

# FEELINGS AND FRACTALS

## Woolly Ecologies of Transgender Matter

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*Crochet Coral Reef* (2005–) is a woolly exoskeleton of coralline geometries and sea critters made by a collective of hands joining animal and plastic fibers in hyperbolic shapes. The reef is a “testimony to the disappearing wonder of living reefs” and a creative experiment of the twin sisters Margaret and Christine Wertheim, a science writer and an art professor, respectively, and the Los Angeles nonprofit Institute for Figuring; like the marine organism, the crochet reef is fertile and spawns its fiber tentacles to stage public art interventions about warming sea temperatures, carbon dioxide, ocean acidification, plastic trash, and the pacific trash vortex.<sup>1</sup> As a collective and aesthetic rendering of threat and survival, *Crochet Coral Reef* is suggestive of how we negotiate environmental risk in myriad forms of collusion, protest, and cohabitation. “We” is an idea and a problem, a shape to ask after. I am particularly interested in the convergence between this project’s engagement with touch, risk/survival, and handicraft, on the one hand, and those issues in transgender theory and experience, on the other: that is, I see promising overlaps between a fiber art project and the everyday process of becoming that transgender life necessitates. In what follows I practice, as a method, *intra action*, a process that Karen Barad describes as “the mutual constitution of entangled agencies,” to think between coral erosion and transgender.<sup>2</sup> Valuing a diversity of fragile ecological bodies—human, animal, fiber, and aquatic—this essay examines how patterns of harm contour vulnerable populations and the administration of life in biosocial scenes of not only climate and biosphere but also sex and gender. It does so by foregrounding feelings *and* fractals—or patterns and repeats—to assemble a lexicon of transgender in coral, crochet coral,

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and hyperbolic geometry, and to craft a tentacle-like shape between transgender and its environments: administrative, aesthetic, cellular, woolly, toxic, oceanic. As Donna Haraway asks in her manifesto for cyborgs, “Why should our bodies end at the skin, or include at best other beings encapsulated by skin?”<sup>3</sup> Oscillating between feelings and fractals, unwieldy and algorithmic modes of description, yields a fibrous and felt science of transgender life.

### Woolly Pedagogy: The Handmade

In *Brain Storm* Rebecca Jordan-Young describes the “confused, confusing, and contentious” configurations of sex, gender, and sexuality as a “three-ply yarn” and endeavors to untangle the “strands that are simultaneously distinct, interrelated, and somewhat fuzzy around the boundaries.”<sup>4</sup> And Sophia Roosth, in her exploration of *Crochet Coral Reef* and the stories we tell to inhabit and transform evolutionary knowledge, writes: “Analogies from the fiber arts run deep in the life sciences, as attested by the preponderance of terms such as *strand*, *tissue*, *membrane*, *fiber*, and *filament* in anatomy and *net* or *web* in systems biology and ecology.”<sup>5</sup> I am similarly compelled by fiber, and this essay animates the labor, process, and materials of handiwork to illuminate the biological and cultural constructions of sex and gender. Like a sewing circle or quilting bee, *Crochet Coral Reef* and its collective labor of “figuring” operates between the optic and sensory. Similarly, identity is made between administrative force and self-determination, between legal and scientific interventions and ad hoc self making. As transgender labors for diverse and sometimes divergent aims, the shape of its analytic force is also knotted to its flux and circulation in, for example, community organizing, arts and culture, the administration of diagnosis and health, and the law. The felt configuration of the “handmade,” then, orients our thinking to the labor and materiality (fiber, flesh, “biocodes”) of crafting identity.<sup>6</sup> This essay is part of a project to place transgender theory in dialogue with craft studies, themes of figuration, collectivity, process, and amateurism, and the ordinary shapes and sensations of bodily transformation.<sup>7</sup>

Craft is a conceptual limit, categorically unlike the sublime; in Immanuel Kant’s aesthetic judgment, it is mere purpose, effect.<sup>8</sup> Maligned in Renaissance hierarchies of liberal and mechanical arts, craft evokes the remunerative, utilitarian, ornamental, and manual labor and laborers—the feminine, ethnic, and “primitive”—however, craft is a legitimate field of inquiry and, while adjacent to art history, is increasingly recognized as a theoretical process and method.<sup>9</sup> Transgender is something of a maligned materiality as well, what the legal theorist Dean

Spade has called “LGB-fake-T studies,” in ways that are both theoretical and concrete; as with craft studies there are no undergraduate or graduate degrees offered in transgender studies (although the new research cluster spearheaded by Susan Stryker at the University of Arizona may be a sign of changing times). *Crochet Coral Reef* offers an opportunity to forge a dialogue between these “minor” fields of inquiry, as materiality negatively saturates transgender and craft studies and thus offers a potential theory of identity in flesh and fabric. As the art historian Julia Bryan-Wilson reminds us with scholarship that mines contemporary craft for insights into feminized labor, the outsourcing of labor, and geopolitical commerce, “Craft is uniquely positioned to allow us to reconsider the politics of materiality and exchange—their labors, pleasures, and hazards.”<sup>10</sup>

Deploying ideas of craft—too frequently dismissed as low art, skilled labor, or “women’s work”—the handmade connects transgender to collective process and quotidian aesthetics. As the material is marginalized by discursive forms of legibility, the performative dimensions of craft privilege the politics of the hand, that which is worked on, and the sensory feelings and textures of crafting transgender identity. The handmade, utilitarian, and purposeful materials popular in craft and material studies is brought to bear in this essay to illuminate the everyday as a site of value for transgender identity. By speaking of “crafting” transgender identity, I mean to highlight the felt labor and traces of making and unmaking identity and the performative doing of gender becoming in relation to the materiality of the flesh. While relevant to all kinds of identity making and politics, it is an especially relevant corrective for transgender histories (of the clinic, of diagnostic force, or of theoretical accounts like, for example, the one made by Jay Prosser in *Second Skins: The Body Narratives of Transsexuality*, which makes a strong objection to performativity as a method for knowing transgender life, as he argues performativity cannot account for “the feeling and experience of being transsexed”).<sup>11</sup> My aim here is to pressure the digestible forms of narrative and diagnostic representation available to transgender people by privileging the labor of texture and touch. Foregrounding process, rather than achievement, is a critical bridge between transgender and craft studies, as the study of *how* works to displace the logic of *when* in the urgent, administrative clock of diagnosis and medicalization.

