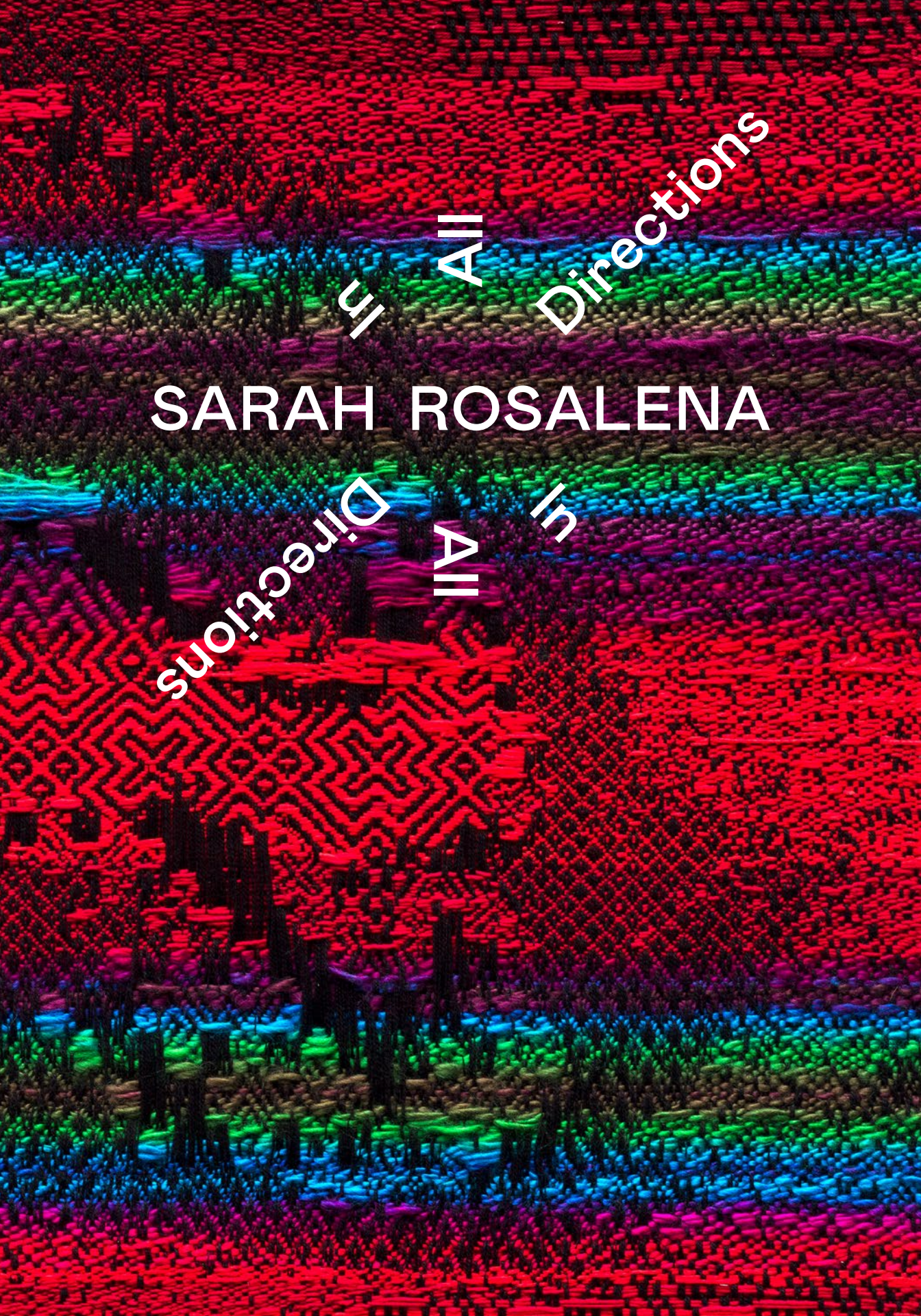
All in All
Directions
SARAH ROSALENA
All in All
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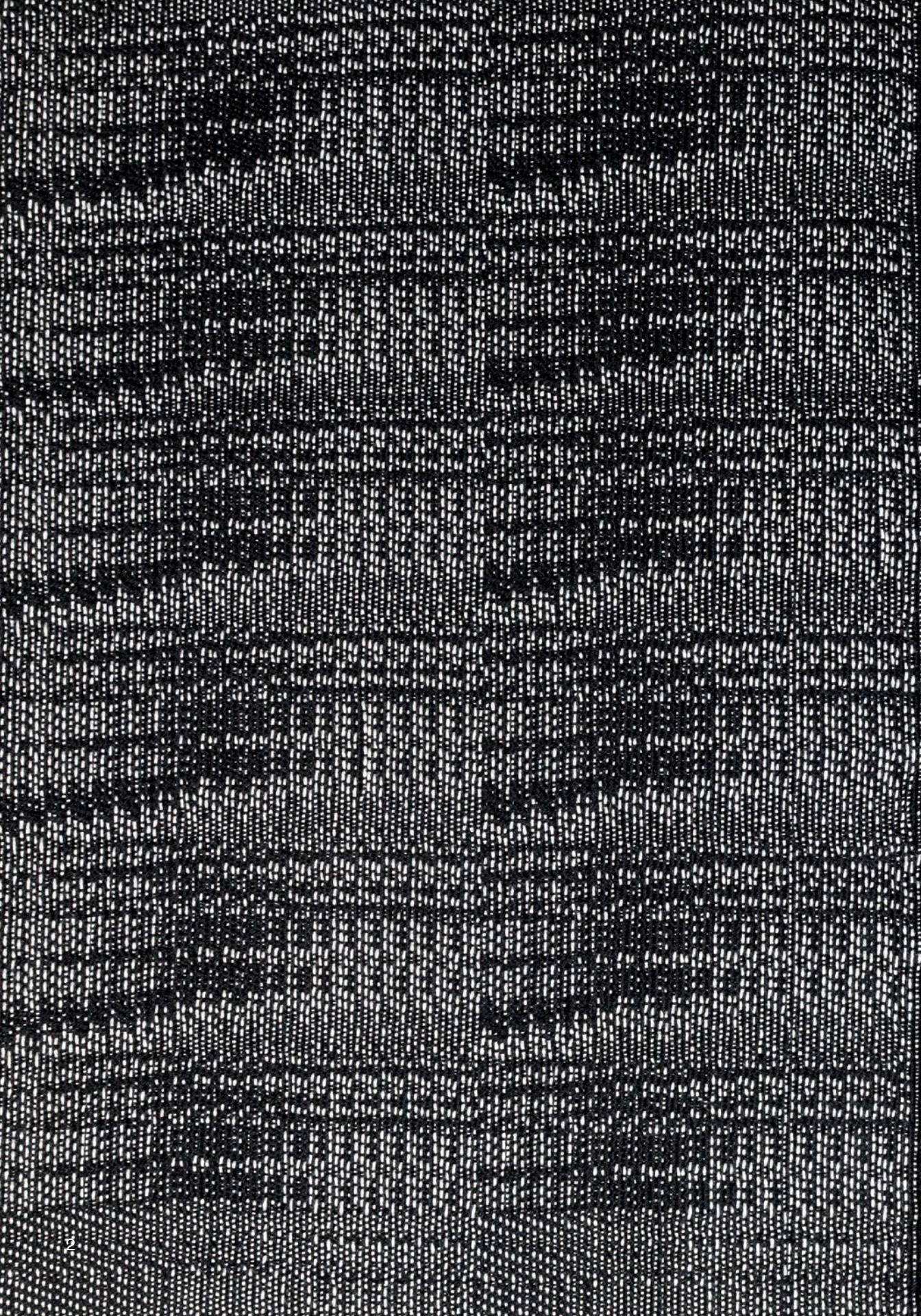
SARAH ROSALENA

In All Directions

In All Directions

COLUMBUS MUSEUM OF ART



Contents

Director's Foreword

The Columbus Museum of Art (CMA) is proud to present *Sarah Rosalena: In All Directions*, the culmination of an ambitious, multiyear collaboration with the Department of History of Art at The Ohio State University. In 2018, former CMA Pizzuti Family Curator of Contemporary Art Tyler Cann, inaugural Roy Lichtenstein Curatorial Fellow Daniel Marcus, and Ohio State Professors Kris Paulsen and Lisa Florman began imagining how the newly acquired Pizzuti building might regularly become a "laboratory" for teaching. The group conceived of a program that would provide Ohio State students with integrative, hands-on experiences working on all components of exhibition making, from conceptualization to public presentation. Crucial skills acquisition and job training opportunities of this sort are typically only received during internships, which remain unpaid at many institutions. By offering these curricular experiences, the program explicitly aims to increase diversity in the museum field by reaching students who may not otherwise have pathways into these careers.

The partnership has already resulted in two exhibitions that took place at CMA on Broad Street due to The Pizzuti's extended closure during the height of the COVID-19 pandemic. In May 2021, Marcus led a group of graduate and undergraduate students through the process of organizing a collection-centered exhibition, *A Primer on the Commons*. Marcus and his students drew upon the upheavals of the previous year—the suffering, grief, isolation, and outrage—to consider how the traditional idea of the commons might reemerge as a political and social ideal under such conditions. *A Primer on the Commons* ran alongside *Partially Buried: Land-Based Art in Ohio, 1970–Now*, curated by Anna Talarico as the culmination of her graduate work in curatorial practice. Like Marcus's show, Talarico's drew upon CMA's rich collection to consider how contemporary artists working in Ohio have taken up the landscape as a subject and site for intervention, confronting its history as a "frontier" and the cultural legacy of Indigenous displacement, as well as grappling with how to document and preserve embodied and ephemeral encounters with the landscape.

The familiarity and spirit of collaboration fostered by this cross-institutional partnership has created opportunities for ongoing educational enrichment. In Autumn 2022, for example, CMA invited Jody Patterson's undergraduate seminar into our collection and archives to produce original research on Columbus-born artist George Bellows (1882–1925). We hope this alliance will continue to enhance the academic careers of Ohio State students and provide professional experiences for future generations of curators, historians, archivists, art educators, and museum workers.

Sarah Rosalena: In All Directions is the most ambitious of these collaborations to date, and it is the first project that delivers on the initial vision to use The Pizzuti as a laboratory for integrative, experiential arts education. The subject of this solo

exhibition, organized by Kris Paulsen and the students in her Autumn 2022 curatorial practice seminar at Ohio State, is Sarah Rosalena (b. 1982), Assistant Professor of Computational Craft and Haptic Media at the University of California, Santa Barbara, and an affiliate at the university's Center for Responsible Machine Learning. She works at the intersection of traditional craft and high technology, bringing Indigenous Wixárika techniques—such as hand-weaving and beading, passed intergenerationally through her family—into conversation with the most advanced material and technical processes, like 3D printing and machine learning. All the works on display at The Pizzuti use craft as a method of interrogating the scientific means by which we have understood our place in the world, and investigating how thinking about the cosmos and the expanding frontiers of space exploration relate to the colonial logics that mark our pasts and continue to shape our futures.

Paulsen's students immersed themselves in Rosalena's art. They deeply researched her work and influences and learned about the mechanics and best practices of writing for art publics. The students not only assisted Paulsen in planning the exhibition, but worked with her to produce this beautiful catalogue. Their object entries and critical texts appear alongside writing by renowned scholars invited to contribute to the publication, including Elizabeth A. Povinelli, Franz Boas Professor of Anthropology at Columbia University. Across her five books, Povinelli has developed a critical theory of settler liberalism and its effects on Indigenous and Aboriginal communities. She is also a member of Karrabing Film Collective, a grassroots, Indigenous-based media collective, with whom she has made numerous films and exhibited in contexts such as the Venice Biennale. Povinelli's critical essay in this volume explores her and Rosalena's mutual interests and inspirations. Kathryn Yusoff, Professor of Geography at Queen Mary University of London and the author of *A Billion Black Anthropocenes or None* (2018), has also contributed to this catalogue. Yusoff is a leading voice in thinking about climate change, biodiversity loss, and extinction. She, too, maintains a creative practice alongside her theoretical and academic work. Yusoff is a member of Planetary Portals, a creative research group that draws upon imperial archives to critically map colonial practices of extraction. In this catalogue, she and Rosalena discuss their related practices and politics.

CMA is grateful to the many donors and partners who have made this exhibition and publication possible. The institutions and individuals who contributed to this project are too numerous to name here but are listed individually in the acknowledgments. We thank you for bringing this vision to life.

Brooke A. Minto
Executive Director and CEO
Columbus Museum of Art

Acknowledgments

Sarah Rosalena: In All Directions is the culmination of a multiyear collaboration between the Columbus Museum of Art (CMA) and The Ohio State University Department of History of Art, which provided the opportunity for graduate students to work with faculty to produce museum exhibitions. As such, this exhibition and the accompanying catalogue represent the collective labor of many wonderful people and generous supporters.

First and foremost, I want to thank Sarah Rosalena for agreeing to be the subject of this exhibition and the educational project from which it is derived. She has dedicated a tremendous amount of her time to talking with students, reading their work, and sharing her thoughts. The students from my Autumn 2022 curatorial studies seminar committed themselves to engaging Rosalena's work, researching her influences, and writing the texts that appear in this book. They are: Maika Kagawa Bahr, Christine Fashion, Julia Harth, Mia Kivel, Hannah McCasland, Sterling Nix, April Riddle, and Amanda Tobin Ripley. Kivel and Riddle continued to work on the exhibition and catalogue, writing entries for new works that had been added to the exhibition and providing additional editorial support, even after the semester ended. Harth developed an Art Education and Public Policy dissertation project around this exhibition, and she has continued to work on the public outreach and educational aspects of the show since the class concluded. I want to sincerely acknowledge the tremendous efforts and dedication of these students and the crucial roles they played in realizing this show and catalogue.

Nicole Rome, the CMA's chief registrar, deserves much of the credit for this exhibition. She was an energetic and willing collaborator on all aspects of this show, with many contributions far exceeding her official CMA duties. This show would not have happened without her help, guidance, and patience.

I also wish to genuinely thank Allison Buenger, administrative coordinator of the Department of History of Art, who dealt with the complicated stream of grants and awards that funded this project. Department chair Karl Whittington and academic program coordinator Gabrielle Stephens graciously assisted on many aspects of this complicated endeavor.

I am indebted to many current and former CMA staff for their support: Maureen Carroll, institutional giving officer, helped extensively in the grant writing and reporting processes; Tyler Cann, former curator, provided the initial endorsement of the proposal and crucial early advice and advocacy; Greg Jones, exhibition designer, and David Holm, Anzel Maloney, and Sam Rietenbach, preparators, lent their hard work to the careful installation of the show; and Cindy Foley, former Scantland Family executive deputy director of learning and visitor experience, and Hannah Mason-Macklin, manager of interpretation and engagement, offered

guidance regarding the educational objectives of the exhibition and devoted time in their busy schedules to working with students. I also thank former CMA director Nannette Maciejunes for her willingness to partner with The Ohio State University on this series of collaborations and Brooke Minto, who became the new Executive Director and CEO of the Columbus Museum of Art late in the planning of this exhibition, for enthusiastically embracing this project. I cannot thank Brooke enough for her interest and engagement; she injected new energy into the project, bringing it through to its public presentation.

Ryland Wharton generously designed the catalogue and exhibition identity, which benefit from his attention and sensitivity to Rosalena's work. He has made this catalogue into a beautiful thing. Flatpage copyedited and proofread the catalogue; I thank Cara Jordan and Kaylee Alexander for their work on this publication.

Elizabeth A. Povinelli and Kathryn Yusoff contributed thoughtful original work to this catalogue and have greatly deepened and expanded the critical writing on Rosalena's art and practice. They are authors who have influenced and inspired Rosalena, and I invited them to participate at her suggestion. The graduate student curators in the seminar related to this exhibition read Povinelli's and Yusoff's books in preparation for our venture. I am greatly honored to have my students' writing alongside theirs and sincerely thank Povinelli and Yusoff for their time and attention.

Numerous grants subsidized this exhibition and the publication of this catalogue. This research was supported by a Craft Research Fund Grant from the Center for Craft, which paid for the content of this catalogue, including the honoraria for our invited contributors. The Ratner Distinguished Teaching Award covered the printing and production costs. A variety of grants from the Ohio State University also supplemented the CMA's contributions toward this exhibition. A Global Arts + Humanities Discovery Theme (GAHDT) Community Engagement Grant provided the initial funding and impetus for this cross-institutional collaboration. I thank GAHDT's Wendy Hestford, Puja Batra-Wells, and Breanne LaJuene for their ongoing support. Vice Provost for the Arts Lisa Florman was my partner in writing and overseeing this grant, and I continually benefit from her mentorship and friendship. Dana Renga, Dean of Arts and Humanities, contributed additional funds through an Arts and Humanities Community Engagement Grant from The Ohio State University College of Arts and Sciences. I extend my most heartfelt appreciation to all the patrons for their generosity and willingness to fund experimental pedagogy, experiential learning, and community partnerships.

Additionally, I would like to recognize the many other people who have aided, enabled, or guided me through this process: Kelly Kivland, Amy Youngs, Indigo Gonzalez, Daniel Marcus, Sharon Takeda, Bobbye Tigerman, Byron Hamman, Max Woodworth, David Weinberg, Damon Northrop, Jessica Davies, Joel Ferre, Mika Yoshitake, and Shana Lutker.

Kris Paulsen
Associate Professor
The Ohio State University

Exit Strategies: Sarah Rosalena's *In All Directions*

Kris Paulsen

Looking up at Mars—through a telescope, satellite images, or NASA's rovers—induces a strange, looping experience of time. The planet's surface reveals an ancient, wind-whipped, and water-carved desert landscape that informs geologists about Earth's deep past and may even provide climatologists with glimpses of its future. Scientists look to the Red Planet for clues about how life may have begun on Earth, and entrepreneurs look to it for a vision of where life could go, fantasizing about how humans might expand into new territories to occupy, reshape, and exploit.[1] While Mars does not have peoples to dispossess in this neocolonial endeavor, the resource mining and related industries needed to move off-world disproportionately affect the Global South and Indigenous populations, poisoning environments and sustaining unethical labor practices.[2] The fantasy of an uninhabited world—there for the taking and remaking—obscures the present realities and structural histories that make that dream possible.

Looking to space as a frontier for exploration, mapping, inhabitation, and extraction imagines a future that appears strikingly and disappointingly like the past—a future that disregards the ecological, political, and cultural urgencies of our present here on Earth. The artworks featured in Sarah Rosalena's mid-career survey at the Columbus Museum of Art, *In All Directions*, intervene in this context of worldmaking and breaking, of imperial futures and occluded pasts. Her art functions as what she calls an "exit strategy from New World geographies and future settler colonization." They are attempts "to dismantle the terrestrial entanglements that spread through the galaxy."[3] Rosalena does so by processing scientific and archival research using emerging technologies and traditional craft techniques. She produces seductive material objects that disrupt calcified narratives of the past, normative views of "progress," and inevitable trajectories toward an unrelentingly unequal future. Her textiles and ceramic sculptures are quite literally unsettling: they rattle the binaries that structure Westernized cultures and their hegemonic epistemologies, cosmologies, and ontologies that endure in the postcolonial condition. Rosalena's objects appear simultaneously traditional and futuristic, handmade and autonomous, organic and artificial, earthly and otherworldly. Working in these blurred boundaries, she shows how such pairings constitute arbitrary divisions that maintain oppressive structures and values that foreclose other ways of seeing the world and our entanglements within it.

Rosalena's artworks activate the destabilizing ambivalences that occur when binary structures collapse. They represent a simultaneity in which an object can be both a given thing and that thing's apparent opposite—not either/or, but both/and. At first glance, for example, *Transposing a Form* (2020) [p. 34] appears to be a handmade, traditional earthenware pot. Its tight, spiraling layers of clay coil grow with hypnotic regularity, building to a tiered structure of stacked, conical forms. It evokes

1 NASA's most recent rover, Perseverance (2020), is tasked with searching for ancient microbial life. "Mars 2020 Mission Perseverance Rover," NASA, accessed July 14, 2023, https://mars.nasa.gov/mars2020/. On entrepreneurial ambitions on Mars, see Christian Davenport, *The Space Barons: Elon Musk, Jeff Bezos, and the Quest to Colonize the Cosmos* (New York: Public Affairs, 2018).

2 Jaya Nayar, "Not so Green Technology: The Complicated Legacy of Rare Earth Mining," *Harvard International Review*, August 12, 2021, https://hir.harvard.edu/not-so-green-technology-the-complicated-legacy-of-rare-earth-mining. For a longer history of environmental damage and the economic exploitation of Indigenous lands in the service of electronic manufacturing and the energy industry, see Lisa Nakamura, "Indigenous Circuits: Navajo Women and the Racialization of Early Electronics Manufacture," *American Quarterly* 66, no. 4 (December 2014): 919–41.

3 See the conversation between Sarah Rosalena and Kathryn Yusoff in this catalogue, p. 16.

the natural, mathematical beauty of mollusk shells and corals—perplexing animals that seem, at times, to be more like plants or stones. But all of these observations and associations begin to glitch as they touch their opposites. This sculpture is not traditional; neither is it natural nor even strictly earthly. Rosalena 3D printed the structure using a clay derived from Martian Regolith Simulant, a material approximation of Martian soil that was developed by scientists to test equipment and procedures to be used off-world.[4] Despite the ease of calling it a pot, the object is not a vessel at all. Its repeating structures are open at both ends—like funnels—and do not close or trap anything inside. Rather, they gesture toward what cannot be contained or fully possessed and known. The shape of each component of *Transposing a Form* cites the structure of a black hole. Its rim acts as an event horizon, pulling everything toward its center, where all concepts of space, time, and the order of things, break down. In the potentially endless combinations and extensions of Rosalena's iterative forms, one can imagine innumerable collapses, explosions, endings, and beginnings, infinite possible universes, outcomes, knowledges, and understandings.

