Foreword

A Wrinkle in Space

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In *The Wild Blue Yonder*, Werner Herzog's 2005 film fantasia on space voyaging, viewers learn about the "Interplanetary Transport Network," a set of winding pathways twisting invisibly through the solar system, sculpted by the shifting pushes, pulls, and resonances of gravitational forces among the planets. Martin Lo, a research scientist at NASA's Jet Propulsion Laboratory and a mathematician who has mapped the network's manifolds, calls this swerving web of ribbon-like gravity tubes a system of "chaotic transport."[1] Riffing on Madeleine L'Engle's epic 1963 children's tale of time travel, *A Wrinkle in Time*, we might describe this system as a suite of wrinkles in space.

Each of the more-or-less anthropologically minded essays in this issue of *Environmental Humanities* offers the reader a novel wrinkle in space—where a wrinkle, following the *Oxford English Dictionary*, might be "a crease, fold, or ridge caused by the folding, puckering, or contraction of a . . . pliant substance," "a minor difficulty or irregularity," "a clever or adroit expedient or trick," or "a piece or item of useful information, knowledge, or advice." Taken together, all these wrinkles in space—tugging on one another, reshaping the path of the reader as she, he, or ze goes—offer a journey through this issue that is one-part cosmic transport and one-part chaotic transport, whirling the reader into zones that an anthropologist would call both familiar and strange.

The wrinkles in space that the reader will encounter in this issue are made, in the main, by human cultural practice, rather than by anything like the bare cosmos "itself." Given the anthropological starting points of most of the articles that follow, this may not be surprising—though some of the creases, folds, and puckers in the new sciences of the extraterrestrial surely are! So, prepare for wrinkles created by Cold War astronauts who enact an anxious sense of disconnection from Earth by blotting out the planet from their spacecraft views by holding up their thumbs, while their Earth-bound

1. Lo, "Space Travel via Chaotic Transport."

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Figure 1. Soviet dog spacesuit, designed at NPP Zvezda in 1954. On display at Memorial Museum of Cosmonautics, Moscow, Russia. Photo by Stefan Helmreich.

planetary scientist successors beckon new Earth-like homes by pointing index fingers to a sky peppered with promising exoplanets—astronaut thumbs and planetary scientist fingers here folding the fabric of the uninhabited and habitable cosmos into the shape of human nightmares and dreams. Or get ready to learn about the wrinkles binding microbial and multispecies life to astronaut well-being, as bioregenerative spaceship life-support systems employ algae to transmute urine and sweat into potable water; any fantasy that would have astronauts as free-floating autopoiets turns out to be wrinkled by the practices of maintenance and care that loop human and nonhuman cosmonauts together.[2] Astronauts or cosmonauts cannot actually long survive solely within the sort of self-contained pods that one thinks of as the canonical spacesuit.

Or consider the universe filtered through the wriggling waveforms of ultraviolet light, which reveals that the shine of Earth and the shine of animal eyes are not simple reflections of sunlight but, like sunlight, emanations that contain ultraviolet radiation (Earth's geocorona shines in the ultraviolet, while the idioretinal apparatuses of animal eyes emit ultraweak light in this range), making planets and eyeballs into kindred kinds of shining forms, energetic and alive; as astrobiologists think across these forms, folding

2. See also Gaard, "Animals in (New) Space."

planetary science together with ophthalmology, they pucker common sense about which sciences go with which. Moving from eye to brain, consider the speculations of unconventional physical cosmologists who hold that, in a vastly expanded future universe dominated by dark matter and dark energy, "it is perfectly possible that a fluctuation with all the complexity and attributes of a thinking consciousness will occur"[3]—a thinking wrinkle in space that might be made of folds of dark, not grey matter. Whether the resulting "Boltzmann brains" constitute for cosmologists a theoretical wrinkle in the sense of "a piece or item of useful information," "a minor difficulty or irregularity," or "a clever or adroit expedient or trick" is an open question, though one that invites reflection about how readers might think of long-standing anthropological definitions of thinking, personhood, and embodiment (though also, perhaps, demands that we activate a sense of the absurd; why couldn't a "fluctuation with all the complexity and attributes" of, say, a Dravidian kinship system [using a patrilineal modulo-2 reckoning system] or an MIT dorm-room refrigerator, emerge? At the very least, reflections on what we might mean by intelligence are demanded).[4] Shift now from outer space to our home planet, with some of Earth's territories imagined as analogous to those on other worlds.[5] Such comparisons roll and unroll the making of a newly "de-extremed" Antarctica, rendered increasingly as a simple storehouse of microbial diversity for all-too-Earthly markets and as a zone now embedded in bureaucratic regulations that seek to make icy emergencies a thing of mundane management, bringing the outer limits into the fold of Earthly control—though never really: as Antarcticans toggle between the scale of everyday hazard and the scale of a planetary climate disaster cracking open beneath their feet, they confront "derangements of scale" that wrinkle and unwrinkle connections between the individual-experiential and the planetary.[6]

In his 1959 novel, *The Sirens of Titan*, Kurt Vonnegut Jr. imagined a space-faring character captured in a cosmic continuum that Vonnegut called a *chrono-synclastic infundibulum*, a space-place that had the effect of stretching the character (along with his companion dog) into a "wave" vibrating between the Sun and the star Betelgeuse. Whenever Earth would intersect the infundibulum, man and dog would materialize, for just a moment. The pair could also exist temporarily and simultaneously on other worlds; on Saturn's moon, Titan, their presence was, for whatever reason of interstellar geometry, more or less permanent.

