

Composing a Cosmic View: Three Alternatives for Thinking Scale in the Anthropocene

Zach Horton

THE ANTHROPOCENE'S UNIVERSAL OVERVIEW

The “Anthropocene” is commonly understood to signify a crisis of scale, bringing into focus the temporal, spatial, and causal extent of the human. In this sense, the Anthropocene is less about the discovery of new scales than it is a form of self-reflexive knowledge: it marks humanity’s confrontation with itself as a trans-scalar entity. Through climate change and geological history (“deep time”) we come to see the human as something alien. The mechanism of this alienation is scalar. We are shocked to discover that in carrying out the routine enterprises of industrial modernity, and perhaps collective agrarian enterprises before that, we didn’t recognize our own scales. The shock of the Anthropocene is less the shock of geological time or planetary space than it is the shock of Western thought confronting its own limits. The surprise is that the Anthropocene is a surprise. Why is this? I’ll briefly suggest three reasons. First, we tend to think in mono-scalar patterns. “The human” evokes,

Z. Horton (✉)

University of Pittsburgh, Pittsburgh, PA, USA

for Westerners, the scale of the rational, autonomous individual of European Enlightenment tradition. Sometimes we append to this subject the scale of a community or nation. Thinking the human itself at multiple scales disturbs the delicately balanced affective and ideological attachments that stabilize our identities. Second, our own scale usually remains unmarked. Entities of enormous or diminutive proportion seem to humans to possess scalar attributes, while we, the perceivers of those objects, seem to occupy a scale-free perspective. Because most of us see other scales and not our own, when we encounter ourselves at other scales, we narrativize the encountered object as something other than human. Third, and most profound, Western subjects have frequently failed to recognize our own scales because Western thought tends to collapse the difference between scales in the process of connecting them. This is not an accidental feature of the Enlightenment tradition, but rather a deliberate and systematic tactic that arises jointly from colonial and instrumental-rationalist logics. I call it *scalar collapse*. It is an interfacial technique of conjoining two or more different scales within a single medium, enabling access from the first to the second by homogenizing their differential dynamics and subordinating the second to the first.

There are many forms of scalar collapse, from Rutherford's model of the atom (the atom functions like a miniature solar system) to Gaia theory (the Earth functions like an organism). Sometimes collapsing scale may be necessary; often it is productive. But the tendency to collapse scale occludes difference, suppressing the fundamental alterity of matter-energy's constant flow of compositions and decompositions into new assemblages. As entities combine and split apart, as they change scale, they gain new properties and potentials. In a fundamental way, collapsing scale in our technology and thought diminishes our understanding of and ability to fully encounter the world that we inhabit.

At one extreme, scalar collapse produces a "universal overview," a mastering gaze that subsumes everything under its single logic. The universal overview can be detected in Western culture from at least the time of the Roman Empire, when what Denis Cosgrove refers to as the "Apollonian eye," or the desire to produce a viewpoint above the Earth and outside the world itself, came to full fruition. This "divine and mastering view from a single perspective" is "at once empowering and visionary, implying ascent from the terrestrial sphere into the zones of planets and stars."¹ This desire for a universal overview, a scopic mastery of the world that would fully authorize its reformulation according

to the projections of religion, Empire, or technoscience, has animated Western culture ever since.

If we accept that scalar collapse and its ideological apotheosis, the universal overview, have been constitutive of the problems of the Anthropocene, it is perhaps all the more surprising that Paul Crutzen, who developed the Anthropocene concept in 2000, seems to promote exactly this form of thinking as a *solution* to the problems of the Anthropocene. After arguing persuasively that human technologies have remade the face of the planet in dangerous and unsustainable ways, Crutzen and Stoermer (his co-author on the original article that introduced the concept in its current form) suggest that the Anthropocene is essentially an engineering problem. That is, once we have achieved the critical self-reflexive knowledge of the scales of human influence (which Crutzen and Stoermer presume we have now achieved), the process of arriving at a solution to the horrific geological and ecological effects that they have enumerated is passed off to scientific specialists and engineers:

To develop a world-wide accepted strategy leading to sustainability of ecosystems against human induced stresses will be one of the great future tasks of mankind, requiring intensive research efforts and wise application of the knowledge thus acquired in the noösphere. . . . An exciting, but also difficult and daunting task lies ahead of the global research and engineering community to guide mankind towards global, sustainable, environmental management.²

Knowledge production for the Anthropocene, in this account, consists primarily of the mapping of the ecosystems impacted by human technoscience, conjoined with the directed application of further technoscientific practices toward environmental management. Leaving aside for a moment the circular nature of this “solution,” it is nonetheless clear that Crutzen’s and Stoermer’s suggestion requires the systematic production of a totalizing vision of human and natural ecology, a data-driven, meticulously assembled overview of all processes involving or affected by humans. This overview, catalyzed by the self-reflexive charge of the Anthropocene but assembled through the protocols of scientific data collection and technological application (the inseparable interrelation of which is generally referred to as “technoscience”), places humanity in the driving seat of the planet’s ecology, first as the unwitting inflicter of “stresses,” and then, ever so swiftly, as the deliberate and self-assured inflicter of corrective

management technique. Humanity, according to this view, has fouled its nest not so much from arrogance or overreach as from under ambition: it has not sufficiently claimed its rightful role as monarch of creation, overseer in both the perspectival and managerial senses. Humanity can and therefore must master all the scales it has inherited by aggregating them into a single map that can also serve as an engineering diagram of potential intervention and optimization. The Anthropocene, as disciplined knowledge practice, *simply is* a kind of self-reflexive mapping of the cosmos as a set of linear scales, with the Earth as their reference point and the human as their perspectival anchor and guarantor. Thus Crutzen's technoscientific cosmic view is itself a universal overview, arising from the same logics of scalar collapse that have obscured the multi-scalar nature of ecology from the beginning.