4 See Hannah McCasland's essay in this catalogue, pp. 36–37.

Rosalena's process and practice culminate in objects bearing unique tactile and conceptual qualities that expose the fact that conventional means of understanding space, time, and history are unsteady and full of cracks. In these fissures, one can see glimpses of alternative histories, futures, and cosmologies. In the act of stargazing, for instance, one is perplexingly in and out of time; looking up toward the heavens, one feels unequivocally present, attending to the constantly expiring moment and its fine, trembling details. At the same time, however, it is an experience of dramatic temporal dislocation: the light one sees is millions of years old and testifies to conditions of a past so remote that the scale is nearly inconceivable. The light's journey does not end in human capture, contemplation, and assessment; it shines past, continuing out toward the edge of the universe, expanding in all directions. The deep past and the emphatic now intertwine in a moment that is disorienting and strange, yet utterly ordinary. Rosalena's woven and beaded visualizations of the cosmic microwave background (CMB)—as in *CMB* (2022) [p. 41] and *CMB RGB* (2022) [p. 39]—perform exactly this kind of time- and mind-bending work. They make the "relic radiation" of the Big Bang, which invisibly surrounds everything in the cosmos, tactilely present and available to the senses, emphasizing that the beginning of time is also quite literally in the now and that the past is still unfolding. Traditional and Indigenous craft techniques become the means through which advanced technological data is visualized and, therefore, evoke the ways in which this information clings to the shape of the present and how it might take on new forms.

Obscured, invisible, lost, dispossessed, and erased data find embodiment and material forms through Rosalena's processes. She does not simply bring such information to light as a means of annotating or correcting histories, such as those of the displaced Tongva people and the marginalized and forgotten female "computers" at Mount Wilson Observatory who inspired her *Standard Candle* works [pp. 46 + 56]; she also dwells in the darkness created at those sites to find potentials for new origin stories and counter-histories. As anthropologist and filmmaker Elizabeth A. Povinelli explains in her contribution to this catalogue, Rosalena's interest in black spaces—black holes, the "black boxes" of computers and algorithms, and black light—"counters the racist understanding of blackness as a null and negative space by demonstrating the abundant relational knowledge darkness makes and the social and relational violence of Western forms of illumination."[5]

5 See Elizabeth Povinelli's essay in this catalogue, p. 13.

The title of this survey of Rosalena's artwork—*In All Directions*—signals the irrelevance of the compass points in the expansiveness of the universe. At the same time, it beckons to the potential held in traditional cosmologies and nonlinear temporalities.

By looking in all directions, one can rewrite accounts of the past and conjure futures that break the binary structures rooted in "discovery"—whether they be the colonial discoveries of "new worlds" or the scientific pursuit of expanded "frontiers." In an interview with geographer Kathryn Yusoff for this catalogue, Rosalena describes her artworks as "portals" that create gaps in time and space, opening exit points in the Western and human-centric narratives that structure the historical past and determine possible futures. "Portals," she writes, "follow the laws of their form, operating in a spiraling time, stretched beyond a linear chronology. When the past and future are together, you can weave materials that deconstruct images of systemic power, thus diverting the future of New World geographies and settler colonialism in space."[6]

The idea of a spiral, nonlinear time may seem like a speculative gesture toward science fiction, but it has become common in fields as diverse as quantum physics, literary studies, and geography. In their various approaches to this concept, theorists in these fields suggest that time may not move in the straight line, as has long been taken as the standard and objective truth in Western cultures and cosmologies. Physicist Carlo Rovelli has translated the daunting mysteries of quantum mechanics for lay audiences, explaining that past and future do not exist in the elementary arrangements of the universe, time is not directional, and there is no present.[7] Anishinaabe literary scholar Grace Dillon, too, has theorized a related concept of spiral time that she calls "Native slipstream," which uncovers quantum logics in traditional thought and storytelling practices. Drawing upon a broad range of Indigenous science fiction literatures and cosmological beliefs, Dillon suggests nonlinear, non-Western conceptualizations of time in which "pasts, presents, and futures flow together like a navigable stream" that allows for intervention and redirection.[8] Native slipstream is experimental and avant-garde, she argues, but nevertheless "models a cultural experience of reality" while also recovering "Native space of the past…to build better futures."[9] Evoking ancient and traditional ways of thinking, the Native slipstream is simultaneously futuristic and radical, resonating with conceptions of time and space only now being described, by scientists like Rovelli, in the field of theoretical physics.[10] In both art and physics, Dillon explains, time may be formed more like a spiral, a shape that has the potential to rupture colonial frameworks and expectations, thereby producing a glimpse of the world outside of settler time.[11]

Likewise, Yusoff's groundbreaking work in her book *A Billion Black Anthropocenes or None* points to how the sedimented geological record suggests a reading that evidences a looping time in which an anticipated event has already occurred. While the Anthropocene fuels fears of impending ecological disaster and civilizational collapse, the perception of the apocalypse being in the future, she argues, is a matter of perspective and racialized privilege. The geological record provides proof of numerous prior apocalypses experienced by Black, Brown, and Indigenous peoples, in which civilizations have been eradicated and ecosystems destroyed by the acts and effects of settler colonialism.[12] Written in rock and in ice, one can see evidence of the slave trade, intercontinental colonialism, and racial capitalism. For example, Yusoff writes, "The invasion of Europeans in the Americas resulted in a massive genocide of the indigenous population, leading to a decline from 54 million people in the Americas in 1492 to approximately 6 million in 1650, a result of murder, enslavement, famine, and disease. This led to a massive reduction in farming and the regeneration of and carbon uptake or sequestration by forests, leading to an observed decline in the Antarctic ice cores of CO^2 in the atmosphere."[13] The future that white liberal communities fear, Yusoff argues, has already occurred innumerable times. To ignore these

6 See the conversation between Rosalena and Yusoff in this catalogue, p. 18.

7 Carlo Rovelli, *The Order of Time* (New York: Riverhead Books, 2018), 81–94.

8 Grace L. Dillon, "Imagining Indigenous Futurisms," in *Walking the Clouds: An Anthology of Indigenous Science Fiction*, ed. Grace L. Dillon (Tucson: University of Arizona Press, 2012), 3.

9 Dillon, "Imagining Indigenous Futurisms," 4.

10 Dillon, "Imagining Indigenous Futurisms," 4.

11 Grace L. Dillon and Pedro Neves Marques, "Taking the Fiction out of Science Fiction: A Conversation about Indigenous Futurisms," *e-flux journal* 120 (September 2021), https://www.e-flux.com/journal/120/417043/taking-the-fiction-out-of-science-fiction-a-conversation-about-indigenous-futurisms.

12 Kathryn Yusoff, *A Billion Black Anthropocenes or None* (Minneapolis: University of Minnesota Press, 2018), 51.

13 Yusoff, *Billion Black Anthropocenes*, 31.

past catastrophes voids a history of experiences that "span multiple scales, manifestations, and ongoing extractive economies."[14]

Povinelli's work has centered on the power formations of settler liberalism with particular attention to Indigenous perspectives within these systems. Her work, like Yusoff's, has been a profound influence on Rosalena's thinking and practice. Povinelli's essay in this catalogue explores how Rosalena's work troubles distinctions between Life and Nonlife that structure Western logics of governance and control. By integrating Indigenous patterns and craft techniques with Western technologies, Povinelli writes, Rosalena activates the nonliving kin—such as water, sand, wind, and rocks—that are already inside these technologies, "summoning them as a powerful and anti-colonial force."[15] Decolonization, however, requires "constant, strategic efforts to refuse the endless repetition of the West's technological fantasy that it can master and transcend the Earth," Povinelli writes. Rosalena's iterative structures and consistent investigations of the pasts and futures of exploration and discovery attempt this work.

Yusoff and Povinelli's contributions to this book sit alongside object entries, topic texts, and critical essays by students from the Autumn 2022 curatorial practice seminar at The Ohio State University's History of Art Department. After spending a semester considering Rosalena's work and reading texts by Yusoff, Povinelli, Dillon, Lou Cornum, Lisa Nakamura, Legacy Russell, Shimrit Lee, and Lisa Messeri, among others, the students researched individual works and series included in this exhibition to produce substantive object entries. Interspersed are topic texts on themes and subjects the students believed would help readers better understand Rosalena's work both materially and contextually. The students produced encyclopedic entries on Indigenous futurisms, the relationship between weaving and computing, the race to reach and mine Mars, as well as the roles glitch and Martian Regolith Simulant play in Rosalena's artwork. Additionally, three students wrote critical and historical essays inspired by Rosalena's art and their work together as a class, tackling questions of decolonial museum practice, traditional craft as a means of understanding the scientific present, and how we might conceive of nonextractive futures on this world and beyond.

It is commonplace to suggest that artworks enable us to imagine new worlds and to indulge utopian fantasies of how things could be otherwise.[16] Sequestered in the blank space of the gallery, art can risk operating as an "imaginative escape from the very real structural injustices, climate catastrophes, and rising authoritarianism that are shaping our societies." Distracted by illusory new realities, viewers might feel relieved of their "duty to engage in the existing ones."[17] Rosalena's detailed and painstaking manifestations of astronomical and geological data do not, however, fantasize about redeemed futures or invent impossible pasts. Her artworks dwell in the now: that speculative, quantum space where past and future coexist and nether is determined or foreclosed. She turns the viewer's attention to the materiality of our world—and others—to provide the opportunity to consider what the future should be and which stories to privilege from the past to get there. Rosalena offers no utopias, whether understood as perfect places or "no places."[18] Rather, her objects—as portals, maps, and artifacts—are exit strategies from the structures and chronologies that might make one feel powerless in writing a different future than that which seems inevitable. Doing this, she writes, "begins with pointing at ourselves," and addressing one's own position in the making and remaking of worlds.

14 Yusoff, *Billion Black Anthropocenes*, xiv.

15 See Povinelli's essay in this catalogue, p. 13.

16 "Other Worlds," *e-flux*, July 5, 2023, https://www.e-flux.com/criticism/548790/other-worlds.

17 "Other Worlds."

18 Thomas Moore coined the term utopia in his 1516 political satire framed as a colonial encounter in the New World. Etymologically, the word derives from the Greek οὐ (not) and τόπος (place) but is phonetically similar to eutopia—meaning good place—which allows for the slip in meaning.

Summoning the Ancestors: The Relational Science of Sarah Rosalena's Anti-Colonial Aesthetics

Elizabeth A. Povinelli

In her exhibition *the desert, the animist and the virus* (2018), Sarah Rosalena embodies the three above-named characters that I describe in my book, *Geontologies, A Requieum to Late Liberalism*.[1] The characters are located in the depth of the desert and refuse the invasion settler imaginaries' logics of Life and Nonlife; they condense the anxieties of the affluent West as the geontological division between Life and Nonlife shakes, a division that was never in nature but is always in how colonialism governs others. As Rosalena's works show for many First Nations and Indigenous peoples—whose kin include the interdependencies of modes and regions of existence, water, sand banks, winds, trees, rocks, and birds—geontopower's corrosive tendrils have never been hidden. Thus, Rosalena's work is not an iteration of these figures, but rather an intervention. *Desert Coatl* transforms the settler anxiety of the desert into a scepter-like staff comprised of a CNC-milled scan of a greatly enlarged rattlesnake tail; *Animist Eagle* is a motorized, twitching sculpture of aluminum-cast replicas of bald eagle talons; and *Virus Tumbleweed* transforms a virus model into 3D resin prints that are scattered across the floor like so many future tumbleweed ancestors.[2]

The trouble with trying to write about Rosalena's work is that its reach and significance is so multivalent that, just as I set off to reflect on its importance to one critical and aesthetic dimension, I find myself facing multiple other avenues of consideration. Her work—such as her *Pointing Star* textiles and sculptures, which refigure the eight-pointed star motifs used across Turtle Island—provides seemingly boundless ways of reconsidering my own and others' work on the arts and sciences of settler colonialism.[3] Wherever we end up, we need to begin not merely with how Rosalena disturbs the figures and anxieties of contemporary geontopower, but with how she disturbs the very nature of Western science's creation myth. So, before delving into specific works, I want to summarize how Rosalena's work is positioned relative to so-called Western scientific technologies and infrastructures.

Rosalena does not figure her artistic practice as an encounter between Western forms of science and technology—for example, Western modes of space exploration and of intelligence gathering and deployment—and Indigenous forms of relational knowledge. To frame her works as an *encounter* would, after all, reinforce the idea of Western technoscience as a sui generis field—something exterior to ongoing colonialism, something that *encounters* other knowledge forms as it rampages across the Earth. Rosalena's works instead insist that her Wixárika relatives, as well as the relatives of other Indigenous peoples, are already inside Western sciences and technologies. These relatives are embedded in its circuitry, its location, and its aims to conquer nature through a totalizing and divisive knowledge of it. When I sit with Rosalena's work, when I talk with her, and when I read the interviews she has

1 Elizabeth A. Povinelli, *Geontologies: A Requiem to Late Liberalism* (Durham, NC: Duke University Press, 2018).

2 "Future ancestors" is a Karrabing-inspired way of messing with settler temporality.

3 See, for example, Audra Simpson, "On Ethnographic Refusal: Indigeneity, 'Voice' and Colonial Citizenship," *Junctures* 9 (March, 2007): 67–80.

conducted, I recall anthropologist Zoe Todd's struggle to understand how she can reawaken a caring relation with her Métis ancestors—namely those whom the petrol industrial complex has turned into petrochemicals—who have been transformed and absorbed into the toxic machinery of extractive consumptive capitalism, sunk in its carbon imaginary.[4] When Rosalena circuits Indigenous patterns through Western technologies, she is likewise reawakening kin who are already inside these technologies, summoning them as a powerful and anti-colonial force. This artistic strategy aligns with Glen Coulthard's political insights that settler colonialism seeks not merely to alienate Indigenous peoples from their land, but to alienate and reorganize Indigenous relations to their human and more-than-human kin, including those who—like his Yellowknives Dene relatives—refuse the geontological distinction of Life and Nonlife.[5] As Rosalena awakens the Indigenous kin living within Western science, she—and they—make visible the horrors of ongoing settler colonialism as their ongoing refusal to be engulfed by colonialism unfolds. More specifically, and what I want to turn to, is how her works demonstrate the relational abundance of black space, 3D spaces within any two-dimensional representation, and, finally, the ancestral present that lies within an Indigenous understanding of infinity.

Rosalena has long been interested in what she calls black spaces—black holes, black boxes, black light, etc. She, like other theorists and artists, counters the racist understanding of blackness as a null and negative space by demonstrating the abundant relational knowledge darkness makes and the social and relational violence of Western forms of illumination.[6] Take, for example, *Standard Candle* (May 20–June 18, 2023), a show she put on at the Mount Wilson Observatory. It was here, in 1923, that Edwin Hubble is said to have created the glass plates that provided the possibility of proving that Andromeda was outside our galaxy, thus paving the way for new understandings of the size and dynamics of the universe. Rosalena shows that these calculations were done by women who were then excluded from history. Rosalena also exposes how colonialism lies within and engulfs the practice of space science. Completed in 1917, the Mount Wilson Observatory is located on unceded Tongva lands, the edge of Anglo-colonial expansion in California. The persistence of Tongva practices of light and darkness were the very condition of the telescope's operation. On the one hand, the observatory was close enough to the infrastructures of colonial settlements that it could be built and maintained without serious threat. On the other hand, it allowed the West to be far enough away from itself so that Native darkness could produce Western knowledge. Only in such darkness could the ancient light of Andromeda imprint itself on a glass plate. Today, Western illumination has transformed the Mount Wilson Observatory into a tourist attraction, while it threatens to alienate Tongva relationality between their sky patterns and earth formations.

Rosalena's *Exit VAR!* (2022)—a black bead and string weaving based on the Hooker telescope print of the Andromeda galaxy—had a particularly powerful effect on me given the relationship between the sky and the earth on the lands of my Karrabing Film Collective colleagues. There, Western light has yet to disrupt the kinship ties among the Seven Sisters (*Penidjibbe*) who descended from the sky to form three reefs before reascending. At night, when sitting on the beach adjacent to these reefs, the intimate relationship between sky and earth is palpable. It is an interwovenness as powerful and as subtle as Rosalena's black beaded fabrics displayed on lightboxes in *Standard Candle* or in her textile, *Exit Point* (2019), an image she created using a neural network to combine NASA's iconic 1972 photograph, *The Blue Marble*—which shows the Earth suspended in the infinite darkness of space—with that of a black hole, a representation of infinite information. In my own ances-

4 Zoe Todd, "Fish, Kin and Hope: Tending to Water Violations in *amiskwaciwäskahikan* and Treaty Six Territory," *Afterall: A Journal of Art, Context and Enquiry* 43 (2017): 102–107. See also Kyle Powys Whyte, "Settler Colonialism, Ecology, and Environmental Injustice," *Environment and Society* 9 (2018): 125–44; and Kathryn Yusoff, *A Billion Black Anthropocenes or None* (Minneapolis: University of Minnesota Press, 2018).

5 Glen Coulthard, *Red Skin, White Masks: Rejecting the Colonial Politics of Recognition* (Minneapolis: University of Minnesota Press, 2014). See also Aileen Moreton-Robinson, *The White Possessive: Property, Power, and Indigenous Sovereignty* (Minneapolis: University of Minnesota Press, 2015).

6 See, for instance, Fred Moten, *Black and Blur* (Durham, NC: Duke University Press, 2017).

tral lands of Carisolo in the Alps, my ability to understand the stars' embrace of the land dimmed long ago.

Rosalena's fabric works consider the politics of color: where specific colors come from, and whose sacral order they uphold. Carmine extracted from cochineal insects and indigo from the tropics adorn Catholic robes and cathedrals, but when Rosalena redeploys these colors, she reminds us of their Indigenous origins. As she works across multiple forms and technologies of weaving—including Wixárika bead-weaving traditions, digital Jacquard looms, and moving and entwining gourds—her artworks demonstrate the dynamics that emerge when patterns repeat. When ancestral practices of three-dimensional space are summoned from within the flatlands of colonial technologies, the "glitch" is reclaimed as part of the ongoing relational fabrication of a world that refuses the geontological divisions of Life and Nonlife, human and nonhuman, complexity and simplicity, the one and the problem. The glitch is called by an older name: Coyote. Here, my thinking aligns with Brian Yazzie Burkhart, who contrasts Native accounts of Coyote with Plato's stories of the ancient Greek philosopher Thales of Miletus. Burkhart notes that both Coyote and Thales often lose sight of their relations, but whereas, according to Plato, Thales's obliviousness toward his neighbors and his environment is to be expected of a philosopher, Native stories highlight the mistake of Coyote having forgotten his relations.[7] Even when Coyote remembers, he understands that he can never be everywhere at the same time.

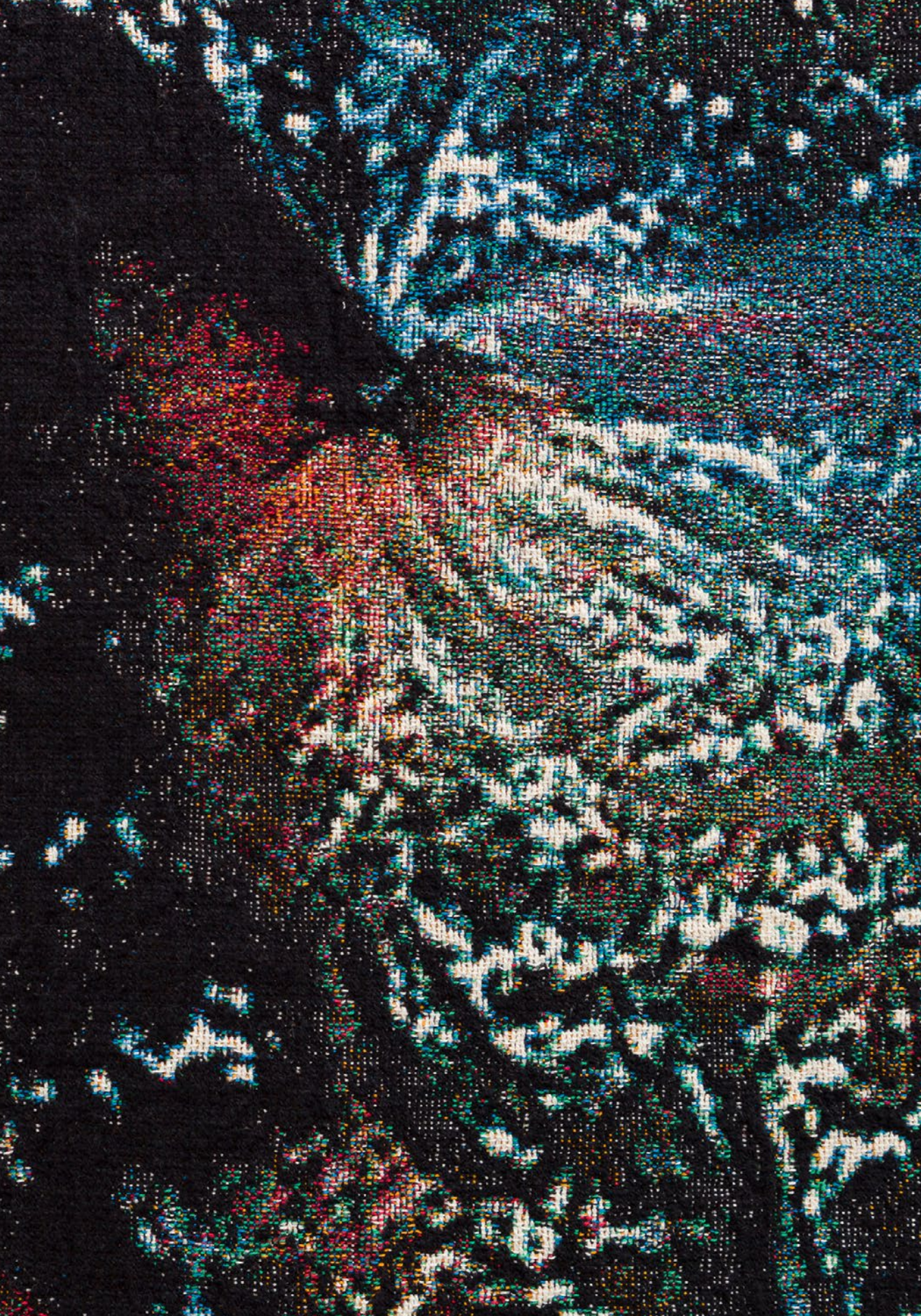
The reality of relational obligations opens the world to the eight-pointed star, a specifically Indigenous form of infinity. Rosalena has been working with this form for some time; the star appears in her work as sculptures, as fabric weavings, as bead weavings, and on the galaxies of embracing gourds.[8] Depending on their materiality, these stars open the world to different modes of infinity, never pointing to one path, never figuring difference as glitch, never seeking an event that will distinguish shore from sea, earth from sky, Life from Nonlife, human from nonhuman, nor past from present and future. They are the infinite anchors of earth and sky: those that move against each other, but always keep sight of our obligations to one another.

