Serpil Oppermann

14 From Material to Posthuman Ecocriticism: Hybridity, Stories, Natures

Abstract: By highlighting the intersections between material ecocriticism and posthumanism, this chapter explores how ecocriticism is becoming more *pos*t-human and *post*-natural in its questioning of the entrenched notion of the human, as well as the blurred boundaries between inorganic and organic matter. Posthuman ecocriticism expands the material ecocritical vision of storied matter to critically discern the cultural implications of currently emerging posthuman agencies – such as synthetic matter responding to stimuli and exhibiting signs of spontaneous activity – that ostensibly transfigure human ecologies and material-discursive practices. With selected literary texts that are labeled posthuman novels, and bio-technological examples, the chapter aims to shed critical light on how posthuman ecologies accentuate the impact of bios-zoe-techno-eco-cultures in re-imagining what it means to be human, or nonhuman, in a world of hybrid configurations, strange natures, and stories.

Key Terms: Material ecocriticism, posthuman ecocriticism, posthumanism, new materialisms

1 Introduction

Life, as marine anthropologist Stefan Helmreich (2009, ix) writes, "materializes as a networked phenomenon linking the microscopic to the macrocosmic, bacteria to the biosphere, genes to globe." Life, in other words, discloses an environmental intimacy of connective matter, explained as "the co-constitutive materiality of human corporeality and nonhuman natures" (Alaimo and Hekman 2008, 9). Being an often alluring but also a lethal vortex of churning forces and substances that affect the vulnerability of human bodies and the accountability of human prospects, this restless materiality underlies the theoretical discourses of the new materialist paradigm. Informed by scientific developments, the new materialist scholarship conceives matter as agentic, generative, active, and expressive, and investigates its existential implications. According to Karen Barad (2007, 139), the new discernment of materiality "represents a profound conceptual shift" in the orbits of scientific and theoretical inquiry.

When Barad (2007, 26) famously stated that "*we are a part of that nature that we seek to understand*" (emphasis in the original), highlighting Niels Bohr's quantum

logic, she did so to draw attention to the importance of a "participatory universe,"[1] our concerted involvement in the world's becoming. In her words: "conceptions of materiality, social practice, nature, and discourse must change to accommodate their mutual involvement" (2007, 25). In the ecological context, being *part* of nature means not remaining *perceptually out-side* as if we exist independent of the world's confluent biotic and abiotic components. If we want to intuit our worldly embodiment, we need to be more alert and less distant to the material world. In a more emphatic note, David Abram (2014, 301) asks: "What is climate change if not a consequence of failing to respect or even to notice the elemental medium in which we are immersed?" The elemental immersion, being a corporeal one, is a seamless mesh of bodies and the environments, otherwise named as "trans-corporeality" by Stacy Alaimo (2014, 187), "a new materialist and posthumanist sense of the human as perpetually interconnected with the flows of substances and the agencies of environments." Like Abram and Alaimo, many new materialist scholars work to theorize this permeable materiality where all bodies are knottily interfaced, insisting that "the ways we understand and interact with nature are in need of a commensurate updating" (Coole and Frost 2010, 5). Composing what increasingly seems a shared platform, posthumanism is the site of such updates, where various theoretical threads of new materialisms – among them material feminisms, eco-materialism, agential realism, prismatic ecology, and material ecocriticism – converge to produce new epistemological configurations. Like the "unrolling of a coil," to borrow Henri Bergson's (1965, 727) simile, all these theoretical positions are superposable on one another, but in a heterogeneous sense, not homogeneously as Bergson would think, producing rather different shades of the posthuman spectrum. Stacy Alaimo (2011, 282), for example, speaks of "Post-humanist new materialisms" when she refers to the intersections and alliances between these interrelated theoretical discourses. Posthumanism, then, is like a perturbed middle space where many crisscrossing discourses mingle to consolidate a non-anthropocentric humanism,[2] and to negotiate the "boundaries of posthuman concern, whether they are moral, political or cultural" (Miah 2008, 87).

Already signaled by material ecocriticism, which focuses on the world's fluid dynamics in both material and discursive terms, ecocriticism holds a crucial position among these theories. The conceptual argument of material ecocriticism is that matter is endowed with creative expressions, manifesting as *storied matter*. Creative materiality is encoded everywhere; there are, for example, "stories of cosmology, geology, history, ecology, and life embodied in every form of materiality" (Oppermann 2013, 57). Storied matter in the posthuman moment exhibits itself in matter's overlapping biotic and abiotic components transmitted through technoscientific practices that seek to graft the technological onto the biological – for example, inorganic nano-

1 I borrow this phrase from physicist John A. Wheeler.

2 Serenella Iovino coined this term in her essay "Ecocriticism and Non-Anthropocentric Humanism."

designing of biophysical systems (Parisi 2008, 294). In this chapter, I argue that since material ecocriticism variously engrosses the critical posthuman visions, it is quintessentially posthumanist. This is an osmosis through which material ecocriticism forges a post-naturalist environmental imagination in the making. In what follows, I will first discuss the posthuman turn in a general theoretical outline and then explore the ways in which material ecocriticism morphs into posthuman ecocriticism.

