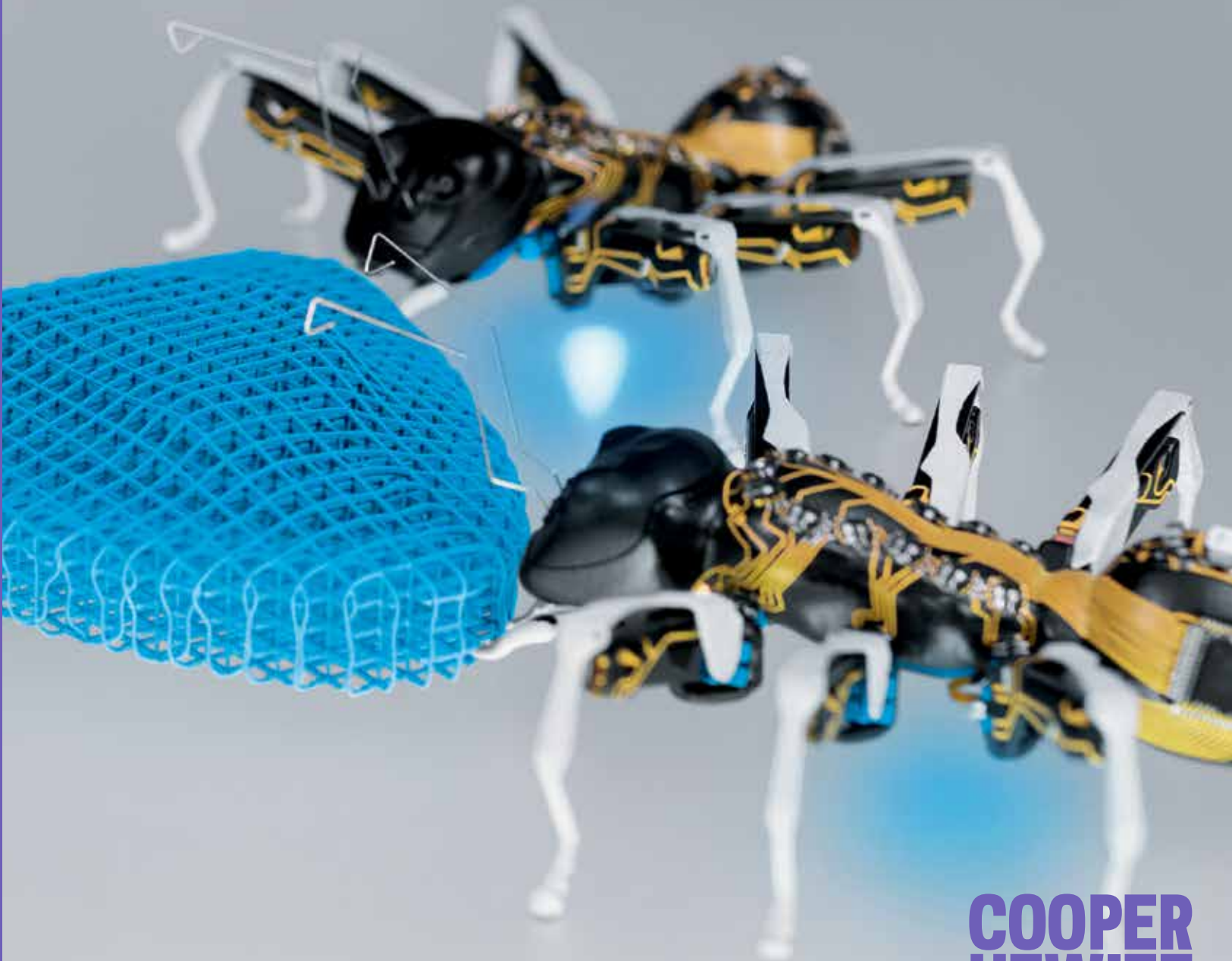


# DESIGN JOURNAL



**COOPER  
HEWITT**

3 **DIRECTOR'S LETTER**

5 **SMITHSONIAN TROPICAL RESEARCH INSTITUTE: DESIGNING TROPICAL SCIENCE**

9 **NATIONAL DESIGN AWARDS 20YRS: 2019 AWARD WINNERS**

13 **BIODESIGN: MAKING TRACKS IN BIOTECHNOLOGY AND SUSTAINABILITY**

16 **UNIVERSITIES COLLABORATE WITH NATURE**

20 **PLASTICS: THE DESIGN STORY**

23 **WYSS INSTITUTE: TAKING LESSONS FROM NATURE**

26 **SHOP**

# DIRECTOR'S LETTER



01



02

## SUMMER 2019 DEAR COOPER HEWITT FRIENDS,

The Arthur Ross Terrace and Garden is now blossoming with color and life, an oasis for all. While we enjoy this verdant space, we also acknowledge our responsibility—as America’s design museum—to serve as a public forum for design and promote its power to change lives. At a critical moment for our planet, the museum is bursting with nature-themed exhibitions and programming that illustrate how design reflects our transforming relationship with the natural world.