In connection with transbiology—“a biology that is not only born and bred, or born and made, but *made and born*” (which I discuss below)—and the elastic materials of fiber arts, this essay aims to build a dimensional record of bodily experience.<sup>12</sup> The handmade is a methodology—a call to value the aesthetic and performative labor of making identity—and builds points of contact between transgender and craft studies by looking at materials that make transgender identity felt

and legible, such as wood, wool, skin, sweat, rubber, foam, cloth, and scar tissue. In this essay I ask after the lush shapes and textures of many things: the hard, rough edges of marine coral and soft, woolly seams of crochet coral; the slippery, translucent film of plastic grocery bags recycled into an environmental manifesto; and the bright and open turbulence of the hyperbolic dimension. My aim here is to highlight the sensory and emotional dimensions of feeling in order to confront the force of diagnosis and value the ordinary politics of crafting transgender life.

As a felt method, the intervention that the handmade offers is to reexamine method as the ordering—its patterns, repeats, echoes (as waves of the sonic, oceanic thumps, and women’s and feminist politics and studies)—of bodily knowledge. In other words, hand making is a mode of knowing and doing objects and bodies. The handmade is an operating system or guide, a fleshy science to untangle ordinary shapes and feelings of embodied life and its intersections with vibrant matter and toxicity. Given this moment of the institutionalization of queer (and increasingly) transgender studies, we are poised to practice transgender studies in what I am thinking of as a tentacle formation, and take up the invitation offered by “trans—,” a “(de)subjugated knowledge” affixed to and made plural by proximity:

“Trans” thus becomes the capillary space of connection and circulation between the macro- and micro-political registers through which the lives of bodies become enmeshed in the lives of nations, state, and capital-formations, while “-gender” becomes one of several sets of variable techniques or temporal practices (such as race or class) through which bodies are made to live.<sup>13</sup>

In other words, leaning on the objectness of craft orients our thinking to the spatial and temporal landscape of embodiment and highlights the force of the hand (rather than the diagnosis) in the worked on, textured, sensory, and amateur labor of making identity in the everyday. Additionally, the lengthened dash in “trans—,” theorized in the introduction to a special issue of *Women’s Studies Quarterly* on the subject by editors Susan Stryker, Paisley Currah, and Lisa Jean Moore, foregrounds the disruption and remade connection of trans- and -gender, and “marks the difference between the implied nominalism of ‘trans’ and the explicit relationality of ‘trans—,’ which remains open-ended and resists premature foreclosure by attachment to any single suffix.”<sup>14</sup> The porosity of its categorization is not vacuous or void; as Stryker and Currah ask of transgender in the inaugural issue of *Transgender Studies Quarterly*, “Postposttranssexual: Key Concepts for a Twenty-First Century Transgender Studies,” “Does it help make or undermine gender identities

and expressions? Is it a way of being gendered or a way of doing gender? Is it an identification or a method?"<sup>15</sup> In the mode of query transgender is made a promise and provocation.

Method is a labor of dispersal, containment, and a pattern, repeat, echo. But as Margaret Wertheim cautions, "by restricting ourselves to a Euclidean perspective we lose the visceral sense of hyperbolic being."<sup>16</sup> By way of offering a cosmic catalog of transgender as labor (cosmic like a mythic science, a mode between sense and belief and a system of study), I focus on patterns and the patterning of identity and the bodies and forms of embodiment we cannot quiet by the work of description. What is foreclosed and what is made quiet by the orientation of our bodies and politics to description? In "I'd Rather Be a Cyborg Than a Goddess": Becoming-Intersectional in Assemblage Theory," Jasbir Puar reads the intersectional as a method to examine the force of its pedagogy and asks how, for feminist thinkers, activists, teachers, and students, the intersectional is, like the university's traffic in diversity language as capital, sometimes invoked to quiet and absorb difference. She stages as "frictional" the false opposition of Kimberlé Crenshaw's intersectionality to Gilles Deleuze and Félix Guattari's assemblage and writes, "Subject positioning on a grid is never self-coinciding; positioning does not precede movement but rather it is induced by it; epistemological correctives cannot apprehend ontological becomings; the complexity of process is continually mistaken for a resultant product."<sup>17</sup> Her staging of a false opposition as "frictional"—X is against X (and is X "a" Body and X an Identity?)—suggests that it is not like or unlike, for or against, or a description of a thing, and so forms a network for thinking of transgender as, for example, a body, a collection of skin and organs, the organizing of social and sexual exchange, a politic, an aspiration, a keyword, a "special guest," a way of being in the world. The handmade, in this spirit, is a frictional offering of transgender as experiment, provocation, potential.<sup>18</sup>

What can the patchwork organization of marine coral, the geometry of hyperbolic crochet, and the transbiological teach us about transgender? The difficulty of language, and my sense of sometimes being at its limits, matter insofar as the work to describe, look, and feel make demands on us differently. To theorize the texture of a thing like politics or identity is always labor of reaching (perhaps desiring), and the space between our descriptive and bodily knowledge is difficult to navigate because the density of material and emotion conjoin to language in uneven and imperceptible modes. It is difficult because the fabric of our alignment in the social is felt at registers we cannot always translate, and language is more than a process of translation or vehicle of connection. If in words we cannot manage the expressive work of identity—we know by our failures we cannot—we

might look to the labor of senses and shapes—or feel for it: in our thinking, politics, writing, and art making. The fleshy, fibrous seams of *Crochet Coral Reef* and the geometry of its marine ecology illustrate how new life, including the new lives constituted by shifts in or confirmations of identity, can flourish as felt patterns. What if we expanded our definitions of transgender to a new form of life, a constant process of making that could be figured by or alongside something like coral or handicraft?