2 Posthumanism

Similar to postmodernism that contested the liberal humanist culture from within its own assumptions through a disrupting set of discourses, but did so without denying it, posthumanism promises a new critical paradigm without leaving humanism entirely behind, and progressively co-opts postmodern skepticism towards the idea of a central human subject. Not surprisingly, posthumanism has elicited unique epistemological configurations, encompassing theoretical discourse, literary-cultural production, and biotechnological developments. Scholars like Katherine Hayles (1999, 285), who helped inaugurate posthumanist theorizing, aver that "the posthuman evokes the exhilarating prospect of getting out of some of the old boxes and opening up new ways of thinking about what being human means" Like Hayles, Cary Wolfe (1998, 42) suggests that we must "rethink the notion of the human *tout court*" (emphasis in the original). Thinking the human *tout court* means rethinking the conceptual frameworks within which we have defined human subjectivity, agency, identity and self, acknowledging the permeable boundaries of species in the natural-cultural continuum, and recognizing the profound interconnections between different forms of life in the composite world where previously we had seen separations. One crucial outcome of posthumanist thinking is, therefore, delegitimation of human exceptionalism as implicitly determined by illusory rules. Pramod K. Nayar (2014, 4), for instance, posits that "the human incorporates *difference* in the form of other DNA, species and forms of life, so that its uniqueness is a myth" (emphasis in the original). Seen from this perspective, posthumanism places the human self in a new conceptual category, fundamentally reframing the ambits in which human identity is enacted, as pertinently explained by Eileen Joy and Christine M. Neufeld:

> Much of the contemporary debates over posthumanism have mainly focused on the ways in which new biotechnologies and new findings in the cognitive sciences have complicated how we conceptualize and enact our human identities, ushering in the language of crisis over the supposed destabilization of the category "human," in its biological, social, and political aspects. (2007, 171)

Although the destabilization of the category *human* evokes considerable angst, the posthuman "does not really mean the end of humanity" as Katherine Hayles (1999,

286) maintains: "It signals instead the end of a certain conception of the human." We are joined together, Hayles (2006, 164) claims, "in a dynamic co-evolutionary spiral with intelligent machines as well as with the other biological species with whom we share the planet," which entails confronting the question of "the identity of humanness itself" (Kirby 1997, 5) outside the human hubris. This formulation of posthumanism therefore calls upon a relational ontology that announces itself in an affirmative fashion. Rather than worrying about the undermined status of human ontologies and mourning the loss of a concept of self as immutable, we should read the new category *human* in terms of co-emergence within a shared field of existence marked by the interdependency of life. If human and nonhuman bodies are "networked with each other and with technologies, practices, and disciplines which may cluster and co-constitute them regardless of species designation" (Wolfe 2013, 34–35), humans can no longer be defined in a separate ontological zone, but as "hybrids of nature and culture" (Latour 1993, 11). In this hybridized world, while we can understandably remain skeptical of the possibility of our dissolution into an utterly alien category, like disembodied intelligence entrenched in a digital medium, many of us would acknowledge the human indexed in processes of co-emergence with other beings. Jane Bennett's (2010, 31) identification of human agency as "an interfolding network of humanity and nonhumanity" exemplifies this process as the key point in posthumanist accounts of human ontologies. Importantly, this shift away from the conjectural singularity of the human agency is not a wholesale rejection of humanism (or the human), but a critical reframing aimed to dissolve the accompanying impulse of exploiting the coexisting sphere of the nonhuman. The prospect of posthumanism in this sense entails a determined theoretical move to resist the tenacious patterns of humanist resurrection that potentially harbor such impulses. Put differently, by mobilizing a significant departure from predominantly anthropocentric discourses and practices in all aspects of social, cultural, political, biological, and ecological relations, posthumanism essentially contests their presumptive power to abolish what Timothy Morton (2008) calls "ecologocentrism."[3] This is of course an endorsement of the postmodern challenge of the grand narratives of humanist culture fashioned by the Enlightenment paradigms, but, going further, posthumanism significantly accentuates the last metanarrative postmodernism mostly de-emphasized, "namely," to quote Stefan Herbrechter (2013, 78), "anthropocentric humanism."

Emerging thus from the "postmodernist critiques of Enlightenment thought" (Heise 2011, 454), and abandoning all anthropocentric dualisms, posthumanism espouses a progressive thought that dispenses with the species barriers. At the same time, however, engaging with technoscientific reconceptualizations of life, it also

3 In his essay "Ecologocentrism: Unworking Animals," Morton (2008, 75) holds that "*ecologocentrism* underpins most environmental philosophy, preventing access to the full scope of interconnectedness."

blurs the boundaries between humans and machines. It is in this sense that posthumanism evokes strange possibilities and impending crises suggested by biotechnological developments, such as synthetic intelligence, robotics, genetic modification, and bio-engineering that insinuate a dystopian condition filled with anxieties about a fuzzy human existence. Since posthumanism upholds the idea that "the other-than-human resides at the very core of the human" (Wolfe 2003, 17), it occasions both unease and enthusiasm, because the other-than-human in the posthumanist vision is not a biological category only. Calling attention to this dual sensibility, Rosi Braidotti (2013, 2) concedes that the posthuman "evokes elation but also anxiety [...] about the possibility of a serious de-centering of 'Man,' the former measure of all things." The aura of ambivalence on the consequences of de-centering the humanist subject stems from what Helena Feder (2014a, 5) refers to as "two poles of the term": "trans-humanist (teleological, transcendent) and critical (materialist) posthumanisms."[4] Both poles, I would suggest, converge in what the intellectual itinerary of posthumanism spells out as *post-anthropocentric humanism*. But what precipitates a crisis here is a cultural imaginary increasingly fraught with subversive meanings, mainly due to the trans-humanist quandaries. In *How We Became Posthuman* (1999), Katherine Hayles (3), for instance, sees "no essential differences or absolute demarcations between bodily existence and computer simulation, cybernetic mechanism and biological organism, robot teleology and human goals." While this understanding of posthumanism has dehumanizing implications (if we assume *no essential* difference between humans and computer simulations), thinking "[m]achine, organism, and human embodiment" (Haraway, 2008a, 163) in co-constitutive relationships negates this effect. More important perhaps is viewing such technoscientific scenarios from the perspective of nonhumans (both plants and animals) who are bio-engineered, genetically modified and thus "tailored to fit [...] market slots," as Val Plumwood (2002, 25) would say. Indeed, the question here is not to what extent humans are dehumanized in the technologized world, but how extensively the nonhuman beings are relentlessly manipulated by the new technologies to meet the demands of global free-markets for foodstuff. Thus, on the one hand, technoscientific developments bring the biosphere and the technosphere together (i.e. designing self-reproducing molecular machines), eliciting new conceptual tools to theorize the complex dynamism of interconnected agencies (for example, "the tools of the new genetic sciences offer new ways to think about the growing malleability of the concept of 'nature'" [Helmreich 2010, 52]), on the other hand, they carry the threat of a "ratiogenetic (reason generated) damage to the earth" (Plumwood 2002, 25). This threat is signaled by, among other catastrophic