The timing of Rosalena's work is crucial. As climate collapse alters the infrastructural purpose of geontopower, those who have long benefited from the practice of dividing Life from Nonlife are now threatened by the toxicity that this division has unevenly produced and distributed. In other words, geontopower has become visible to those who have long claimed it to be a science of things, a mode of governance. What had once been experienced as natural has come to be seen as power; with this new visibility, novel sets of discursive and aesthetic anxieties have emerged in Western discourse. Original hierarchies are reemerging and claiming to be ways of exiting geontopower, even as they fit neatly into Western traditions of beginning and ending.[9] As we see in Rosalena's work, however, the decolonization of Western epistemologies and sciences does not work in the abstract, nor does it occur once and for all. Decolonization depends on constant, strategic efforts to refuse the endless repetition of the West's technological fantasy that it can master and transcend the Earth; it remains obligated to other compasses, replacing the question of similarity and difference with relationality and belonging.

7 Brian Yazzie Burkhart, "What Coyote and Thales Can Teach Us: An Outline of American Indian Epistemology," in *American Indian Thought: Philosophical Essays*, ed. Anne Waters (Malden, MA: Wiley-Blackwell, 2003), 15–26.

8 See the following works by Rosalena: *In All Directions* (2022), *Spiral Arm* (2023), and *CMB/RGB* (2022).

9 See Elizabeth A. Povinelli, *Between Gaia and Ground: Four Axioms of Existence and the Ancestral Catastrophe of Late Liberalism* (Durham, NC: Duke University Press, 2021).



Collapsing Portals: A Conversation about Geographic Imaginaries

Sarah Rosalena and Kathryn Yusoff

SARAH ROSALENA

I want to begin this conversation with a quote from your book, *A Billion Black Anthropocenes or None* (2018), which is a point of reference for my exhibition at the Columbus Museum of Art, *In All Directions*.

You write:

> Across the spaces and places of geology, its languages of description and dispossession, the question of the Anthropocene shapeshifts, world making in epochal pronouncements of the "New World" of humanity, world breaking in the formation of the "Ends" of master subjects: Man, History, Civilization. In its brief tenure, the Anthropocene has metamorphosed. It has been taken up in the world, purposed, and put to work as a conceptual grab, materialist history, and cautionary tale of planetary predicament. Equally, this planetary analytic has failed to do the work to properly identify its own histories of colonial earth-writing, to name the masters of broken earths, and to redress the legacy of racialized subjects that geology leaves in its wake. It has failed to grapple with the inheritance of violent dispossession of indigenous land under the auspices of a colonial geo-logics or to address the extractive grammars of geology that labor in the instrumentation and instrumentalization of dominant colonial narratives and their subjective, often subjugating registers that are an ongoing praxis of displacement.[1]

1 Kathryn Yusoff, *A Billion Black Anthropocenes or None* (Minneapolis: University of Minnesota Press, 2018), 1–2.

In All Directions functions as an exit strategy from New World geographies and future settler colonization, creating and collapsing portals through material, time, and space. The construction and meaning of place through technology needs constant addressing to dismantle the terrestrial entanglements that spread through the galaxy—the geography of space is based on imperialist knowledge production used against Black and Brown bodies. Pointing outward begins with pointing to

ourselves and to computations of the past and future. Power and construction reside less at the center and more at the edges of geospatial relations.

Much of the work in the show operates between binaries: past and future, handmade and autonomous, art object and epistemological tool. For example, *Above Below* (2020) is a series of Jacquard textiles made using computer code to project and reshape satellite images of ice from the Mars Reconnaissance Orbiter—a spacecraft orbiting Mars—from a neural network based on Earth. Pointing to Mars provides a different perspective and scale for terrain imaging. It operates between signifiers of planetary change: Blue and Red—the desertification of the Blue Planet and colonization of the Red Planet, each the result of millions of years of water and climate, now captured from above and below, coming from and being on Earth. I've thought about this in relationship to your term *geologic life*. Can you talk about this—what is geologic life and how is it formed by material and psychic forces?

KATHRYN YUSOFF

With *geologic life*, I wanted to both unsettle the terms in which we understand life—as a biological construction and as a preferred form of individuated human subject inherited from Enlightenment humanism—and dismantle the separation between the Bios and the Geos as distinct spheres. This is to say that forms of life are made and sustained through relationships to the earth and its geopowers (whether empires built on coal or sugar or forms of masculinity and family that are maintained through the narrativizing of fossil fuels). I also wanted to point toward the histories of colonialism that have perpetuated a division between subjects caught on the side of nature—Indigenous, Black, and Brown subjects—and those who proclaim themselves the apex cultural achievement outside of nature (i.e., white, Western subjects). When colonial powers place Indigenous, Black, and Brown subjects in the earth (in different ways, e.g., as part of nature, inhuman property, and indentured labor), then the problem of being on the wrong side of the bios–geos line becomes apparent. So, we might see geological life as a material condition of being and as a psychic experience of being placed in different proximities to adverse or beneficial material conditions through the historical discourse of race, which has, of course, material epistemologies, structures, and affects. This is a rather long explanation, but perhaps it speaks to the questions of binaries and what happens when we start to invert or change expectations around those binaries, as you do in your work. If going to Mars is about a trajectory of complete ascendency over and above Earth, then what are the geographic imaginaries that can resituate those practices of distancing in the earths that they inevitably erase to reach those heights? How does a portal form a different kind of escape hatch from that settler-colonial trajectory over the Earth?

SARAH ROSALENA

In my work, portals operate as gateways toward poetics of inversion. The *Above Below* textiles are meant to be viewed from their reversal, on both sides, up and down. The geographical gaze scans downward from the sky to Earth; the textiles invert geographic imaginaries that make Mars possible, such as those trained on histories of extraction, warfare, and surveillance. I was interested in making a portal via the origin of the computer itself: the Jacquard loom. Jacquard weavings represent a material ghost of itself, tracing its method of production and reproduction from imagery to weaving patterns and back again, operating in the gap between past and future. In this gap is the Electronic Numerical Integrator and Computer (ENIAC)—the world's first computer—which the US military created during

World War II, and that produced the first image of Earth from above New Mexico's White Sands Missile Range. Their inversion is at the root of computation itself; the reversal is weaving images that deconstruct the meaning of place through technology, which needs constant addressing to dismantle future terrestrial entanglements. Conceptions of up and down dissolve in space, providing a vantage point against colonial conversions to shift directions.

The portal artworks move through gaps in time and space beyond the human. They follow the laws of their form, operating in a spiraling time, stretched beyond a linear chronology. When the past and future are together, you can weave materials that deconstruct images of systemic power, thus diverting the future of New World geographies and settler colonialism in space. Shades of red, brown, and blue—formed over millennia—are captured from above and below, becoming points of abstraction through machines that generate our perception. Colors and the materials that make them visible in relation to one another are very important in the work and in a portal itself. Glitches appear in black spots and manifest in absences, giving it form. Black holes are strongly referenced in much of my work, as they represent the opposite of inertia and exponential expansion. I'm curious about your thoughts on portals.

KATHRYN YUSOFF

I work with a group called Planetary Portals (Casper Laing Ebbensgaard, Kerry Holden, and Michael Salu), and we are thinking about the portal as an analytical tool and methodology for approaching imperial archives and the legacy of colonial infrastructures. We are particularly looking at the imagination and the material manifestation of geographical fantasies of Africa as a continent that is always positioned in a narrative of development through material transformation, whether it be through minerals and metals, or, more recently, Google Africa. For us, the portal is a way to understand how particular versions of time and space are stabilized and how these spatial and temporal renderings facilitate the reproduction of colonial or neocolonial geologics. We are also trying to find ways of reading and rendering space that "shred" these logics, thereby showing the fiction of these narratives. I think we are, like you, looking for escape hatches in the fabric of time and space that can help us imagine the flesh and labor of those colonial "event-horizons" and rescript narratives of colonial achievement. It is interesting to me that, in your work, you choose textiles to render landscapes "alien" to scientific visualizations and that your ceramics transmit a looping rhythm or a coil. In both of these visual strategies the question of touch becomes apparent, who has touched and made this thing, in contrast to objects that erase the conditions of their labor. This visionary muscularity of scientific images appears as if it has come out of a material structure of making that is only authored by the scientist's name. You highlight a sphere of blindness that is beneath and in every calculation. It seems that there are processes of bringing one closer but also of shearing the "happening" of these events. Can you say more about this?

SARAH ROSALENA

For *Above Below* (2020) and *Transposing a Form* (2020), processes of scaling and shearing images come out of abstraction and the collapse of digital media. The digital medium, and computation itself, is unthinkable without an iconoclash of extraction, racism, and colonialism; yet, it is also dependent on resolution to render images visible. Machines view land as an abstraction, transforming numerical data and imaging from telescopes and satellites into blown-up worlds, and then concrete

places. Satellite imagery is inherently political in its use on Earth, recognized by machines as a pixel grid of numeric intensity values that inform the classification of and speculation about physical properties and processes. Each image depends on the number of pixels, each fixed with complexity, and the pixel being the smallest controllable physical point represented on a screen. As a weaver, I insert Indigenous abstraction into each pixel and, with or without touch, shred images as a deconstructive gesture toward breaking boundaries and borders through the disfigurement of images. It can be viewed as a process of fragmentation and dispersal; the scattering of pixels across directions in woven form anchors new coordinates in the material realm.

The use of the looping coil and infinite imagery of landscapes from machine learning produce a generative strategy in spiral rather than linear time. Their patterns are self-replicating, synonymous with "nature" in a life spirit outside the human and existing at the outermost boundaries of labor and resource extraction. That being said, AI-generated hallucinations of land decenter humans structured by hierarchies. They exist beyond the cartographic imagination and white-settler subjectivity. AI-generated Jacquard textiles are output directly to a mechanical loom, without human touch. Other works in *Above Below* that are produced from direct MRO satellite imagery are handwoven, touch becoming a manual gesture of writing over its pixelated structure.

As for the coiling and collapsing ceramics, works are extruded with a customized 3D printer as a portal for future vessels. *Transposing a Form* explores interactions through material research in 3D printing with Martian clay made from MMS-2 Mars Soil Simulant (created by engineers at NASA), which represents materials generated through space colonization. Digital simulation and autonomous technology have a tremendous impact on how future objects will be made and how we will engage with the environment, simulated from materials found and based on Earth. The forms are exit points for time, land, and technologies that signal future settler colonialism, wherein the "new materiality" of Mars becomes its own exit strategy. The form examines how machines function as the next interpreter or mediator in the language of forms on other planets as well as a tool for understanding our past and reversal. They function as anti-vessels or non-containers in that they cannot hold anything. Some of the forms' patterns feed into themselves, collapsing on themselves. I'm curious about your thoughts on Martian Regolith Simulants, since they are based on a rover's interpretations of compositions on Mars and made from materials found on Earth, mainly the Southwest.

KATHRYN YUSOFF

I am tempted to say that the other-worlds trajectory is a result of settler violence and settlement's psychological need to secure itself in a belonging of its own making. Settler societies cannot ground truth because of the fictions they have spun to cover the actual forms of justice that have yet to be accounted for on stolen ground. One of the things that has been important in my work, and with the portals, is to talk about violence and white supremacy—and this is often not a welcomed discussion. One of the things I notice in responses to this work is that narratives of negation always seem to invoke the positive aspects of colonial world-making to detract from the catastrophic, world-breaking activities that went on in or to so-called other-worlds, which is to invoke the technological telos of redemption via the making of another world. There are historical parallels to this from the 1950s, in white-flight imaginaries of space colonialization or the settler paintings of Edenic imaginaries that envisioned the Americas as a place to start again. The religious

narrative of being reborn without sin springs to mind. In Africa, the British imperialist Cecil Rhodes imagined the continent as one for white supremacy that would redeem the failed projects of white supremacy elsewhere. Poor Africans, racialized as "natives" or monetized as "labor," paid and are still paying a heavy price for his vision of another world. As in North America, the degree zero of settlement was the process of making racialized subjects landless or creating conditions that resulted in geographical orphanage, whereby the very interdependent, subjective life of ecologies and land were destroyed, and forms of life displaced. In terms of Mars and the simulations of test landscapes to practice settlement on, the parallels to the always unfinished, always violent process of settler colonialism are stark. With "test landscapes," I'm also reminded of the nuclear holocausts that were unleashed on Indigenous people around the world—for example in the Marshall and Pacific Islands, on American reservations, in North Africa, and within Aboriginal communities—and how there is no such thing as a test. The idea of testing and attempts to achieve exactitude of simulation suggests that real places can be abstracted into a practice ground. Again, I see this as a displacement.

The lure of beginning again is compulsive and drives the muscular machine of an ever more vertical ascendancy to the promise of an abstract space; yet, the mundane mechanics of mining outer space are very real. The psychic desire for ground zero and the imagination of its possibility frames all these endeavors, which reminds me of the edges of your tapestries and their refusal of such closure or axis of a total horizon (or edge). Implicit in both our work are questions of ends and origins and of beginnings and teleologies. I think there is also a desire to introduce a disruptive terrain into those problematic New World visions. Ghosts of memory, ghosts of geology, refuse such fictions—unceded—and rattle their unheard speech, so that a chatter is about the land. Settler societies do not want to hear this, so they turn their fragile ambition upwards. This chatter is always resurgent, a noisy anti-colonialism. There is no such thing as erasure despite the best efforts of colonial minds. How do you see this task of relanguaging earths and their representations?

SARAH ROSALENA

I see the task of relanguaging Earth at the planetary scale as essential due to its formation within the cartographic imagination as universal. By tracing old or oppressive cosmologies, I am interested in how you can view both as conceptually similar in their production and knowledge-making, as well as in their modes of sensing. I sense my hand through technology and perceive how it intersects with modes of mapping as textile and ceramics function as 3D surface topologies—over and under, positive and negative, a material made digital and woven back into the physical. I like how you used the term *disruptive terrain*, as weaving can be viewed as a terrain within pattern-making and 3D fabrication. In my weaving, the disruptive terrain emerges in a variety of forms as glitches: subtractions of yarn, changing gradients, unravelings, and frayed borders. The terrain form exits to release itself from its structure and reaches toward the boundless to produce new origins and multicosmologies.

Origin stories are woven through my work, especially in *Standard Candle* (2021–2023), a piece recently installed in the base of the hundred-inch telescope at Mount Wilson Observatory, which resides on unceded Tongva land. The site is ground zero for discoveries about our expanding universe, grounding location, and measurements throughout the cosmos. You and I had the opportunity to see the show together in June 2023, and terms like *shredded cosmos* and *black glitches* came up

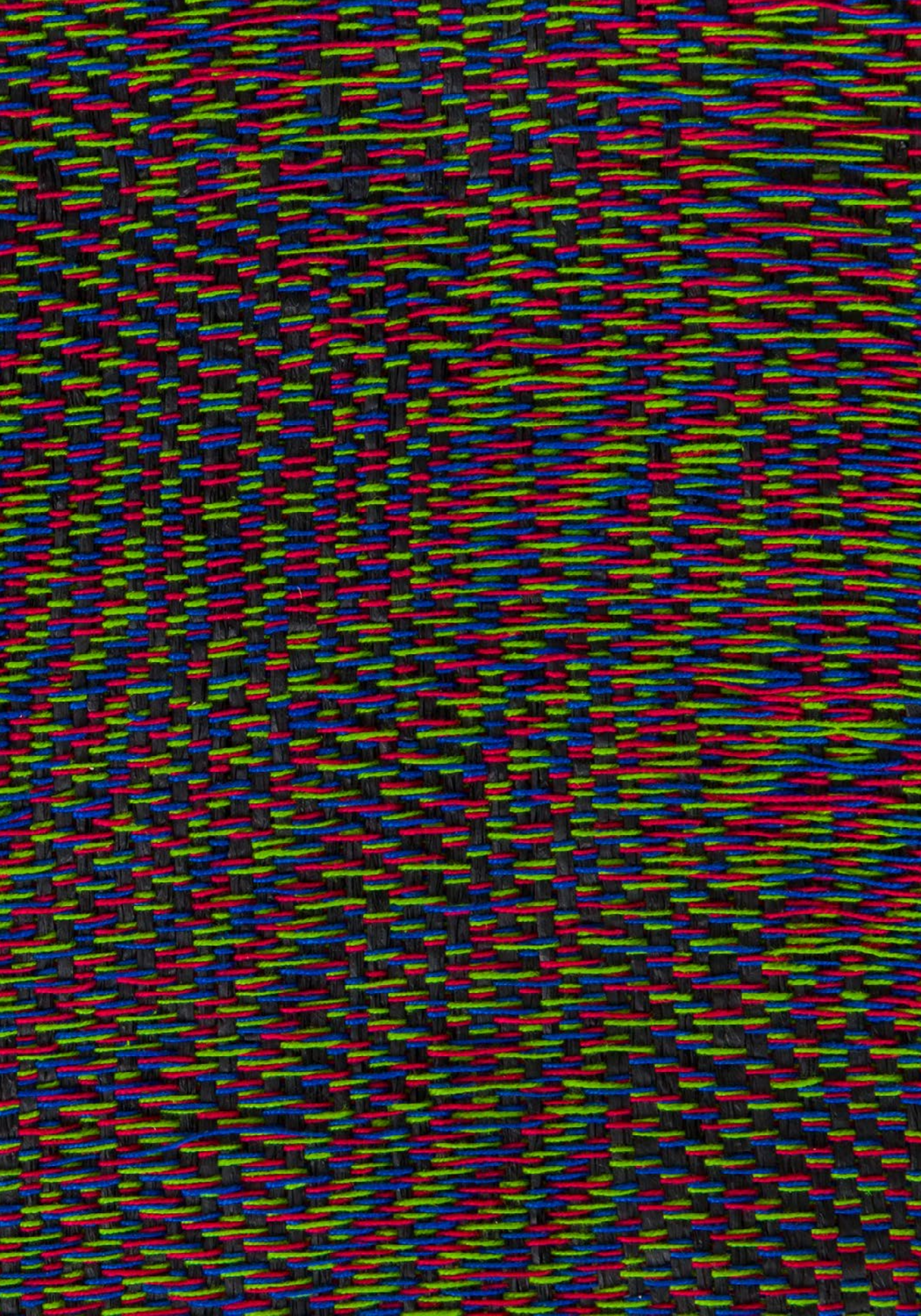
in our conversation then, helping me to think about how my material interventions could constitute a disruptive terrain.

KATHRYN YUSOFF

Seeing *Standard Candle* was a very moving experience, in part because of the contrast between the height of the observatory above the cloud line and the minute labor of your beaded renderings of variable stars used to produce measurements from Earth. These light-boxed, beaded "plates" had such a tender and labored relationship with knowledge production: the production of a knowledge that allowed Hubble to show that the universe is expanding. The computation of luminosity that allowed such a cosmic statement, as well as the failures to compute, are held in tension in your work, so the affective shock is like inverting the telescope such that the very small practices of weaving are in dialogue with the most profound and expansive statements about the universe. The cosmic statement that the universe is expanding could break your heart in what it asks us to imagine is possible, and yet your work points us to an earthbound cosmology without abstraction. This, of course, is intentional in your work, but something else emerges from the corporeality of the textiles both in the reminder of how cosmic statements are made and in the enlivening of what you referred to as "old cosmologies," which understand the cosmos as earthed and unceded to a singular account of space.

SARAH ROSALENA

It is powerful to imagine the disruptive terrain or an inversion from the viewpoint of the mountain peak, the breaking point between earth and sky. Also, as so much of my work in this show attempts to insert multiple terrains at the boundary of geospatial edges—forcing the 2D map-making plane to become digital imagery and then an unraveled, complex origami. This large unfolding of new structures in the 3D, woven plane is a site for new technologies and new media resolutions to form from what was cropped out, unsupported, obscured, or unrendered. For me, the disruptive terrain defies the grid and old cosmologies that have become embedded in technology. Because what is there is land and kin; knowledge in darkness that renders stars visible; knowledge in the surface topology of geo-logical histories and materials; and ancestors, above and below, supporting beneath—their never-ending resonance is there.



