FORMING PART OF THE UNIVERSITY OF COLORADO Boulder’s Grand Challenge initiative, the Nature, Environment, Science & Technology (NEST) Studio for the Arts is a new endeavor that explores the intersection, generative overlaps and productive differences between the sciences and the arts by means of exhibitions, student work, lectures, panels, courses and events. Operationally launched in the summer of 2018, NEST seeks efforts that engage with central questions regarding alternative and constructive ways of passing information and methodologies back and forth between the two worlds. Efforts such as these are key to advancing cross-disciplinary efforts in siloed campuses across the nation.

Lay

It was 2 April 2013 when President Barack Obama called on research universities, as well as any capable institution and individual, to join him in identifying and pursuing the grand challenges of this century: demanding yet achievable goals that harness innovation in science, technology and engineering to solve both local and global issues while engaging the imagination of broader audiences everywhere. Different universities, including our own, the University of Colorado Boulder (CU), took up the gauntlet.

Our world is facing a changing environment, increasing populations and limited resources. At the intersection of these is where CU could use its expertise in Earth, space and social sciences to tackle the world’s most pressing challenges. “Our Space. Our Future” was born to combine CU’s unique strengths with new technologies and partners to address the pace and pattern of changes. Its broad and ambitious mission includes, among other ends, creating an environment within which partners work collaboratively to solve problems as well as devising new ways of educating and training students.

In a world thirsty for innovation, creativity is a must, and there is no creativity without exposure to the arts. It was Carl Sagan who once said, “Science is more than a body of knowledge. It’s a way of thinking” [1]. To that we add, “Art is a way of thinking, much more than it is a body of work.” We find ourselves with two different yet powerful and complementary ways of thinking about the world—both inside and around us—that can help us overcome the grand challenges of this century. This simple yet powerful idea of art-science engagements has engendered mutual benefits for the two disciplines, ranging from breakthroughs in research and creative work to improved communication skills and student engagement [2] and has allowed the Nature, Environment, Science & Technology (NEST) Studio for the Arts to receive a generous grant from the Grand Challenge umbrella at CU in 2017.

Incubate

Art and science philosopher Elizabeth Grosz once wrote on bridges between the two:

Science, like art, plunges itself into the materiality of the universe, though with very different aims in mind. . . . This is not to say that art does not draw on science or that science does not draw on art, but in drawing on the other’s resources each must transform the work of the other into its own language and its own purpose [3].

Contemporary attempts at bridging the arts and the sciences often veer toward one of two avenues: (1) artists seeking inspiration in scientific research to produce their own individual creative works or, conversely, (2) scientists seeking ways of broadening the impacts of their intrinsically complex research and making it accessible to the general public through various creative formats—e.g. data visualizations.

While we certainly encourage empiricism within these existing models, a central research goal for NEST is to explore alternative ways of passing information and methodologies...
back and forth between the two worlds. As compellingly noted by Espelie:

Nest is a verb that has roots in the scientific method: to find categories of containment, in the lineage of Linnaeus, and connections that maximize efficiency and inspire innovation and discovery while maintaining autonomy. We were aiming for that, as well as using nest as a noun, concerning ourselves with establishing a physical base, too [4].

NEST fits within a modern trend poised to stage these kinds of interactions, including Arts at CERN [5] and Lean Out of Windows (LOoW) at Emily Carr University of Art + Design [6]. The former was founded in 2011 to explore notions of creativity, human ingenuity and curiosity, pioneer new ways of bringing artists and scientists together, lead the conversation about art and science, and support artistic innovation and openness in research environments. LOoW is a four-year interdisciplinary art and science project composed of four phases designed to be completed between 2016 and 2022, all of which involve codesigning, curating, testing and analyzing models of collaboration between art and science. Other similar pioneering efforts include Art + Science at Stanford [7], Bio Art Lab at SVA [8] and SymbioticA at the University of Western Australia [9].

There is a clear interest in pushing what it means for science and art to meet each other, and NEST aims to leverage two of CU Boulder’s strengths—scientific research and a broad range of cutting-edge artistic practices—to connect academia with public-facing efforts, like museums and magazines, taking CU’s myriad research manifestations, internally and externally, into new realms.

With all this in mind, during its first year NEST developed exhibitions, sponsored undergraduate and graduate courses, funded graduate research and creative work, ran public programs and workshops and hosted events with the clear mission of celebrating a meaningful and empowering dialogue between the sciences and the arts. These ranged from workshops and demonstrations such as Sensing Climate, where students materialized climate data in the form of woven tapestries, and Sound Planetarium, where attendees experienced their bodies rotating in virtual space, to public events such as Dome Poetry, a celebration of immersive poetry at the intersection of science and art at Fiske Planetarium (Color Plate A) and an Imagine Science Films satellite festival [10].