4 In "Ecocriticism, Posthumanism, and the Biological Idea of Culture," Helena Feder (2014b) emphasizes the point that since posthumanism has many meanings, "some of which are mutually exclusive," it has become an equivocal term. According to Feder, "It may function as a spatial category, as a landscape of virtuality or the possibility of new connections between material agencies" (226).

changes, receding glaciers, disappearance of the honeybee colonies, appearance of androgynous fish in rivers, climate disasters, ocean acidification, and global pollution. In thinking the human and the nonhuman together this way, and in critically assessing their "imbrication in technical, medical, informatics, and economic networks" (Wolfe 2010, xv), posthumanism can be as uncanny as it can be liberating. As Donna Haraway (2008b, 15) claims, "A great deal is at stake in such meetings, and outcomes are not guaranteed." For humans who are closely bound to material networks, the posthuman landscape can foreseeably become "a swirling landscape of uncertainty," as Stacy Alaimo (2011, 282) points out. And apparently, in the thick of many uncertainties, it is impossible to disregard the immediacy of those stakes Haraway mentions, since the human and the nonhuman realms and bodies in today's post-natural world are more mutually determined and intermeshed than ever. Cecilia Åsberg (2013, 10) pertinently illuminates this point:

> transgenic biotechnology and patented genes, wildlife conservation and anthropocene rhetorics, in-vitro meat and in-vivo foetal imaging, embryo selection and consumer custom-made pharmacology are the *post-natural* orders of the day (2013, 10, emphasis in the original).

In such a post-natural environment, cultural, ecological, and biotechnological forces render the corporeal divisions between species meaningless, making the human self increasingly fluid in a sea of distributed agency, and the body a permeable sponge in its trans-corporeal interchanges with other bodies. Moving through bodies, bacteria, microbes, and many environmental elements draw their potency from this process of material transits. As Dorion Sagan (2013, 21–22) writes: "We are crisscrossed and cohabited by stranger beings, intimate visitors who affect our behavior, appreciate our warmth, and are in no rush to leave." We are, in a way, what Pramod K. Nayar (2014) dubs "*humanimal*"; we can never disengage from being "an instantiation of a network of connections, exchanges, linkages and crossings with all forms of life" (2014, 5). As envisioned in the British poet Ted Hughes's poignant account in his poem "If," networks characterize all environmental relations. "If" is penned in an apt metaphor that strikingly reflects the environmental knot crystallized in somatic connections: "If the sky is infected," writes Hughes (1993, 137), "The river has to drink it." Such a causal unfolding of ecological networks highlights the materializing effects of nature's agency, which – as the poem implies – is ostensibly disrupted by anthropogenic factors. The posthuman condition here is an entanglement in the formidable efficacy of antagonistic forces. There is also the ecological understanding of an embodied kinship in the sense of what Ted Hughes (1993, 136) considers "dissolving in earth-wave" that co-constitutes the posthuman condition, linking the humans "to the planet both personally and evolutionarily" (Helmreich, 2010, 50). For Rosi Braidotti, this condition is a question of vital materiality, which disturbs the regulative idea of impermeable bodies and ensures the continuity between human and nonhuman natures. The common denominator of posthuman condition, then, can be

located in "the assumption about the vital, self-organizing and yet non-naturalistic structure of living matter itself" (2013, 2).

Similar to Braidotti's view, I would also define the posthuman condition in terms of an agentic realm where every material formation, every narrative and image of the world reveals the passionate ontics of matter's connecting threads – the porous materiality made visceral by the enactments of human-nonhuman natures and bodies. Here, lively organisms, inorganic matter, and Titanic forces blend and clash to expose human frailties, arrogance, and negative capabilities. This vision is clearer perhaps in Gaston Bachelard's (2002, 17–18) claim that "matter is the *mirror* of our energies; a mirror that focuses our strengths by illuminating them with imaginary gratifications" (emphasis in the original). Like the sea that speaks anthropomorphically in the opening pages of Morgan Llywelyn's novel *The Elementals* (1993), "*Our sentience is in your blood, in everything that contains water*" (emphasis in the original), vibrant forces compose all that exists and humans are not immune to their material effects. Consider the challenges of carbon emissions, hydraulic fracturing,[5] the Great Pacific Garbage Patch, electronic waste discarded in landfills,[6] radioactive debris, invasive species, mutating viruses, and other environmental complexities inseparable from socio-economic life on this planet. It is impossible not to be aware that the nonhuman not only dramatically underscores our daily lives, but also shapes our environments and social dynamics in a very direct way. As Jane Bennett (2010, 108) rightly says, we live at a time "when interactions between human, viral, animal, and technological bodies are becoming more and more intense." On a larger scale, this connection is also manifest in dramatic earth changes from earthquakes, volcanic eruptions, tornadoes and tsunamis to deterioration of ocean ecologies, and extreme weather conditions, such as the 2014 polar vortex in the U.S, which deeply affect bodies, daily lives, economy, health, and politics. The striking image Ted Hughes (1993, 53) sketches in his poem "Wadsworth Moor" epitomizes the consequences of such earth changes: "Earth bleeds her raw true darkness / A land naked now as a wound / That the sun swabs and dabs." But astonishingly, the best delineation of our times that arrestingly captures the intrinsic irony of posthuman existence comes from a nineteenth century writer. In this regard, no other definition can compete with the famous first words of Charles Dickens's (1939, 1) *A Tale of Two Cities* in describing the present posthuman condition: "It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness." From another equally enticing literary perspective, living in the best and the worst of times can occasion a Gulliver syndrome.