Scholars in the humanities have approached the concept of the Anthropocene, and its attendant scalar shift, with both trepidation and cautious optimism. The optimism tends to come from the environmental humanities, and those who feel more generally that we need new forms of thought radically disarticulated from human exceptionalism, capitalism, and the exploitation that they enable. For scholars such as Dipesh Chakrabarty and Timothy Morton, the looming shadow of the Anthropocene acts as a check on some of the most hegemonic and intransigent traditions of the Enlightenment, enabling a darker form of thought more open to other scales and beings (Morton) at the same time that it demands a "cross-hatching" of two disparate histories: that of capital and that of species (Chakrabarty).³ The trepidation, for some, stems from a suspicion that shifting the scale of inquiry from human relations to larger ecological, planetary, and geological scales threatens to homogenize human difference into one mass subject—the human species—and erase the important work accomplished in the academic humanities over the past fifty years to theorize the construction of knowledge, exposing the compositional character of naturalized "facts." Claire Colebrook argues: "If theory has become an attention to construction and composition, the Anthropocene often appears as a reactionary insistence on the real and non-negotiable. Indeed, it often seems as though it is theory as such that seems to have fallen victim to the new scale of the Anthropocene."⁴ The danger of shifting scales, then, is not that we may lose sight of the familiar, but that we may lose a certain critical capacity to trace the history of our own ideas and impressions—that we may impose our own concepts (such as those that animate Crutzen's

global engineering regime of environmental management) without recognizing them, so benumbed are our critical capacities in the face of that which is so immense (the planet, climate, deep time) that it seems *given*, no longer subject to critical inquiry.

Humanities scholars have often critiqued the Anthropocene concept for its seemingly central focus upon the human. This comes at the moment when the humanities are working hard to decenter the universalizing concept of the human as inherited from the European Enlightenment. Ushering back in a central focus on the human by naming the current epoch after it threatens not only deconstructive and genealogical work that has traced the construction and colonial deployment of the “human,” but also work in philosophy, feminist theory and the environmental humanities that has effected a shift to thinking, valuing, and becoming-with entities other than the human: animals, plants, and other forms of matter-energy. As Donna Haraway notes, evolutionary biology and human historiography alike, as knowledge practices, have moved on from notions of static and autonomous beings toward a form of multi-species becoming: “What happens when organisms plus environments can hardly be remembered for the same reasons that even Western-indebted people can no longer figure themselves as individuals and societies of individuals in human-only histories? Surely such a transformative time on earth must not be named the Anthropocene!”⁵

Indeed, there is more than a little perversity in naming what should be a radical shift away from the centrality of the human after the human itself. Jussi Parikka has suggested that, in order to mark this perversity, we modify our geological marker to the “Anthrobscene.”⁶ Haraway in turn suggests that, in order to respond to the challenges of the Anthropocene we must move beyond it, inheriting its scale but introducing a new form of multi-species relationality in our theory and practice, an engagement with the “Chthonic Ones,” the beings of the earth. Haraway calls this hypothetical shift the “Chthulucene.”⁷

Following Chakrabarty, Colebrook, Parikka, and Haraway, I would like to frame the central question of the Anthropocene as one explicitly about scale: How do we meet the challenge of this moment in which we as humans are faced with the destruction we have wrought upon each other and non-humans alike—when we are forced to face our true scale as a species—without resorting and reverting to the universal overview, a standpoint that renders a guilty verdict on human activity only to put us back on top of the epistemological ladder as sole masters of ever-larger

scales? How do we keep alive not only an active engagement with difference at all scales, but also a thick understanding of how new forms (bodies, collectives, concepts) emerge and change? If our thinking is, as I have suggested, plagued by scalar collapse—a meeting of disparate scales that erases their difference and imprints the qualities of one onto the other—then how do we escape from this cycle? How do we generatively engage other scales and give them their due while maintaining an openness to the transformative nature of the trans-scalar encounter itself?

It is easy to get caught up in the urgency of the Anthropocene's eternal present, its ahistorical irruption, a crisis that seems to demand novelty of response. I suggest that, as we look to the future, we also look to the past for "new" ways of thinking. Attempts to cultivate a cosmic view that aggregates the scales of being into knowledge and experience are not novel to this self-reflexive period of the Anthropocene. Mystic, literary, and scholarly works have long sought to provide such trans-scalar access to the many scales that touch us, as well as those we touch. In the remainder of this essay I will examine three alternative models of cosmic view composition that predate the concept of the Anthropocene: the microcosm, as exemplified by the writings of Paracelsus, the serialized cosmos evoked by Walt Whitman, and the resolved or mediated cosmos explored by Kees Boeke.

Each of these alternative cosmic views consists of a model of scalar relationality, affordances of human access to other scales, a prescriptive set of practices for the cultivation of a trans-scalar perspective, and implicit or explicit arguments for the social value of such practices. Rather than assume, as Crutzen appears to do, that the technoscientific assembly of a universal perspective stands at the zenith of human achievement in the realms of knowledge, ethics, and milieu-building technique, I will consider these three alternative forms of cosmic view composition as singular in their positioning of the human vis-à-vis ecology, perspective, and potential. Even a brief discussion of these alternatives will help us to contextualize the scalar assumptions implicit in Anthropocenic discourse and critically evaluate how they function to establish particular relationships between ecology, human intervention, social identity, and personal identity. In short, these considerations will suggest that human ecological intervention in the Anthropocene must begin a bit further back, not with the confident implementation of a set of already-assumed technoscientific purposes, but with a questioning of how we have arrived at our scalar assumptions and perspectives in the first place.

THE MICROCOSM: HEALING THE TRANS-SCALAR BODY

George Perrigo Conger, who in 1922 published the first monograph on the subject of “theories of microcosms” in the history of Western thought, and remains the closest we have ever had to an expert on the subject, finds “traces of these theories . . . throughout practically the whole history of philosophy. . . . [A]lthough they exhibit periods of rise and decline, such views apparently belong among the philosophical perennials.”⁸ These perennial views have in common the positing of a structurally homologous relationship between at least two different size domains within the totality of the universe. The term “microcosm” is from Greek, meaning “little world.” The microcosm, of course, always comes with a sister world, a “macrocosm” that outscapes it but remains attached as if by a mysterious umbilical cord. Conceptually, a microcosm is always conjunctive: it circumscribes a space, draws the boundaries of a world, but at the same time draws another world nearer—causally and poetically—than it might otherwise seem to be. Conger’s definition of microcosmic theorization tellingly conflates the literary with the mathematical, “the attempt at a descriptive parallelism indicating, point by point, that one portion of the universe imitates another or others on a smaller scale.”⁹ I am going to challenge Conger’s formulation of microcosmic philosophy as fundamentally mimetic, but for now the important point is that microcosmic theorization is simultaneously mathematically precise in its pinpointing of the universe’s scalar joints and poetic in its evocation of the potential articulations that such a structure affords.