*Nature—Cooper Hewitt Design Triennial* (May 10, 2019–January 20, 2020) presents a global perspective on contemporary design and a prescient look at where design is heading. All sixty-two projects were realized through a collaborative process of multidisciplinary creativity—designers, engineers, biologists, material scientists, philosophers, and artists working together to find meaningful alternatives for humanity to live in harmony with the natural world, from the microscopic to the monumental. Co-organized with Cube design museum in Kerkrade, The Netherlands, this sixth Design Triennial allows audiences in both the United States and Europe to experience the works simultaneously—a first for each of our institutions.

Nature is activating all floors of the museum and campus. Drawing from every area of Cooper Hewitt’s collection, the second-floor galleries present *Nature by Design*, which explores how designers have been working with nature throughout history—investigating its materials, observing its complexity, and imitating its patterns and shapes. Through mid-2020, nine rotating exhibitions will feature Frederic Edwin Church’s sketches of icebergs, majestic paisley textiles, natural plastics from tortoiseshell to bioplastics, katagami, and more, illustrating design’s engagement with nature from the sixteenth century to the present day.

*Nature’s* roster of companion programming includes hands-on workshops, panel discussions, and the 2019 National High School Design Competition with Target, which challenges students around the country to design (or redesign) a nature-based solution to a global problem. The popular outdoor summer concert series, Cocktails at Cooper Hewitt, will energize the Arthur Ross Terrace and Garden with music and performance inspired by *Nature* (see adjacent schedule).

We’ve invited Harvard University’s Wyss Institute for Biologically Inspired Engineering to guest curate our eighteenth exhibition in the popular Selects series. Wyss scientists mine and interpret our collection to present their vision of Bio-Futurism, which translates principles of nature into bio-inspired engineering innovations to create a more sustainable world and advance human health.

Cooper Hewitt continues to honor its commitment to educate, inspire, and empower people through design by extending its global presence and participation. We presented a special installation of the groundbreaking exhibition *Access+Ability* at the January 2019 World Economic Forum. World leaders and change agents interacted with innovative designs—created by and with people with disabilities—on view at the heart of the forum’s Congress Centre. Cooper Hewitt is in the vanguard of museums tackling inclusion comprehensively and it’s an all-team effort. *Access+Ability* will travel to Carnegie Museum of Art, Pittsburgh (June 1–September 29, 2019) and Nelson Atkins Museum in Kansas City, Missouri (October 19, 2019–February 9, 2020).

Closer to home with colleagues from Smithsonian’s Hirshhorn and Freer Sackler museums, Cooper Hewitt produced training videos for pan-Smithsonian use that demonstrate how to write dynamic visual descriptions for online images to make our websites more accessible to people who are blind or with low vision. The videos, along with the broad range of accessibility initiatives, programming, resources, and original content, are available at *Design Access*—the newly created web-based accessibility portal. <https://www.cooperhewitt.org/design-access/>



03

In 2000, the National Design Awards program was conceived to honor lasting achievement in all aspects of the field. This year, celebrating the Awards' twentieth anniversary, we've created a new honor to recognize a designer who has demonstrated profound talent in the early stages of their career. The recipient of the Emerging Designer Award will receive a cash prize to accelerate their advancement. Our winners actively engage in Cooper Hewitt's educational initiatives that are expanding across the country to help communities realize the transformative capacity of design. In addition, thanks to Target, museum admission will be free every day of National Design Week (October 12–19, 2019).

This issue of *Design Journal* focuses on the numerous ways designers are seeking greater cooperation to understand natural processes, remediate imbalances in ecosystems, salvage materials, and facilitate essential change. Design is reframing the discourse around human impact on Earth. *What is your relationship with nature?*

Caroline

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@baumstagram  
@cooperhewitt  
cooperhewitt.org

**01**  
In *Tree of 40 Fruit* (2008–ongoing), artist Sam Van Aken (American, b. 1972) uses centuries-old grafting techniques to combine multiple fruits in a single tree. Preserving dozens of heirloom and rare fruit varieties, Van Aken puts more delicate varieties, like cherries and apricots, in the center of the tree, and surrounds them with more vigorous fruits, like plums and peaches.