### **Yarns, Plastic, and the Geometry of Craft**

*Crochet Coral Reef* plays at the intersection of marine biology, feminine handicrafts, and mathematics. It began as a creative experiment in the Los Angeles living room of the Wertheims; soon, the crochet reef became difficult to contain, a dense and voluminous fabric in the house, much like the abundant and organic excess of the hyperbolic dimension, a kind of geometry characterized as non-Euclidean by its excess surface and negative curvature, and like the spawning reproductive force of marine coral itself. Looking for some extra hands to help spawn the reef, the artists posted an open call on the website of the Institute for Figuring (IFF)—the nonprofit organization they founded in 2003 for the material and physical exploration of science and mathematics—seeking participants to assist in the making of hyperbolic crochet coral reef as a public artwork. Today, over eight thousand people have contributed to thirty satellite reefs in Germany, Abu Dhabi, Ireland, Latvia, Baltimore, and Japan. Collectives of volunteers, often organized around lectures and interactive workshops taught by Margaret Wertheim, have stitched sea slugs, kelp, anemones, and coral polyps, and produced branches of the crochet coral reef like a kelp garden, the Branched Anemone Garden, the Ladies' Silurian Atoll, a toxic reef made of white and gray recycled plastic trash, and a “bleached” installation made of cotton tampons. *Crochet Coral Reef* stretches over three thousand square feet and has been exhibited at the Andy Warhol Museum (Pittsburgh, 2007), the Hayward (London, 2008), the Science Gallery (Dublin, 2010), the Smithsonian's National Museum of Natural History (Washington, DC, 2010), and the Cooper Hewitt National Design Museum (New York, 2010). According to the IFF, the reef is “one of the largest participatory science + art projects in the world.”<sup>19</sup>

The Wertheims formed the IFF in 2003 as a “play tank” for public education about the “aesthetic and poetic dimensions” of science, mathematics, and engineering.<sup>20</sup> Figuring—a process of calculating, shaping, patterning, and forming things and ideas—is a pedagogical method and a hopeful bridge between



Figure 1. Institute For Figuring's *Crochet Coral Reef* project, 2005–ongoing, as installed at New York University Abu Dhabi Institute, 2014. Photo © the IFF

intellect and physicality. In its exhibitions, workshops, lectures, and artist residencies, the IFF seeks to animate abstract ideas like geometry, engineering, topology, physics, and biological life, and does so by making public and accessible exercises of material play, things like how to cut and fold paper, crochet yarn, and tie rope knots. At workshops and installations of the *Crochet Coral Reef* the techniques of hyperbolic crochet (a way to fabricate ruffles and squiggles by increasing stitches on a traditional crochet foundation chain) are taught alongside ideas of hyperbolic space and activist interventions in plastic waste and the crisis of climate change. In this process, making things with the hands intervenes in hierarchies of sensory knowledge to value the work of sensation and touch and make a potentially difficult idea tactile and intimate. Figuring a calculation is a labor shared by our motor, optic, and cognitive capacities. In crochet and handicraft, figuring yields a felt dimensionality and augments our limited ability to know a thing as impossible and imaginary as hyperbolic space. Reef makers take yarn and repurposed plastic trash in a hopeful occupation of a different perspective, abundant, infinite, and spiraling outward, proliferating an excess of surfaces, points of parallel, curvature, and intersecting lines.

The *Crochet Coral Reef* is created in a patchwork process out of many hands and by joining natural, manufactured, and recycled fabrics. Many makers do not identify as artists and are drawn to participate in an environmental, if

not aesthetic, intervention. Crochet art workers convene in a collective practice reminiscent of quilting bees and ladies' sewing circles.<sup>21</sup> Bodies lean, eyes dart, and hands touch to repair stitches, learn and exchange technique, and create and share a feeling of community. Stitching kelp, sea slugs, and anemones out of materials like synthetic and animal fibers, plastic yarn, and repurposed trash makes an assemblage evocative of the seascape of coral. The *Crochet Coral Reef* takes the fragile ecology of marine coral as inspiration to build community in a creative and collective process of viral art making: "Just as living coral reefs replicate by sending out spawn, so the Crochet Reef sends out spawn."<sup>22</sup> The IFF bridges public art education and activism to build connections between the domestic and ecological and inspire transformative politics. An environmental aim of the hyperbolic *Crochet Coral Reef*, directed at people who make or encounter the reef in gallery and museum exhibitions, is to teach art makers about climate change and encourage them to make inventories of their plastic trash and develop strategies to lessen waste. The action of stitching is attached to a hopeful idea—the potential of small and private alterations to plastic waste use to inspire institutional and public dialogue.

*Crochet Coral Reef*, rather than being expressly transgender, is coded in feminine and feminist ways: handicraft is characterized as "women's work," and the collective labor of the artwork bridges public and private spheres in a gesture to the consciousness-raising ethos of the feminist slogan "the personal is political." Still, how might we think of the reef in connection to a transgender politic? It is not an artwork about gender or identity politics per se, and it is not explicitly created by transgender artists, and, insofar as the reef is created in a collective and anonymous way, it is incidental if transgender, queer, or feminist artists contribute crochet corals and woolly sea creatures to the reef. The maker's identity is inessential to the capacity of crochet, craft, and coral ecologies to animate the woolly and felt matters of transgender life. Moreover, why conjoin transgender art making and artists? I borrow techniques and ideals of craft, but without defining craft itself as queer or transgender, or linking transgender art making to trans artists. I do so to create and demand dense and elastic transgender politics as open, bright, and turbulent as the hyperbolic dimension and a coral seascape. But though craft shares an outside positionality with transgender politics, their connection is more than just an allegory. Sensory and sensual, craft is a praxis primed to illuminate queer bodies and politics; as the textile artist L. J. Roberts argues, "Craft can gain from the methods and tools that queer theory has deployed to reclaim and reconfigure its own marginal position into a place of empowerment."<sup>23</sup> Similarly, queer and transgender theory can gain from the methods and tools developed in craft.