EXIT POINT

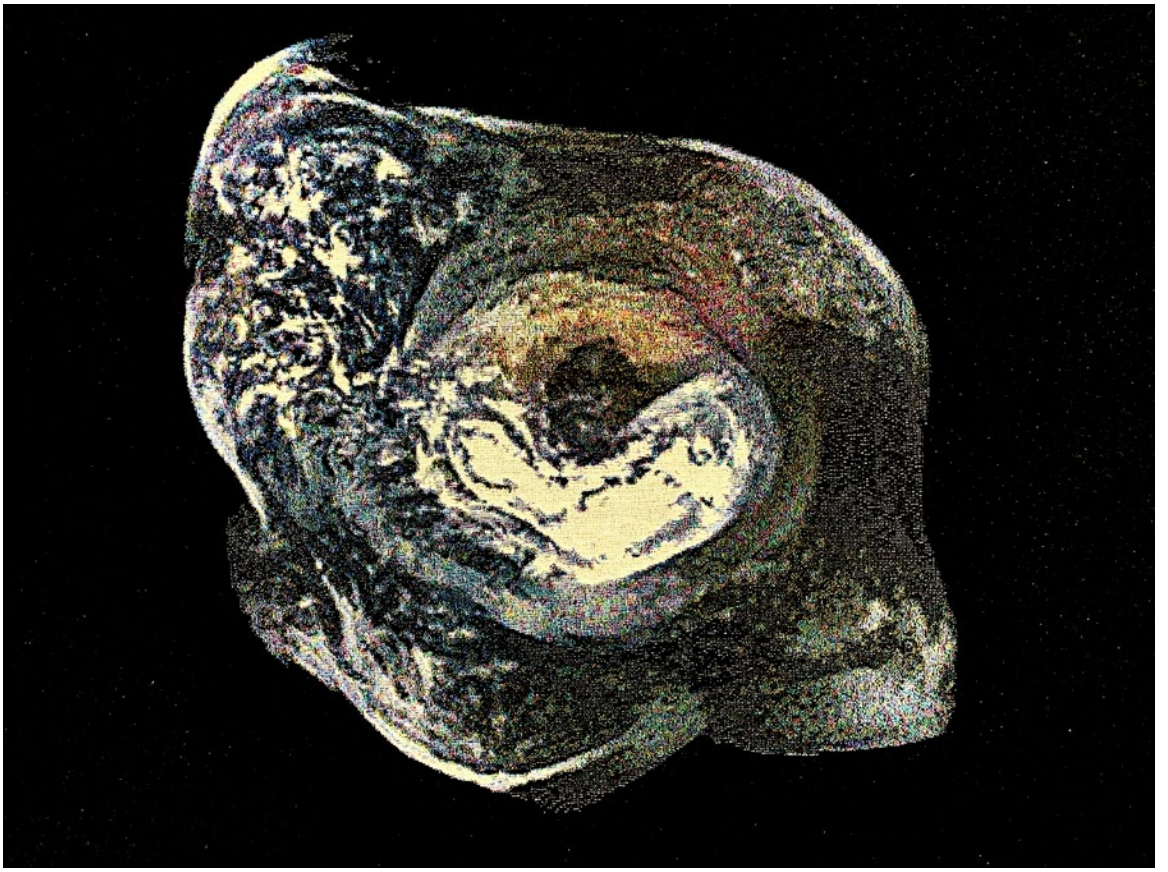
In 1972, the crew of the Apollo 17 spacecraft looked back toward Earth and took a photograph of the home they had just left. *The Blue Marble*, as the image is known, was one of the first photographs of Earth to be taken by humans and shows the illuminated Earth in its entirety. Shrouded in a delicate layer of swirling clouds, the pristine orb of land and sea floats in the ink-black void of outer space. The few thousand miles between Earth and its photographer are sufficient to compress all that humanity had ever known into a single frame. This image challenges viewers to consider their place not only in the world, but in the boundless cosmos beyond. *The Blue Marble* has also become an important symbol of the environmental movement, with many interpreting its universalizing image of Earth as a call for people to come together as stewards of the planet we all share.

In 2019, a different kind of image arrived from outer space. The Event Horizon Telescope (EHT) collaboration, a team of more than 200 scientists, garnered international recognition when they used an array of terrestrial radio telescopes to produce the first image of a black hole. Although black holes cannot be photographed directly, a ring of red-orange light bent under the force of its immense gravity rendered it visible. If *The Blue Marble* is an image of the known, EHT's depiction of the Messier 87 black hole (M87) is an image of the unknowable.

Sarah Rosalena uses artificial intelligence to combine these cosmic photographs into *Exit Point*, a Jacquard-woven textile upon which the familiarity of *The Blue Marble* is made inscrutable through its fusion with the image of the M87 black hole. Rosalena weaves the digital image in cloth at a one-to-one ratio, representing each pixel through a single intersection of warp and weft. *Exit Point* distorts Earth's familiar features: green, blue, and white threads respectively suggest land, sea, and clouds, but these are mirages. All are dissolved in the destructive vortex of the black hole, a manifestation of space and time. Unlike *The Blue Marble*, *Exit Point* is not a representation of anything real, but is instead a reimagining of Earth as something no more familiar than a black hole fifty-three million light-years away.

Exit Point integrates images of Earth and the M87 black hole to flatten all categorical distinctions between them. Its swirling planetary body simply exists in a manner that refuses any familiarity and encourages viewers to reconsider their own knowledge of Earth. Does *The Blue Marble* accurately reflect human experience, or does it only serve to mask the ecological and geopolitical strife that continues to threaten our planet's future? In *Exit Point*, Rosalena offers her viewers a glimpse of the end of the world as a call to action. Accepting that the end is possible reifies the urgent need for environmental stewardship and suggests that without drastic change, the blue marble we all call home may not be inhabitable forever.

(Mia Kivel)



Exit Point, 2019
AI-generated textile, training: Blue Marble image
from Apollo 17 and Black Hole image
from Event Horizon Telescope.
50 × 62 in.

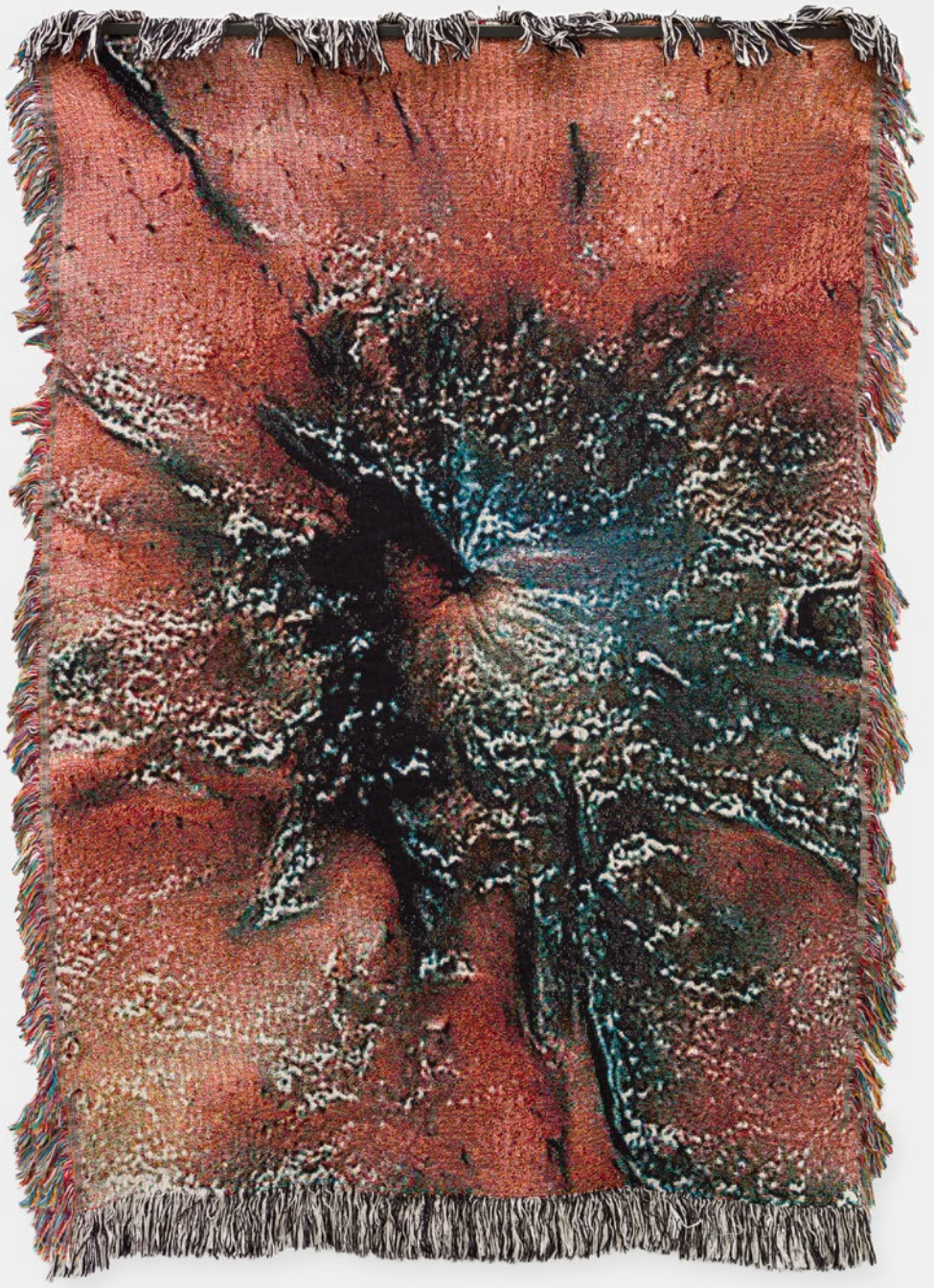
ABOVE BELOW

Above Below is a series of double-sided AI-generated textiles woven on a Jacquard loom at the scale of one pixel per thread to examine the origins of satellite imaging and how it relates to place-making. Trained on satellite images from the Mars Reconnaissance Orbiter, Rosalena's tapestries distort the pixelated boundaries of Mars to imagine the planet's transformation through "terraforming" and colonization. Rosalena uses a neural network to structure the Mars Reconnaissance Orbiter images into shifting fields of blue and red. The textiles appear as maps hypothesizing planetary changes in water and climate on Mars over the course of millions of years, backward into the distant past and forward into a speculative future.

Imaging technology for space exploration is tethered to a legacy of colonialism. Colonial cartography sought to map the "unknown" and, in this pursuit, created destructive frameworks that not only damaged indigenous landscapes and lifeways, but also severed connections with ancestral forms of knowledge. Any future exploration and settling of Mars will depend on advanced technology and will risk reproducing colonial legacies. While there are no natives on the planet, the current and future technologies needed to reach Mars require destructive forms of resource extraction and mining on Earth that also take neocolonial and exploitive forms, primarily in the Global South. To imagine an equitable off-world future that is not dependent on the further destruction of our planet in pursuit, NASA and the commercial space industry must not replicate the extractive violence of the colonial past. *Above Below* offers a vision that challenges the colonial place-making apparatus and forces us to reconsider where we want to be in the future.

(Sterling Nix)

Above Below, 2020
AI-generated textile, cotton, training: Mars Reconnaissance Orbiter satellite images taken from High Resolution Imaging Science Experiment (HiRISE).
60 × 80 in.



Above Below, 2020
AI-generated textile, cotton, training: Mars Reconnaissance Orbiter satellite images taken from High Resolution Imaging Science Experiment (HiRISE).
52 × 37 in.

Above Below, 2020
AI-generated textile, cotton, training: Mars Reconnaissance Orbiter satellite images taken from High Resolution Imaging Science Experiment (HiRISE).
52 × 37 in.

Mining Mars

Sterling Nix

"Curiosity" and "perseverance" are two of the elemental human attributes that drive NASA's efforts to explore Mars; they also lend their names to the space agency's two active rovers: Curiosity (landed 2012) and Perseverance (landed 2021). Curiosity's mission studies the climate and geology of Mars to see if it has ever had conditions to support life. Perseverance, on the other hand, seeks out evidence of microbial life by collecting regolith samples from ancient river deltas to eventually bring back to Earth; it also tests the oxygen of Mars's atmosphere to determine future human habitability. Studying and exploring Mars will provide a deeper understanding of the planet's past and potential, ascertaining if it has ever supported life and if it could sustain future human civilizations. According to NASA, Mars "is the next tangible frontier for expanding human presence."[1] The space agency figures this ambition as not just a scientific project, but also as a commercial venture, stressing that their mission is one that "will foster and attract new commercial enterprises."[2]

The United States Congress signed the Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act into law on August 9, 2022, allocating $280 billion toward "NASA's science, exploration, aeronautics, space technology, and STEM activities to support NASA in continuing to lead, inspire, discover, explore, and carry out ambitious and challenging missions."[3] The legislation tethers space exploration to the economic mission of CHIPS, an essential component of modern electronic devices, including the Mars rovers and commercial spacecrafts. Such technologies and

1 National Aeronautics and Space Administration, *NASA's Journey to Mars: Pioneering Next Steps in Space Exploration* (Washington, DC: NASA, 2015), 1, https://www.nasa.gov/sites/default/files/atoms/files/journey-to-mars-next-steps-20151008_508.pdf.

2 "NASA's Journey to Mars," 1.

3 *CHIPS and Science Act of 2022*, H.R.4346, 117th Cong. (2022).

innovations require the destructive mining of rare earth metals and the production of e-waste, which will exacerbate the already precarious environmental and social conditions on Earth that make moving to Mars a seductive fantasy.[4] NASA also imagines mining industries moving off Earth and lobbies to support "a policy and regulatory environment that promotes the commercialization of LEO [Low Earth Orbit]."[5] Asteroids, the moon, and Mars are all potential future sites for mining the materials that fuel technological advancement and environmental destruction.[6]

NASA's multistage mission to the moon and to Mars aims to decrease reliance on Earth as a launchpad for space exploration that eventually, perhaps, will reduce our need for Earth at all. The three stages to complete the interplanetary journey will, NASA writes, "advance science and technology in ways only dreamed of with current robotic explorers" and will "mark a transition in humanity's expansion as we go to Mars not just to visit, but to stay."[7] While there are clear scientific goals associated with the project, the commercial aspects of the enterprise come to the fore: on a planet severely polluted and damaged by (neo)colonial economies of extraction, venturing across the so-called final frontier may seem more expedient than working to change exploitative cultures and practices at home. Rather than offering a vision of a radically new and progressive human future, corporate and state visions of colonizing Mars risk repeating the environmental, social, and political errors of the past, turning the attention away from efforts to remediate and restore Earth's environments.

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4 Jaya Nayar, "Not So 'Green' Technology: The Complicated Legacy of Rare Earth Mining," *Harvard International Review*, August 12, 2021, https://hir.harvard.edu/not-so-green-technology-the-complicated-legacy-of-rare-earth-mining.

5 *NASA's Journey to Mars*, 15.

6 Jan Osburg and Mary Lee, "Governance in Space: Mining the Moon and Beyond," *The RAND Blog*, November 18, 2022, https://www.rand.org/blog/2022/11/governance-in-space-mining-the-moon-and-beyond.html.

7 *NASA's Journey to Mars*, 7.

TRANSPOSING A FORM

In a pattern of undulating bands, rust red melts into grooves of metallic gray. Although unified in texture and color palette, each iteration of Sarah Rosalena's series of sculptures *Transposing a Form* differs in shape as variations on a form. The distinct structures narrow, open, and collapse. Although the ceramic objects reference the structure of coil pots—an ancient pottery method that has endured for thousands of years—their meticulous construction reveals a digital "hand." Rather than employing a manual building technique, Rosalena creates a similar aesthetic through 3D printing. The uniformity of the close ridges, while reminiscent of coiling or weaving, betrays the precise regularity of the 3D-printing process. Rosalena's contemporary adaptation of an ancient practice yields a new form of ceramics, one that suggests possibilities for other future constructions.

The material, too, contributes to the novelty of this form. Typically, clay is a compound of earth and water. In contrast, Rosalena's clay is the soil of another planet—Mars—or so she suggests. In 2012, NASA's Curiosity rover extracted the first Martian soil samples, transmitting information about the planet's chemical composition back to Earth. Scientists used the data to create a soil simulant for research, which they rely on to test equipment for future missions and build habitat models. In *Transposing a Form*, Rosalena experiments with a similar material, mixing MMS-2 Enhanced Mars Simulant into clay slip for 3D printing. Enhanced with iron oxide, this compound lends the sculptures Mars's iconic red hue. In contrast, the metallic gray derives from an aluminum-based glaze. Light, strong, and malleable, aluminum is a common material for space technology. The glaze reinforces Rosalena's ceramics in the firing process and lends them an industrial edge. Like other materials critical to development in the modern Western world, this metal carries a history of capitalist, colonial, and environmental exploitation. By using aluminum, Rosalena not only physically strengthens her ceramics, but also cites the mining practices needed to make space exploration possible.

Rosalena's grandfather worked as an aerospace engineer and astrophysicist; her grandmother trained her in Wixárika craft. Building on these intergenerational relationships, Rosalena relies on multiple worldviews and forms of knowledge in her work. As part of her research, Rosalena has studied Puebloan pottery traditions, learning their material processes and conceptions of object animacy. Many Indigenous cultures affirm that objects are living, and, as such, these communities have practices relating to the protection and care of objects as beings. Rosalena extends these perspectives by centering machine labor in her practice, complicating the relationships among humans, machines, and objects. Uplifting Indigenous technologies and ontologies, Rosalena challenges the binary between living and nonliving and asserts a form of object agency.

As the title suggests, *Transposing a Form* refers to objects rearranged in shape and shifted in function. Rosalena describes her ceramics in this series as "anti-vessels" or "anti-containers." Rather than holding something securely within, the open modular pieces interact, alluding to shifting, infinite variables. Through structures that flow and collapse into themselves, the dynamic shapes purposefully recall black holes. Whereas the gravity of black holes prevents the escape of light, energy enters and exits the ceramics freely. The transposed form invites fluidity: housing and releasing the energy of the object, learning from and breaking with the past, and offering a space for multiple understandings of the universe.

(Julia Harth)

Transposing a Form, 2020
ceramic 3D print of MMS-2 Enhanced Mars Simulant,
bentonite clay, aluminum-based glaze.
9 ½ × 13 ¼ × 10 in.

Transposing a Form, 2020
ceramic 3D print of MMS-2 Enhanced Mars Simulant,
bentonite clay, aluminum-based glaze.
37 × 9 ½ × 9 ½ in.

Transposing a Form, 2020
ceramic 3D print of MMS-2 Enhanced Mars Simulant,
bentonite clay, aluminum-based glaze.
5 × 7 × 7 in.

Martian Regolith Simulant and the 3D-Printing Process

Hannah McCasland

The Martian landscape consists of layers of sand and dust that infuse the ground and air with a vibrant rust color. Like Earth, the surface of the rocky red planet is rich with minerals. Iron dominates its composition, but aluminum, silica, calcium, magnesium, red iron oxide, and sulfate also make up the planet's crust. Mars is similar in constitution and appearance to parts of Earth, such as the deserts of central Australia and the canyon lands of the American Southwest.

Scientists are currently using robotic rovers to analyze the surface of Mars. NASA's *Curiosity* and *Perseverance* rovers have the ability to analyze Martian soil and send data back to Earth. NASA's Jet Propulsion Laboratory (JPL) has used this information to create a "Martian Regolith Simulant" from terrestrial material. No actual Martian soil has yet made it back to Earth, but the similarities between the two planets allow for this physical simulation to be made. For example, basalt—a fine-grained rock that forms when volcanic lava is cooled quickly—has a high magnesium and iron content that is very similar to the surface of Mars, which is covered in volcanoes.

NASA and JPL have produced multiple iterations of Martian Regolith Simulants. In 1998, the Johnson Space Center created JSC Mars-1 and JSC Mars-1a from volcanic rock mined in Hawai'i using data from the Viking 1 and Viking 2 Landers and the Mars Pathfinder Rover. The Mars Phoenix Mission in 2007 acquired new data that helped scientists create Mojave Mars Simulant 1 (MMS-1), which contained only basalt sourced from the Mojave Desert with the aim of matching the particle size of real Martian soil. MMS-1, however, was not a full mineralogical match to Martian soil. MMS-2 Enhanced Martian Simulant (2018) is the current version of Martian Regolith Simulant. It has the closest mineral accuracies to Martian soil, containing additives such as iron(III) oxide, silicon dioxide, magnesium oxide and calcium oxide. These additives balance the aluminum

oxide to iron oxide ratio to match that of Mars more accurately.

Sarah Rosalena utilizes MMS-2 to 3D print her ceramic work as well as to dye thread for some of her textiles. She adds bentonite clay to the material to increase its workability in the 3D-printing process and aluminum to aid in the glazing process. While scientists developed Martian Regolith Simulant to better understand the surface of Mars for the purposes of future manned exploration and potential settlement, Rosalena uses it to strengthen the ties between Earth and its neighboring planets. Her use of 3D printers further emphasizes this connection. Current Mars rovers are composed of many 3D-printed parts, and NASA hosts a competition for 3D-printed designs for habitats that might be used in future Mars missions. Rosalena's adaptation of simulated Martian soil for ceramics reiterates a connection between the two planets and sustains a fantasy of being able to touch Mars.

CMB RGB

How does looking into the deep past allow us to see our present moment more clearly? This question is at the heart of Sarah Rosalena's *CMB RBG*. The cosmic microwave background (CMB) is detectable relic radiation produced during the Big Bang. Astronomers accidentally discovered the CMB in 1965 by using a radio telescope, which can recognize light waves in registers beyond what the human eye can see, including the microwave spectrum where the CMB is brightest. Although invisible to the naked eye, the CMB pervades every inch of the universe, infusing the seemingly empty space between stars with a soft glow of light—a faint background noise to our (extra) planetary drama.

The CMB is the most solid proof supporting the theory of the Big Bang as the origin of the universe. To know that the CMB exists from the farthest star to the surface of our skin is to recognize ourselves as entangled with other epochs in time, including those predating humanity, life, and even planets. Rosalena's *CMB RGB* augments our existing visual capacities by fusing Western scientific discoveries and traditional Indigenous technologies. In Wixárika (Huichol) and other Indigenous cultures of the Americas, gourds often present nonlinear histories and narratives, offering a continuous surface on which to etch or paint stories that have no beginning or endpoint. Beadwork also evokes traditional Wixárika ceremonies and arts, as a means of making objects sacred through associations between beads and water and corn kernels, which are both foundational to life. Rosalena then uses beeswax and tree sap to inlay the beaded CMB onto the gourds, many of which were grown in her own garden. With advanced telescopic imaging of the CMB and organic gourds inlaid with glass beads, Rosalena gives us a way to see what is always present but invisible, to interweave the origin of the universe with our current existence.

Rosalena arranges the gourds in overlapping knots, forming a constellation out of terrestrial materials and celestial data. *CMB RGB* is a physical and cosmological entanglement of Indigenous and Western technologies. Rosalena materializes the CMB images in RBG color: the red, blue, and green (RBG) color family that serves as the foundation of all digital images. The gesture points to the irony of our reliance on simulated digital imaging to see our ancient cosmic relationship with the universe.