**02**  
Visitors explore the *Curiosity Cloud* (2015–2019) designed by Katharina Mischer and Thomas Traxler of mischer+traxler studio in *Nature—Cooper Hewitt Design Triennial*. Each bulb contains a robotic insect that sits inert until it senses a presence. When movement is detected the insects begin to flutter against the glass bulbs in which they are contained.

**03**  
A cross-Atlantic trip by Cooper Hewitt Board members and friends to Cube design museum celebrating the opening of *Nature—Cooper Hewitt Design Triennial* in Kerkrade, Netherlands. (Left to right) Lisa Roberts, Gène Bertrand, Crystal English Sacca, Elizabeth Ainslie, Helen Hintz, Hans Gubbels, Madeleine van Daele, Matilda McQuaid, Margaret Gould Stewart, Shelby Gans, Caroline Baumann, Todd Waterbury, David Seltzer, Joan Kaplan, Miriam Kuenzil, and Fred Gans.

## COCKTAILS AT COOPER HEWITT

Dance. Music. Design.

The popular summer series returns to the Arthur Ross Terrace and Garden at Cooper Hewitt. Come for the performances. Enjoy cocktails and light fare for purchase from Tarallucci e Vino. All ages welcome. Held rain or shine.

### THURSDAYS, 6–9 P.M. ALL SUMMER

<b>JUNE 13</b>	Music from Tippet Rise Art Center
<b>JUNE 20</b>	Young Patrons Night: Coco & Breezy with special guest Zak Læever
<b>JUNE 27</b>	Cooper Hewitt Pride Night: Bushwig
<b>JULY 11</b>	Tom Gold Dance
<b>JULY 18</b>	Juilliard Night: Four by Four
<b>JULY 25</b>	Artichoke Dance Company
<b>AUGUST 1</b>	Juilliard Night: The Brass Project
<b>AUGUST 8</b>	Juilliard Night: Samora Pinderhughes' The Transformations Suite
<b>AUGUST 15</b>	Dylan Dunlap with DJ Jennifly

\*Performances subject to change

Tickets at [cooperhewitt.org/cocktails](http://cooperhewitt.org/cocktails)  
\$14 online / \$16 at door

**BECOME A MEMBER TODAY**

FOR FREE ACCESS ALL SUMMER TO COCKTAILS AT COOPER HEWITT

#DrinkUpDesign

Cocktails at Cooper Hewitt is made possible by A/D/O and Enid and Lester Morse. Additional support provided by MOO

# SMITHSONIAN TROPICAL RESEARCH INSTITUTE:

## DESIGNING TROPICAL SCIENCE



01

By **Beth King**

Tropical ecosystems are under threat now. But a mutually beneficial relationship between the Republic of Panama and the Smithsonian that began more than one hundred years ago continues to make it possible for the Smithsonian Tropical Research Institute (STRI), headquartered in Panama City, to further the understanding of tropical biodiversity and its importance to human welfare. The Institute—home to thirty staff scientists—annually hosts more than one thousand visiting scientists and students from more than fifty nations, and is focused on training the next generation of researchers in the tropics.

STRI supports conservation efforts by increasing public awareness of the beauty and importance of tropical ecosystems. Estudio Nuboso, also in Panama, emerged as co-producer and organic STRI collaborator, providing a nomadic platform for exchange between art, ecology, culture, and society. Estudio Nuboso aims to reconnect people with nature and generate and share knowledge that promotes resilience and sustainability in individuals, communities, and the environment. Together, artists and scientists design a range of formats for multidisciplinary and cross-sectoral

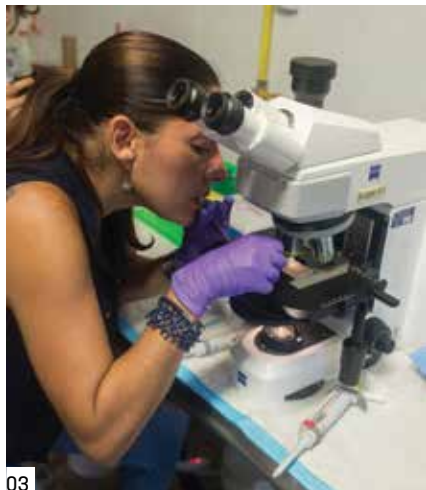
encounters in different ecosystems, from residencies to workshops, publications, and special projects.

Innovative global designers and artists from Estudio Nuboso partner with STRI researchers to explode cultural barriers, communicate with a broader audience, and invent positive, informed interpretations for pressing environmental challenges. “Speed-dating” sessions spark dynamic interactions between designers, sound recordists, architects, writers, and scientists.