Rather than consider a genealogy of microcosmic philosophy, which runs from Pythagoras through Plato to the Stoics, then later through Jewish, Muslim, and Christian thinkers, I wish to focus briefly on a single philosopher whose system of thought is in many ways the apotheosis of microcosmic thought, an unrestrained, ecstatic exploration of the potentials of scalar homology for dwellers at any scale: Paracelsus, the sixteenth-century German philosopher, physician, and alchemist.

For Paracelsus, medicine and alchemy are one and the same knowledge practice. Both are “signatory” arts that teach us “how to give true and genuine names to all things.”¹⁰ To understand the proper names of things is vital, because each thing is a sign of something else at another scale. To understand a thing’s name is to understand its essence, but that essence is relational: every individual thing encountered is what it is only by virtue of the principles by which it is differentiated from all

other things. This difference, the primary differentiation of substances in the universe, is almost always occluded through their undignified mixing. The Art of Alchemy is the art of divining occluded difference, recovering the proper names that signify each element as unique unto itself. "In order to understand what separation is, you should know that it is nothing else but the segregation of one thing from another, whether two, three, four, or more have been mixed."¹¹ Linguistic differentiation and material separation are thus two sides or perspectives of a single alchemical process of recovery. Paracelsian alchemy proceeds from the assumption that fundamental difference has been sensibly occluded through the mixing of all things, and that making differentiating cuts in this apparent manifold reveals essential relationships that hold at all scales. Thus scalar homology underlies material difference, which, viewed from the wrong perspective, looks like undifferentiated substance, the milieu inhabited by the non-Alchemist. For Paracelsus, the hard work of assembling a cosmic view begins by differentiating the human from its environment, which further entails breaking the human down into its essential components:

The first Separation of which we speak should begin from man, since he is the Microcosm, the lesser world, and for his sake the Macrocosm, the greater world, was founded, that he might be its Separator. But the separation of the Microcosm begins from death. For in death the two bodies of man separate from each other, that is to say, the Celestial and the Terrestrial, the Sacramental and the Elemental.¹²

Paracelsus differentiates two components that are essentially unlike, yet mixed or occluded in life. These two "bodies," the one made of earthly stuff and the other of heavenly stuff, once differentiated, reveal another difference: the celestial part of the human consists of a soul belonging to the "first matter of the sacraments" and the spirit belonging to "the first matter of the aerial chaos."¹³ Each operation of alchemical thought, in producing a differentiating cut, reveals a relationship between those essential components that have been separated. It is this relationship, between the celestial and the terrestrial on one hand, and the (corporeal) body, soul, and spirit on the other, that Paracelsus sees as universal: it animates *every* body, from the human to the earth to the universe at large. This is why the human is a microcosm: the relationships between its constituent components are universal in structure, and repeat at larger and larger scales:

What has now been said concerning the separation of the Microcosm should also be understood of the greater world, which the mighty ocean has separated into three parts, so that the universal world is thus divided into three portions, Europe, Asia, and Africa. This separation is a sort of pre-figuration of the three principles, because they, too, can be separated from every terrestrial and elemental thing. These principles are Mercury, Sulphur, and Salt. Of these three the world is built up and composed.¹⁴

Paracelsus's alchemical analytic, proceeding down to the most fundamental difference (three "principles" or fundamental forms of matter), has thus revealed the structure of all bodies. In the example above, he shows that the human body is a microcosm of the earth: mercury, sulfur, and salt form a homologous relationship at these two different scales. In Paracelsus's theory of difference, then, every point of differentiation, every site of separation, forms a point of collocation or correspondence between different scales. These are the cosmic "joints" that articulate the world. They can be found at every scale, but this homology itself weaves all scales together. Paracelsus notes that "there is a similar star also in the elements, as in the earth, and that an efficacious one. That star receives an impression from the higher star, and then of itself acts on the earth, so that there is drawn forth from the earth whatever exists or lies hid in it."¹⁵ The cascade of scales that comprises the universe is more than a set of cosmic Matryoshka dolls, each nested inside the other: it establishes a causal axis:

External stars affect the man, and the internal stars in man affect outward things, in fact and in operation, the one on the other. For what Mars is able to effect in us, that also can the man effect in himself if he restrain himself in his manly operations. Thus are the double stars related one to the other. Man can affect heaven no less than heaven affects man.¹⁶

This is certainly a surprising result. Differentiation at one level has revealed fundamental relationality, a structure that corresponds point by point with bodies composed at different scales. But those points themselves, when viewed laterally as lines running through all scales, form causal axes. As conjoined articulations, movement at one scale can influence movement at other scales. This efficacious influence is bidirectional: smaller structures can influence larger ones just as the latter can influence the former. Scale literally animates the universe.

We have now clarified the scalar relationship between the human and the rest of the universe: like every other body, the human is caught up in this vast cascade of scales, each exerting its influence on the others. The uninitiated human, then, is at the mercy of these trans-scalar impressions. He bears the weight of all scales, and is reduced to the state of the automaton or animal:

The stars compel and coerce the animal man, so that where they lead he must follow. . . . What other reason is there for this, save that man does not know or estimate himself or his own powers, or reflect that he is a lesser universe, and thus the whole firmament with its powers hidden within himself?¹⁷

Alchemy produces a particular kind of knowledge, not only about the composition of all substances, but about the universal structures that underlie all forms, connect vastly different scales together, and enable movement to ripple through the universe along these scalar axes. This is why Paracelsus sees alchemy as a healing art and a suitable replacement for the practices of ancient medicine: infirmity and disease are nothing other than the mixing of those principles that should remain apart, and thus the disarticulation of the individual body from the cosmic whole.

The process of healing, for Paracelsus, is one of purification: various mixed elements must be separated within the sick body so that they may return to their proper proportions and places. These internally optimal relationships are determined by the homologous relationships that pertain at other scales. The sick body can no longer function normally because its internal relationships are out of alignment with the cosmic order of the universe, and thus with the causal axis of influence that ties scales together. Healing is thus, paradoxically, the art of reading signs of other times and places. Medicine is astronomy; one learns as much about the human body by studying the stars as one does through anatomical study. Of course, the reverse is also true: alchemical medicine traces the scalar ties of the human to all other scales of the universe. "Hence man is now a microcosm, or a little world, because he is an extract from all the stars and planets of the whole firmament, from the earth and the elements; and so he is their quintessence."¹⁸