5 Also known as "fracking," this is the process of drilling and injecting fluid, filled with carcinogens and toxins, into the ground at a high pressure in order to fracture shale rocks to release natural gas inside.

6 20 to 50 million metric tons of electronic waste discarded in landfills or incinerators release various toxics into the air.

Like Gulliver, we are forced to step into somewhat strange environments of beings and forces that are "worlding"[7] with us.

Strange though it may seem, this previously uncharted phenomenon of *worlding* designates posthumanism as the cognitive key to conceptualizing life anew with a higher awareness and more conscious ecological perception than humanity had before. This is so despite the inherent uncertainties caused by the technologies of genetic engineering, cloning, reproductive technologies, and pharmacological manipulation of human and nonhuman biologies. Simply because there is no escape from the webs of connections and exchanges in a shared environment saturated with alien substances and metabolic forces; and, more importantly, there is a real sense in which the naturalcultural forces, bodies, and countless material agencies bear witness to the viral condition within which the nonhuman (animal, vegetal, mineral) is as much enmeshed as the human. Like the "acidic tomatoes" that can "power a small radio / or cause / phototoxic / burns on exposed skin" in the Canadian poet Adam Dickinson's (2013, 57) poem "Hand Picked," this viral condition is visible in every aspect of life. Indicated by Dickinson's poems, "the animating force of hydrocarbons and their crudely oiled futures" (100), or what he calls the "age of polymers" (100), thus become significant poetic substances in the contentious landscape of posthumanism. Expressing some of the contours of the posthuman, Dickinson ironically writes: "A human has the alien right to viruses in her genome, microbes in his gut, phthalates in her blood, pharmaceuticals in his brain, contacts in her eyes, and a battery against his heart" (100). Although such poetic images imply that we have shot the albatross like Coleridge's ancient mariner, and are "now living on a qualitatively different planet," as Elizabeth Ellsworth and Jamie Kruse (2013, 8) contend, we can reinvent our knowledge practices "from an entirely different angle" to understand the complexity of the world's posthuman co-shapers, and to apprehend the significance and depth of our interactions with the earth's variously uncanny nonhuman players.

Think of the story of the ocean-travelling plastic bag, whose ironic fate is narrated in *The Majestic Plastic Bag* (2010) by Jeremy Irons. The plastic bag's struggle to reach its destination, the Great Pacific Plastic Patch, where it will join millions of its own so-called petroleum "species" to contribute to the pollution of marine environments and to the demise of countless fish, penguins, dolphins and other oceanic creatures is a telling narrative of the posthuman condition. To fulfill its detrimental destiny and using the wind to move, the bag "flees for its life," acting as if it is endemic to the ocean like the sperm whale that travels great distances. Following such a trajectory, the plastic bag arrives at the Great Pacific Plastic Patch and completes its "plastic cycle of life." Of course this is not a natural location, but an area of human debris composed of synthetic substances that demolish the oceanic ecosystem. What is impor-

7 I use the term "worlding" in the sense of becoming and being-in-the world, as something generative and coexisting.

tant here is not that the plastic bag is portrayed as a naturalcultural agency in the complex dynamics of materiality to prove there is 'thing power' as Jane Bennett would say; but that in its material cycle, the plastic bag has an impact, a conclusive one, on other bodies, ecosystems, health, economy, politics, and also material imagination as epitomized in Adam Dickinson's book of poems, *The Polymers*. Plastic, Dickinson writes, "recreates the world as an alternate or translated reality" (2013, 1). Simply put, the plastic bag's epic journey in this documentary film signifies a posthuman environmentalism of "the incalculability of other than human forces we typically fail to acknowledge, yet which haunt all considerations of environmental change" (Hird 2010, 54).

When read together with similar documentaries, such as Chris Jordan's feature film *Midway* (2009) that lays bare the tragic story of the Laysan albatross on Midway Island in the North Pacific ocean, the plastic bag's journey remarkably demonstrates the dire consequences of the social and the natural interpenetrating each other. Worse than T. S. Eliot's river that sweats oil and tar, the landscape here sweats unfortunate birds engulfed in plastic inducing deadly effect on their bodies. Is it any wonder that plastic permeates biological organisms, their flesh, their blood stream, their bodily mechanisms, practically interfering with the evolutionary cycles of life by its very indestructible nature? *Midway* reveals this fact as a "ghastly tale" by zooming into the plastic-filled stomachs of dead birds. "Do we have the courage to face the realities of our time?" asks Jordan, inviting the audience to a journey "across an ocean of grief." Marked by an explosion of material vitality literally colored by the countless plastic objects, and by a shocking recognition, the images of the dead albatross confront the challenge of dissolution when the agency of manufactured substances dominates the ecosystems. In this film, the "ocean of grief" is caused by "petroleum-species," which are manufactured by greedy human petro-cultures. Therefore, their agentic power becomes alarmingly disquieting when it is shown interacting recursively with the oceanic environment, colonizing it relentlessly like an unstoppable virus. It is also an ironic homage to what Serenella Iovino (2012b, 136) calls "the power of matter to build dynamics of meaning in and across bodies." According to Eileen Joy (2014, n.p.), this dynamic incites a serious interest in exploring the "creative materialism of things," which encourages "critical examinations of the aliveness and agency of animals, objects, environments, and other nonhuman forces and propensities, all enmeshed with humans." The link, then, between "the natural life forms" and "cultural forms of life" (Helmreich 2009, xi) signifies both creativity and destructiveness across the entangled spheres of human and other biotic forces, and material agencies. It is in this province of interplays that humans become differential composites, assemblages, and congeries of persistent agencies.