Let's imagine this issue's conversation about anthropology off Earth as itself chrono-synclastically infundibulated. Think of anthropology as a planet that intersects occasionally with the stretched waveform of astronomical phenomena and discourse. What have its various chrono-synclastically infundibulated manifestations looked like

3. Walford and Kirk, this issue.

4. Dunér, this issue.

5. Compare Messeri, *Placing Outer Space*, on Mars-Earth analogies and see Jones, *Magic's Reason*, on how anthropologists have often made analogies to other styles of reasoning in order to authorize their own comparisons and claims.

6. Clark, "Scale"; see also O'Reilly, *Technocratic Antarctic*.

over the years? We might recall—as the editors of the present collection usefully do—the 2012 appearance of Debbora Battaglia, David Valentine, and Valerie Olson's "Extreme: Humans at Home in the Cosmos," in *Anthropological Quarterly*. Or recall Alexander C. T. Geppert's 2012 *Imagining Outer Space: European Astroculture in the Twentieth Century*. Or Douglas A. Vakoch and Albert A. Harrison's 2011 *Civilizations beyond Earth: Extraterrestrial Life and Society*. Or, from an earlier orbit, Debbora Battaglia's *E. T. Culture: Anthropology in Outerspaces*, from 2005. Still earlier intersections would call up Stacia Zabusky's 1995 *Launching Europe: An Ethnography of European Cooperation in Space Science* or George E. Slusser and Erica Rabkin's 1987 *Aliens: The Anthropology of Science Fiction* (which drew upon anthropology's analytic of "the other" in a way few pieces in the present collection do; in this issue of *Environmental Humanities*, the "other" is mostly other worlds, other planets . . . a sign that space science has come to be interested in habitats, and not so much, as were its earlier incarnations, in unexpected intelligence). Or remember Ben Finney and Eric M. Jones's 1985 *Interstellar Migration and the Human Experience*.[7] Winding our calendars back further would land us on Magoroh Maruyama and Arthur Harkins's 1975 *Cultures beyond Earth: The Role of Anthropology in Outer Space*.

What have previous co-materializations of anthropology and astrosciences looked like? How have they differed from those convergences pointed to by the present collection? Well, to take Finney and Jones's *Interstellar Migration and the Human Experience* as a touchstone for thinking about a previous generation's anthropology of outer space, I would note that, in that enunciation, anthropology was not itself unsettled by the possibility of its application to cosmic contexts. Finney and Jones posed anthropology as durably about the evolutionarily tuned capacity for hominid exploration and adaptation, with space simply a new "frontier" (the word appears again and again in their text) for social organization and cultural meaning making. Authors in *Interstellar Migration and the Human Experience* universalized the relevance of anthropology in another way, too, speculating on the applicability of anthropology to studying the cultures of extraterrestrial life forms (indeed, action anthropologist Sol Tax had explored that angle in his afterword to Maruyama and Harkins's 1975 *Cultures beyond Earth*. For still earlier data points on the convergence of anthropology and search for extraterrestrial intelligence (SETI), see Steven J. Dick's 2012 "The Role of Anthropology in SETI: A Historical View," which reports on early 1960s calls for anthropological insight by scientists interested in extraterrestrial intelligence and documents the participation of anthropologists Kent Flannery, Richard B. Lee, and Ashley Montagu in 1970s symposia on SETI).[8] Much has changed since these traditional articulations of the spacey anthropological mandate—not least the arrival of self-critique into anthropology in the 1980s and the rise of feminist and postcolonial anthropology, to say nothing (though one should say everything) of the emergence of science and technology studies, which has made it possible to study the astrosciences themselves as cultural forms.