The healer, the alchemist, cultivates a cosmic view that renders visible these scalar homologues and, in the sick body, their condition of misalignment. The alchemist recognizes that "the interior or invisible man is

a kind of constellation or firmament,” and that these human stars should correspond with the stars of the firmament: they are “so arranged by the Olympian spirit that the man can be led and changed into quite another man.”¹⁹ The physician’s cosmic perspective gives him the capacity to effect this re-articulation, the return to health, and thus the recovery of the ability to act. Bringing the constituent elements of the body back into alignment with cosmic structure means recognizing the place of the human in that larger structure, including human needs and dependencies: “Such, then, is the condition of man, that, out of the great universe he needs both elements and stars, seeing that he himself is constituted in that way.”²⁰

Ultimately, Paracelsus’ alchemical knowledge of scalar homology becomes a kind of cosmic ecology. For sustenance, man depends upon both the earth (nature) and the heavens (spirit). These dependencies, which cannot be circumvented, require human alignment with the axis of scalar causation that wends its way through the entire universe. Human efficacy and health depend upon the cultivation of scale-articulated knowledge. Dwelling harmoniously in the universe is thus contingent upon being able to read the signs of scale: one thereby participates in a bidirectional, entangled form of trans-scalar causality, a self-reflexive process that reveals the human as constellated at many scales.

THE SERIALIZED COSMOS

Microcosmographies such as that developed by Paracelsus are mapping devices: they attempt to chart the whole of the universe without producing a totalizing perspective by positing the universe as a cascading set of interrelated scales. This cosmic chart can be drawn in advance of empirical investigation, because structure is homologous at all scales. The microcosmic knowledge practitioner, as soon as she examines any structure, is immediately embedded in a cosmic ecology, but that ecology functions on the basis of similarity instead of difference. Not only does this create a potentially vexed relationship between microcosmic knowledge and empirical knowledge (thus provoking the purge of homologous thinking that enabled modern chemistry to emerge from alchemical occultism, with all of the losses that entailed), but also has the disadvantage of denying difference between scales. This is one of the ironies of Paracelsian scale thinking: it celebrates intra-scalar difference only to collapse *inter*-scalar difference.

A form of cosmic view production capable of preserving a more robust inter-scalar difference would need to abandon a priori knowledge of scalar homology, which would in turn require some other method of aggregating or tying together diverse scales. One such alternative would be a serialized approach that incorporates ever more entities into its model in an iterative fashion. Instead of starting from a totalizing overview or posited scale-spanning homology, it would begin in punctiform fashion, with something singular. It would then add to this structure in iterative waves of incorporation. It could never incorporate *everything* in the universe into its model, of course, as it would be limited by finite accumulation in time. It would have the advantage, however, of preserving the singularity and difference of every scale that it engages.

Walt Whitman develops exactly such an approach in his most celebrated poem, *Song of Myself*. It opens with a declaration of self-valuation: "I celebrate myself, and sing myself, / And what I assume you shall assume, / For every atom belonging to me as good belongs to you" (29).²¹ This stanza sets in motion two seemingly opposed vectors: one inward, into the psyche and experiential field of the narrator, and one outward, directed at an indefinite "you" who acts as the potential recipient of the narrator's constitutive particles. The tension between these two vectors will develop throughout the poem into a serialized aggregation of the scales of the cosmos as enunciation, as song: a lyrical cosmic view.

The self is a scale, a home, a perspective: scale ground zero. The opening stanzas relate the most intimate of processes: "My respiration and inspiration, the beating of my heart, the passing of blood and air through my lungs." The body of the narrator (hereafter "the poet"), molecularized into processes and flows, however contained, compact, and scale-intimate, soon finds itself connected to flows outside of itself: "The sniff of green leaves and dry leaves, and of the shore and dark-color'd sea rocks, and of hay in the barn" (30). Particles from the surrounding environment travel through the blood and inhaled air, and thus an intimate awareness of the scale of the human body imperceptibly morphs into an awareness of a world, the scale of a habitat. It goes without saying that this pattern will be repeated again and again, that more particles will be taken in, sung in ever-expanding scales. Keeping up with this process, this concentric journey outward through the ecological-scalar meshwork is the poem's explicit challenge to its reader: "Have you reckon'd a thousand acres much? have you reckon'd the earth much?" (30). "Reckoning" signifies more than the act of contemplation or measuring. It means,

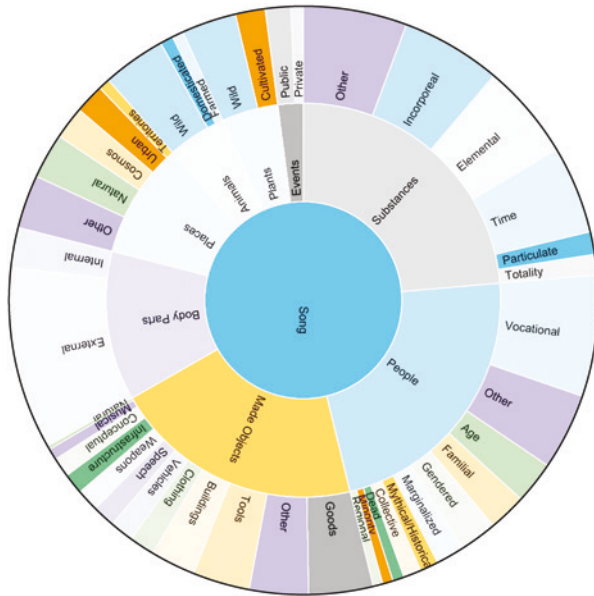


Fig. 2.1 Interactive “object ecology visualization” of Walt Whitman’s *Song of Myself*, top level

for the poet, an enlargement of the self, an incorporation: “and of these one and all I weave the song of myself” (42).

The progressive incorporation of scales into the poet’s self does not proceed abstractly, but in famously concrete detail. *Song of Myself* is a set of nested lists, organized categorically but ultimately populated with singular entities (Fig. 2.1). Thus we encounter, inter alia:

<i>Events:</i>	Apple-peelings, a regatta. (57, 40)
<i>Body parts:</i>	“The malfom’d limbs are tied to the surgeon’s table,” “convex lips.” (39, 35)
<i>People going about their business:</i>	clam-diggers, the President, a “clean-hair’d Yankee girl works with her sewing-machine.” (36, 41, 40)
<i>Marginalized people:</i>	a runaway slave, a prostitute being mocked by a crowd. (59, 41)
<i>Animals:</i>	a turkey-hen, a “gigantic beauty of a stallion.” (39, 55)

<i>Plants:</i>	pecan-trees, "the running blackberry." (41, 54)
<i>Tools:</i>	"a staff cut from the woods," the hand-saw. (73, 75)
<i>Places:</i>	Manhattan, "the old hills of Judæa." (56, 75)
<i>Elemental Substances:</i>	the dirt, "You sea!" (50, 46)
<i>Celestial bodies:</i>	Uranus, "far-sprinkled systems." (51, 72)