"Every species is a multispecies crowd" (Haraway 2008b, 165). That's how Donna Haraway systematically describes this mélange of entwined agencies in *When Species Meet* (2008). The life-principle of matter is enhanced, Jane Bennet (2010, 23) concurs, "*in* or *as a heterogeneous assemblage*" (emphasis in the original). Echoing Bruno

Latour, Dorion Sagan (2013, 22) says that "[l]ike all visible life-forms, we are composites." Thinking agency as "an enactment, a matter of possibilities for reconfiguring entanglements," rather than as "a property of persons and things," Karen Barad (2012, 54) also discerns material agency in its compositional state. A more poetic expression comes from the Chicano poet Gloria Anzaldúa's (2009, 25) "The New Speakers": "We don't want to be / Stars but parts / of constellations." But this lyrical image evaporates when we consider what kind of constellations we are becoming. Already evident in the anthropogenic biomes and toxin-infused ecospheres, we engage in patterns that form dark constellations, or what I would like to call posthuman biochoreographies.[8] They engender narratives that can be called 'compositionist' in Latour's (2010, 473–74) sense ("that things have to be put together [...] while retaining their heterogeneity").

In the ecocritical context, a compositionist narrative would be a material-discursive template for a process that consolidates organisms, languages, ideas, and imagination as in symbiogenesis – a merger of two organisms from distant lineages into a more complex organism. It is not, of course, a narrative written by humans, but consists of layers of stories, meanings, and signs stored and encoded in material processes, organisms, and semiotic objects that become visible when in interaction with human imagination. This narrative resembles symbiogenesis in its fusion of human and nonhuman codes, which is "like the growth of complex symbolic meanings in literature" (Wheeler 2014, 77). Life, then, as Wendy Wheeler contends, "is made of stories" (77). Being emblematic of a map of agentive expressiveness found across different spectrums and vibrancies of being, these stories describe "our ever-increasing degree of *intimacy* with the new natures we are constantly creating" (Latour 2011, n.p.; emphasis in the original); therefore they are "all about 'multi-naturalism,'" as Latour [2010, 476] would say. If Latour (2010, 481) is right, "micro-and macrocosm are now literally" as well as "symbolically connected." Material ecocriticism analyzes this embodied narrativity mapped onto the meaning-generating evolutionary structures as *storied matter,* "storying itself through humankind" (Abram 2014, 307). It means that "bodily natures and discursive forces *express* their interaction" in terms of cumulative narratives with "undeniable signifying forces" (Iovino and Oppermann 2014, 2, emphasis in the original). Among these signifying forces are the new biotech forms that are as story-filled as biological agencies, revealing "a posthuman performativity in its narrative disclosures" (Iovino 2012a, 58). From such an ecocritical perspective, whether elemental, biological, geological, climactic, or technological, the world's manifold agencies are always deeply interlaced with human mindscapes, reflexivity, and imagination (↗18 Material Ecocriticism, Literary Interpretation, and Death in Venice). This is a re-alignment of material ecocriticism's conceptual templates to critically discern the cultural implications of life sciences and new technologies. In this approach, the world's dynamic self-articulation, or narrativity, is deemed to open

8 In coining this term I am inspired by Jeffrey J. Cohen's (2010, 5) "geochoreographies."

a radical perspective, one that cannot be dismissed as the stuff of dreams, though it strangely "alters the tenor of our reflections and the tonality of our dreams," as David Abram (2010, 141) eloquently articulates it.

This is the voyage of the storied matter as it convokes the compositionist narratives of what Latour (2004, 61) also calls an "ecology of collectives consisting of humans and nonhumans." Now intelligent machines also story themselves to join the hybrid compounds of the Earth. This is the juncture where material ecocriticism becomes *post*-human and *post*-natural, and also *post*-green in critiquing the taxonomy of the human, the nonhuman, and the machine.

3 Posthuman Ecocriticism

A posthumanist material ecocriticism begins from the premise of the ecology of collectives and compositionist narratives conserving the new materialist understanding of the nonhuman as already part of the human in the world's becoming. It seeks to maintain a sustainable ecological critique of the material interaction of bodies and natures in a highly technologized world and their conceptualizations in literary and cultural texts. The central concepts of material ecocriticism – storied matter and narrative agency – that explain the agentic dimension of living matter in terms of stories embodied in material formations, are particularly suited to explore the emerging posthuman agencies, the technological posthuman forms.[9] By re-working these concepts in the light of abiotic visions of materiality, posthuman ecocriticism becomes a way of reading the biosphere and technosphere transversally in the variations of matter, and interpreting ecologically the ethical and social implications of existence beneath the carbon-based life embedded in agential intra-actions with the biotic forms. The literary reflections of the new reconceptualizations of life attend concurrently to posthuman ecocritical analyses, making a unique contribution to redefining nature, body, gender identity, race, sexuality, reproduction, and evolution.

Neither fully imaginary nor real, animal-machine hybrids, cyborgs, cloned animals, aliens, synthetic matter, and toxic bodies populate contemporary scientific and literary narratives, offering a critical prism for posthuman ecocriticism to scrutinize their stories' corrosive as well as productive powers. The cataclysmic stories of toxic accretion in the human body, for example, are also the stories of massively distributed pollution in the earth's biosphere, showing the "extent to which all bodies are kin in the sense of inextricably enmeshed in a dense network of relations" (Bennett 2010, 13). They may appear in scientifically convoluted literature not too accessible

9 They are dense with agency. As Luciana Parisi (2008, 293) explains, "technical machines are able to enter in direct relations with the biophysical layers of matter."