Rosalena reveals the emptiness of the dichotomy between what is sacred and what is machine, showing us the ways in which the Big Bang origin story, Indigenous cosmologies, and technological innovations complement and build upon one another. The juxtaposition of the ethereality of the CMB with shimmering Wixárika beadwork and the twisting, undulating surfaces of the gourds confronts us with the inextricable connections among the origins, sustenance, and future of life.

(Amanda Tobin Ripley)

CMB RGB, 2022
glass beads, gourds, pine sap, beeswax, cosmic microwave background visualization.
13 gourds, various dimensions

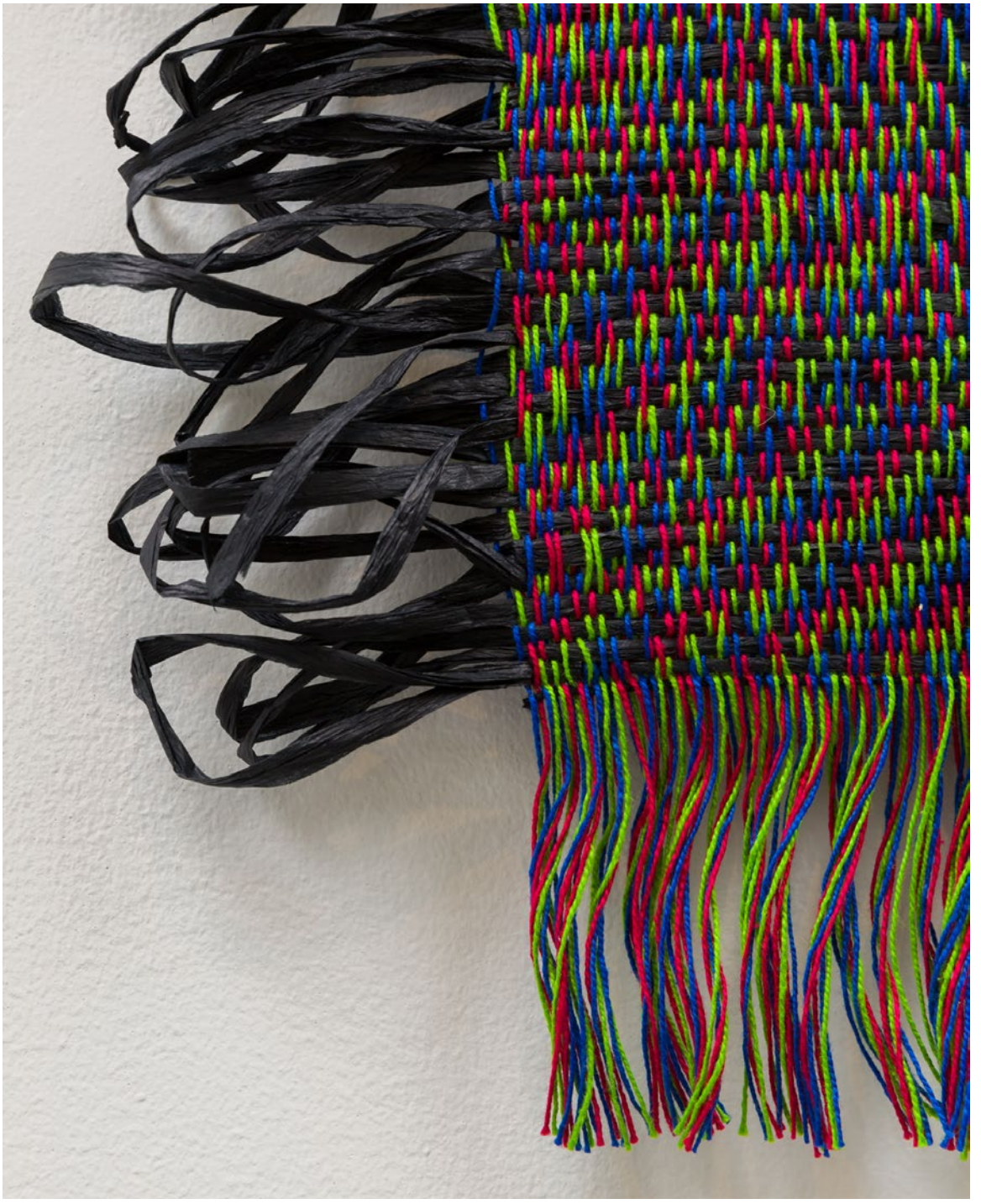
RGB

In 1981, John McPhee coined the term *deep time* in his book *Basin and Range* (1981) to describe the long span of geologic history. Geologic time is inconceivably greater than the time scale of human existence, making it near impossible to imagine the vastness of the past. McPhee offers a bodily metaphor to understand human history relative to Earth's geologic age: if one were to imagine the timeline of Earth's existence as the distance from a person's nose to the tip of their outstretched hand, then one stroke of a nail file on the middle finger would be enough to erase all of humanity from the record. Deep time, however, stretches back even before the planets, extending to the Big Bang. Scientists have a means of visualizing deep time back to the beginning of the universe by mapping the cosmic microwave background (CMB). CMB is the leftover "relic" radiation imprinted all throughout the universe, dating to shortly after the Big Bang. Soon after its discovery in the 1960s, scientists began mapping CMB. It was not until 2018, however, that scientists were able to create a full rendering of CMB's presence. CMB maps visualize the origin of the universe, displaying the oldest and most distant light; NASA calls them "baby pictures of the universe."

Sarah Rosalena's textile series *RGB* (2022) materializes the CMB in physical form. To make her weave draft, she extracted the red, green, and blue color values from the digital image of the CMB and assigned them to the warp of her twenty-four-shaft dobby loom. These digital bits of color, which represent the invisible origins of all light, take solid form through Rosalena's chosen natural, earthly materials and her careful manual labor. The repetitive pattern creates a vertiginous moiré effect that makes the tapestry appear to be trembling, expanding in and out of depth. Now in textile form, one can imagine the CMB not as a flat digital image on a screen, but instead as the material that cloaks and covers every object in the universe. Rosalena uses the CMB maps to think back to the beginning of time and to make possible new relationships to scientific data through material craft practices and embodied knowing.

(Maika Kagawa Bahr)

RGB, 2022
cotton, paper yarn
26 × 30 in.



RGB [detail], 2022
cotton, paper yarn
30 × 26 in.

RGB, 2022
cotton, paper yarn
22 × 18 in.

Weaving Processes and Computing

Hannah McCasland

Patented by Joseph-Marie Jacquard in 1804, the Jacquard loom is a punch-card programmed weaving device that enables the easy production of complex textile patterns, such as brocade and damask. The horizontal thread, the weft, intricately travels between an array of vertical threads, the warp, as they lift and lower. Punch cards act as instructions for the loom to weave a pattern, controlling the warp's ability to allow the weft to pass through.

Each unique pattern requires a custom set of punch cards to control the warp and weft. When a card is placed into the Jacquard mechanism, each hole becomes a place for a pin to pass through, causing the thread hooks to rise. Before Jacquard's invention, master weavers and their assistants painstakingly did this skilled work by hand. Jacquard's invention automated skilled labor and thus drastically affected the material and aesthetic value of textiles in modern culture.

Perhaps the most notable legacy of the Jacquard loom is its relationship with the development of computing. The binary code of the Jacquard punch cards inspired the inventor and mathematician Charles Babbage to invent the analytical engine, the very first design for a general purpose computer. Babbage's collaborator, mathematician Countess Ada Lovelace, researched Jacquard's weaving system and realized that she could likewise use punch cards to program Babbage's machine, authoring what is now considered to be the first computer program.

While the recognition of Lovelace's role in the history of computing was long overlooked, her innovations form the basis of modern computer programming. Attending to the intertwined histories of weaving and computing reveals the hidden and often disregarded contributions of women in scientific discovery, a theme that runs through Sarah Rosalena's work. It also calls attention to how weaving and computing continue to be tightly related,

as contemporary Jacquard looms are now controlled by computers.

Rosalena utilizes both a standard mechanized Jacquard loom and a manual TC2 Digital Weaving Machine to make her textile works. A standard mechanized loom is a computerized Jacquard loom that replaces the human hand with a machine. Rosalena composes bitmaps—grids of pixels with individual color values—to digitally dictate the loom's weaving output at the scale of one pixel per thread. A TC2 manual Jacquard loom puts the human hand back into the process of weaving by using a manual running shuttle. The weaver creates the weft by hand, allowing for more manual control of an otherwise automated procedure. This opens opportunities for error and chance effects, as well as real-time choices and interventions. Rosalena's weaving practice plays with the linked and looped histories of textile and computing technologies, using error and innovation to permit hidden figures and suppressed stories to appear.

STANDARD CANDLE

The *Standard Candle* weavings investigate the role that Los Angeles's Mount Wilson Observatory played in conquering the mysteries of space. Until the 1950s, the observatory's 100-inch Hooker reflector telescope operated as the preeminent tool for measuring the universe and proving its expansion. These investigations served as an origin point for subsequent scientific discoveries and pursuits, including endeavors to visit and inhabit other planets.

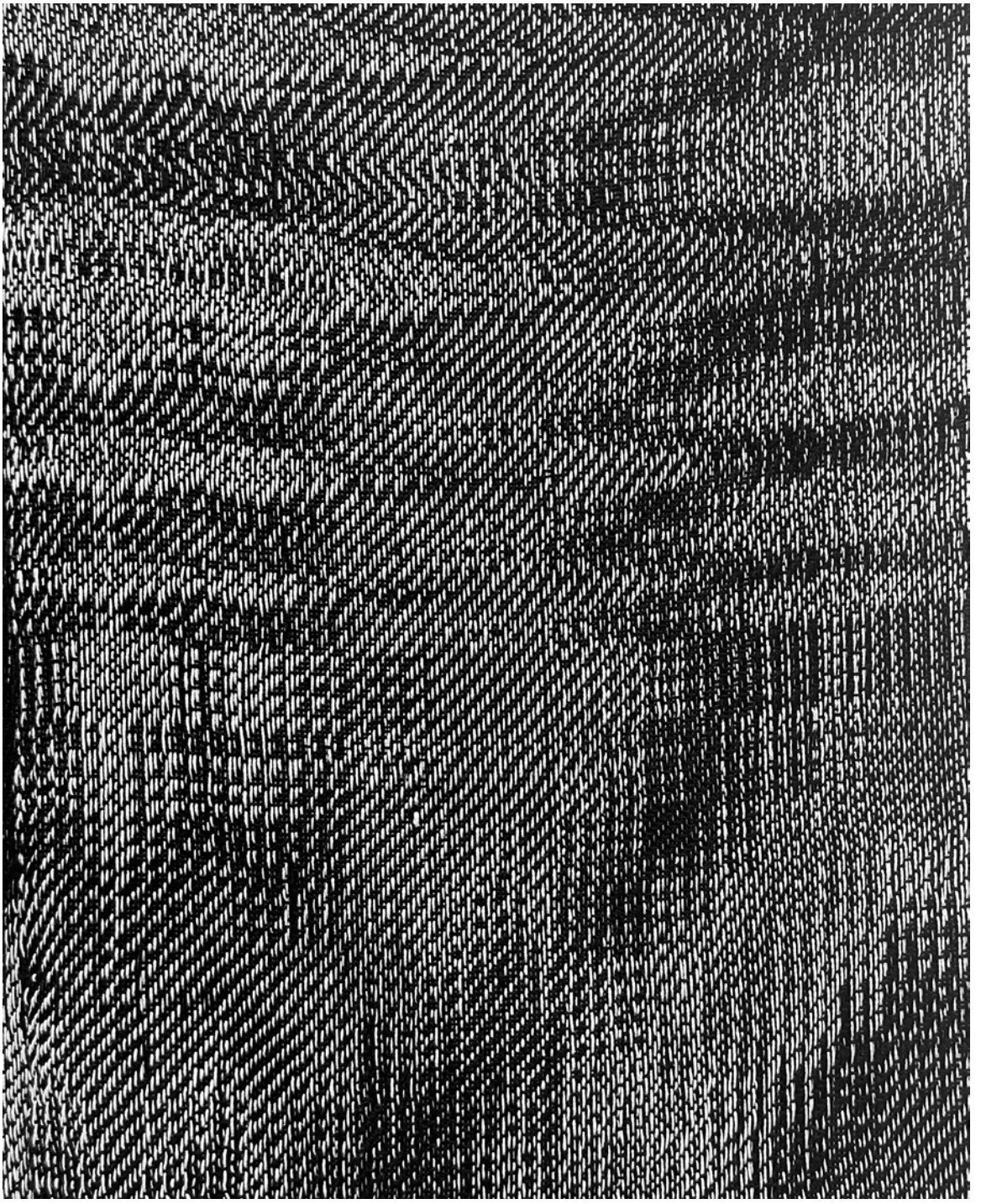
Rosalena's weavings call attention to the uncredited, and often forgotten, women who worked as mathematicians for the observatory. Referred to as "computers," these women analyzed data from silver nitrate-coated photographic plates that astronomers attached to telescopes to capture starlight.

Standard Candle reinforces the connections among computation, craft, and "women's work." Rosalena created these textiles on a programmable hand loom related to the original Jacquard machines, which used punch cards to create textile patterns and are thus considered the precursors to modern computers. She weaves women back into the histories of computation, citing both Ada Lovelace who, inspired by Jacquard, wrote the first program for Charles Babbage's analytical engine and computers like Henrietta Swan Leavitt. Leavitt, an astronomer working at Harvard College Observatory, authored the standard candle algorithm, which measured light variations to calculate the distances between individual stars. Her algorithm, which enabled Edwin Hubble's paradigm-shifting discoveries, among many others, also served as the weaving template for these three textiles. After graphing the data, Rosalena wove it by hand on a Compu-Dobby programmable loom using black and white cotton and fine silk, gradually shifting the graph's variables over time. The resulting weavings shimmer and flicker, encouraging one's eyes to dart across the surface of the textiles and get lost in the infinite vacillations of individual threads.

The interwoven rectangular sections visualize the algorithm's calculations. The fluctuating dominance between their black and white threads tracks the individual luminosities of Cepheid stars, which pulse with varying brightness over regular periods of time. Rosalena's materialization of this data highlights Leavitt's 1912 discovery. While other components of the *Standard Candle* project, like the beaded plates and UV reactive textiles, recreate the imagery found on the photographic plates studied by computers like Leavitt, these three textiles serve as a counterpoint, reflecting the information these women meticulously drew from them.

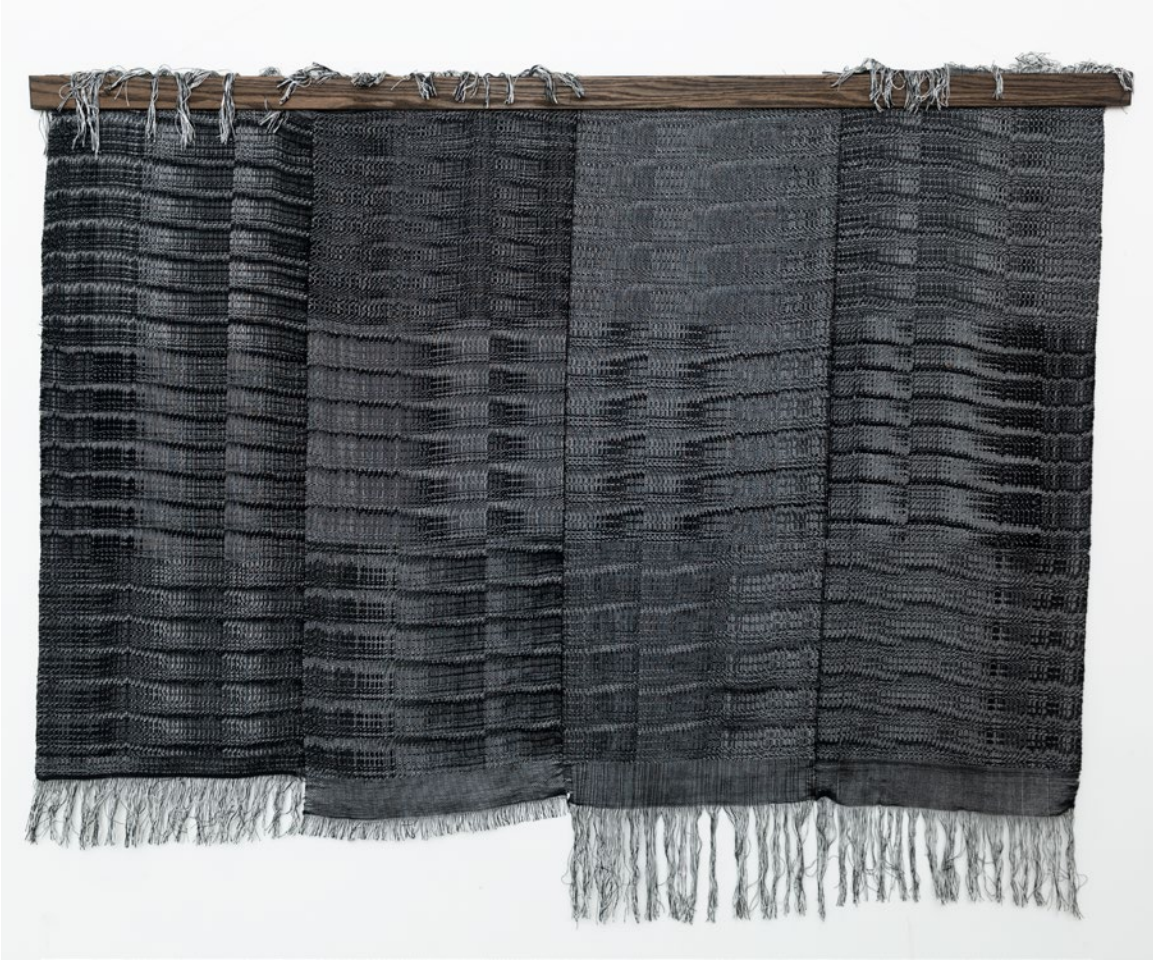
Observatories often operate as black boxes that obscure their own histories and emphasize the information revealed through the help of their machines rather than by the people who made such discoveries possible. Institutions like Carnegie Observatories Archives—which contains Mount Wilson's photographic plates—preserve very few traces of the computers' identities or of the specific reasons they used particular plates in their studies. *Standard Candle*, conversely, decenters the observatory and breaks its focus on instrumentation by emphasizing how their calculations form the foundations of current astrological research and the collective imagination of what lies beyond this world.

(April Riddle)



Standard Candle [detail], 2021
cotton yarn
45 × 49 in.

Standard Candle, 2021
cotton yarn
45 × 59 in.



Standard Candle, 2021
silk yarn
65 × 52 in.

EXPANDING AXIS

Expanding Axis is a collection of ten beaded reproductions of photographic plates analyzed by women working at Mount Wilson Observatory in the 1920s. These "computers"—whose title would only later apply to machines—studied the images captured by the 100-inch Hooker telescope, physically marking the surfaces with gridlines and notations to calculate the variability of starlight. Their calculations mapped outer space and established our position in the galaxy; the plates index the exact moments of these discoveries, but also the erasure of women from this history.

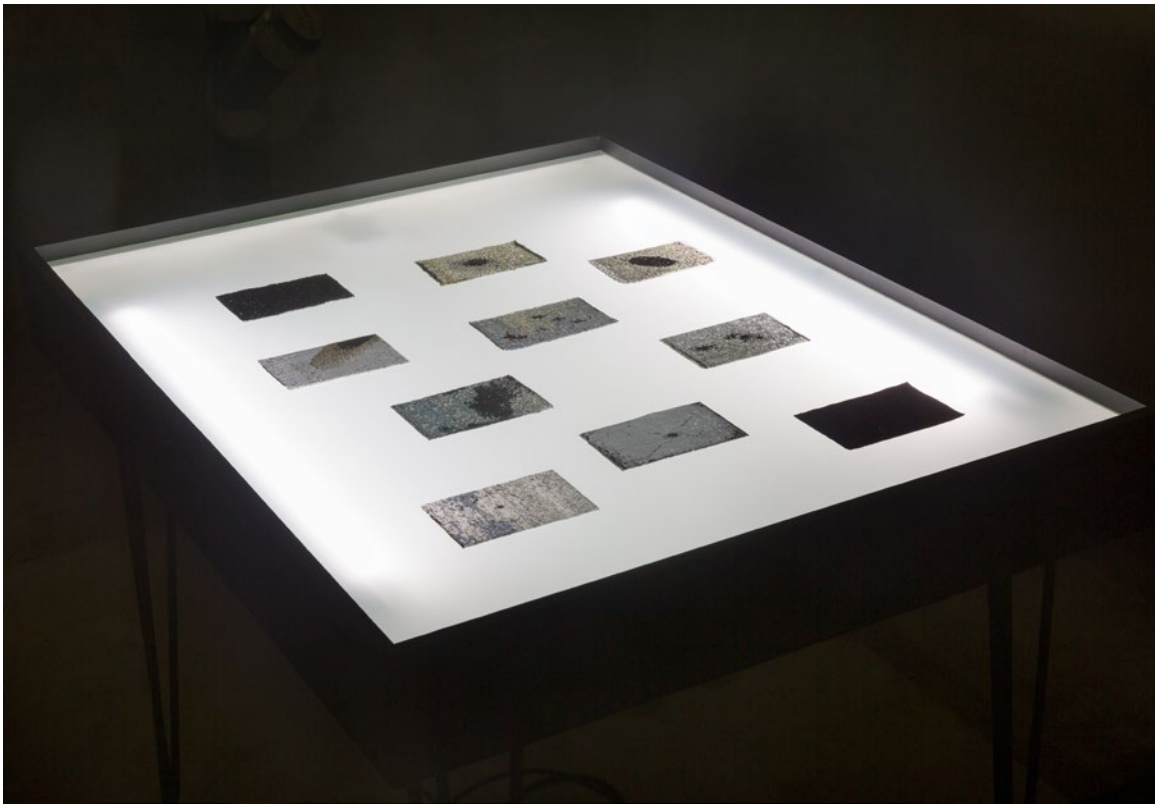
The slow beading process required to reproduce these plates allows Sarah Rosalena to painstakingly reembody the labor of the disavowed computers of Mount Wilson and brings their history to new light. Rosalena wove the images on a Wixárika handloom, which had been passed down to her from her mother, using techniques taught to her by her grandmother. The woven works mimic the exact dimensions of the original plates and reproduce their archival color. Just as the plates were broken down into individual units of vision using grid tools, the beads act as pixels that divide the plates into physical, manipulable points.