Starting with the scale of the self, Whitman (the poet-narrator) proceeds not linearly to other scales, through some abstract medium, but rather through a kind of quixotic spiral, encountering and incorporating these diverse objects and subjects. It is not that they are caught in an ever-widening net so much as they form the fibers of the net itself, conjunctive strands that are at once the raw materials of the poet's weaving and the woven garment itself. This poetic self, then, is not unchanging, remote, autonomous. It is animated intersubjectively by that to which it is connected, acting as a center but not a whole: "there is no object so soft but it makes a hub for the wheel'd universe" (76). This scalar assertion is striking. The part is not to be subordinated to the whole; in this radically dehierarchized ontology, any point, any singularity, can serve as the center to everything. And yet this "everything" is not a totality: "They are but parts, anything is but a part" (73). This is what authorizes Whitman the narrator-poet to assume that subjectively central position; anyone else would do just as well. The key to occupying the position of the hub, the central condensation point for an aggregation of entities at multiple scales, is the perspectival feat of producing universal articulations given only a finite collocation of elements (the objects that populate the categories listed above) while also acknowledging the radical, embodied contingency of this necessary perspective.

This dual paradox, of universality in singularity and necessity in contingency, produces the conceptual space of the serialized cosmic view. It proceeds through a necessary incorporation (it couldn't have been otherwise; the meshwork of the universe cannot be denied) of elements into an entirely arbitrary center, while each entity thus incorporated retains its singularity, remains differentiated from everything else. Every iteration, every turn of Whitman's wheel adds more *detail*, as differentiated bodies in motion gathered into a single mass. The resulting aggregate is therefore always maddeningly incomplete for anyone craving a universal overview, but in its openness to further conjunction, the potential to always add more, it avoids scalar collapse. It aggregates and conjoins without homogenizing.

More and more detail accumulates, always articulated to the “I” that is the center of perspective, the surface that makes possible such conjunctions by presenting itself as the substratum for proliferating differentiation. Thus Whitman as the self, the song, fulfills the role of what Deleuze and Guattari refer to as the “body without organs,” which “forms a surface where all production is recorded, whereupon the entire process appears to emanate from this recording surface.”²² As a surface of inscription that produces nothing but provides an assembly point for all production (movement, change, connection, weaving), the body without organs keeps all of its aggregated entities apart from one another. They multiply, squirm, differentiate, because they are unable to join in a single whole: “Machines attach themselves to the body without organs as so many points of disjunction, between which an entire network of new syntheses is now woven.”²³ A new entity takes form as a set of virtual connections coursing through the universe, producing one possible geometry for its articulations, one out of an infinite set of potential hubs.

Thus instead of wading deeper and deeper into endless differentiation, an accumulation of detail that could only adjust our focal point closer and closer—a scalar myopia—Whitman weaves difference into cosmic vectors that expand ever outward. Again, he discovers necessity in contingency, universality in difference. We may find it suspicious, however, that we can know the outcome of Whitman’s poetic encounters prior to their occurrence, as in Paracelsus; however singular they are, they necessarily lead to a disjunctive conjunction: they will be aggregated into the tapestry of the self as detail, as conserved difference. As Deleuze and Guattari note, “the body without organs reproduces itself, puts forth shoots, and branches out to the farthest corners of the universe.”²⁴ Whitman always explores two vectors at once: the actual detail contained everywhere he looks, and the virtual vectors of universal conjunction that spiral ever outward, encompassing new scales: “My voice goes after what my eyes cannot reach, / With the twirl of my tongue I encompass worlds and volumes of worlds” (50). Whitman’s suspended tension between these two vectors, one discovering ever more detail within and the other encompassing ever more without, keeps his serialized cosmic view from collapsing into an abyssal plunge into detail on one hand (the actual), or infinite potentiality that resolves no actual detail on the other (the virtual). Instead, Whitman produces a paradoxical literary persona that suspends reduction on either side, becoming both a potentially

infinite being (“a kosmos,” containing “multitudes,” capable of standing “cool and composed before a million universes”), and an entirely circumscribed singularity that gazes into the eyes of particular oxen, aids a runaway slave, etc.²⁵

Thus Whitman’s affirmation of all that he encounters and a priori all that he could potentially encounter, his dismantling of any and all hierarchies, his radical democratization of objects and subjects should be understood as components and consequences of a delicate balance between actual and virtual scales, with his poetic self poised on the fulcrum between the two: “I am an acme of things accomplish’d, and I an encloser of things to be” (71). His project consists of the production of a particular viewpoint integrating both. In its accretive mode, it functions as an approach to detail and difference as *potentially* infinitely assimilable, but *actually* endlessly differentiated and serialized.

Whitman’s cosmic view affirms the beauty of difference, but also the labor of reading, the labor of constructing a viewpoint that is always necessarily incomplete and thus fully open, never closed to new scales, whether larger or smaller. He declares this paradoxical aim in the preface to his first edition of *Leaves of Grass*: “Let the age and wars of other nations be chanted and their eras and characters be illustrated and that *finish the verse*. Not so the great psalm of the republic. Here comes one [who] sees the solid and beautiful forms of the future where there are now no solid forms.”²⁶ The goal is to conjure these forms that have not yet come to be, to trace their vectors of actualization while fully affirming their difference (for this movement of actualization is both a condensation of the limitless potential of the virtual and a movement outward from the actual, a swerve from one state to an entirely new one). This is the cosmic view as a speculative process or rhythm, a poetic ecology that one cannot learn in the mode of empirical cartography or astronomy. To inhabit it is to serve, for one moment, necessarily but contingently, as the hub of the universe.