to the general public, but when these stories appear in visceral states of anguish in literary texts such as Richard Powers's *Gain* (1998) and John Burnside's *The Glister* (2008), two highly disconcerting novels about how densely bodies and ecosystems are interrelated in ominous toxic kinship, they bring many resistant forms of nonhuman agency into sharper focus. In *Gain*, we encounter two interrelated plots with a reciprocal focus on Clare, an international chemical conglomerate founded in the nineteenth century as a soap company, and on Laura Bodey, whose body (the pun here is intentional) gradually deteriorates with ovarian cancer while the company's toxic waste poisons Lacewood, Illinois where she lives. The company's "super-pesticides" (Powers 1998, 293) literally control Laura's body, while they also play a central role in changing the environment. When Laura realizes that Clare is "hiding under the sink, swarming her medicine chest, lining the shelves in the basement, parked out in the garage, piled up in the shed" (345), she gives expression to the bodily and environmental effects of toxic chemicals. The Scottish writer Burnside's novel *The Glister* undertakes a similar depiction of how toxic forces induce a bodily crisis and also cause spiritual infection in the vicinity of a chemical plant. The runoff from the shut-down plant, which was built 30 years ago by the Consortium to manufacture chemicals, has not only thoroughly poisoned the inhabitants of the Innertown, but also irreversibly contaminated the entire environment. Incurable diseases, "mysterious behavioral problems," and mutant creatures haunt the Innertown daily. The local constable John Morrison says: "You could see evidence wherever you looked of the plant's effects on the land: avenues of dead trees, black and skeletal along the old rail tracks and access roads; great piles of sulfurous rocks where pools of effluent had been left to evaporate in the sun" (Burnside 2010 [2008], ch. 1, n.p.). The forest nearby is so contaminated that the people call it "the poison wood," where the trees "were veined with a dark, poisoned sap" (ch. 1, n.p.). Leonard Wilson, a pedantic teenager, says that "[t]his wood has poison running in its veins, in the sap of every tree, in every crumb of loam and every blade of grass." (ch. 7, n.p.). In such a dismal environment where "the entire land under their feet is [...] poisoned by years of runoff" (ch. 1, n.p.), humans, living like Latour's collectives, suffer from "unexplained clusters of rare cancers," "terrible diseases," "untreatable illnesses," "depression," and "blossoming madness," while animals develop "swollen, twisted bodies" (ch. 1, n.p.). Disclosing a posthuman condition not too remote from our reality, these novels shed light on the fact that "we, our technologies, and nature can no more be disentangled" (Latour 2011, n.p.), and invite a complementary reading of natural-cultural dynamics of human-nonhuman existence. The intra-actions of material and human agencies dramatized in these novels point to the hazy nature of boundaries between the social and the scientific, technology and morality in an illuminating way.

Exposing the lethal interchanges of bodies and xenobiotic substances that percolate through soil, air, and water, such texts are also narratively useful for understanding the nature of compositionism as a hybrid formation. The intimate entanglement, for example, between humans and "microbial, molecular, and mobile life

forms" (Helmreich, 2009, 73) is figured as diagrammatic invocations for posthuman hybridity. These novels gather meaning from the dystopian categories through which posthumanism becomes a matter of concern for environmental humanities scholars, ecocritics, and scientists. But, instead of imagined dystopian futures, they present quite realistic scenarios of humans dwelling in daunting material networks. As Michel Serres (1995, 105) says, this is "a complex and supple network," which invites us to examine the corporeal dimension of a poisoned nature and the intensities of its transformed vital forces. A posthumanist material ecocriticism exposes the dynamics of this unfolding causality in humanity's composite story, with a special focus on the constitutive role of posthumanly intertwined agencies in this story. We are all parts of the composite narratives engendered by entangled forces whose impact may range, to quote Rob Nixon (2011, 47), "from the cellular to the transnational." The varieties of biotechnological relationships that emerge from within hybrid geographies, as showcased by *The Glister*, require distinct ecocritical attention, not only in order to expose the toxic kinship, but to analyze the currents of compositionist narratives running through the social, the technological, and the political. Compositionist narratives are like roads, one can say, borrowing Potteiger and Purinton's (1998, 281) words, "that lead to both actual and metaphorical destinations." They not only put the storied matter into perspective, but also reveal the ways in which the human is submerged in inhuman loops. Focusing on this entrancing posthuman reality discloses how literature, biology, chemistry, technology, aesthetics, and politics become inseparable from the material webs, forming a material-discursive space as an intermingling spillway of science and literature. Contemporary fictions also cast social, political, and ethical concerns about hybrid life forms, and draw attention to the ambivalent ethical stakes of certain likely scenarios; for example the redesigning of biotic life by the inorganic components, as nanotechnologies are already attempting to do today.

Take, for example, the synthetic cells that defy our definitions of 'being alive.' A recent research project at the University of Glasgow has proven that it is possible to create life from carbon-free, inorganic chemicals, which the researchers called iCHELLS: inorganic-chemical-cells. Similar to carbon-based cells, they saw, these inorganic chemical compounds could self-replicate and evolve in their environment (see Quick 2011). iCHELLS are now part of a bio-technological evolution, projecting interesting life patterns emerging from the traffic of nonliving and living beings. iCHELLS, to borrow Jeffrey J. Cohen's (2014, xxii) words, exemplify "inorganic compounds that act like living creatures." They perform what Luciana Parisi (2008, 292) calls "a chimeric bio-logic." The story of iCHELLS, then, is the story of matter as a dynamic becoming, because iCHELLS are queer constructions, hybrids of life and nonlife, with a capacity to evolve.[10] Their story supports a profound conceptual

10 Another example is the invention of "the world's first synthetic life form" by geneticist Craig Venter and his team in 2010. This is a single-celled organism, Venter claims, that "heralds the dawn of a

shift in our understanding of evolution, as it inscribes the artificial into the natural and writes life into nonlife. Apparently, this story is a compositionist narrative that expressly closes the great divide between the natural and the artificial. It is not about a "technologization of nature" (Herbrechter 2013, 91), but what we can call a 'biologization' of inorganic matter in the posthuman world, refiguring our foundational notions of agency, matter, and life.

