percipience, and other sensitivities. The ethical model outlined here prompts *phytophilia*—the love of plants—by embracing vegetal beings as agential subjects and resisting the fetishistic substitution of the plant for the human, animal, bird, or other mobile organism (Irigaray and Marder 155). A more ethical mode of time-lapse, additionally, would incorporate technical developments in micro- and subterranean cinematography to narrativize the metamorphosis of typically unseen roots, rhizomes, tubers, and mycorrhizal associations. Recognizing the intrinsic ethical limitations of time-lapse, visualizations would strive to integrate symbionts, pollinators, disseminators, predators, and other organisms integral to the life cycle of the plant. What's more, an intermedial ethics pushes time-lapse towards place-based cinematographic practices to document transformations of plants in their habitats—rather than in clinical greenhouse settings only—while stressing the importance of in-situ efforts. Integrating the botanical wisdom of Indigenous and local people would involve working with communities to employ imaging technologies and craft culturally-inflected styles of time-lapse that narrativize plants in ecological relation to humans, animals, insects, and manifold other beings.

In closing, practitioners of time-lapse cinematography might look towards experimental botanical film for new models. As a case in point, Canadian filmmaker Louise Bourque's film *Jours en Fleurs* (2003) invokes the French Canadian phrase for "flowering days" connoting menstrual cycles. For several months, Bourque soaked video footage of flowers in menstrual blood, degrading the images and generating abstract visual patterns. In the trans-corporeal metamorphosis of human, vegetal, and filmic bodies, *Jours en Fleurs* materializes the concept of an intermedial vegetal ethics. Decoupled from the scientific reductionism that isolates the vegetal body from its trans-corporeal mesh, botanical time-lapse might integrate experimental film styles and motifs in an effort to reach broader audiences and generate even greater impact on ensuring plant futures. Through the influence of experimental films such as *Jours en Fleurs*, plant cinematography would move beyond the technologization of vegetal life towards greater ecological connectivities between plants and media. In response to the decline of plant

communities globally, including in Sumatra, these imperatives are crucial for the botanical time-lapse to come.

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