Estudio Nuboso's formats for cross-disciplinary collaboration in art and science motivate positive change in society. During two consecutive days of immersive interaction in the “Flash LAB” (a speed-dating and prototyping session) or over longer periods, artists and scientists learn new ways to work together, generate prototypes for future projects and grant proposals, and discover ways to make their ideas widely available. Four of those projects follow.



02



03

### HOW MIGHT ZOOS SAVE ANIMALS FROM EXTINCTION?

Zoos play a critical role in species survival. But rescuing wild animals and bringing them into captivity depends on understanding what they need to survive and reproduce. And that is no small task.

In the 1980s, scientists in Monteverde, Costa Rica watched amphibian numbers decline precipitously as a fungal disease epidemic swept across the country. Because they saw it coming, researchers at the Smithsonian in Panama were able to coordinate a team to breed about twenty of the most threatened species in captivity.

By converting used shipping containers into a modern-day ark, the Smithsonian's Panama Amphibian Rescue and Conservation project (PARC) pioneered the creation of temporary habitats for the most vulnerable species of tropical frogs and other amphibians facing this global epidemic. PARC's built environments buy these species some time while researchers learn more about the disease, as well as the abilities of wild frogs to overcome it, and hopefully, to survive again in the wild.

Gina Della Tonga, Panamanian postdoctoral fellow at the Smithsonian Conservation Biology Institute, was the first to describe and preserve sperm from Panama's iconic golden frog, now extinct in the wild. During her doctoral dissertation research she developed a way to safely freeze sperm so it could be used for artificial insemination to increase captive frog populations. The project has already generated some hopeful results, successfully breeding twenty frog species in captivity for the first time.

Estudio Nuboso inspired Della Tonga to devise creative ways to raise awareness about amphibian decline. With Ecuadorian artist and curator

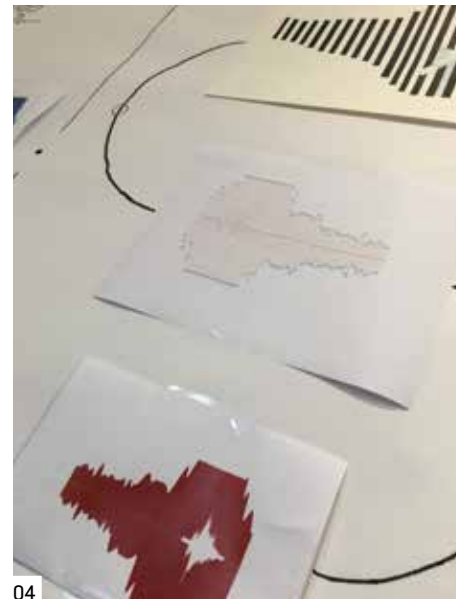
Juan Carlos León, she came up with a refreshing surprise for kids at a municipal park. Free popsicles were offered in exchange for participation in an informal survey, simultaneously providing welcome relief from the tropical heat. Each popsicle stick was tattooed with "did you know" facts about endangered frogs.

At another municipal park and animal rescue zoo, León strategically placed magnifying glasses inviting curious hikers to zoom in on facts about Della Tonga's work with the frogs as well as persistent realities for women in science, such as, "Worldwide, salaries of women are 24 percent lower than men's salaries, but in every region, women work longer hours than men do."

### HOW CAN GRAPHIC IMAGES OF SOUNDS PROTECT ANTILLEAN MANATEES?

Imagine if every time you started a conversation, a massive trailer truck downshifted just outside, making it impossible to hear.

Gentle, cow-faced manatees plough through the muddied waters of Panama's coastal rivers. Mothers and their calves call back and forth with a series of chirps, squeaks, and