What does the handcrafting of animal fibers and synthetic, plastic yarns teach us about how transgender identities are fabricated and figured? Fabricating an identity, like figuring an idea or crocheting a seascape, is a calculation—a fuzzy method to track the distance or proximity between me and you; my sense of self and how I fit into the world; a topographical misshape; a reworking, one more try one more time; a labor to build something and belong. The collective labor to fabricate the shapes of marine coral in woolly and plastic yarns illuminates the patterning of transgender I describe as handmade, which, like the figuration of the crochet coral, forges a fuzzy and felt knowledge. Stitching a fabric in crochet, knit, or embroidery is like any mode of ordinary labor—a repetition of movement, a performative gesture. Think of fingering yarn, the loop and drag of the crochet hook, as a sensory algorithm. Suturing the so-called natural and manufactured—the fleshy, fibrous, and plastic—the trope of mixture offers an antidote to the surface and depth models that foreclose transgender subjectivity as “wrong” embodiment (as in trapped, diagnosed, released) or other systems of enclosure. As opposed to some psychoanalytic readings, the ethnographic or sociological, the handmade does not operate by a narrative of discovery. Instead, its movement is about cocreation, about making connections and contexts. In the collective joining of hands, *Crochet Coral Reef* is a reconfiguring of shapes and gestures into a diversity of embodied forms and identities that labor as a set of material practices against the toxic effects of climate change and the reproduction of species (and identities).

### Transgender Is a Shape

“Straightness turns out to be a subtle and surprisingly plastic concept,” writes Margaret Wertheim in the instructional manifesto for hyperbolic crochet, *A Field Guide to Hyperbolic Space: An Exploration of the Intersection of Higher Geometry and Feminine Handicraft*.<sup>24</sup> She describes the discovery of hyperbolic space by the mathematicians Janos Bolyai and Nicholay Lobatchevsky in the nineteenth century as “disturbing” and “undeniable”; efforts to substantiate and/or negate the parallel postulate and the reign of Euclid “struck terror into mathematicians’ hearts, offending rational sensibilities and evoking a sense of moral outrage.”<sup>25</sup> The “aberrant formations” of hyperbolic space promise, for Wertheim, both an optic and a sensory way to look, feel, and inhabit dimensions that exceed the grids, rectangles, and straight networks that organize the built architecture of our lives.<sup>26</sup> In other words, if knowledge production and sight are intimately connected, as many have contended, then thought itself is transformed as hands look and eyes touch.<sup>27</sup> The “woolly pedagogy” of *Crochet Coral Reef* is a sensuous encounter

with the turbulent geometry of hyperbolic space, and the hyperbolic form of the crochet reef “verif[ies] materially the manifest untruth of Euclid’s axiom” of the parallel postulate, which in two dimensional geometry regulates the possibility for a straight line to intersect another.<sup>28</sup> To fabricate shapes evocative of ocean life, the Wertheims adapted a method of hyperbolic crochet, an invention of Latvian mathematician Diana Taimina.<sup>29</sup> In hyperbolic crochet, an exponential increase of stitches yields dimensional permutations of the fiber, made in a fractal pattern. To fabricate shapes like the coralline tentacles of marine life, crocheters manipulate the rate of stitches by increasing stitches per row; the more stitches are increased per row, the more intense the volume and the more dense and crenellated the form and shape of the crochet fabric.

*Crochet Coral Reef* is made by a collective process of adaptation, using the techniques of Taimina’s hyperbolic crochet to mutate patterns and discover how fabric shapes into sea critters and ocean life. An experiment with the mathematic elasticity of hyperbolic geometry and the fiber strands of yarn let crocheters, inspired and instructed by the IFF, build a network environment of feeling and sight, and between coral, fiber (synthetic or animal), and human bodies. Taimina is a professor of mathematics at Cornell University, and her invention in 1997 of hyperbolic crochet is significant for the field of geometric models. The elasticity, strength, and sensory capacity of fiber offer a way to manipulate, hold, touch, pull, and disassemble a physical model of hyperbolic space. In yarn she could illustrate a feeling of hyperbolic space in her classroom and remedy a disconnection between the optic and felt knowledge of hyperbolic geometry. Taimina looked to yarn and a synthetic fiber (ideal for stitching a stiff and durable model) to avoid the way that cloth and paper models of hyperbolic space tear, crease, and buckle. She began to experiment with knitting, but in order to yield an abundant excess of surface she needed too many double-pointed needles (which allow the yarn to slide on and off in different directions) to increase her rate of stitching. Crochet requires only one needle and a skein of yarn, and so is less cumbersome and unwieldy, letting Taimina formulate a tactile and dimensional method to interact with hyperbolic space.

A reorganization of form and matter, the hyperbolic dimension is suggestive of shapes that bodies make, and geometry—a study of shapes, figures in position, lengths, distance, volume, and properties of space—gestures to new kinds of relational identity and embodiment. The elliptical configurations of hyperbolic geometry and its myriad surfaces and points of intersection prompt us to reexamine how distance and difference are measured by proximity or belonging and on a horizontal-vertical grid of equivalences. Like the handmade labor of mak-



Figure 2. Institute For Figuring's *Crochet Coral Reef* project, 2005–ongoing. Hyperbolic model by Margaret Wertheim. Photo © the IFF

ing identity, the dimensional field of hyperbolic space provides another method to measure the relation between bodies and objects differently, to resist the limited and oppositional categories of surface and depth that locate transgender either on or inside the body. We might foreground, for example, gender transformation as a process of assembly and disassembly in which bodies auto-engineer shape and form, building and remaking connections between the soft and pliable material forms of emotional and material life. An alignment of lines in infinite intersection, transgender is a shape and, in the conjoining of feelings beside fractals, an alternative dimension of shapes—of negative (hyperbolic) and positive (Euclidean) curvature—can coexist to proliferate an abundance of shapely possibilities



Figure 3. A mathematically precise model of a hyperbolic plane by Diana Taimina. Photo © the IFF

for transgender life. Identity is a kind of geometry, too. It approximates the desire to apprehend the boundaries of a body, to calculate the relation of skin, sweat, blood, and hair, to measure the distance between one shape and another, perhaps to configure the measurements and intersections, the way “I” join (or do not) with “you,” who “we” are to each other, and how to make contact with some other things like bodies, objects, and ideas. Is the ambient, floating feel of desire, between bodies and for politics, enough of an alternative, or can we devise some new ways to make contact? I am interested in how we attempt to measure these distances and movements between slippery and stuck things. The diagnostic sciences of observation and their administrative instruments of evidence collection seem to always foreclose the openness and possibility that material experience leaves ajar. As a meditation on straight lines and flatness, drawn onto dimensional spaces and curvatures, the hyperbolic dimension invites us to examine positioning, or figuring, and the orientation of bodies, eyes and hands, knowledge and feeling. The material and conceptual work of reconfiguring how lines intersect—in dimensional, or at new and unknown, points of contact—foregrounds the labor of embodiment, the joining and disconnecting work of belonging, and the ways that bodies make and remake identity in the biosocial landscape. In the idea of an excess of surface the seeming problem of “transgender” as the uncontainable body is reimagined as a provocation.