SHORT CIRCUITING THE OVERVIEW: MEDIAL SCALE JUMPING IN BOEKE’S *COSMIC VIEW*

The serialized cosmic view, as modeled by Whitman in *Song of Myself*, achieves undeniable poetic heights, heights from which much can be seen. It does require, however, a condensation point for the virtual

entities of the world, a singular perspective that is both a surface and a container for the collection of detail. If Whitman creates a persona to play this role, we may nonetheless remain skeptical about the essential communicability of this vision, its potential to be shared and remain efficacious, as well as its potential to be abused. Must we start with a self, and must we rely so heavily upon its capacity for transcendence? Perhaps, but I wish to consider one final alternative form of cosmic view production that begins with and relies upon quite a different set of relationships between the self and its scalar others. This is the mid-twentieth century book *Cosmic View: The Universe in 40 Jumps*, by radical Dutch schoolteacher Kees Boeke. This remarkable work produces something like a universal overview that is nonetheless fragmented, discontinuous, and mediated. The subject who attains such a cosmic view remains situated, embodied, and uncertain rather than transcendent. Boeke's scale-jumping experiment nonetheless takes the production of new subjectivity seriously, according it a position of centrality. Ultimately, this twentieth-century mutation in cosmic view composition functions by bringing a medial sensibility to bear on elements of both serialized cosmography and the therapeutic dynamics of Paracelsian microcosmic medicine.

Both Boeke and his wife, Beatrice Cadbury, were wary of individualism. Beatrice, the daughter of one of the founders of the Cadbury Brothers company in England, became so disillusioned with the class hierarchies produced and reproduced by capitalism that she permanently ceded all of her shares in the company to the workers in the Cadbury factory.²⁷ During World War I, Beatrice and Kees, newly married, became pacifists in order to protest Britain's continued participation in that conflict. In London, they attended weekly Quaker meetings during which the entire community would collectively discuss a topic and arrive at a consensus decision. The lack of political hierarchy within the organization particularly impressed Boeke, and after the war the couple set out to replicate this radically communitarian, anarchistic structure in the domain of education. If children could be taught communitarianism and responsibility, perhaps a better society could be built. The Boekes thus shared Whitman's basic desire for a radically new, radically democratized society; their emphasis, however, was less upon the affirmation of difference and more upon the production of a collective subject.

The nature of subjectivity itself was to change along with its scale: in 1926 they founded the Werkplaats Children's Community, a radical primary school in which the children were treated as full shareholders

and decision makers. The school was (and is still) located in the town of Bilthoven, outside Utrecht, where it became the site of a new scalar experiment in education. The children not only made collective decisions regarding the running of the school, but also divided their labor into productive units for the active maintenance of its infrastructure, building its chairs and desks, maintaining a garden for food, and so forth.²⁸ The school was meant as a scalar foothold on the collective imagination of the world's peoples. Boeke hoped that the skills, procedures, and forms of subjectivity required to organize a school along communitarian lines would, once developed in its students, successively scale up to ever higher levels, until it would culminate in a "World Meeting to govern and order the whole world."²⁹

After World War II, during which the Nazis had occupied the school and rebuilt its main structure for use as a communications hub, Boeke developed a new group project for the school's children, designed to guard against the possibility that "our attitudes may become narrow and provincial,"³⁰ a state of affairs all-too-recently verified by the tragic nationalism that had led to this second European conflict. The subject of this work was not merely the Netherlands, or Europe, but the entire cosmos. Together with the Werkplaats' students, Boeke composed a book consisting of a series of drawings, each to a different scale and containing a miniature version of the one before. Thus on forty pages in *Cosmic View* appear forty images and forty units of text that attempt to capture the dynamics and features of each particular surface and thereby to impart to the reader "a sense of scale."³¹

The book begins with the image of a student sitting in a chair on a concrete pad, holding a cat. The accompanying text informs us that this is a student at the Werkplaats school, sitting in the center of its courtyard, holding her pet cat. The scale of the image is marked: its field of view encompasses a space 1.5 meters by 1.5 meters in area, while the borders of the image on the book's page measure 15 centimeters square. Thus the scale is 1:10. The next image is the same size on the page, yet depicts a scene ten times larger: the entire Werkplaats' courtyard. The scale is now 1:100. Inexplicably, a whale has become visible, sprawled out in the courtyard. It was right there next to the girl on the first page, but unrevealed until now. A small square (1.5 cm × 1.5 cm) in the center of the image reproduces the field of view of the image on the previous page. On the next page, a third square will appear, depicting the field of view two pages back; the edges of this third frame are

only 1.5 mm in length. Thus the surprise revelation of the whale in the courtyard is scale-contextualized in relation to the previous view. “A long and unlikely story would certainly be needed to make the presence of a whale at this place and time plausible or even possible,” notes the text, and leaves the mystery at that.³² This surprise whale, however, establishes a pattern of revelation afforded by jumps in field of view.

As we jump to ever greater scales, more and more context for the Werkplaats is revealed. By the sixth scale, a map of the Netherlands fills the 15 cm × 15 cm frame on the page. The accompanying text points out feature after feature:

Here we see the central part of the Netherlands. The small square in the middle of course shows the town of Utrecht, and the tiny square inside is the twice-reduced picture of illustration 4. There is Bilthoven, and . . . there is the little girl: we know she must be there, but we cannot see her!³³

The text’s point is seemingly mundane: of course we can no longer see the girl, since we are looking at a map of the whole country. But the implication for scale-jumping media is significant. The book has set up a material scalar relationship between the resolution of the paper and ink droplets, the area of the image’s frame (15 cm × 15 cm), and the dimensions of the surface that each image describes. Here, Boeke is asserting that the girl is in the picture even though we can’t see her. This is a radical claim, of which we can only make sense in relation to the dynamics of *resolution* and the scalar relationship between two surfaces. The ink droplets on this page cannot resolve the girl because the amount of detail that they can register in a given area of paper is less than that required to code any recognizable *detail* of the girl into the fibers of the paper, given this field of view or medial scalar ratio. Nonetheless, the girl continues to exist on the surface described by the book. She is in the picture by dint of the retentive capacity of the reader’s mind.

Resolution in *Cosmic View* is highlighted as a material property or relationship between two scales: the scale of the book in the reader’s hands and the scale of the surface that each page depicts. The reader, given the affordances of the ink and paper fibers, must negotiate the scalar relationship initiated by each page. What is in the picture and what isn’t? What can be retained even though it can no longer be resolved? The process of scale jumping becomes both material and serialized. The reader must work within the material limitations

of resolution and the discontinuity between scales, yet generate virtual connections between these scalar slices of the universe.

The seventeenth scale that appears in the book depicts not much more than the inky void of space. The text, however, takes issue with this too-easily assumed void: "This seems like a very uninteresting picture: it contains no more than one tiny white spot in the center of a black square! That spot, however, stands for the whole solar system, which on this scale would be only little more than 0.1 millimeter in diameter."³⁴ The solar system is not resolvable, but we know it is there. Boeke suggests that when we look at other stars, they may also contain planets, continents, living organisms, and so forth. Just because we cannot resolve detail given a particular medial relationship does not mean that no detail exists.