Posthuman ecocriticism offers compositionist narrative as a viable expression for this new understanding of life that has gone *post* in almost every sense. When natural and technological actors transcend their radical divides, what happens is a shift from nature, as Latour (2010, 477) says, "to an assemblage to be slowly composed." Such a slowly composed posthuman life-text tells a story, not of the "continuity of all agents in space and time," to quote Latour (2010, 484) again, but of their discontinuous pieces progressively forming a material-discursive composition that often projects a messy vision of coexistence. This is a story of untotalizable heterogeneity that began with ecological postmodernism,[11] got forged into new kinds of collective with material ecocriticism and is now pulling more of the unexpected into this hybrid formation with posthuman ecocriticism. It is, thus, no longer possible to rely on notions of green ecologies, such as cooperative, congenial coexistence in this new ecocritical framework. Instead, posthuman ecocriticism entertains the intricacies of environmental anomalies caused by climate change, ozone-fleeing ultraviolet radiation, anaerobic environments, pesticides, invasive species, toxic bodies, hybrid natures, intelligent machines, and a motley of other strange agencies. Embedded in this background are the intriguing maps of co-evolution of organisms, inorganic matter, ecological colors, perception and imagination in interesting hybrid life-worlds. Taking this complex background into account, posthuman ecocriticism scrutinizes the intertwined experiences of emerging naturecultures to build novel forms of post-anthropocentric discourses. In view of the narrative horizons, posthuman ecocritical accounts offer a diffractive analysis of compositionist narratives and literary texts, reading the scientific and the literary through one another. The result is a picture of "constitutive and intractable hybridities" (Cohen 2014, xx). And this picture is replete with ethical, ecological, and cultural questions, "questions that need to be put to the ideology and value system that is humanism" (Herbrechter 2013, 57).

Probing thus into the interfaces between biophysical, cultural, and technological environments, and by engaging strategically with a vast array of nonhumans that are not always biological, posthuman ecocriticism discloses the "topographies of the world's hybridization" (Iovino and Oppermann 2013, 334). Like a "fluid map in flux"

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new era in which new life is made to benefit humanity, starting with bacteria that churn out biofuels, soak up carbon dioxide from the atmosphere and even manufacture vaccines." This invention Venter also says, changed his "views of definitions of life and how life works" (Sample 2010).

11 On this point, see Oppermann 2014.

(Duckert 2013, 48), this form of ecocriticism captures a sense of "what we made and what we became co-evolved together" (Hayles 2006, 164). In a fundamental sense, then, posthuman ecocriticism, as a constellation of *posts* (postmodern, post-anthropocentric, post-natural), confronts the challenges and possibilities posed by the multi-sited cartography of posthumanism: from nonhuman and often deviant material agencies to unknown forms of life lodged in newly visible territories, as indicated by the example of iCHELLS.

Posthuman ecocriticism also posits that emergent entities like iCHELLS push life to its "conceptual limits spilling across scales and substrates, becoming other, even alien to itself" (Helmreich 2009, 8). When borders between life and nonlife are so blurred, one feels compelled to ask the "question of what, exactly, is alive" (Hunter 2009, 4), as molecular biologist Lawrence E. Hunter pertinently does in *The Processes of Life*. Claiming that even "fundamentally ordinary materials can be alive in so many extraordinary ways" (2009, 1), Hunter invites us to the study of life:

> While some materials (like DNA and proteins) are found in nearly all living things, it is not a special kind of stuff that makes something alive. The mere presence of any particular material (including DNA) doesn't make something alive. The materials of life, it turns out, are just fairly ordinary chemicals, in particular combinations. What makes something alive is not what it *is*, but what it *does*. (2009, 2, emphasis in the original)

If "doing" is the life-principle, matter, organic or synthetically engineered like the iCHELL, emerges as the enactment of its ongoing materialization. Posthuman ecocriticism integrates the power of expressiveness that the materials of life exhibit to the principle of "doing," and thus rethinking matter in terms of its own signifying power "irreducible to representations," as Levi Bryant (2011, 23) also posits, enables us to acknowledge being as comprised of heterogeneous partners intersecting one another, rather than as signifiers of human cultural codes or norms. This understanding rejects the idea that nonhuman entities are "screens upon which humans project their intentions, meanings, signs, and discourses" (2011, 247). All forms of life in this vision – living organisms, forces of nature, a DNA protein, or an inorganic chemical compound – are co-constituted. As Morgan Llywelyn (1993, 281) writes, "[l]ife in any form is part of life in every form." Since all life forms are capable of generating order, as Manuel DeLanda (1996) claims, hurricanes, for instance, that he calls "creatures which inhabit the atmosphere," become "creatures that create themselves. They don't have genes, they don't have anything that tells them what to do. They are completely spontaneous creatures" (1996, n.p.). There are also interesting literary instances of these volatile agencies. Morgan Llywelyn's (1993, 195) novel *The Elementals* presents several cases, such as the stone that sits on its hillside and "thinks," fire that possesses "vigor, ardor, intensity, vehemence, fervor, passion, fury, magic, inspiration, genius, brilliance" (1993, 76), and the air that is alive and articulate. They all enact "a cauldron of creativity" (DeLanda 2003, 279). They don't need viscera, but their thoughts, like that of the stone, "are the thoughts of the earth" (Llywelyn 1993, 195).