At this scale, however, the beads cannot replicate the resolution of the original photographs. The beaded imagery thus prompts one to consider the information lost in this material translation, but also offers the opportunity to consider what different knowledge these manipulations might produce. While the data drawn from these photographs is often considered objective and universally factual, the beaded plates deprioritize the value placed on this extracted information and make room for multiple cosmologies.

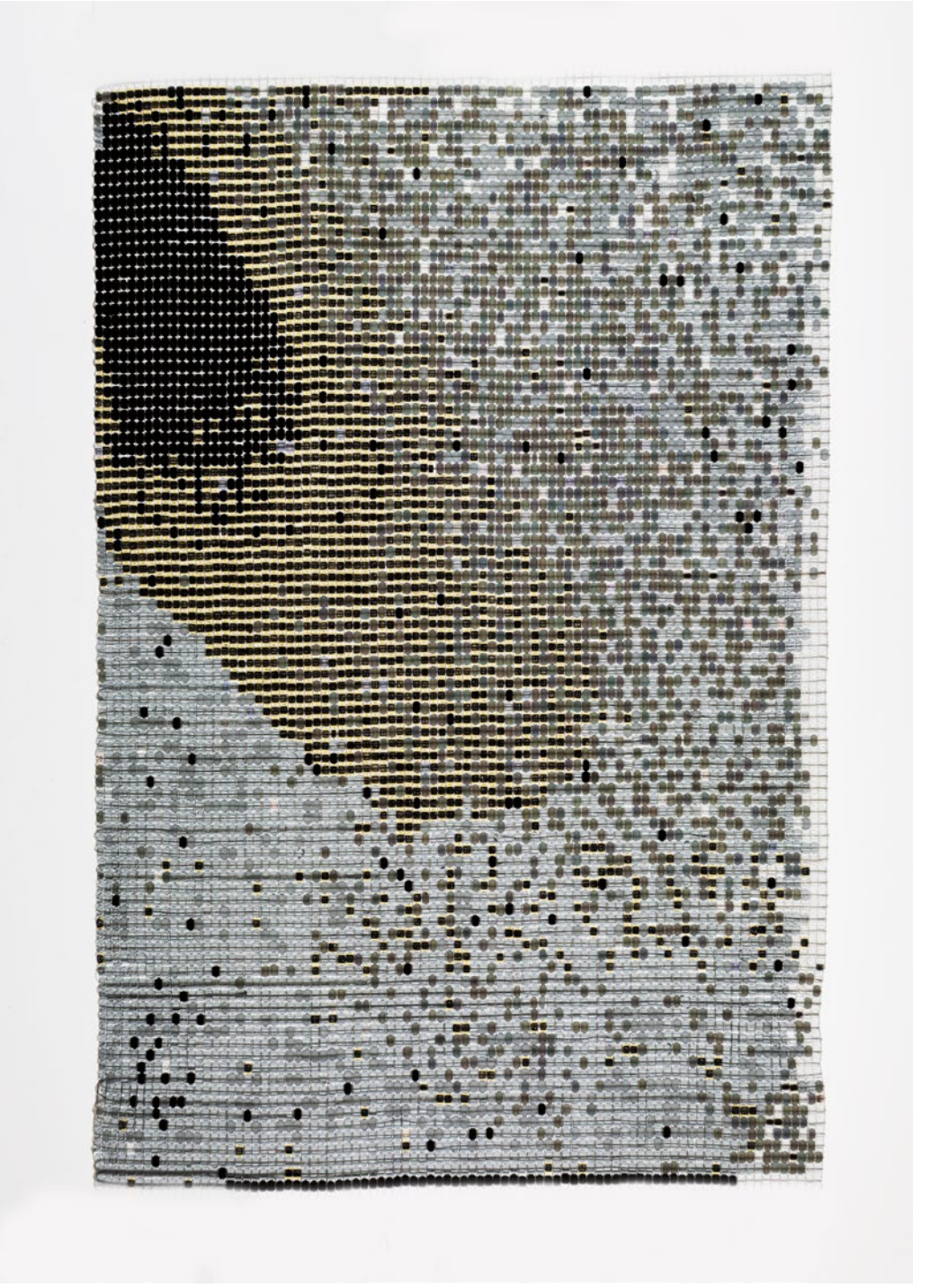
The glass beads, illuminated from below on a light table similar to how the astronomers' glass plates would have been viewed, appear to pulse and animate the celestial bodies. Displayed together, they encourage one to draw comparisons between them. Though the majority of the ten plates resolve into clear, albeit mysterious, celestial bodies, two black plates stand out in their refusal to identify or reveal. These are reproductions, like the other plates, but they exist in the archive as errors rather than as prized artifacts, the overexposure rendering them useless for scientific study.

These plates operate differently here. In recreating and displaying them with the others as valued traces of the buried history of this site, Rosalena summons darkness as a potential exit point from the legacies of dominating the unknown that continue to fuel many of the observatory's activities to this day. Mount Wilson and the institutions developed in its shadow, such as Caltech and the Jet Propulsion Laboratory, are not neutral zones of discovery. Though they produce some forms of knowledge, there remain much more to embrace and cherish by entering the darkness.

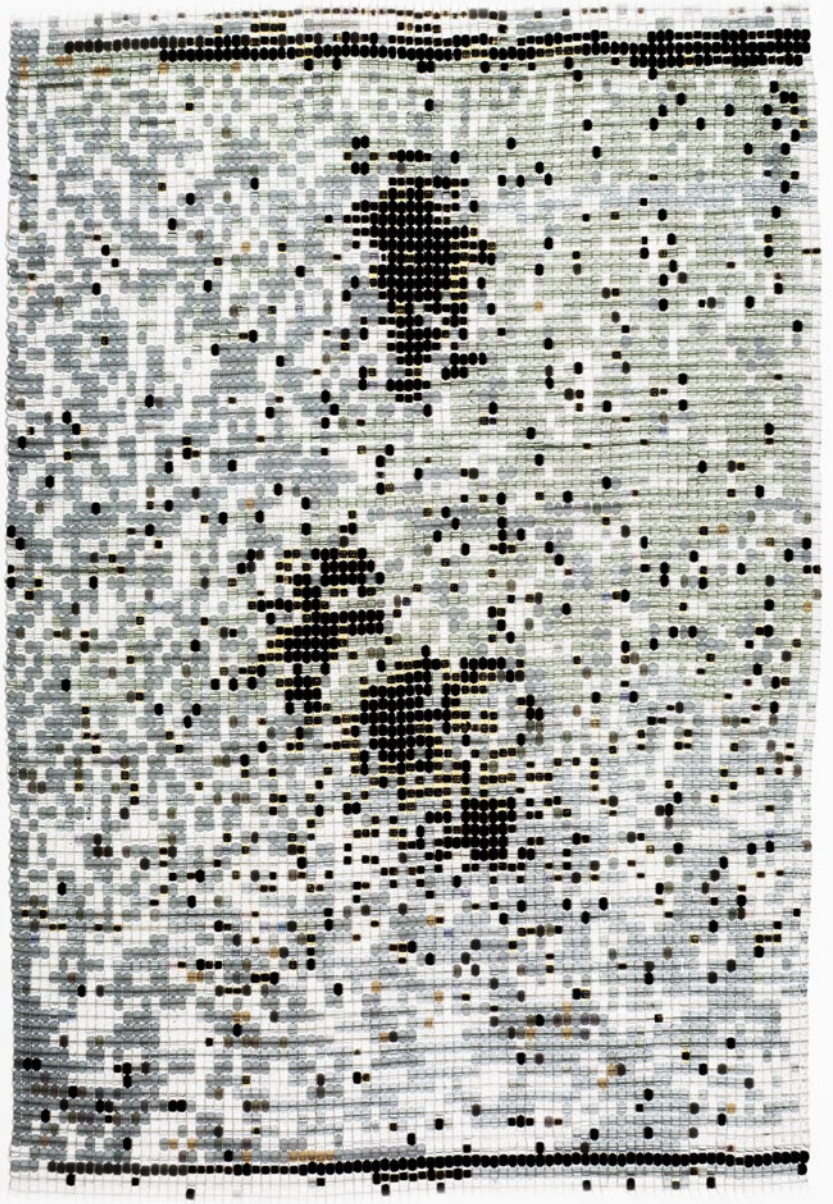
(April Riddle)



Expanding Axis, 2022
glass beads, nylon thread
10 works, 4 × 6 in. each



Expanding Axis, 2022
glass beads, nylon thread
4 × 6 in.



Expanding Axis, 2022
glass beads, nylon thread
4 × 6 in.

EXIT VAR!

Exit VAR! uses glass beadwork to recreate the famous "VAR!" photograph that astronomer Edwin Hubble used to identify the Andromeda Galaxy and prove the existence of other galaxies beyond the Milky Way. Hubble typically receives sole credit for this discovery, but his findings relied on the research of Henrietta Swan Leavitt, a "computer" who, while working at Harvard College Observatory, developed the standard candle formula to determine the variable light of stars (VAR). Hubble's application of Leavitt's formula enabled his realization that the star he was observing in the photograph was from galaxy outside of our own.

The erasure of Leavitt's role in Hubble's discovery is, unfortunately, representative of much of the history of women working in observatories in the twentieth century. At Los Angeles's Mount Wilson Observatory, where Hubble made his marks on the "VAR!" photograph, the men allowed to directly observe astral objects through telescopes were valued and praised far more than the women who calculated and organized the data extracted from the photographic plates. The "computers," as the female astronomers were called, were even physically separated from the site where men captured images of the night sky. They worked in offices in the suburbs at the base of the mountain in Pasadena. As part of the *Standard Candle* project, Sarah Rosalena conducted research in the observatory's archives to gain a deeper understanding of the role these women played in the discoveries at Mount Wilson. The lack of information she found, demonstrated by erased logbooks, eventually led her to converse with archivists at Harvard College Observatory to fill in some of the gaps in the written accounts.

While individual traces of these women and their work could be only partially recovered through intensive investigation, much can be learned from their strategic erasure, which suggests a countertactic to decenter prized discoveries and their vestiges in astronomical history. Rosalena's recreation of the "VAR!" plate, for instance, obscures Hubble's markings on the photograph and pulls the viewer into the center of the shimmering star. Rather than exactly reproducing the dimensions of the original plate—as in *Expanding Axis* (2022)—*Exit VAR!* dissolves into long, trailing tendrils of beads and expands across the light box that illuminates it from below. Rosalena demonstrates the impossibility of fully recapturing such histories by making this data unknowable. Through her manual override, the extensions break the gridwork imposed on the plates for mathematical study and stretch out toward new and unknowable endpoints, dissolving what appear to be the firm boundaries of this discovery and making room for the disavowed histories hidden within.

(April Riddle)

Exit Var!, 2022
glass beads, nylon thread
23 × 4 in.

STANDARD CANDLE (IN DARKNESS)

Sarah Rosalena wove this set of five UV reactive tapestries as part of her larger *Standard Candle* series. She transforms the imagery found on the photographic plates of Mount Wilson Observatory's archives using light-reflective materials woven on a TC2 manual Jacquard loom. To craft these, Rosalena first laboriously patterns the images into weave drafts in Adobe Photoshop, generating a bitmap, a computer-readable simulation of what the textile will look like. She then introduces glitches into the images: she lowers their resolutions, warps their sizes and scales, and zooms in and out, using embodied gestures and subjective choices to distort the apparently objective information captured on the plates. These disruptions return mystery and the unknown to these objects of scientific study and mastery.

In her textiles, the flattened photographic images expand back into depth. Viewing them up close reveals immense textural variation, which stalls attempts to easily identify the celestial bodies the yarn visualizes. While some threads are tightly locked together, others hang loosely, draping over each other. From afar, these irregular patterns seem to blend, generating views of night skies filled with millions of stars.

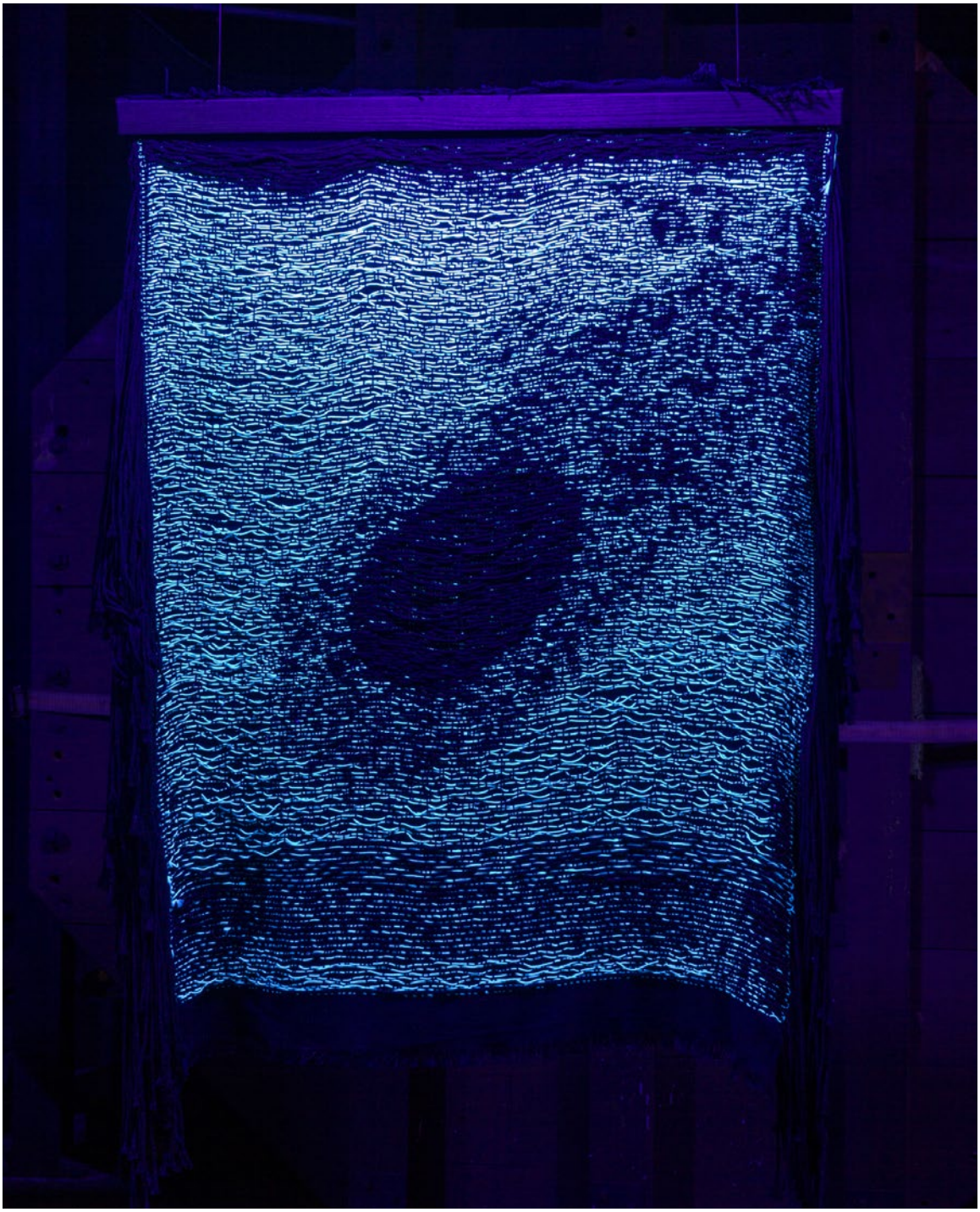
Woven in part from UV reactive yarn, these textiles need total darkness to become fully visible and thus mimic the conditions required to make the original plates and their related discoveries. Unlike the beaded plates of *Expanding Axis* (2022), which are illuminated from below, these tapestries appear to radiate their own light, immersing viewers in an expanding neon universe.

Rosalena originally produced these textiles for her May 2023 exhibition, which was held inside the base of Mount Wilson's 100-inch Hooker telescope. For Rosalena, this institution is the origin site of a worldview that presumes universal value in observatories and their intentions to map and control outer space at the expense of harming the sacred sites they occupy. These endeavors compel scientists to move further and further into Indigenous lands in pursuit of the darkness they ultimately destroy, as witnessed at sites such as Mauna Kea in Hawai'i. Mount Wilson's importance lured aerospace industries to Southern California, contributing to the vast growth of the region. The dark conditions necessary for taking the photographs that Rosalena studied cannot be recreated at Mount Wilson today. As light pollution crept over the San Gabriel Mountains, most of the observatory's prized instruments fell into disuse. All that remains now are traces of arrested light captured on unceded Tongva land.

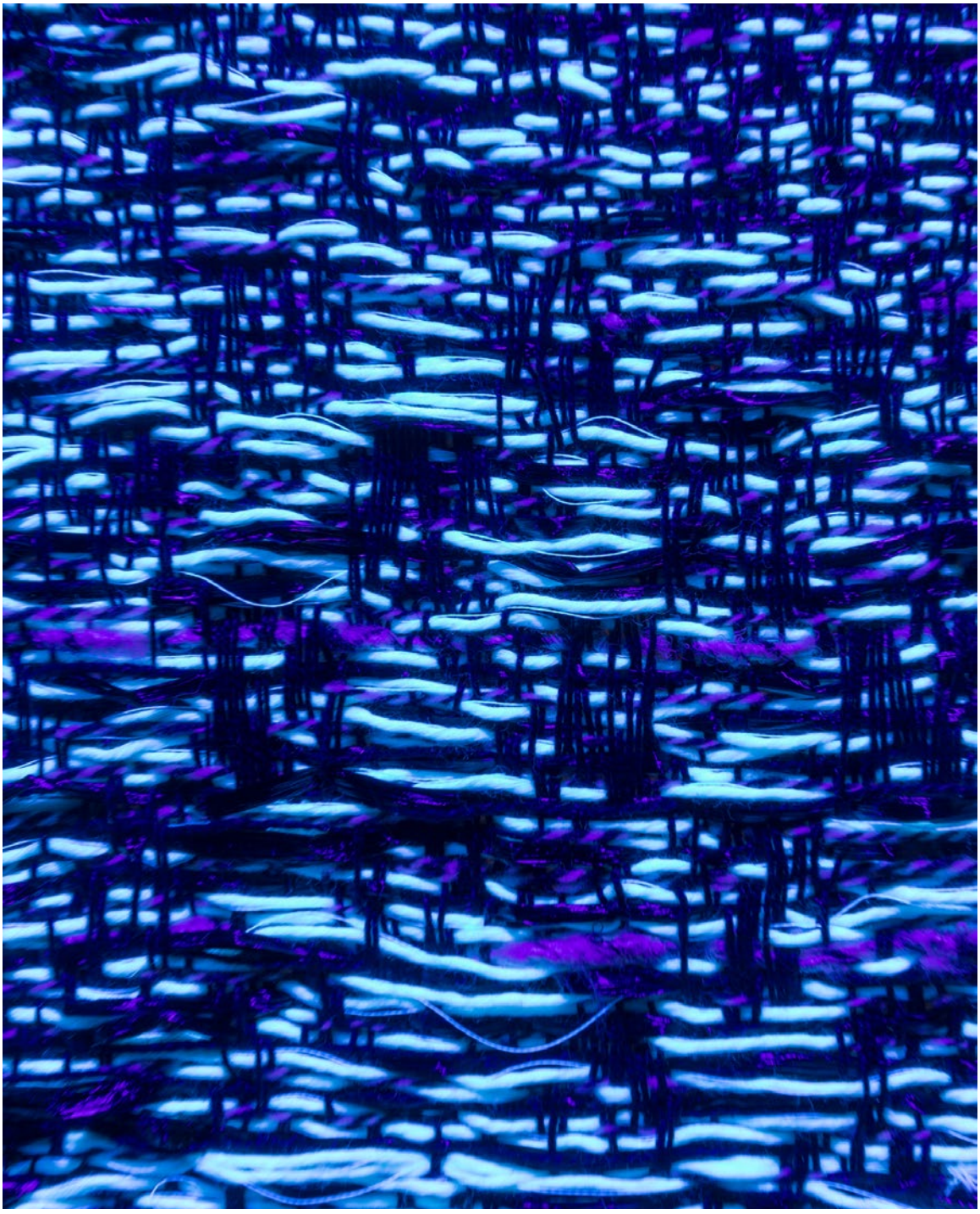
Rosalena's repatterning of these fragments of information necessarily illuminates some details while dimming others, offering the possibility of valuing darkness, embracing mystery, and putting these records to uses beyond the domination of the unknown. Activated by the very darkness destroyed by the observatory, her textiles cast light on different forms of knowledge and overwrite the site's origin story by speaking to the infinite, expanding universe, which one can never fully grasp.

(April Riddle)

Standard Candle [installation view], 2023
Mount Wilson Observatory
May 20–June 18, 2023



Var!, 2023
glass beads, cotton yarn, UV reactive yarn
53 × 41 in.



A6990, A3393, D11362 [detail], 2023
cotton yarn, UV reactive yarn
56 ½ × 41 in.