04



05

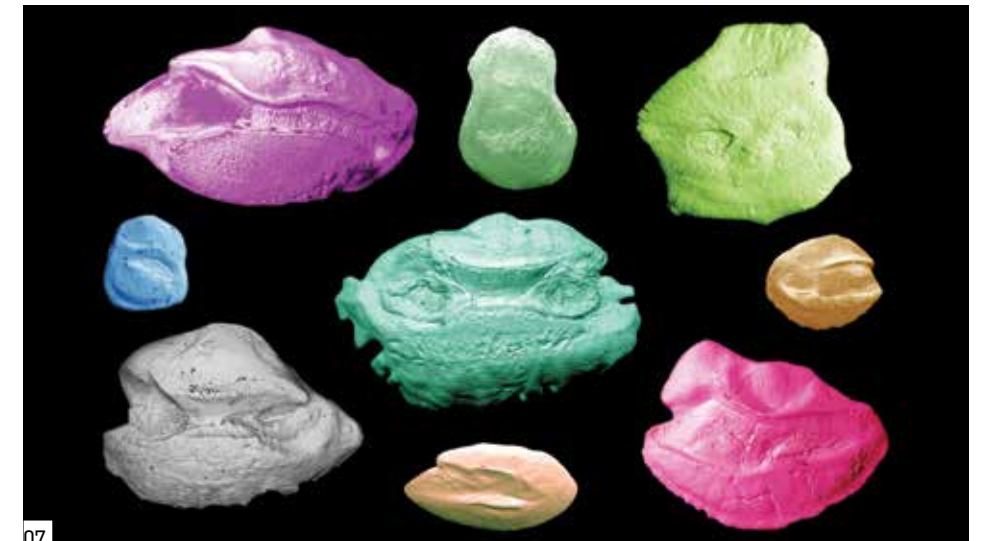
whistles, detectable only with special underwater microphones. But passing boats obscure their sounds completely, making it impossible for one individual to locate another in the murk and contributing to the confusion and decline in their numbers that has brought them to the edge of extinction.

In the San San Pond Sak protected wetland, Hector Guzmán, marine biologist at STRI, worked with Giacomo Echevers, a student at Panama's Technological University, to record countless hours of manatee communications and come up with a way to estimate the number of manatees in the dark waters of the reserve.

During Estudio Nuboso's Flash LAB, Smithsonian graphic designer Paulette Guardia imagined a graphic representation of the manatee sound occluded by the sonogram of a motorboat. The team hopes to use her design as a symbol for manatee conservation—as a brand for the project on T-shirts and Instagram posts.



06



07

### WHAT DOES EXTINCTION SOUND LIKE?

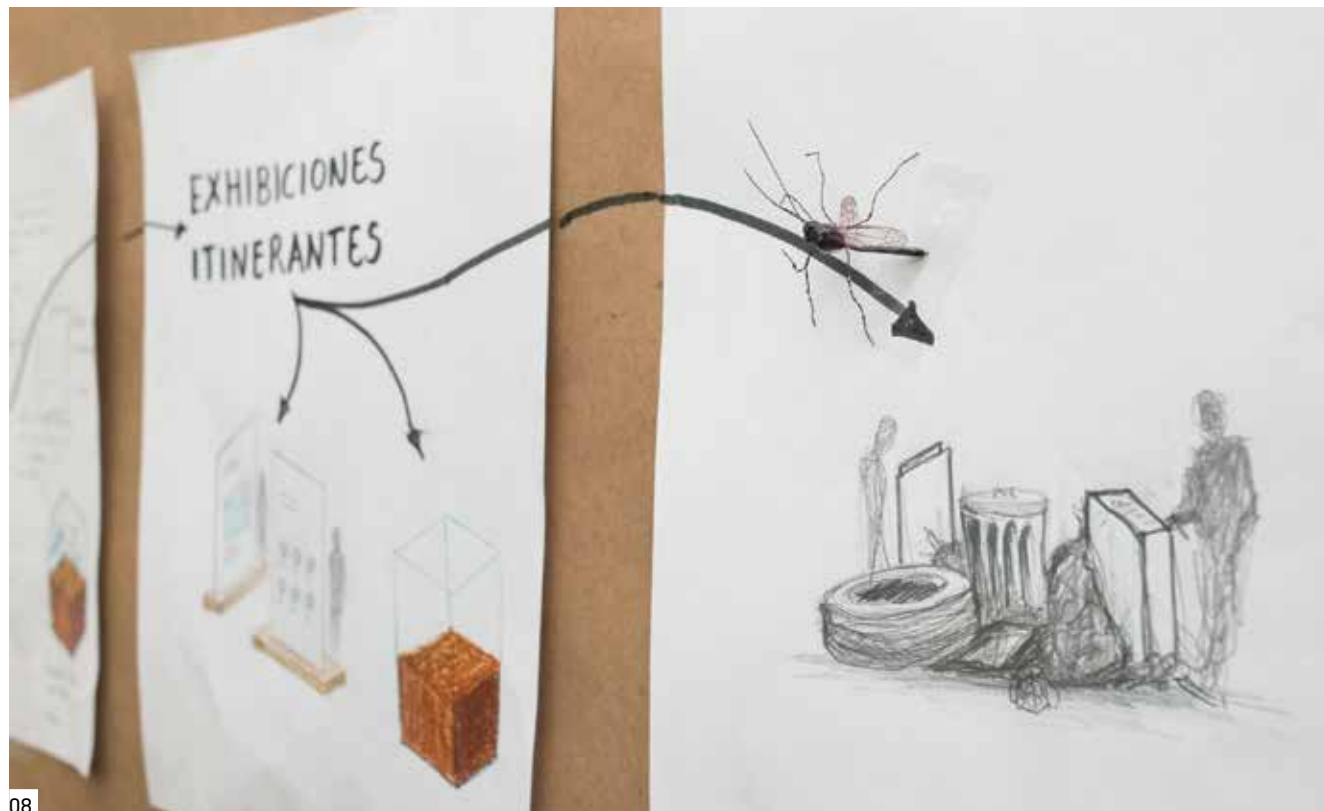
Fish have tiny, pearly bones in their ears called otoliths that outlast the rest of their bones in the fossil record. By sifting through rubble from ancient coral reefs, Brigida Degracia and colleagues in STRI staff scientist Aaron O'Dea's lab can tell when a fish species was abundant on the reef and when it became extinct.