Transgender is a mode of inquiry in my writing, an organizer, a schema, something I ask after: is transgender something we can ascertain in the tools of description, or as a set of bodily practices? The diffractive methodology Barad proposes is instructive for this inquiry into transgender (in/as) patterns. In physics, diffraction describes a wave in an encounter with an obstacle—for example, how light bends. For Barad, diffraction is an optical form meant to describe a reading practice of how knowledge is made in and with text, and it “can serve as a useful counterpoint to reflection,” as “both are optical phenomena, but where reflection is about mirroring and sameness, diffraction attends to patterns of difference.”<sup>30</sup> Ordinarily, geometry seeks a method of measurement in equivalence, a formula familiar to studies of gender and sexuality. But in geometric studies of shape we can also animate computations to measure the distance between things—calculations of lines, area, angles, volume, the perimeter of a triangle, circumference of a circle, and intersections. We can use these ways of thinking and ascertaining to investigate the space between bodies and politics and categorical configurations of the self and other, human and animal, and surface and depth. Relationality as a non-Euclidean geometry offers a different way to grasp at, feel, and imagine a body and its shape in the world, and to grasp its formulation as, for example,

made by the labor of the hand rather than by an administrative or diagnostic force or foreclosure. In particular, orienting our perception to the dimensional field of hyperbolic space is a labor of sensory alignment and reorganization.

In this provocation, mathematical concepts of excess of surface, geodesics, void, finitude, and dimensionality animate the transgender body. There are, however, many other permutations of mathematical knowledge that could illuminate the bodily flesh and matter of transgender. Katie King, for example, has written beautifully about *kipu*, an Andean recording device of fiber cords and knots, which let her reconsider fundamental questions such as “What counts as writing? as counting? as connecting or disconnecting them?,” as “the word *kipu* comes from the Quechua word for ‘knot’ and denotes both singular and plural.”<sup>31</sup> King harnesses the shapes of knots, the gathering of materials, and the multiple meanings associated with a language and practice in order to investigate her theory of transdisciplinary knowledge. Hyperbolic space, a deviation of geometry with origins in Europe and deeply entangled with Western philosophy, may represent a radical departure from Euclid’s axiom of the parallel postulate and foundational mathematic knowledge, but is not the only possible path of inquiry. It is, however, especially relevant to my study of transgender precisely because geometric narratives such as interior versus exterior selves have so often delimited the movements and possibilities for transgender experience. As diagnostic and administrative forces condense and consolidate bodily feelings and sensations into narratives of prior and emergent selves contained or liberated by the body, we can recall how the demands of medicalization and strategic performances of “wrong” embodiment (“feeling trapped in the ‘wrong’ body”) collapse transgender into legible forms of identity and fold trans subjectivity into coherent figurations of binary gender and sexuality.

### **Transbiologicals**

“Coral is good to queer with,” writes Stefan Helmreich in “How Like Reef: Figuring Coral, 1839–2010.”<sup>32</sup> And coral is a kind of queer object and inquiry—difficult to taxonomize, hovering at the boundaries of plant and animal, softs and solids, inhuman passivity and bodily action, a single thing or a plural collection, life and death. Coral is a breathy and spineless marine invertebrate, inelastic as human bone, fertile and spawning. These are curious contradictions, to be breathy (lively), yet to spew not air but its own reproductive force. Coral sex and sexuality (another odd word to pair with a coral) is also ambiguous: corals reproduce sexually and asexually, spawning gametes and budding genetic material, like a

clone, and often broadcasting to reproduce en masse once a year, during the full moon. An object of fascination and study for Charles Darwin, corals, writes Helmreich, “come with durable, multiple, and porous inheritances,” and Helmreich foregrounds the labor of figuration and composition to “discern a movement from opacity, to visibility, to readability.”<sup>33</sup> Fertile and generous, coral polyps secrete calcium carbonate to form an exoskeleton, a space for diverse species of sharks, chimaeras, bony fishes, crustaceans, sponges, mollusks, clams, sea snakes, seaweed, saltwater crocodiles, and turtles to thrive. A fragile organism, sensitive and receptive to environmental stressors, coral is under enormous threat from climate change. As erosion causes ocean temperatures to rise, sudden spikes of salinity bring on “bleaching events,” which leave the white bone of the coral exposed in an environmentally violent shedding of skin.

Marine coral, like sea pods, succulents, lettuce, and fungi, is an organic hyperbolic shape. Its hyperbolic form is adaptive, as the crinkles, frills, and ruffles of its shape allow coral maximal opportunities to filter feed. As a stationary organism with access to a limited volume of nutrients, the coral uses its stinging cells to gather and strain food in an interactive process between the coral tentacles and ambient particles of fish and plankton. This porous interactivity is a promising model for crafted and becoming modes of transgender reproduction. In a collaborative politics of risk and vulnerability, the devaluing of human and inanimate bodies share an economy; as Mel Chen writes, “for biopolitical governance to remain effective, there must be porous or even co-constituting bonds between human individual bodies and the body of a nation, a state, and even a racial locus like whiteness.”<sup>34</sup> Violence threatens transgender bodies and coral colonies alike, in registers of diverse feeling and administration as, for example, street harassment, un- and underemployment, toxic waters and chemical pollution. In the patchwork patterns of coral we can learn something about our fragile ecology of identity politics, and so we do not need to inquire about the animacy of coral—is it animate, with a capacity to act and affect objects, things, and life forms?—to do so. Instead we can build connections between organic hyperbolic shapes, like lettuces, kelp, and sea slugs, and the transformation of human bodies in nonbinary and morphologically complex ways, without reproducing hierarchies of the natural and manufactured, the animate and inanimate. Inspired by Chen’s inquiry into the “role of metaphor in biopolitics,” I want to draw a hyperbolic line to connect how violence is shared between transgender and coral.<sup>35</sup> In *Animacies* Chen offers a “political grammar, what linguists call an *animacy hierarchy*, which conceptually arranges human life, disabled life, animal life, plant life, and forms of nonliving material in orders of value and priority.”<sup>36</sup> As our fragile ecologies