Glitches, Anti-Vessels, and Worldbuilding

Julia Harth

The common usage of the word *glitch* began in the 1960s in the context of space exploration. Astronaut—and later Ohio senator—John Glenn explained that while the term originally referred to the effects of a change in voltage, the definition of *glitch* expanded to indicate any technical problem that his team faced.[1] Today, glitches are widely associated with errors. More than just a mistake, a glitch—in its original definition—references potential energy. Curator and author of *Glitch Feminism* Legacy Russell reclaims this earlier meaning to open up ways of existing between binaries, inhabiting contradictions, and embracing hybridity in our personal, political, and embodied lives. "Glitch," she writes, "is all about traversing along edges and stepping to the limits…claiming our right to complexity, to range, within and beyond the proverbial margins."[2]

Rosalena, too, utilizes glitch as a tool to push her audience to see beyond conventional boundaries and binary divisions. She creates room for errors, breaks, and slacks in her computer-programmed weave patterns, performing what Russell would refer to as forms of refusal, calls to action, sociocultural malware, or a means of worldbuilding.[3] Rosalena advocates for interruption and capacious disruption as means of interrogating colonial histories of domination and extraction. Her works create opportunities to imagine alternative futures and to exit a present that clings to neocolonial logics and hierarchies. Here, glitches function as "deco-

1 Emily Siner, "What's A 'Glitch,' Anyway?: A Brief Linguistic History," *NPR*, October 24, 2013, https://www.npr.org/sections/alltechconsidered/2013/10/24/239788307.

2 Legacy Russell, *Glitch Feminism: A Manifesto* (New York: Verso, 2020), 37.

3 Russell, *Glitch Feminism*, 21–25, 135.

lonial cracks," offering possibilities for resistance and resurgence.[4]

The *Transposing a Form* (2020) ceramics, for instance, read as glitched bodies or, in Russell's terms, "anti-bodies."[5] The clay "anti-vessels" challenge imposed binaries, blurring the boundaries between human and machine labor through a 3D-printing process. This fluidity creates indeterminacy as well as a form of potential energy. Through glitches, indeterminacy, and a refusal to close or contain, Rosalena's anti-vessels assert the hybridity and dynamism of identities, including her own.

The multiplicity and movement that characterize Russell's glitch feminism are also key to Indigenous ontologies. Blackfoot writer and activist Leroy Little Bear proposes three tenets of Indigenous science: everything is animate, everything is in constant flux, and everything consists of energy waves.[6] Respecting the animacy of her artworks, Rosalena creates multiple points of entry and exit to encourage multidirectional flows of energy. Connecting the ideas of Indigenous relationality and nonlinear flow, artist and Indigenous scholar Sebastian De Line suggests that entanglements between beings are opportunities for Indigenous self-determinacy and the decolonization of belief systems.[7] Embracing entanglement in her artistic practice, Rosalena engages in a form of anti-colonial worlding. She questions colonial narratives surrounding exploration, centers Indigenous knowledges, advances creative applications of technologies, and considers our shared futures. As exit points, Rosalena's glitches provide an opportunity to reimagine and co-create our world.

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4 Catherine E. Walsh, "On Decolonial Dangers, Decolonial Cracks, and Decolonial Pedagogies Rising," in *On Decoloniality*, eds. Walter D. Mignolo and Catherine E. Walsh. (Durham. NC: Duke University Press, 2018), 81–98.

5 Russell, *Glitch Feminism*, 107.

6 Leroy Little Bear, "Native Science and Western Science: Possibilities for Collaboration" (paper presentation, Heard Museum, Phoenix, AZ, March 24, 2011).

7 Sebastian De Line, "A Generous and Troubled Chthulucene: Contemplating Indigenous and Tranimal Relations in (Un)settled Worldings," *Graduate Journal of Social Science* 14, no. 2 (September 2018): 83–106.

EXIT GRID

Sarah Rosalena based her tapestries titled *Exit Grid* and *Exit Grid Spectra* on visible light spectrum diagrams. These diagrams distinguish colors by mapping out variations in their wavelengths, which are determined by temperature. Studying such differences allows one to ascertain the elemental compositions of objects and atmospheres, monitor radiation, and track environmental changes. Dividing color in this way also allows astronomers to classify stars.

Rosalena hand dyed the wool yarn used to produce these textiles, which challenge endeavors to map visible differences. Though the stripes of color appear distinct when viewed at a distance, closer inspection reveals how they bleed into one another. This ombre effect oozes throughout the textiles' black grids, disintegrating defined color boundaries and, at times, overtaking the gridlines entirely. What might at first appear as isolated red, green, and blue pixels—the essential colors of digital display technology—break down here, collapsing the straightforward divisions between the handmade and digital. A companion work, *Exit Grid Paper* (2023), draws on the research artifacts produced by mathematicians and astronomers in their observations and calculations, such as graph paper, punch cards, and logbooks. The verso of the tapestry materializes a connection with these documents and the computers' labor by revealing loops of paper tape running through its weft.

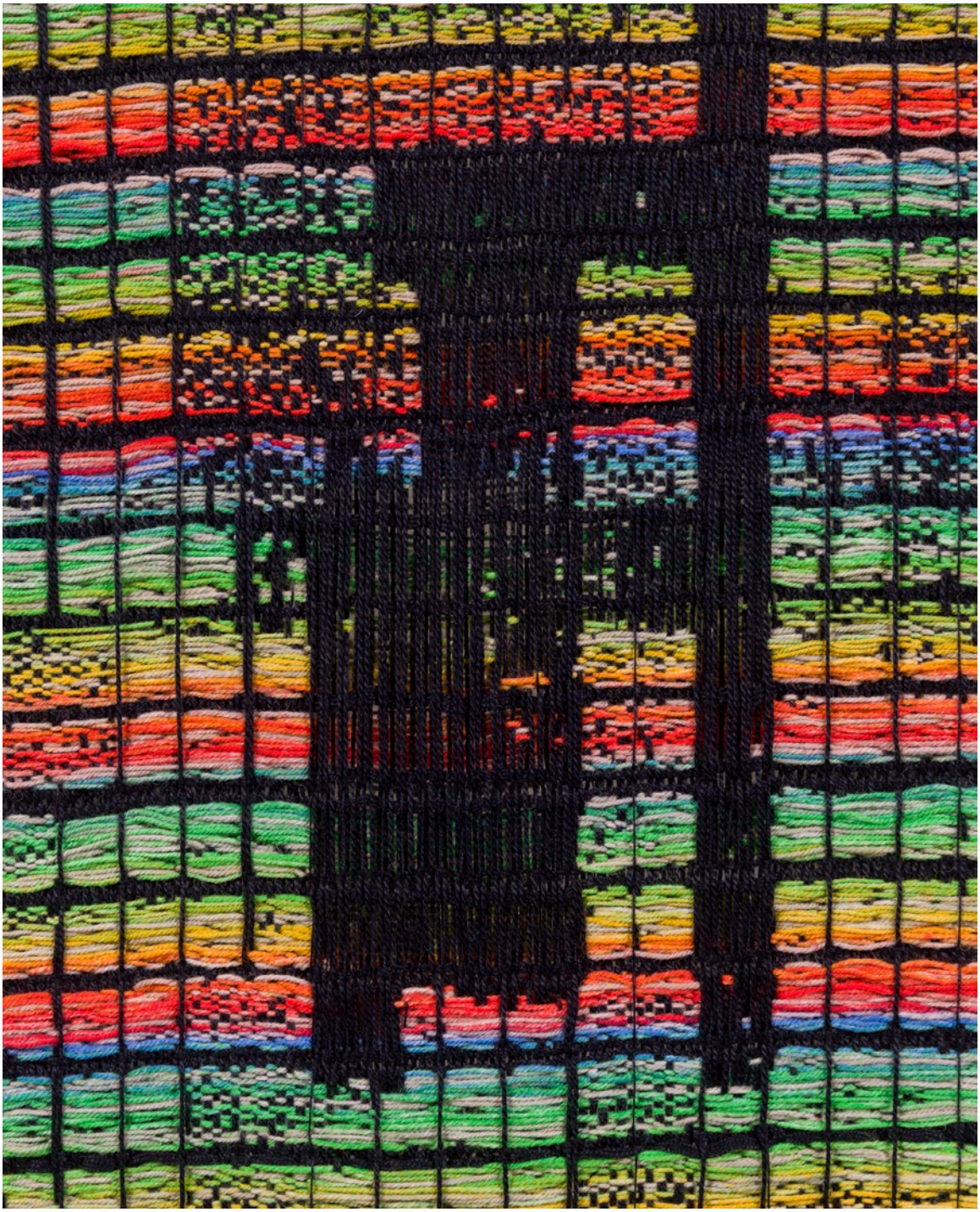
Black glitches spread across the surfaces of both textiles. Like dead pixels on a digital screen, they disrupt attempts to view the works continuously. These noisy distortions break the grid and allow for an exit from the shallowness of Euclidean space and linear time, which render the universe fully masterable and knowable, and instead call for an understanding of the world as beyond measurement and borders.

Exit Grid Spectra's grid appears tight and consistently spaced at the top, but falls apart toward the bottom of the textile, where its lines become thinner and irregularly spaced. Some lines droop from the surface of the textile while others become engulfed by the colored bands of yarn. While *Exit Grid Paper*'s grid appears more consistent, it breaks down in a different way, as one can see directly through many of the loosely woven black bands at the bottom of the textile.

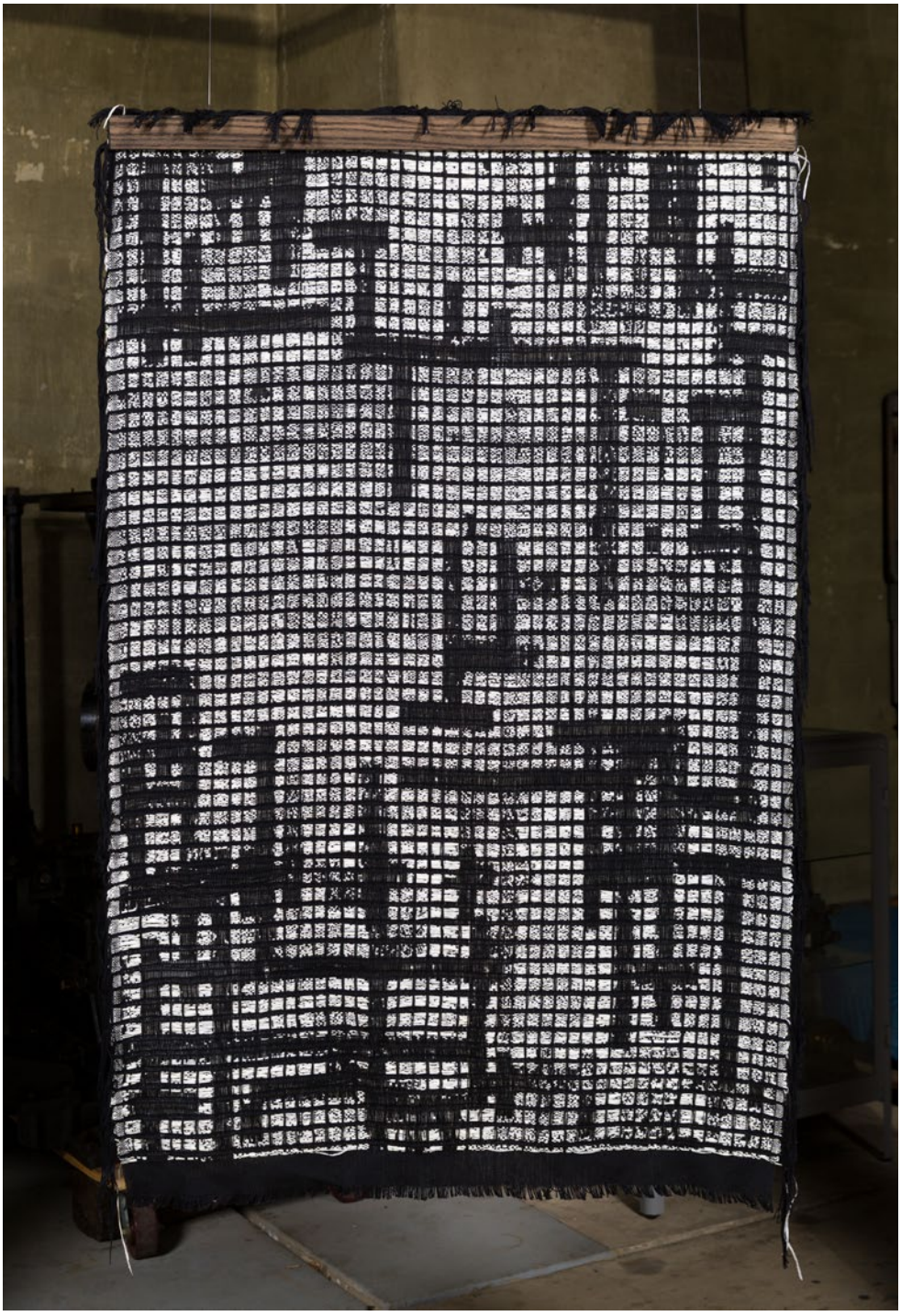
Rosalena's tapestries begin as digital designs that she then interprets manually during the weaving process. Though she plans some of these errors in the creation of her digital weave draft, she inserts others as she slowly weaves both tapestries in partnership with her loom. These handmade glitches, which she introduces as sites of transformation, allow her to override the grid and manually exit Eurocentric efforts to divide the universe. The fray of both textiles also welcomes the physical and metaphorical unraveling of these patterns. *Exit Grid Paper* and *Exit Grid Spectra* do not have clear endings or borders; their fray acts as an infinite glitch that cannot resolve into measurable, geospatial edges.

(April Riddle)

Exit Grid, 2023
cotton yarn, hand-dyed wool yarn
52 × 40 in.



Exit Grid [detail], 2023
cotton yarn, and-dyed wool yarn
52 × 40 in.



Exit Grid Paper, 2023
Cotton yarn, wool yarn, paper yarn
52 × 41 in.

POINTING STAR (SCULPTURES)

Sarah Rosalena's exhibition at the Columbus Museum of Art takes its title from one of the sculptures in her *Pointing Star* series, *In All Directions* (2021). Like the other works in the series, such as *Axis* (2023) and *Pointing Star* (2023), *In All Directions* is a 3D-printed stoneware object that adopts the theme of the compass as a central motif and as a site for the anti-colonial questioning of the logics of mapping and "discovery." Each object is a rich, iridescent gray-black, a result of smoke firing at a high temperature with wood and paper to capture its carbon color. The resulting sculptures appear impossibly old and weathered, despite bearing the telltale signs of their high-tech manufacture. They evidence the elemental forces of earth, fire, water, and air at the same time as they speak of the abstract methods of cartography and computation.

Rosalena deploys the eight-pointed star motif throughout the *Pointing Star* ceramics and their related textiles. While the shape may recall the compass rose that appears on most maps and globes as a symbol of the cardinal and ordinal directions, the eight-pointed star functions as its opposite. The compass rose is a symbolic, Western construct that allows for the representation of the Earth's complex topography as a flat, cartesian space in which a mere navigational vector of direction and magnitude is sufficient to describe the relationship between any two points. It is a colonial tool that produces mapping and cartography as forms of exploitation, extraction, and control of Indigenous peoples and lands.

In Rosalena's work, the eight-pointed star functions, conversely, as an "anti-compass." It does not denote direction on a flat surface but rather the potential for omnidirectional and multidimensional expansion from a single point of origin. Each of the *Pointing Star* ceramics serves as a microcosm of this process: coils of machine-extruded clay are layered on top of one another to create the form of each sculpture, rendering the concept of potentially endless expansion visible. The structure of each sculpture is always built upon itself, forever expanding outward into the infinite.

(Mia Kivel)

Pointed Star, 2023
Smoked stoneware,
3D ceramic print, stoneware
14 ½ × 16 × 11 in.

In All Directions, 2021
smoked stoneware, 3D ceramic print
6 × 5 × 6 in.

Axis, 2023
smoked stoneware, 3D ceramic print
9 × 9 × 3 in.

POINTING STAR (TEXTILES)

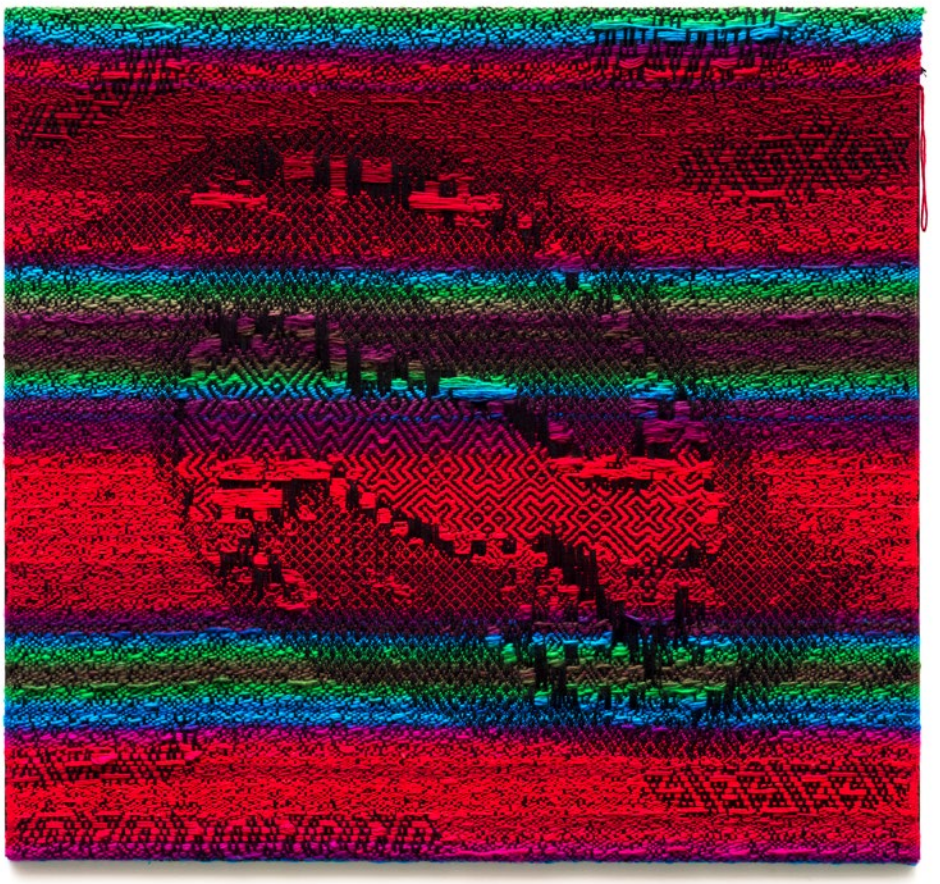
Spiral Arm (2023), *Spiral Arm Blue* (2023), *Eight Pointed Star* (2023), and two tapestries both titled *Dissolve* (2023), collectively comprise the textiles in Sarah Rosalena's recent suite of works, *Pointing Star*, which takes the eight-pointed star as its central motif. The textiles are handwoven from wool and acrylic yarn on a TC2 digital Jacquard loom, a machine that hybridizes programmability and manual production. In its woven form, the eight-pointed star appears not as a single iteration of a stable, fixed shape but as a fractured, fractal pattern. Each instance of the star conjoins with the next in an expansive field. The pattern flickers in and out of view across the colorful red, blue, and green threads of the background.

As Rosalena employs it throughout this series, the eight-pointed star represents omnidirectional expansion outward from a single point. It is an "anti-compass" that disturbs Western epistemologies and worldviews that use mapping and cartography as tools of exploitation, extraction, and control. In Rosalena's words, the eight-pointed star instead "points to the boundless, borderless, and infinite, symbolizing the potential of a cosmos outside of the Western gaze." Her patterns convey a sense of ceaseless movement that is duplicated by the viewer who attempts to follow the twisting lines of the woven design. These designs, however, are not entirely abstract and geometric. Images of galaxies serve as the template of Rosalena's iteration of the eight-pointed star pattern, although they may not always be immediately identifiable in the completed textile. *Spiral Arm* and *Spiral Arm Blue* hide and reveal traces of the Milky Way amid their threads. One of the *Dissolve* textiles holds an image of the Andromeda Galaxy, offering the most recognizable application of this technique: the fractal lattice of star designs radiating out from the center of the textile in a pair of spiral arms that immediately suggest the centrifugal force of expansion at a cosmic scale.

Despite the epic magnitude of Rosalena's imagery, there is a material intimacy to the *Pointing Star* textiles that keeps them firmly grounded in the common experience of life on Earth. Traditional natural dyes, including cochineal and indigo, provide, respectively, the rich pink-reds and blues in *Spiral Arm* and *Spiral Arm Blue*. Though the textiles were created by a machine, she emphasizes the physical process of weaving by leaving their edges unfinished. Loose strands of yarn hang down from the sides of *Eight Pointed Star* and the *Spiral Arm* weavings, while a long, black fringe remains at the bottom of one of the *Dissolve* textiles. Ultimately, the *Pointing Star* textiles generate meaning through juxtaposing the cosmic and the earthly, the artificial and the natural, the handmade and the machine.

(Mia Kivel)

Spiral Arm, 2023
hand-dyed cochineal wool yarn,
cotton yarn, image source Milky Way Galaxy
33 × 41 in.



Dissolve, 2023
cotton, hand-dyed acrylic yarn,
image source Andromeda Galaxy
38 × 41 in.

Dissolve, 2023
cotton, hand-dyed acrylic yarn,
image source Milky Way Galaxy
36 × 41 in.

Spiral Arm Blue, 2023
hand-dyed indigo wool yarn, cotton yarn,
image source Milky Way Galaxy
28 × 38 ½ in.

Eight Pointed Star, 2023
Hand-dyed cochineal wool yarn, cotton yarn
33 × 41 in.

Indigenous Futurism

Maika Kagawa Bahr

Indigenous Futurism considers how Indigenous knowledge shapes the identities and futures of colonized peoples. The current ecological crisis looms over our era and affects how we can imagine the future. This existential threat may feel new, but Black and Indigenous communities have experienced "end of the world" scenarios continuously since the colonization of the Americas, Africa, and beyond. From the transatlantic slave trade to today's environmental threats—which disproportionately affect the Global South—settler-colonizers induce so-called apocalypses through enslavement, dispossession, and damaging (neo) colonial resource extraction. While Western culture envisions the impending end of the world as forthcoming, Black and Brown communities have already lived through periods of collapse, destruction, and rebuilding.[1] Many Indigenous artists and writers use science fiction and speculative tactics to reimagine what seems to be an inevitable post-apocalyptic fate by playing with the structure of linear time and drawing analogies between the temporalities in ancestral stories and experimental science, such as quantum physics. Having already experienced and survived an apocalypse, and yet often positioned as the remnants of archaic and "extinct" cultures, Indigenous peoples paradoxically seem to inhabit multiple human chronologies simultaneously; this offers the possibility for new narratives and alternative histories to form.