During the Flash LAB, Degracia partnered with contemporary musician Heriberto Pinzón. Because the role of otoliths in fish is to perceive sound and to maintain balance, Degracia and Pinzón created two ocean soundscapes representing marine environments with and without the fish species critical to ocean health. The first, soothing to the ear, represents an ecosystem in balance, whereas a clanging, dissonant soundscape represents life out of balance, the loss of beauty, and the dwindling fisheries that sustained coastal villages in the past.

### HOW CAN DATA VISUALIZATION HALT TROPICAL DISEASE?

An empty ice cream container filled with standing water in a household garden in Latin America may potentiate the next worldwide disease outbreak. Draconian measures in the early 1900s, such as emptying baptismal fonts between uses and fining residents who failed to place a mothball in a vase of flowers, eradicated yellow fever in the U.S. and made Panama Canal construction possible by eliminating the mosquito, *Aedes aegypti*, that carries yellow fever.

In the last few decades *Aedes aegypti* populations have rebounded, especially in urban areas. But perhaps of more concern, the Asian tiger mosquito, *Aedes albopictus*, which carries not only yellow fever but also dengue fever, Zika, and Chikungunya viruses, has been traveling around the world in car tire shipments. This species is considered a greater threat on a global scale because it endures cold temperatures and can easily



08

hop between countries to the north and south.

Scientists at STRI, with Panamanian government researchers, visit rural communities to monitor the number and type of mosquitos in people's gardens and share information to reduce the chances of a new disease outbreak.

During an Estudio Nuboso Flash LAB, José Loaiza, STRI research associate and senior scientist at Panama's government research institute (INDICASAT-AIP), and Kevin Lim, designer at Frank Gehry's BioMuseo in Panama—a Smithsonian Affiliate Museum—developed an interactive exhibit to motivate people to remove trash that serves as a mosquito-breeding habitat.

One of the design features is a clear tube in which people who have had a mosquito-transmitted illness in the last year can add a marble, thus creating an interactive graph of the amount of illness in the community.

With the aim of promoting cross-sectoral and creative thinking from a young age, Estudio Nuboso is currently designing a series of workshops similar to the Flash LAB for STRI visitor center guides. The projects developed will become temporary exhibits and activities within the STRI Curioso Program for children at Punta Culebra Nature Center in Panama City.

Beth King is the Science Interpreter at Smithsonian Tropical Research Institute.



09

**01** During wars, field doctors are forced to triage, deciding which patient has the best chance of survival. Frog researchers have been forced to make a short list of the frog species most likely to be wiped out by the chytrid fungal disease that infects their skin. Only a few species, such as these *Atelopus varius*, can be bred in captivity, an expensive, labor-intensive process.

**02** "Did you know? Forty-two percent of amphibians in the world are endangered."

**03** Gina Della Tonga developed a technique to freeze sperm from endangered frogs in order to improve captive breeding programs.

**04** Sound pictures of a manatee call created by manatee researcher Giacomo Echevers working with Smithsonian designer Paulette Guardia.

**05** Paulette Guardia, graphic designer at the Smithsonian Tropical Research Institute, explains how she and manatee researcher Giacomo Echevers, developed their idea to graphically represent the endangered manatee calls as a small white area, surrounded by the overwhelming sound of a motorboat: sonograph in red.

**06** STRI scientist Brigida Degracia explains her research project to sound artist Heriberto Pinzón

**07** Colorful otoliths.

**08** José Loaiza, STRI research associate and senior scientist at Panama's government research institute (INDICASAT-AIP), and Kevin Lim, designer at Frank Gehry's BioMuseo in Panama, a Smithsonian Affiliate Museum, working on a project to help rural community members understand how their own actions, removing containers that may hold mosquito larvae from their gardens, have implications for world health, since these mosquitos can easily move to distant locations in car tire shipments.