of sex, gender, and species cohabitate, an ethics of thinking between transgender and coral demands that we read for animacy hierarchies and the uneven shape and distribution of “subordinate cosmologies,” returning us to the provocation of a cosmic transgender studies.<sup>37</sup> Coral exoskeletons stretch in a collective shape. A coral polyp is kind of dead, a “brainless jellyfish,” yet coral polyps breathe, seek nourishment, and reproduce in a plural formation like an assemblage.<sup>38</sup> In this rigid sea of bone, animate and animating, a rough skeleton is soft and receptive. Here let us imagine how diverse bodies—of land and water, plastic waste, and human in/action—cohabitate to share and distribute violence and form a potential politics as an ecology of trust.

Is it possible to connect plastic trash recycled as yarn to the repurposing work of a transgender body—a body of material flesh and collective politics? Something feels sensible, if strange, in adopting the language of recycling and repurposing to describe human, transgender experience, yet we undo and remake gender in messy and creative negotiations of physicality and capacity, social and financial in/access, and the space between need and desire. Porous flesh, for example, is a way we share or stretch a politics of cohabitation; Beatriz Preciado offers such an account of the porous in *Testo Junkie: Sex, Drugs, and Biopolitics in the Pharmacopornographic Era*, archiving an experiment of the body and how it makes contact and contracts with testosterone as a practice of self-care. Preciado writes to wrestle the flesh and its capture by the administrative coding of gender dysphoria as disorder and to record a breathy, sensual feeling of resistance and containment, and animates Michel Foucault’s notion of “biopower,” the administration of life, and Deleuze and Guattari’s “control society” in order to trace an architectonics of control to the soft, gelatinous technologies of testosterone injection and digestion. “Testosterone,” writes Preciado, “is one of the rare drugs that is spread by sweat, from skin to skin, body to body. How can such trafficking—the microdiffusion of minute drops of sweat, the importing and exporting of vapors, such contraband exhalations—be controlled, surveyed; how to prevent the contact of crystalline mists, how to control the transparent demon’s sliding from another’s skin towards mine?”<sup>39</sup> By offering an account of feeling as seepage from within and against the governmental and cultural apparatuses that foreclose feeling, s/he provides a vital document of feelings and fractals for trans— and —gender.

Like Preciado’s account, which dislodges transgender from the singular “event” of its diagnosis to foreground the fleshy, fibrous seams of transformation, handmade and handcrafted identities are characterized by bodily and felt labor. The handmade intervenes to value transgender as matter and fleshy substance, and is a response to both feminist and queer thought experiments and to the history of

the clinic, to the way gender “deviant” and nonconforming bodies are made objects of scientific practice, sexological and psychiatric diagnosis. Systems of traditional close reading sometimes govern transgender studies, organized by categories of surface and depth—the body as a text, a surface to interpret or depth to excavate. Yet insofar as it seeks to be an intervention of method, a call to reconsider how the body is read as text, the handmade is not an alternative reading practice. A different epistemology is at work in the figuration of transgender as crafted, one that puts to the side the textual to animate textural modes of labor, process, collectivity, duration, and pattern. If method is a form of ordering knowledge to contain, repeat, and echo an idea again and again, it is also a labor of dispersal. My investment in method for transgender studies is in parsing the tasks of mimetic responsibility and process and untangling the associations of method with novelty, discovery, and invention to make count the ordinary feelings of identity. The demand to feel wrong, to perform a wrong body and a broken feeling, and not, for example, the pain of a discrimination, forecloses the dimensionality of feeling and the fissures, seams, and textures of experience, those things impossible to encapsulate in diagnostic language. For feminist thought and politics, the transgender body is a paradox, mobilized to evidence the immutability of sex and social construction of gender. The demand to be liberated materially or conceptually by physicality prohibits an ability to inhabit the body with meaning or strategy. Here I do not mean to suggest that transgender people substitute strategic ways to inhabit the body for the ways they wish to modify it, but to suggest that these two processes may be mutually constitutive.

In an effort to remedy the problem of transgender bodies doing the work of evidencing both the construction and the immutability of the flesh, it is productive to turn to a biology that does not correlate transformation with technologies of intervention. A potential fleshy and felt science is found in “transbiology,” “a biology that is not only born and bred, or born and made, but made and born.”<sup>40</sup> In “The Cyborg Embryo: Our Path to Transbiology,” Sarah Franklin traces how Donna Haraway’s cyborg gives birth to an embryo; she examines the work of biological transfer in assisted reproductive technologies and the embryonic stem cell, and defines transbiology as “the literal back and forth of the labour of creating new biological.”<sup>41</sup> While the “trans” to which she refers is not “transgender,” the reproductive labor of the cyborg embryo is in productive dialogue with more explicit work connecting transgender to animality by scholars like Eva Hayward and Bailey Kier, who investigate the slippery sex and fingery eyes of coral and endocrine-altered “trans” fish in the Potomac River.<sup>42</sup> Franklin’s interest is the biological drag, the push and pull of microscopic things in pipettes and the capture, contain-

ing, and insertion of reproductive matter. In the “trans- work of embryo transfer, and the translation of embryology into stem cell derivation and redirection,” trans is meant to signify directionality: to cross, go beyond, oppose, or exchange. To “trans” is an action, and transbiology contains the moving parts of biological matter, capital, scientific reach, and the emotionality of hope, despair, and desire in reproductive engineering. Franklin notes the “queer lineage” of the transbiological reproduction of species, populations, and ideas manufactured in a laboratory, how in the diverse proliferation of life forms and narratives about life, the heterosexual matrix of reproduction is made unstable.