Indigenous Futurism also explores how Indigenous technologies are the past, present, and future of sustainability. Indigenous peoples are the carriers of advanced technical knowledge that can be

1 Kathryn Yusoff, *A Billion Black Anthropocenes or None* (Minneapolis: University of Minnesota Press, 2018).

life-giving in comparison to the destructive forces of Western capitalism.[2] For example, the NASA Centennial Challenges program, which began in 2005, invites competitors to build 3D-printed habitats for deep space exploration. The most efficient way to build structures on other planets will be to use the existing materials that are already there, and many of these "futuristic" designs resemble traditional adobe buildings. Craft practices formerly denigrated as primitive are now visions of innovative technological futures. Sarah Rosalena's artworks address the themes of post-apocalyptic survivance, science fiction, and the dissolution of linear time. They urge the viewer to recognize the ancient wisdom in Indigenous technologies, particularly in relation to the colonization of Mars and the ongoing climate crisis on Earth.

Looking ahead with hope requires what Indigenous literary scholar Grace Dillon calls "returning to ourselves." Dillon writes that this form of introspection "involves discovering how personally one is affected by colonization, discarding the emotional and psychological baggage carried from its impact, and recovering ancestral traditions in order to adapt in our post-Native Apocalypse world." In this return to oneself, the past, present, and future collapse and expand as one determines how to heal and rebuild through Indigenous technologies.[3]

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2 L. C. Cornum, "The Creation Story is a Spaceship: Indigenous Futurism and Decolonial Deep Space," *Voz á Voz*, 2015, https://web.archive.org/web/20220927090040/http://www.vozavoz.ca/feature/lindsay-catherine-cornum.

3 Grace Dillon, *Walking the Clouds: An Anthology of Indigenous Science Fiction* (Tucson: University of Arizona Press, 2012), 10.

How Do We Exit Museums?

Amanda Tobin Ripley

While the title of this exhibition, *In All Directions*, might imply movement, progress, or advancement, Sarah Rosalena emphatically focuses on the need to arrest and disrupt any unquestioned momentum. Photography historian Ariella Aïsha Azoulay deconstructs narratives of progress, exposing the colonial violence of the insatiable drive to accumulate and grow. "We do not require more grandiose motions forward," she argues, "but rather need slowed-down spaces for repairing, providing reparations, and reviving precolonial patterns and arrangements ungoverned by Man."[1] *In All Directions* offers us one such space, where alternative world-building is also a sense of return, of detour, of exiting.

Rosalena describes her practice as creating "exit points"—gravitational tugs that reroute our habitual orbits into new dimensions. She aligns exit points with black holes, which set in motion an irrevocable process of breaking down and transforming at the molecular, or even quantum, level. The vacuum of a black hole, however, is not purely destructive or emptying; it can be a force of indeterminacy and opportunity responsible, as Karen Barad writes, "not only for the void not being nothing (while not being something), but it may in fact be the source of all that is, a womb that births existence."[2] The black holes that haunt the exhibition harbor this potentiality, posing urgent—and unsettling—questions to the viewer: What is pulling us in? What happens if we stop resisting the pull? What world(s) are we leaving? What, if anything, is on the other side?

Through her work—intricate, ethereal weavings; delicate, perplexing ceramics; and multidimensional, shimmering beadwork—Rosalena slowly yet insistently draws us into these black holes—into a process of transformation. She asks us to critically examine and, crucially, exit the patterns and pathways that have become invisible or habitual in our daily lives and in the systems that determine our orbits. Rosalena's black holes transport us into outer space to refocus our attention on Earth. In *Transposing a Form*, for example, Rosalena blends bentonite clay with Martian Regolith Simulant. These anti-vessels refuse containment even as they embody a gravitational pull, collapsing in on themselves in an insistent openness. In this series of sculptures as well as in the other black holes throughout the exhibition, Rosalena exposes how climate change solutions that seek to enable a future for humanity on Mars actually reinscribe (neo)colonial desires to conquer and settle unchartered territory. Rosalena confronts us with the question of how imagining space as the next frontier available for rampant and unchecked extraction extends the lineage and violence of colonialism. As a potential alternative, she offers visitors

1 Ariella Aïsha Azoulay, *Potential History: Unlearning Imperialism* (New York: Verso, 2019), 31.

2 Karen Barad, "What Is the Measure of Nothingness? Infinity, Virtuality, Justice," *Infrasonica* (April 2020), https://infrasonica.org/en/wave-1/what-is-the-measure-of-nothingness.

the opportunity to exit this orbit and imagine other trajectories for stewarding life here and now on Earth.

For the student curators working on this exhibition, engaging in the process of researching, writing about, and presenting Rosalena's work brings us into confrontation with a very specific black hole that grows ever more foreboding, enormous, and urgent. This black hole screams: How do we exit museums? In other words, what does it mean to exhibit and engage with worldbuilding (and worldending) artwork by an Indigenous artist within the colonial framework of the museum? How does that question matter when considering that we are graduate students embroiled in the complexities of learning and labor at a land-grant university? Founded as instruments to hoard and display imperial plunder, museums have contributed to racist and eugenicist discourses, collecting and exhibiting the material and human remains of colonized peoples. Museums aided the justification of this looting in the narratives they presented of cultural progress, building a taxonomy of colonized peoples as less-than-human and asserting the Western museum as the proper place for these holdings. Today, museums are in crisis, stumbling through good-faith and superficial efforts to account for and rectify these histories and inheritances. Despite growing worker-led activism, museum leaders and structures continue to uphold these colonial legacies by (mostly) refusing repatriation claims, (almost always) accepting donations and sponsorships from individuals and companies engaged in neoliberal forms of resource extraction and exploitation, and (often) silencing the voices of their staff members and most vulnerable audiences in favor of the status quo. How do we exit these patterns, these well-worn terrains of professional practice and policy?

To follow Rosalena's lead, we might look to the black holes currently changing the gravitational pull from within and outside the museum—community advisory boards that invite and compensate expertise from beyond curatorial and programming departments; staff-led unionization drives and mutual aid funds; community-centric fundraising models; repatriation and restitution; and democratic acts of refusal and disruption, including anonymous Instagram accounts, salary transparency spreadsheets, public letters of resignation from exploited and tokenized staff members, and climate protests involving superglue and tomato soup. This group of curators can offer one possible exit point: the cocurating model that decenters the construct of individual expertise. In cocurating, we have engaged in mutual inquiry based on common readings, following Rosalena's guidance in identifying an intellectual framework. We have also conducted a rigorous process of peer editing, such that every word presented in this catalogue and on the exhibition walls constitutes a cyclical and communal process of composition. Together, then, we offer a sum of our collective inquiries and knowledges that is greater than our individual contributions, a multivocal and porous attention to *In All Directions* that destabilizes singular authority. In turning toward this black hole, we acknowledge that we are on unfamiliar terrain and we advocate for a collective navigation into the unknown.

Repurposing Surplus Data in Pursuit of Nonextractive Futures

April Riddle

In his 1915 reflection on the first ten years of astronomical work conducted at the Mount Wilson Observatory, George Ellery Hale, the observatory's founder and director, described the challenges he encountered in grappling with the unknown. Hale explained how he and his colleagues planned to explore the unfamiliar with a systematic "mode of attack." To do so, scientists at Mount Wilson developed new equipment and methods for breaking down and examining the physical phenomena of stars.[1] The observatory's 100-inch Hooker telescope first peered into the night sky on November 1, 1917, just nine years after the unveiling of its 60-inch telescope. Inspired by his attendance at this inauguration, the poet Alfred Noyes wrote his "Watchers of the Sky," in which he echoed Hale's stated goals of mastering space: "The explorers of the sky, the pioneers of science, now made ready to attack that darkness once again and win new worlds."[2] For several decades, the 100-inch reflector operated as the dominant tool for unlocking the mysteries of space, such as the existence of other galaxies and the expansion of the universe. These discoveries and the photographs that enabled them piqued scientific imaginations of how people might visit, and even one day conquer, other planets via habitation, much like the visualizations of manifest destiny that fueled US expansionism. As Noyes's poem reveals, this "winning" of new worlds requires the destruction of existing ones, and such attacks demand immense resource extraction. The construction of Mount Wilson required, to name just a few components, the production of a mountain road, the transfer of "hundreds of tons of materials," and "the erection of brick, steel, and concrete structures," perched on stolen Tongva land.[3] Despite these efforts to establish a strategically located observatory, the prized Hooker telescope was obsolete by the 1980s, as light pollution from an ever-expanding Los Angeles eradicated the darkness required for its operation.

Sarah Rosalena's *Standard Candle* (2021–2023) examines Mount Wilson as an origin point for contemporary scientific practices engaged in the search for future habitability elsewhere, supported by the destruction of resources necessary for sustaining life in the present. While her earlier series *Above Below* (2020) manipulates the surplus data produced in these searches, *Standard Candle* reflects on multiple forms of darkness either enforced or attacked by the modes of investigation formulated at Mount Wilson. As the observatory worked to decimate the unknowns of space, it simultaneously imposed darkness on much of its history, suppressing memories of many of its key contributors. Through her scrutiny of the observatory's

1 George Ellery Hale, *Ten Years' Work of a Mountain Observatory: A Brief Account of the Mount Wilson Solar Observatory of the Carnegie Institution of Washington* (Washington, DC: Carnegie Institution, 1915), 5–6.

2 Mike Simmons, "Building the 100-inch Telescope," Mount Wilson, accessed December 5, 2022. https://www.mtwilson.edu/building-the-100-inch-telescope.

3 Hale, *Ten Years' Work*, 3–4.

obscured labor, Rosalena reveals how these early acts of invisibilization drove later pursuits of mass extraction.

The culture of Mount Wilson established clear hierarchical distinctions, endorsed by Hale, between those who theorized astral objects and observed through sophisticated telescopes, and those who performed the labor of calculating and organizing the resulting data. In his 1906 annual report, Hale even noted the financial disadvantage he perceived in "quartering a large force of computers"—i.e., women working as mathematicians—in the San Gabriel Mountains. He thus moved them to an offsite location in Pasadena, leaving Mount Wilson as a site exclusively reserved for use by men, who even slept in a dormitory called "the monastery."[4] The "computers," whose title would only later apply to machines, analyzed the photographic plates that captured starlight. Together, these women counted celestial objects, measured distances, and studied and compared photographs, often making their own discoveries without receiving credit. Though they enabled space to take comprehensible shape and form, Hale concealed their integral contributions to the observatory's projects of expansive visibility and uncovering.

4 Hale, *Ten Years' Work*, 80.

Standard Candle highlights the unrecognized nature of this work and takes its name from an algorithm developed by Henrietta Swan Leavitt while she was employed at the Harvard Observatory. Leavitt's precise and painstaking observations helped her determine the absolute magnitude (i.e., brightness) of particular astronomical objects, such as rapidly pulsing Cepheid variable stars. This allowed her to calculate the stars' distances from Earth, giving scientists a clear sense of Earth's place in the universe and of how long it might take to travel elsewhere. The astronomer Edwin Hubble later used Leavitt's work while studying plates taken with the 100-inch telescope at Mount Wilson. Though her calculations directly supported his assertion of the existence of galaxies beyond the Milky Way through the identification of the Andromeda Galaxy, he exploited her labor by extracting the information that was valuable to him without crediting her.[5]

5 Carnegie Science, "Hubble's Famous M31 VAR! Plate," Carnegie Science, accessed November 6, 2022, https://obs.carnegiescience.edu/PAST/m31var.

Leavitt's algorithm served as Rosalena's pattern for several of her *Standard Candle* textiles. She meditated on Mount Wilson's intentional obscurations and exclusions while working with her TC2 programmable manual loom. After first drawing the graph data, she reiterated Leavitt's computer labor through handweaving, selecting the ways the black and white threads interfaced with the algorithm each time the shaft went up. Rosalena embodied an alternate, ultraslow timeframe while dwelling in the potentially infinite variables of the graph.

She also meticulously wove beaded plates on a loom passed down from her mother for *Standard Candle*. These plates reproduce imagery captured in photographs taken at Mount Wilson in the 1910s and early 1920s, leading up to Hubble's discovery.[6] In addition to materializing and revisioning these records, Rosalena pursued an archival project as part of *Standard Candle*. She worked directly with the Carnegie Observatories Archives to sift through thousands of plates, searching for traces that would recover the identities of the computers and the specific reasons they used these plates in their studies. In the end, she found very little aside from traces of their labor, often in the form of markings on plates, demonstrating the erasures that took place at Mount Wilson.

6 Hernán Díaz Alonso, "Sarah Rosalena: Intersectional and Intergalactic Art-Making," SCI-Arc Channel, June 21, 2022, YouTube video, 9:51, https://www.youtube.com/watch?v=OxlbtN3GPVc.

Mount Wilson's photographic plates index both the difficulty of picturing the night sky and the intentional erasure of the women who worked to make it possible. What is known, however, is that the computers were essential, active participants in Mount Wilson's endeavors. Their calculations form the founda-

tions of current astrological research and the collective imagination of what lies beyond this world.

While typically taken at face value as experimentation for the sake of expanding knowledge, exploration is anything but neutral. Often, industrial cultures of extraction, which continually displace and decimate Indigenous peoples in the pursuit of new value, drive the demand for proof of habitability elsewhere. These industrial cultures born from colonial pursuits are powered by the exploitation of Earth's natural resources and the people tasked with mining them. Such extraction accelerates climate catastrophe and makes searching for other worlds seem necessary.

Research institutions like NASA's Jet Propulsion Laboratory are currently seeking any indication of the presence of water on Mars in the hope that exploring and colonizing other planets might be possible. Pursuing this fantasy of inhabiting the Red Planet requires immense informational extraction that allows one to imagine occupying the surface and atmosphere of Mars. Take the Mars Reconnaissance Orbiter as just one example of this process. Since 2005, this spacecraft has constantly taken and relayed images, resulting in immense quantities of surplus data, including anything from soil compositions to the vast number of photographs required to render a navigable digital globe of Mars. These endeavors require further resource extraction on Earth, which exasperates labor and environmental conditions.

Rosalena critiques the surveillance of the cosmos and the spaceward projection of narratives of cartographic and military control that drive the development of these technologies by putting this data to alternative uses in *Above Below*. She materializes the images using a neural network trained on images taken from satellites, rovers, and drones, which results in new views. Through this process, she deprioritizes aerial vision and compresses excess information to a sensorially relatable scale. Ultimately, one does not view these textiles from above or below. Instead, one navigates among and around them as bodies in their own right. Rendered in thread, these machine visualizations take on new roles as Rosalena actively chooses how to repattern the data in materializing these images. This control allows her to both illuminate obscured histories, such as those buried in Mount Wilson's archives, and embrace unknowns, like the results of feeding machines devalued perspectives.

The woven works that make up *Above Below* and *Standard Candle* serve as reminders that the same narratives of destruction and displacement played out at sites like Mount Wilson can also carry out in space. Diné scholar Lou Cornum suggests that Indigenous Futurism "is about thinking up distinctly alternate visions of progress and advanced technology."[7] This often involves embracing nonlinear time as one attempts to engage with an unknown future in which people use technologies entangled in troubled pasts to develop "non-hierarchical, non-coercive relations" between individuals and the worlds around them. With the help of Indigenous craft technologies, Rosalena distorts data gathered in the projection of colonial narratives into space, and thus makes the data unknowable. Rosalena's work is full of refusals. The black beaded plates deny attempts to be instrumentalized as measurement tools, and loose threads fail to settle into clear visualizations of space. They operate as rebellions against extractive futures and endeavors to dominate space enabled by many of the same technologies Rosalena uses in their creation. Through Rosalena's materializations, one can imagine the possibility of nonextractive futures, as they make room for multiple cosmologies. By embracing AI and other nonhuman entities as welcome unknowns and collab-

7 L. C. Cornum, "The Creation Story is a Spaceship: Indigenous Futurism and Decolonial Deep Space," *Voz á Voz*, 2015 https://web.archive.org/web/20220927090040/http://www.vozavoz.ca/feature/lindsay-catherine-cornum.

orators, Rosalena practices different ways of engaging with technologies that do not prioritize accumulation.

Rosalena reflects data gathered from Mars and other astronomical entities back to Earth and thus calls for becoming closer with the present and the materiality of what is left of the planet. If extraction fuels the conditions that are transforming Earth into a desert planet—the red overcoming the blue—one must consider how to exit this destructive trajectory, which echoes Hale's calls to attack the unknown. This cannot be accomplished without first reckoning with these histories and the fantasies of future space habitation that they inspired. Through threads, beads, and clay, Rosalena shows just how one might "hold something in the past and the future at the same time" and "tie a knot or undo it altogether."[8]

8 Alonso, "Sarah Rosalena."

Crafting Space: Sarah Rosalena's Materializations of Astronomical Data

Mia Kivel

In the ongoing quest to explore the distant universe, scientists rely on high-tech equipment available only to top universities and government institutions. Mars rovers like Perseverance allow earthbound scientists to visualize the surface of the Red Planet almost in real-time, while massive space telescopes offer tantalizing glimpses of the furthest reaches of the cosmos. For Sarah Rosalena, this technology-dependent way of interacting with the universe is worthy of skepticism: Are scientific instruments the only way to picture what lies beyond our world? And what would it look like if millennia-old, Indigenous technologies were instead used to render the cosmos visible?

Rosalena is no stranger to the technological ways of seeing favored by the scientific establishment. She has consulted with NASA's Jet Propulsion Laboratory, has conducted research at the Mount Wilson and Carnegie Observatories, and routinely incorporates astronomical discoveries into her artistic practice. The materialization of scientific discovery through Indigenous craft is a common feature of her oeuvre, which is informed by her Wixárika and Laguna Pueblo ancestries. Through her process, Rosalena flattens colonialist distinctions between technology and craft, presenting a future in which Indigenous knowledges have a role to play in the exploration of outer space and our visions of the future.

In *CMB RGB* (2021), Rosalena uses a beading technique taken directly from Wixárika craft traditions to depict the cosmic microwave background that was published by the European Space Agency in 2018.[1] *CMB RGB* draws inspiration from recent images of the cosmic microwave background; she materializes the abstract data through the application of colored glass beads to the surface of brown dipper gourds. While precolonial Wixárika artisans would have used shells, feathers, and stones in their craft rather than glass beads, the latter has since become a quintessential element of the community's material culture.[2] Rosalena's work is most reminiscent of beaded Wixárika bowls, which feature appliqué adhered with beeswax to the interior surface of hollowed-out gourds. These are the same materials used in *CMB RBG*. While Wixárika artisans typically apply beads to the concave surface of bowls, Rosalena applies them instead to the convex exteriors of gourds. Just as the cosmic microwave background that gives *CMB RGB* its name appears to expand outward from a single point, the beads on the surface of Rosalena's gourds appear to push out into the space beyond. In this manner, the round form of the gourd becomes an analog for the topology of the observable universe.

Best known as a weaver, Rosalena draws on what is perhaps the most widespread form of Indigenous craft. *Exit Point* (2019), *Above Below* (2020), *RGB* (2022), and *Standard Candle* (2021–2023), are a few of the of most prominent

1 European Space Agency, "Planck's View of the Cosmic Microwave Background," *ESA Science & Technology*, September 1, 2019, https://sci.esa.int/web/planck/-/60500-plancks-view-of-the-cosmic-microwave-background.

2 "Beaded Art, " Wixárika Research Center, accessed November 25, 2022, https://www.wixarika.org/object-medium/beaded-art.

woven textiles she has created using a programmable loom. Rosalena presents *Exit Point* in a manner that emphasizes its representational content and allows its materiality to recede into the background. The textile's edges are trimmed to disguise the process of its construction, such that it appears as a two-dimensional aesthetic object rather than as a functional, multisided textile. In contrast, the visible woven structure and unaltered fringe are integral aesthetic components of *Above Below* and *RGB*. In *RGB*, the stark juxtaposition of red, blue, and green warp against a black weft emphasizes the weaving's structure, allowing the viewer a glimpse into Rosalena's process. Unlike these machine-and-computer-aided textiles, Rosalena executed the beaded glass plates of *Expanding Axis* (2022) and *Exit VAR!* (2022) on a traditional loom that had been passed down through her family. While the handloom may not allow for the scale and precision of the programmable looms used for *Above Below* or *Exit Point*, it more clearly demonstrates the materiality of weaving by making each intersection of warp and weft visible through the application of a single glass bead.

Martian Regolith Simulant, a blend of terrestrial rocks and minerals intended to replicate the chemical composition of Martian soil, is Rosalena's chosen medium for her ceramic series *Transposing a Form* (2020). She shapes this striking red-orange material—which recalls the iron-rich soil of the American southwest—into 3D-printed sculptures inspired by traditional coil pots. Whether made by hand or machine, these processes give shape to a three-dimensional form through the gradual application of many layers of a thin material—in a sense, 3D printing is to coil pottery as the Jacquard loom is to the handloom. The material process is the same, but the need for human labor is diminished through technological intervention. Rosalena demonstrates her consciousness of this similarity by refusing to smooth the sides of *Transposing a Form* as a traditional potter would typically do. This small change makes the coil-layering process more visible, allowing her viewers to see the technique used to construct each object.

Sarah Rosalena turns extraterrestrial locations into places that can be known experientially through engagement with physical objects rather than purely through abstract, scientific data. She flattens the distinction between "craft" and "art," which Western academics have long employed to relegate the work of Indigenous creators to the natural history museum over the art gallery. Ultimately, Rosalena's practice challenges her audience to examine the artificiality of boundaries among scientists, artists, and Indigenous artisans. Her work therefore invites viewers to consider the value of Indigenous ways of thinking and knowing, as human exploration of the universe accelerates in the years to come.

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2
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15
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25
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