**09** Kevin Lim, designer at Frank Gehry's BioMuseo in Panama, a Smithsonian Affiliate Museum, created this model of an interactive exhibit piece in which rural community members could indicate whether they had recently had a mosquito-borne disease.

# COOPER HEWITT NATIONAL DESIGN AWARDS 20 YRS

DESIGN CAN CHANGE THE WORLD. SEE WHO IS MAKING IT HAPPEN.

Cooper Hewitt's National Design Awards is the only annual program of its kind, bringing national recognition to the ways in which design enriches everyday life. Launched at the White House in 2000 as a project of the White House Millennium Council, the National Design Awards were established to promote design as a vital humanistic tool in shaping the world. Twenty years later, the National Design Awards continue to honor and support excellence, innovation, and lasting achievement in American design. Cooper Hewitt continues to broaden access nationwide to the vision and work of the country's design leaders through National Design Week and NDA Cities, inspiring people of all ages to engage with design and design thinking.

## 2019 NATIONAL DESIGN AWARD WINNERS



LIFETIME ACHIEVEMENT  
**SUSAN KARE**



Susan Kare is a pioneering graphic designer based in San Francisco. For over thirty-five years, she has designed many notable icons and graphics. Known as the artist "who gave the Macintosh a smile," she was hired at Apple in 1982. In 1986, she joined Steve Jobs at NeXT Computer and in 1989 formed Susan Kare Design, spending the next twenty-five years developing thoughtful solutions to design problems for hundreds of clients, including Autodesk, Facebook, Fossil, General Magic, IBM, Microsoft, PayPal, and Pinterest. Since 2015, she has worked as a Creative Director at Pinterest.

Signature image for the art creation application on Macintosh, MacPaint, which was featured in the manual, packaging, and advertising. Some say it is the most famous MacPaint image, and in 1984, the fact that this could be made on a Macintosh showed the power of the program (Cupertino, California, 1983).



DESIGN MIND  
**PATRICIA MOORE**



Patricia Moore is an internationally renowned designer, gerontologist, and leading authority on consumer lifespan behaviors. From 1979 to 1982, Moore traveled throughout North America disguised as elder women—her body altered to simulate the normal sensory changes associated with aging—to better respond to people, products, and environments. Moore's clients include Johnson & Johnson, Maytag, NASA, OXO, and Whirlpool, and she has designed more than three hundred physical medicine and rehabilitation environments for healthcare facilities throughout North America, Europe, and Japan. Moore is the author of numerous articles and books including *DISGUISED: A True Story; Ageing, Ingenuity & Design; and The Business of Aging*.

Phoenix Arizona METRO Light Rail system (Phoenix, Arizona, 2008).

**MIT D-Lab** CORPORATE & INSTITUTIONAL  
ACHIEVEMENT  
**MIT D-LAB**



MIT D-Lab has become a global leader in participatory design, empowering thousands to address the daily challenges of poverty through design and social entrepreneurship. Founded in 2002 by MIT senior lecturer Amy Smith, D-Lab's programs now include more than twenty interdisciplinary courses, six research groups working in collaboration with global partners, and technology development for, with, and by people living in poverty.

Across Botswana, cattle die of starvation each winter. Crop waste is available but not used because cattle cannot eat uncut stalks. The Fodder Chopper was developed by a diverse team of international and local participants with additional input from D'Kar residents at an International Development Design Summit (IDDS) organized by D-Lab and local organization These Hands, GSSE. The prototype is made of welded metal, strong enough to chop several stalks at a time with one just person using it. Stalks are laid in a tray and come out on a large sheet for collection. Power is provided by hand, but an electric motor option will be available (D'Kar, Botswana, 2015).

**ARCHITECTURE DESIGN**  
**THOMAS PHIFER**



Thomas Phifer founded his New York studio in 1997. He has completed projects such as the Glenstone Museum expansion in Potomac, Maryland, the Corning Museum of Glass expansion in Corning, New York, and the Raymond and Susan Brochstein Pavilion at Rice University in Houston, Texas. Phifer is the William Henry Bishop Visiting Professor of Architectural Design at the Yale School of Architecture.

Located on 200 acres, the Glenstone Foundation provides a serene and contemplative environment where visitors form a unique connection with contemporary art. Pavilion installations from individual artists and are linked by a passage facing a courtyard water garden (Potomac, Maryland, 2018).