7. And see Finney, "Anthropology and the Humanization of Space."

8. See also Aveni, *Conversing with Planets*, for the view from archeology.

In the sciences of extraterrestriality, meanwhile, astrobiology has in many quarters come to eclipse the search for extraterrestrial intelligence, which has folded interested anthropologists and their associates into conversation with the primary, secondary, and science studies literature on biology, geology, ecology, and environmental science.[9] This said, SETI-styled interest in information theory still persists,[10] something like a chrono-synclastically infundibulated phenomenon that keeps rematerializing.[11] A continued interest in human life in space—now no longer so much about "colonizing"[12] as about mundane travel—has also had anthropologists keeping an eye on space medicine and on research into habitation in the off-world.[13] As near-future long-term space habitation recedes somewhat from the horizon of present possibility, some scholars have taken to thinking about remote presence[14] or displaced, Earth-analogical presence.[15]

A looking and listening outward has thus been joined by treatments of space science as Earthly in its origin, in its analogical meshwork,[16] and in its everyday practice—which last continues to animate analyses that tackle matters of space sex/gender and sexuality,[17] indigeneity and space science,[18] US race and space politics,[19] and nation-state, intergovernmental, and private space projects.[20] There is also an ongoing move toward space-themed examinations of other social domains, such as religion.[21]

9. E.g., Anker, "Ecological Colonization of Space"; Helmreich, "Signature of Life"; Olson, "Political Ecology in the Extreme"; Praet, "Lune de Saturne"; Bertoni, "Resources (Un)Ltd." The field of environmental history has joined in as well: see Rand, "Orbital Decay"; Degroot, "Catastrophe Happening in Front of Our Very Eyes"; Maher, *Apollo in the Age of Aquarius*; and Pritchard, "Trouble with Darkness."

10. See Denning, "Learning to Read"; and Capova, "Detection of Extraterrestrial Life."

11. And check out "Breakthrough Listen," a massive new project to tune for communiqués from space: breakthroughinitiatives.org/Initiative/1; thanks to Claire Webb, poised to do fieldwork on Breakthrough, who alerted me to this endeavor.

12. Though consult Dittmer, "Colonialism and Place Creation in Mars Pathfinder Media Coverage."

13. Olson, "Ecobiopolitics of Space Biomedicine"; Olson, *American Extreme*; and Valentine, "Atmosphere."

14. Mirmalek, "Working Time on Mars"; Clancey, "Becoming a Rover"; Vertesi, *Seeing like a Rover*.

15. Messeri, "Resonant Worlds"; Salazar, "Speculative Fabulation"; and see authors in this issue.

16. Cf. Battaglia, Valentine, and Olson, "Relational Space"; and Praet, "Lune de Saturne."

17. Casper and Moore, "Inscribing Bodies, Inscribing the Future"; Litfin, "Gendered Eye in the Sky"; Oman-Reagan, "Queering Outer Space."

18. Young, "Pity the Indians of Outer Space"; Lempert, "Decolonizing Encounters of the Third Kind"; Swanner, "Contested Spiritual Landscapes in Modern American Astronomy."

19. E.g., Womack, *Afrofuturism*; Shetterly, *Hidden Figures*.

20. Zabusky, *Launching Europe*; Lewis, "Okudzhava and Scott-Heron"; Redfield, *Space in the Tropics*; Codignola and Schrogl, *Humans in Outer Space*; Lewis, "Red Stuff"; Siddiqi, *Red Rockets' Glare*; Hopkins, "African Space Programs Aren't Science Fiction"; Matthews, "Why Ghana Started a Space Program"; Bagla and Menon, "Reaching for the Stars"; Erickson, "China's Space Development History"; Japan Aerospace Exploration Agency; Mitchell, "Countdown to an Impasse"; Stroikos, "China, India in Space and the Orbit of International Society"; and see "Towards an Anthropology of Space"; whether @RogueNASA is a sign of shifting US national investments in space will bear watching—see Weisberger, "'Rogue' Science Agencies."

21. See Launius, Bjørnvig, and Pop, "Space Flight and Religion"; Lewis, "Muslims in Space"; Swanner, "Contested Spiritual Landscapes."

These emphases might constitute less a looking out at frontiers than a folding and wrinkling inward that could be called a kind of extraterrestrial involution, where involution is "a rolling, curling, or turning inwards" (OED) (apologies to Geertz's *Agricultural Involution* and Hustak and Myers's "Involutionary Momentum"). The rolling and curling of the extraterrestrial into and through the terrestrial, mundane, and extreme[22] has permitted scholarship to travel across thematic and topical distances that might have been otherwise far-flung and unlikely (anthropology and ultraviolet light? Anthropology and space junk? Anthropology and exo-planets? What?). Such wrinkles in space have also permitted anthropologists to robustly claim that they can conduct "anthropology off the Earth" on Earth[23]—where Earth itself is also always itself multiple, not at all a self-evident "place." But perhaps what most distinguishes the newest anthropology of outer space from the old is the irreversible wrinkling of some of anthropology's dearest analytics—the self-evidence of "being there," the steadiness of "perspective," what we mean by "sensing," what counts as a "relation," the difference between "small" and "large" scales, and the "ecology" in political ecology. The anthropology of outer space these days—as represented in this issue of *Environmental Humanities*—is a machine for chaotic and cosmic travel, chrono-synclastic infundibulation, and analogical involution, a wrinkle in the discipline and its companion fields that changes what can count as both the "environment" and the "humanities."

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22. See Lepselter, "From the Earth Native's Point of View"; Launius, "Writing the History of Space's Extreme Environment."

23. See Battaglia, "Life as We Don't Yet Know It."

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