This is a critical insight about scalar mediation's relationship to ecology. Any apprehension of difference across scales is necessarily the dual function of differentiation on the surface thus described—the mechanism by which Whitman's serialized cosmic view proceeds—and the resolving power of the medial apparatus of the observer. As we negotiate jumps across ever greater scales, our field of view changes while the resolving power of our media remains the same. In short, field of view and resolvable detail are inversely proportional: the larger the area we represent, the less detail we can see. This basic equation cannot be circumvented no matter how much we increase the resolution of our media: the apprehension of scale will always be a negotiation of difference between two surfaces, one medial and one mediated. *Cosmic View*, by making visible the apparatus of scalar mediation itself, enrolls its readers in a drama of resolution that speculatively connects their own scale to many others, not as a permanent and unmediated form of access, but as a contingent and mediated negotiation of difference.

What is the end result? After we as readers have resolved forty different surfaces at forty different scales, with what are we left? We have resolved the surface detail of the entire known universe right down to the nucleus of an atom, and explored at each stage the dynamics that take place within that scale. This view of the cosmos, while aggregative, is nevertheless, like Whitman's, never complete, for the surface it resolves is discontinuous. In order to focus on each scale, we must negotiate a medial relationship with its surface, a process that takes time and effort. Certain details are available to us at each scale that by necessity disappear at most other scales. The book reminds us that we cannot change scales

without losing as much as we gain. While later filmic versions of Boeke's book attempt to smooth over scalar difference, representing all scales as a single, smooth, zoomable surface,³⁵ here the process of stabilizing a particular scale and the revelation of ecological detail that is thereby afforded remains self-reflexively foregrounded. The scales of the universe simply are not continuous: each is marked by different processes, dependencies, and interactions. These are irreducible scalar dynamics, brought into focus by a consideration of the medial nature and inherent limitations of any attempt to bridge scale.

CONCLUSION: HUMANITY'S NEW SCALES

When we view the Anthropocene through the lens of the universal overview, it appears in the guise of an engineering problem: How to optimize the earth's systems, prevent the scaling up of negative effects, and enable the scaling up of positive ones? How to re-tool the interrelationships between the planet's many scales so that humans may increase their mastery of its multi-scalar ecology? How to shore up human exceptionalism by further protecting and isolating the planet from human resource extraction? These framing questions all stem from a singular logic of planetary management, an example of what Jacques Ellul refers to as "technique," a conjoining of technological systematicity with organizational totality.³⁶ Technique can produce no solution outside the perspective that enables and sustains it. The dominant scalar technique of the Anthropocene is one in which technoscience is conjoined with a universal overview of all scales. The human returns as villain and savior—in fact, as the entire cast of an apocalyptic theater that subsumes all scales and collapses the difference between them. In the Anthropocene, if the human has become the defiler, nonetheless everything else has become human.

The microcosm too has wormed its way back into Anthropocenic thought, especially in climate change discourse. The polar bear becomes a discursive condensation point, an analogue for the larger dynamics that threaten humanity's future. The individual human body similarly serves as the figurative and literal accumulation point for globally diffuse toxicity, a byproduct of the Anthropocene, whether in the form of heavy metal poisoning, petroleum contamination, or radiation. Microcosmic thinking can help to give us a new perspective, to break us out of our monological form of technoscientific thinking. The problem, from a Paracelsian point of view, is not one of stabilizing a viewpoint outside

and above the world in order to manipulate, exploit, and optimize it more effectively, but rather one of following the inter-scalar threads that ineluctably tie us to the movements of stars, planets, and microbes. Any inquiry into the dynamics contained within one scale automatically becomes an inquiry into most of the other scales of the universe, larger and smaller. A view of the human as “constellated” goes some way toward dismantling the hyper-separation between mind and matter, human and nature, active design and passive receptivity to imprinting, a set of policed binaries that ecofeminist philosopher Val Plumwood has diagnosed as the condition of Western modernity.³⁷

The multiple, constellated human contains Whitman’s kosmos as a virtual horizon. This is an empowering vision of trans-scalar engagement that nonetheless proceeds by difference rather than homogeneity or totality. The always-incomplete self functions as a cosmic map, encompassing only those differences that can be detected and described, yet at the same time standing “cool and composed before a million universes” (76). This second, virtual dimension to cosmic view composition overshoots totality just as the dimension of actualization undershoots it. Infinite potential and necessarily incomplete detail mark the two halves of the circuit that electrifies the serial cosmic view.

Ultimately, however, the Anthropocene calls for an ecological cosmic view, an apprehension of scale that avoids both the Scylla of totalizing vision and the Charybdis of individualized subjectivism. Humans can no longer occupy the roles of naïve adventurers and colonizers of the continents of other scales. Our field of view has become wide indeed, but the detail we can resolve using this vast apparatus of technique has only decreased proportionally. This would be less of a problem if we could remember what is in the picture even when it cannot be resolved. But alas, we have spent too much time and effort composing a cosmic view that is glassy smooth and fully continuous—a cosmic view that promises to deliver a totality for human contemplation and intervention, but that only achieves this breathtaking illusion by eliding scalar difference.

The self-reflexive medial project undertaken by Boeke and his revolutionary students reminds us that we can potentially see the entire universe, but not all at once. Whatever connectives appear, whatever articulations of the universe we experience, they are only unified in the speculative mind of the student, reader, or viewer. The fragments of scale that comprise our world cannot be unified through a single, linear axis. Instead, this kosmos is only a fragmented whole, always incomplete,

but by the same token always open to differentiation, the appending of new details through medial resolving cuts. What emerges from this meshwork is a new, trans-scalar ecology that hurls the willing observer into a trans-scalar medium. This self-reflexive process of scalar mediation links her to endlessly branching connective ligaments between all scales, a rhizome consisting of mediated detail and proliferating observation points rather than progressively purified observational distance.

Our new question, as we face the millions of universes that are our possible futures, is not merely how the human has become multi-scalar, or how to outscale the negative effects of the Anthropocene by re-implementing technoscientific technique within ever-larger fields of view, but how we have mediated scale in such a way as to produce our current version of the Earth—and how, if Paracelsus is correct that humankind “needs both elements and stars,” we can work our way back down to that Earth and up to the stars through one and the same wheel’d motion.