Taking up the invitation of the elongated dash to stretch the category of transgender, this essay interrogates the space between “trans” and “biology” as a realignment of the distance and proximity between bodies and objects, forms of theory and practice, natural and manufactured. If we characterize the body as “transbiological,” is our description limited to transgender bodies? Can bodies be transbiological or transgender or both? Is transbiology a kind of transgender biology? If some bodies—of flesh, knowledge, and/or politics—are transbiological, those bodies are not containable in a singular form, a body with plain borders, or as a simple reference. Like a collective, one with participant-driven taxonomies, transbiology might be a prompt, a method of disturbing the oppositional formations of surface/depth, human/animal, nature/culture, and before/after. Anchored to the material body and its diverse conditions and mobilized as a political possibility independent of fleshy matters, “trans” beside biology is a prefix able to attach to multiple suffixes like *-national*, *-feminist*, *-genic*, and *-animality*. Franklin writes, “Like the cyborg embryo, transbiology is a mix of control and rogue, or trickster, elements.”<sup>43</sup> Cyborg politics sometimes stands in for forms of transgender as bodily liberation and the post- or inhuman, making abstract and diluted the material weight of flesh. While a shared genealogy of biological and artificial matter marks the cyborg and transbiological body, the transgender body (in states “natural” or otherwise) is not an artificial one. A fleshy science like transbiology can be harnessed to counter how quantitative knowledges made about transgender bodies by, for example, institutions like hospitals, laboratories, or administrative bodies like departments of motor vehicles and passport agencies support hierarchies of knowledge between instruments and objects, an expert and patient, and the animate and passive.

Trans figures for me as the possibility of the re-formation of gender, making it impossible to theorize the formation of life—human, marine, aesthetic, textured, or felt—without gesturing to an alternative experience of embodiment. The handmade promise of the prefix *trans*, to which I affix a porous transgender in the definition of transbiology, is “an encounter with technology.” If, for Franklin,

to trans is an action, I read trans as an encounter, a suturing of trans and biology signaling a potentiality of relational politics. As a reconfiguration of trans in connection to biology, another way to read Franklin's "encounter with technology" is as a felt sense of the body encountering its own flesh. Variations of the handmade and fleshy sciences like transbiology offer a way to access, in autonomously sensible and choreographed forms, the body's encounter with its material composition (blood, skin, skeleton, cellular, and imperceptible workings). Between feelings and fractals, those unwieldy and algorithmic forms, I see a way to gain access to the soft actions and sensations that precede, anticipate, or remake our limited categories of biological containment, observation, evidence, and repeatability and let be variables, contamination, and uncertainty. The handmade, transbiological encounter records the way that bodies accumulate, become in proximity, and build contact, independently of intervention defined as an intrusion, made by one for another, to foreground the relational capacity of bodies to evidence, measure, and reproduce identities difficult to quantify or control.

In "Evolutionary Yarns in Seahorse Valley" Sophia Roosth investigates the "manifold biological theories that inform the *Crochet Coral Reef* makers' descriptions of their project, showing how they draw on contemporary, historic, and folk understandings of evolution and morphogenesis in describing their work," and suggests "that in so doing, they pose evolution as akin to handicraft—something open-ended, lively, time consuming, perpetually becoming."<sup>44</sup> This study also takes the *Crochet Coral Reef* as an invitation to mine the way that we—to return to and reflect on the impossible and imaginary collective—inhabit and transform identity practices by reproducing bodily knowledges. Forging a dialogue out of transgender, woolly and marine coral, hyperbolic geometrics, and transbiological interventions, this essay offers a handmade account of transgender life and something between a provocation and a method for how transgender studies can integrate and value both the feelings and the fractals of transgender knowledge. This essay lingers with the possibilities of preoccupation and the knowledge production it makes possible; it is also a hopeful thought experiment about the queer reproductive ecologies of identity and the politics of crafting a handmade transgender materiality. While it may be difficult to conceptualize bodies evenly accessing health and survival on an intellectual and political terrain that does not value the animal, inhuman, objects, and all kinds of stuff and matter, the knowledge production that preoccupation makes possible is. As Margaret Wertheim offers, "Knotted in thread, bound together across continents by tendrils of shared, evolving energy, the *Crochet Coral Reef* offers us a metaphor—take it or leave it—we are all corals now."<sup>45</sup>

## Notes

1. Margaret Wertheim, "We Are All Corals Now: A Crafty Yarn about Global Warming," *Brooklyn Rail*, April 2, 2014.
2. In *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*, Karen Barad describes how "the notion of intra-action constitutes a radical reworking of the traditional notion of causality" and is "in contrast to the usual 'interaction,' which assumes that there are separate individual agencies that precede their interaction" (Durham, NC: Duke University Press, 2007), 33.
3. Donna Haraway, "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century," in *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991), 149–81.
4. Rebecca M. Jordan-Young, *Brain Storm: The Flaws in the Science of Sex Differences* (Cambridge, MA: Harvard University Press, 2010), 15.
5. Sophia Roosth, "Evolutionary Yarns in Seahorse Valley: Living Tissues, Woolly Textiles, Theoretical Biologies," *differences: A Journal of Feminist Cultural Studies* 23, no. 3 (2012): 9–41.
6. In *Testo Junkie: Sex, Drugs, and Biopolitics in the Pharmacopornographic Era*, Beatriz Preciado writes of sex hormones and "master hackers of gender, genuine traffickers of semiotico-technological flux, producers and tinkers of copyleft biocodes" (New York: Feminist, 2013), 395.
7. In my book manuscript "Handmade: Everyday Feelings and Textures of Transgender Life," I examine fibrous and fleshy modes of bodily capacity and transgender art making in soft sculpture, knitting, embroidery, dance, and performance. For a study of transgender textiles and fabrics, see my essay, "Felt Matters," in *The Transgender Studies Reader II* (New York: Routledge, 2013), 91–100.
8. In *Critique of the Power of Judgment* Kant describes the aesthetic beauty of art as oppositional to labor and purpose; while art is "liberal" "play," handicraft is "remunerative art" "attractive only because of its effect" (Cambridge: Cambridge University Press, 2000), 182–83.
9. An important text inaugurating the contemporary field of craft studies is *Thinking through Craft* by the scholar and curator Glenn Adamson (New York: Oxford, 2007). His book investigates the art-craft binary and suggests craft is a "problem" and the "conceptual limit" of art" (3, 2). Yet as the feminist art historian Elissa Auther observes, "More than the names themselves, it is the preoccupation with naming and distinguishing that is of interest here, for such naming is a primary component of artistic consecration" (*String Felt Thread: The Hierarchy of Art and Craft in American Art* [Minneapolis: University of Minnesota Press, 2009], 7).
10. Julia Bryan-Wilson, "Sewing Notions," *Artforum*, February 2011.
11. Jay Prosser, *Second Skins: The Body Narratives of Transsexuality* (New York: Columbia University Press, 1998), 67.