The air in *The Elementals* stands out as the most conspicuous instance of material agency. "Myriad life forms dance in what appears, to human eyes, to be empty air. Air is not empty. Air is alive" (1993, 281). Interestingly, scientists also agree with this allegedly fictional statement. In the words of biologists Ann M. Womack, Brendan J. M. Bohannan and Jessica L. Green:

> As humans, we have an intimate relationship with the air around us. This relationship is by and large unconscious; we breathe in without thinking, move through the eddies and tides of air often without notice. This largely unconscious relationship has led to a delayed appreciation of the *air as a biological entity. But air is as alive as soil or water*. Not only does it host large macroscopic organisms [...] but it also hosts a wide variety of micro-organisms. Hundreds of thousands of individual microbial cells can exist in a cubic metre of air. (2010, 3645; emphasis mine)

In making this argument, Womack et al. (2010, 3646) rely on four sources of information: 1. "the atmosphere [has] environmental characteristics consistent with other microbial habitats;" 2. "biogeochemical cycling [...] occurs in the atmosphere;" 3. "at least some microbes found in the atmosphere are metabolically active;" 4. "residence times of microbes in the atmosphere are long." Hence, the air is a wonderful example of being an incipient determinant of life, an agentic materiality with profound effects on human and nonhuman natures. In her essay "Teaching a Stone to Talk," nature writer Annie Dillard (1988, 72) refers to this agentic materiality as "[t]he whole inhuman array." When one becomes "wholly attentive," says Dillard, one can "feel the world's word" (72), and be aware of the agency of things: "those created objects, discrete, growing or holding, or swaying, being rained on and raining, held, flooding or ebbing, standing, or spread" (72). These objects may not be metabolically active, but they possess creative agency, and represent different episodes of life's alterity. This is a good way to understand why all agencies matter, and why we should be more attentive to their agentic role in today's world, and be ecologically aware of the crisscrossing strands of their stories. Once in the purviews of posthuman ecocriticism, the study of the episodes of such alterity, not only as they emerge from scientific research, but also in their emulated fictional accounts, now traverses a range of disciplines as a seismic shift in the way life is imagined and experienced. The complexly bio-engineered and mechanically augmented hybrid forms in Justina Robson's (2004) sci-fi novel *Natural History* illustrate this shift in vision and thus provide a palpable literary example.

Natural History focuses on a distant future, the third millennium, when the expansion of humanity through the solar system is made possible via many redesigned humans represented by hybrid beings, the Forged. They "had originally been created for work of specific kinds" (Robson 2004, 85) for the Earth-bound humans called the Unevolved, or monkeys. Being embodiments of human DNA and animal genes coupled with metal and silicon, the Forged come in all sizes and shapes: hives of bees, birds, beasts, spiders, armored machines, space combat vehicles, titanic Gaiaforms (terraforming spaceships designed to rebuild planets), and other monstrous

and protean forms that can travel between planets. Realizing "the Monkey wasn't worth the effort any longer" (85) – because they find the human claims to superiority and governance false – the Forged "want to make a new beginning and forget their origins" (86). As posthuman entities composed of multi-natures, the Forged epitomize "the co-extensive materiality of humans and nonhumans" (Alaimo and Hekman 2008, 9), as in the case of the Pigeon, a gigantic human-bird hybrid designed to carry passengers:

> What was the protocol for dealing with the entry into another's bodily cavity? Should she move the hatch membrane aside like a curtain? The Pigeon put her out of misery by drawing aside the sheets of skin with a smooth flex of muscle and machinery in her hatch-rim. (Robson 2004, 82)

With the Forged representing "trans-species flows of becoming through interaction with multiple others" (Braidotti 2013, 89), *Natural History* poses fundamental questions about the nature of life, the future of evolution, and the possible coalitions of humans and nonhumans that spawn the posthumanist vision of "the differential constitution of the 'human'" (Barad 2008, 144). If fictional texts can project such imaginable pathways for material-conceptual horizon of humanity, literature becomes a useful site to explore the unfolding implications of posthuman identities, bodies, and natures. All are essentially multiple within themselves, like identity is, as Karen Barad (2012, 32) states; "identity is diffracted through itself", as it is envisioned in *Natural History*. For example, Isol's identity – the Forged entity searching for earth-like planets – is at once in the skin of her hand, her organic cells, her engine, her reactor core, and her dreams. She also finds her "self" entangled with ocean creatures like the octopus, sharks, and whales. This is what makes her radically posthuman. Isol is shaped by technological and biopolitical forces as effectively as evolutionary ones, and this is not an ultimately distant issue from our own posthuman reality, with possibilities opened up by biology and technology. As Ursula Heise concurs (2011, 456), "[t]he cyborg and the animal mixing with the human are no longer figures of the future, but dimensions of human identity as it exists now, in these authors' visions."

Although not all literary examples focus on the extreme forms of otherness like Robson's human-animal-machine hybrids, they help amplify environmental awareness by dramatizing global anthropogenic processes with devastating effects on planetary life and ecosystems. Their stories are meant to be disturbing, because they hold a mirror to a condition that is likely to happen in our reality marked by similar risks. These fictions[12] are important, because they urge us to "rethink 'the human' in more than human terms" (Rose et al. 2012, 3) in the actual posthuman world represented

12 See also works by Don DeLillo, Peter Heller, Kim Stanley Robinson, Liz Jensen Sarah Hall, Margaret Atwood, Nathaniel Rich, Maggie Gee, Paolo Bacigalupi, Stephen Baxter, Jeanette Winterson, Barbara Kingsolver, Michael Crichton, David Kramb, John Barnes, Alan Weisman. These novelists bring into play ethical and cultural implications of the posthuman developments. Working in genres such

by dispersive torrents of surprising relations, like viruses and parasites in our digestive tract, pesticides in food, and radioactive specks in air currents. Timothy Morton (2013, 53) calls them agents with "dark designs," which impinge on and constitute the present-day environments in unnerving, dark constellations, and designate an apodictic posthumanity. Since this composite reality demands new forms of engagement with "the realities of our changing world" (Rose et al. 2012, 3), the critical entryway posthuman ecocriticism provides becomes a significant area of theoretical inquiry and practice in the compendium of posthuman approaches. It indeed shows that life itself "as a networked phenomenon" (Helmreich 2009, ix) invites such a compendium of stories from cultural, literary, and scientific accounts. On this view, genealogies of humans and nonhumans overlap, creating a new "epic of creation as understood by modern science" (Chaisson 2005, xiii) as well as by literature, culture, and philosophy.

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