NOTES

1. Cosgrove, xi.
2. Crutzen and Stoermer, 18.
3. See Morton, 5–6; Chakrabarty, 214.
4. Cohen, Colebrook, and Miller, 94.
5. Haraway, 30–31.
6. See Parikka’s essay *The Anthrobscene* for his introduction to the subject, as well as his more fleshed-out treatment in *A Geology of Media*.
7. Haraway, 2.
8. Conger, 133.
9. *Ibid.*, xiv.
10. Paracelsus, “Nature,” 188.
11. *Ibid.*, 160.
12. *Ibid.*, 161.
13. *Ibid.*, 162.
14. *Ibid.*
15. Paracelsus, “Hermetic Astronomy,” 286.
16. *Ibid.*, 285.
17. Paracelsus, “Nature,” 174.
18. Paracelsus, “Hermetic Astronomy,” 289.
19. Paracelsus, “Composition of Metals,” 116.
20. Paracelsus, “Hermetic Astronomy,” 291.
21. Whitman, *Song*, 32–33. Hereafter, pages from *Song of Myself* cited in parentheses.

22. Deleuze and Guattari, 10.
23. Ibid., 12.
24. Ibid., 10.
25. Whitman, *Song*, 48, 78, 76, 38, 36.
26. Whitman, "Preface," 6, emphasis added.
27. Joseph, "Prologue."
28. Boeke, "Bilthoven," 106.
29. Boeke, "Sociocracy."
30. Boeke, *Cosmic View*, 7.
31. Ibid.
32. Ibid.
33. Ibid., 11.
34. Ibid., 22.
35. *Cosmic View* was adapted into three films by the end of the 1960s. The first, an educational film titled "How Vast is Space?" is now lost ("Letter from Offices of Johnson and Tannenbaum"). The second, "Cosmic Zoom," is a short animation by Canadian artist Eva Szasz. The third was "A Rough Sketch" by the celebrated US designers Ray and Charles Eames. Both of the latter films, released in 1968, use large plates on an animation stand to blend different resolving cuts (still images) together to effect the illusion of a cosmic zoom. The fundamentally discontinuous nature of these scalar slices is nonetheless abundantly evident, as the detail of each plate fails to increase along with its magnification; detail suddenly jumps as each new plate is introduced. By the time the Eames Office produced their most famous film in 1977, however, a substantially more expensive re-make titled "Powers of Ten," improvements in source imagery and animation techniques, combined with a persuasive narration written and performed by physicist and popular science promoter Philip Morrison, lead to an effective illusion of scalar continuity throughout the entire known universe. By this point, then, Boeke's project had been transformed from a self-reflexive consideration of the dynamics and trade-offs of scalar mediation and the fundamentally discontinuous nature of scale into the emblematic medial representation of the universal overview.
36. Ellul, xxv.
37. Plumwood, 51.

WORKS CITED

- Boeke, Kees. "Bilthoven, Holland's International Children's Community." *The Clearing House* 13, no. 2 (October 1, 1938): 106–8.
- . *Cosmic View: The Universe in Forty Jumps*. New York: John Day Co., 1957.

- . “Sociocracy.” Accessed August 31, 2014. <http://worldteacher.faithweb.com/sociocracy.htm>.
- Chakrabarty, Dipesh. “The Climate of History: Four Theses.” *Critical Inquiry* 35, no. 2 (2009): 197–222.
- Cohen, Tom, Claire Colebrook, and J. Hillis Miller. *Twilight of the Anthropocene Idols*. London: Open Humanities Press, 2016.
- Conger, George Perrigo. *Theories of Macrocosms and Microcosms: In The History Of Philosophy*. New York: Columbia University Press, 1922.
- Cosgrove, Denis. *Apollo’s Eye: A Cartographic Genealogy of the Earth in the Western Imagination*. Baltimore: Johns Hopkins University Press, 2003.
- Crutzen, Paul, and Eugene Stoermer. “The ‘Anthropocene.’” *IGBP Newsletter* 41 (May 2000): 17–18.
- Deleuze, Gilles, and Felix Guattari. *Anti-Oedipus: Capitalism and Schizophrenia*. New York: Penguin, 2009.
- Eames, Charles, and Ray Eames. *A Rough Sketch for a Proposed Film Dealing with the Powers of Ten and the Relative Size of Things in the Universe*. Pyramid Media: 1968. Film.
- . *Powers of Ten*. Pyramid Media: 1977. Film.
- Ellul, Jacques. *The Technological Society*. Translated by John Wilkinson. New York: Vintage, 1964.
- Haraway, Donna J. *Staying with the Trouble: Making Kin in the Chthulucene*. Durham, NC: Duke University Press, 2016.
- Joseph, Fiona. *Beatrice: The Cadbury Heiress Who Gave Away Her Fortune*. Birmingham: Foxwell Press, 2012.
- Morton, Timothy. *Dark Ecology: For a Logic of Future Coexistence*. New York: Columbia University Press, 2016.
- Office of Johnson and Tannenbaum. “Letter to Offices of Kaplan, Livingston, Goodwin, Berkowitz & Selvin.” TS, August 13, 1971. Eames Archive, Library of Congress.
- Paracelsus. “Concerning the Nature of Things.” In *The Hermetic and Alchemical Writings of Paracelsus, Volume I*, edited by Arthur Edward Waite, 120–94. N.p.: Martino Fine Books, 2009.
- . “Hermetic Astronomy.” In *The Hermetic and Alchemical Writings of Paracelsus, Volume II*, edited by Arthur Edward Waite, 282–314. N.p.: Martino Fine Books, 2009.
- . “The Composition of Metals.” In *The Hermetic and Alchemical Writings of Paracelsus: Volume I*, edited by Arthur Edward Waite, 114–19. N.p.: Martino Fine Books, 2009.
- Parikka, Jussi. *A Geology of Media*. Minneapolis: University of Minnesota Press, 2015.
- . *The Anthrobscene*. Minneapolis: University of Minnesota Press, 2014.
- Plumwood, Val. *Feminism and the Mastery of Nature*. London: Routledge, 1994.

Szasz, Eva. *Cosmic Zoom*. National Film Board of Canada: 1968. Film.

Whitman, Walt. "Preface." In *Leaves of Grass: The Original 1855 Edition*, 3–20. Mineola, NY: Dover, 2007.

———. *Song of Myself*. In *Leaves of Grass*, 29–78. Philadelphia: David McKay, 1892.



<http://www.springer.com/978-3-319-64241-3>

Scale in Literature and Culture

Tavel Clarke, M.; Wittenberg, D. (Eds.)

2017, XIV, 323 p. 23 illus., Hardcover

ISBN: 978-3-319-64241-3