Nevertheless, one effort has proven to be the most effective: funding graduate research and creative work through the highly competitive annual NEST Graduate Fellowships. These fellowships are awarded annually for projects to be completed over the summer. The first graduate cohort worked on their projects during summer 2018; the second cohort worked on theirs during summer 2019. A third cohort worked on their projects during 2020, and a fourth cohort is now working on their projects [11]. Follow-up workshops and events naturally blossomed from our support of graduate work.

HATCH

Our first exhibition, EMBRYONIC, ran 21 September–21 December 2018 and included, besides preexisting content from within NEST’s network, far-flung contributions from renowned artists and scientists and work from eight student teams from our first graduate cohort; three examples are discussed in detail below. The exhibition could be viewed empirically, contemplatively, immanently or with a sense of urgency for a world beset with endocrine disruptors, rising sea levels and rampant resource competition. Above all, the work was germinial and full of potential, testing our thresholds for declaring fertile conclusions, intermediaries and, of course, inventive beginnings. Thousands of people visited our exhibition hosted at a gallery space in CU’s CASE Building.

Aaron Lamplugh and Camila Friedman-Gerlicz, then a PhD candidate in the Department of Mechanical Engineering and an MFA candidate in the departments of Art and Art History, respectively, incorporated porous materials such as activated carbon into ceramic surfaces to create simple and elegant air-cleaning art pieces that could be used in toxic indoor environments, e.g. nail salons, where technicians face chronic exposure to volatile organic compounds that can lead to adverse health outcomes, including cancer. These conditions disproportionately impact women and people of color, who constitute the majority of the industry’s workforce in Colorado [12]. Their work, “Activating Carbon,” followed an iterative process of introducing adsorbent materials—tested in their raw nature at CU’s Montoya Lab, where Lamplugh worked—into ceramic and plaster matrices and evaluating whether they could still remove toxic air pollutants in their new form (Figs 1,2). Lamplugh has placed several full-sized installations in regional nail salons in order to characterize their impact on indoor air quality. The project was a finalist of the United States Environmental Protection Agency’s People, Prosperity and the Planet Student Design Competition, which is open to teams of college students working to design solutions for a sustainable future [13].

Molly McDermott and Aaron Treher, then a PhD candidate in the Department of Evolutionary Biology and an MFA candidate in the Department of Art and Art History, respectively, jointly worked on Observation Station and Framework (Fig. 3), explorations of the intersection of ecology and culture and its relation to traditional building styles through the lens of a barn swallow. Observation Station is a site-specific sculpture built by Treher and installed at a barn swallow colony on a private property north of Boulder, where McDermott’s PhD advisor, Rebecca Safran, and her team have been researching barn swallows for more than 10 years [14]. Barn swallows, who consume more than 800 mosquitoes a day each, have dramatically reduced in number due to several factors, such as the lack of available structures for them to use. McDermott’s research focuses on migration and how that interacts with barn swallow breeding biology, including how providing more places for barn swallows to nest could help researchers determine how to protect them. The sculpture doubles as a space where this research is conducted. Framework was meant to translate this effort into a gallery.
setting. The artists intentionally used building components specific to barn structures, such as oblique butt joints, joist hangers, mending plates, hurricane ties, corrugated roofing and structural connector screws and nails, to build the spiral-like structure. Barn swallows often work around some combination of these structural elements to make their nests in and on barns, houses and commercial properties or buildings. Framework confronts the notion that our spaces and building standards are habitats for barn swallows. Both the sculpture and accompanying image (on the column in Fig. 3) created a space for the contemplation and understanding of the population overlap between humans and animals in regard to our spaces, building traditions and public policy toward architecture—a common thread in Treher’s ongoing sculptural work and art practice.

Sarah Crump and Nodin de Saillan, then a PhD candidate in the Department of Geological Science and a PhD candidate in the Department of English, respectively, worked on Aqsarnit (ᐊᐊᐊᐊᐊᐊ), or polar light (Fig. 4), a series of prints representing the dramatic yet abstract changes in the Arctic climate and ecosystems that have occurred over the past 10,000 years as a contextual backdrop for modern warming [15]. By enabling the visualization not only of fluctuations in temperature, sea-level rise and ice-sheet extent but also of how the local ecosystem is affected by these changes, this
series transformed scientific data into a graphic narrative that ignites curiosity, facilitates conversation and inspires action. The work itself was created using sediment extracted from the lakes on Baffin Island; paleoclimatologists extract biogeochemical cues from this sediment to investigate past environments—e.g. ancient DNA can inform the reconstruction of past ecological communities and reveal how climate fluctuations have affected the distribution of species. This insight can help us better understand the potential ecological effects of future climate change. The process for creating ink from the mud extracted from lakes on Baffin Island includes (1) collecting the sediment from lake bottoms using a coring rig, (2) drying the sediment, (3) grounding the sediment to powder using a mortar and pestle, (4) sieving the powdered sediment to extract any coarse particles, (5) mixing the powdered sediment with a thickening agent and (6) rolling the sediment ink into an even layer. The ink is then spread across a carved relief plate onto which paper is placed to create each print. Aqasarnit (ᐊᐊᐊᐊᐊᐊ), or Polar Light has now been acquired for the permanent collection of the Nevada Museum of Art.