12. Sarah Franklin, "The Cyborg Embryo: Our Path to Transbiology," *Theory, Culture, and Society* 23, nos. 7–8 (2006): 71.
13. Susan Stryker, Paisley Currah, and Lisa Jean Moore, "Introduction: Trans—, Trans, or Transgender?," *Women's Studies Quarterly*, Fall–Winter 2008, 11.
14. Stryker, Currah, and Moore, "Introduction," 14.
15. Susan Stryker and Paisley Currah, "Postposttranssexual: Key Concepts for a Twenty-First Century Transgender Studies," *Transgender Studies Quarterly* 1, nos. 1–2 (2014): 1–18.
16. Margaret Wertheim, *A Field Guide to Hyperbolic Space: An Exploration of the Intersection of Higher Geometry and Feminine Handicraft* (Los Angeles: Institute for Figuring, 2007), 30.
17. Jasbir Puar, "'I'd Rather Be a Cyborg Than a Goddess': Becoming-Intersectional in Assemblage Theory," *philoSOPHIA: a journal of feminist philosophy* 2, no. 1 (2012): 49–66.
18. In "Beyond the Special Guest—Teaching 'Trans' Now," Shana Agid and Erica Rand describe how "structures and beliefs" of the special guest "even as adapted by well-meaning, feminist allies in the struggle against gender oppression" and ask, "What does it mean to teach about trans matters without exoticizing or marginalizing trans people, bodies, identities, and issues?" (*Radical Teacher* 92 [Winter 2011]: 5–6).
19. Institute For Figuring website, theiff.org.
20. Like the chemical, agricultural, and genetic modifications to our food and water, plastic shapes how bodies occupy physicality and the in/capacity of flesh. Parallel to *Crochet Coral Reef*, Margaret and Christine Wertheim undertook an experiment to store their domestic plastic trash between February 2007 and 2011: plastic packaging, food containers, bottles of shampoo, and electronic debris like computers and cellular telephones. In addition to tracking their waste use, the Wertheims repurposed some of the plastic into plarn (plastic yarn) and midden monsters (dolls and sculptures made of trash) and posted observations about oceanic trash and the great Pacific garbage patch on the IFF website. A participatory installation of *The Midden Project* was exhibited at the New Children's Museum in San Diego, "like a forest filling up with toxic fruit" (October 15, 2011, to March 30, 2013).
21. In *Art Workers: Radical Practice in the Vietnam War Era* (Berkeley: University of California Press, 2011), the art historian Julia Bryan-Wilson examines the Art Workers' Coalition and the myriad permutations made possible by the conjunction of "art" and worker."
22. Although satellite reefs organize locally at universities, community centers, art galleries, and museums, the IFF requires exhibition fees and contractual recognition of *Crochet Coral Reef* and its ideas and techniques as the intellectual property of the organization and Margaret and Christine Wertheim; this contradiction brings to mind Julia Bryan-Wilson's critical observation, "The left-progressive valence of many of the

- activist and artistic appropriations of craft is evident, but craft-based techniques, like any other, are ideologically ambivalent” (“Sewing Notions,” *Artforum*, February 2011, 74).
23. L. J. Roberts, “Put Your Thing Down, Flip It, and Reverse It: Reimagining Craft Identities Using Tactics of Queer Theory,” in *Extra/Ordinary: Craft and Contemporary Art*, ed. Maria Elena Buszek (Durham, NC: Duke University Press, 2011), 243–59.
  24. Wertheim, *Field Guide to Hyperbolic Space*, 30.
  25. Wertheim, *Field Guide to Hyperbolic Space*, 9.
  26. Wertheim, *Field Guide to Hyperbolic Space*, 10.
  27. See, for example, Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, MA: MIT Press, 1992); for a feminist critique of the visual as an apparatus of knowledge making, see Joan Scott, “The Evidence of Experience,” *Critical Inquiry* 17, no. 4 (1991): 773–97.
  28. The parallel postulate is an axiom of Euclid’s two-dimensional geometry and states that at most one line can be drawn through any point not on a given line parallel to the given line in a plane.
  29. In 1997, at Cornell.
  30. Barad, *Meeting the Universe Halfway*, 29.
  31. Katie King, “In Knots: Transdisciplinary Khipu @ UMD 2012,” [transkhipu.blogspot.com](http://transkhipu.blogspot.com); see King’s website for illustrations and an interactive exploration of khipu.
  32. Stefan Helmreich, “How Like Reef: Figuring Coral, 1839–2010,” in *Party Writing for Donna Haraway!*, [partywriting.blogspot.com](http://partywriting.blogspot.com), [reefhelmreich.com](http://reefhelmreich.com).
  33. Helmreich, “How Like Reef.”
  34. Mel Y. Chen, *Animacies: Biopolitics, Racial Mattering, and Queer Affect* (Durham, NC: Duke University Press, 2012), 194.
  35. Chen, *Animacies*, 190.
  36. Chen, *Animacies*, 13.
  37. Chen, *Animacies*, 29.
  38. Wertheim, “We Are All Corals Now.”
  39. Preciado, *Testo Junkie*, 65.
  40. Franklin, “Cyborg Embryo,” 67–187.
  41. Franklin, “Cyborg Embryo,” 74.
  42. For exceptional work in queer and trans animality, see Bailey Kier, “Interdependent Ecological Transsex: Notes on Re/production, ‘Transgender’ Fish, and the Management of Populations, Species, and Resources,” *Women and Performance: A Journal of Feminist Theory* 20, no. 3 (2010): 299–318; and Eva Hayward, “Fingeryeyes: Impressions of Cup Corals,” *Cultural Anthropology* 25, no. 4 (2010): 577–99.
  43. Franklin, “Cyborg Embryo,” 75.
  44. Roosth, “Evolutionary Yarns in Seahorse Valley,” 11.
  45. Margaret Wertheim, “We Are All Corals Now.”

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