Other graduate work included Migrant Water by filmmaker Toma Peiu and hydrologist Alice Hill, a multimedia (cotton, 360° video, VR headset, satellite photography, animation, 35 mm film, 3D viewfinder, interactive sound map, headphones) collaboration on connections between the losses of water and people from the Aral Sea basin in Central Asia, a vast ecosystem whose arid, dry, downstream flatlands are shaped by the region's decision to pursue centralized agriculture and whose upstream water sources in the high mountain glaciers of the Pamir and Tien Shan ranges are now increasingly affected by climate change.

To complement the graduate work, we also, as we often do, included in the exhibition work by renowned creatives including master dyer Mary Edna Fraser, photographer James Balog and sculptor Robert Sievers. As well, we held related workshops, screenings and panels.

In an effort to build strong bridges within the college campus, NEST cosponsored an exhibition at the CU Art Museum (2 February–20 July 2019), which was curated by Espelie and NEST’s Hope Saska. Documenting Change: Our Climate (Past, Present, Future) considered how our observation of natural worlds is influenced by measures of time and representations of form and brought together diverse ranges of materials and observers that spanned historical and contemporary eras. The exhibition featured work from artists Maya Lin, Tali Weinberg and Teresita Fernández, among others.

NEST’s second exhibition, WILD | TAME, ran from 21 January–21 May 2019 and was hosted at CU’s Sustainability, Energy and Environment Community. The works in the exhibition existed at the interface of the undomesticated and the acclimatized, the primal and the pacified. The exhibition once again was heavily rooted in graduate efforts. At this juncture, humans try to make sense of the natural world—which both serves and betrays us. We are at once agent and observer, even if for a mere instant, at the front line of an indiscriminate wildfire, in the sway of cellular replication, at the controls of a remote TundraCam or at the edge of the ocean, coexisting in the stillness of the sand and the crash of the waves.

Examples of graduate work included Justin Trupiano’s Incendium, a series of dye-sublimation aluminum prints that show years of climate data gathered by NOAA and NASA as a single image, facilitating the understanding of long-term trends; Amy Richman’s Blueprint Series, a series of cyanotype prints centered around the color blue and the many forms it takes in the psychological, corporeal and environmental realms; Dakota Nanton’s The Makings of Us, a series of prints based on actual magnifications of the liquid-crystal phases of human DNA and RNA; and Joe Steele, Carly Anderson Stewart and Christa Torrens’ Stories from the Archive: An Exploration into New Ways of Looking Using Photographs as Data, Glaciers as Archives, Lichens as Creators, and Dust as Conclusion, a performative lecture that draws on both human-created archivism, like photographic databases and herbaria, and natural archives such as glaciers, dust and lichens (Fig. 5), to explore how researchers use facets of the Earth to inform the use of data.

As we wrote this article, we looked forward to the work of the cohort of 2019 fellows on projects with topics ranging from microplastics along Boulder Creek, to fracking in East Colorado, to urban coyotes in the Denver metropolitan area.

In the meantime, we were working on a new exhibition, Under- and Overstories, which opened in August 2019 at the Boulder Public Library; just as a letter can scale up to a word and galaxies telescope down to the atomic. The exhibition considered the paradox of scale within the microscopic and the cosmic, the single-celled organism and the ecosystem. More than 20 exhibitors displayed work at the intersection of science and art at a local venue.

Further efforts included commissioning work for the university’s new Ann & H.J. Smead Department of Aerospace Engineering Sciences building and working with the Mul-
Acknowledgment

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References and Notes

11 A full list of students and project titles can be found at www.nestcuboulder.org/opportunities/graduate-fellowships/past-fellows (accessed 9 June 2021).
13 United States Environmental Protection Agency, People, Prosperity and the Planet (P3) Student Design Competition: www.epa.gov/P3.

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COLOR PLATE C:  A NEST FOR ART AND SCIENCE

Poet T.J. McLemore during our “Dome Poetry” event at CU’s Fiske Planetarium, 10 April 2019. (© T.J. McLemore. Photo © Jorge Pérez-Gallego.) (See the article in this issue by Jorge Pérez-Gallego, Erin Espelie and Tara Knight.)