**COMMUNICATION DESIGN**  
**TOBIAS FRERE-JONES**



Tobias Frere-Jones is one of the world's leading typeface designers, creating some of the most widely used typefaces, including Interstate, Poynter Oldstyle, Whitney, Gotham, Surveyor, Tungsten, and Retina. He has taught type design at the Yale University School of Art since 1996 and at the School of Visual Arts since 2014. He established his own type design practice, Frere-Jones Type, in New York in 2015.

A new typeface designed during the renovation of Grand Central Terminal to keep new signage in harmony with the existing American beaux-arts lettering style and also comply with the Americans with Disabilities Act of 1990 (New York, New York, 1998).

**FASHION DESIGN**  
**DEREK LAM**



Derek Lam is a designer of relaxed yet elevated American sportswear known for its calculated simplicity and detailing. A San Francisco native, Lam began his fashion career in 1990, going on to spend eight years as a designer at Michael Kors before launching his New York-based eponymous fashion house with partner Jan-Hendrik Schlottmann in 2004 and the contemporary line Derek Lam 10 Crosby in 2011.

Derek Lam 10 Crosby, Look 4, Fall/Winter 2019 (New York, New York, Fall/Winter 2019).

**INTERACTION DESIGN**  
**IVAN POUPLYREV**



Ivan Poupyrev is an award-winning scientist, designer, and technical leader. Over the last twenty years, he has invented, developed, and brought to market breakthrough technologies that allow for the blending of digital and physical interactivity in everyday objects and devices. Previously at Walt Disney Imagineering Research Division and Sony Computer Science Labs in Tokyo, Poupyrev is currently Director of Engineering at Google's Advanced Technology and Projects group in Mountain View, California.

Revel is an interaction technology that allows the overlay of virtual tactile textures onto physical objects. In this image, the user can feel virtual tactile patterns by touching the model of a teapot that she can also observe on the screen (2012).

**INTERIOR DESIGN**  
**IWAMOTOSCOTT ARCHITECTURE**



IwamotoScott Architecture is a San Francisco-based architecture and design firm founded by Lisa Iwamoto and Craig Scott in 2000. Committed to pursuing architecture as a form of applied design research, the firm believes that each project can achieve a unique design synthesis. The firm's clients range from technology companies and arts organizations to venture capital firms and educational institutions, including Pinterest, Google, Tishman Speyer, the Vitra Design Museum, MoMA/PS1, SFMOMA, and University of California Berkeley.

IwamotoScott was invited to contribute to the ongoing series of experimental installations in the SCIArc Gallery. The project proceeds with the premise that the design should not simply sit in the gallery space as sculptural object but rather, it should offer a more immersive spatial experience (Los Angeles, California, 2008).

**LANDSCAPE ARCHITECTURE**  
**SCAPE LANDSCAPE ARCHITECTURE**



SCAPE Landscape Architecture is a design-driven landscape architecture and urban design studio based in New York and New Orleans. Founded by MacArthur Fellow Kate Orff in 2005, SCAPE believes landscape architecture can enable positive change in communities through the creation of regenerative living infrastructure and public landscapes.

The First Avenue Water Plaza, located along the FDR at the entrance of the American Copper Buildings, serves as an active civic space and a functional stormwater management system. The plaza is activated by a layered water-collection system that manages multiple types of inundation, including stormwater and storm surge, to reduce CSO events and flood impacts (New York, New York, 2018).

**PRODUCT DESIGN**  
**TINKER HATFIELD**



For nearly four decades, Tinker Hatfield has been designing some of Nike's most popular athletic shoes. After studying architecture at the University of Oregon, Hatfield joined Nike in 1981, and he currently serves as VP of Creative Concepts. Hatfield has earned global recognition for the Air Jordan line at Nike and specialized products for athletic and entertainment figures including LeBron James, Kobe Bryant, Laird Hamilton, Gabrielle Reece, Renaud Lavillenie, and Justin Timberlake.

Nike Air Jordan III (1988).

In celebration of this milestone year, Cooper Hewitt introduced the Emerging Designer Award, which recognizes the achievements of an extraordinary young talent and provides a springboard for a new career on the rise.



EMERGING DESIGNER

OPEN STYLE LAB



Established in 2014, Open Style Lab is a nonprofit organization dedicated to creating functional wearable solutions for people of all abilities without compromising on style. Led by board members Grace Jun, Christina Mallon-Michalove, and Pinar Guvenc, the New York-based organization teams designers, engineers, and occupational therapists to conceive and build accessible wearables that address the needs with and for people with disabilities. In addition to apparel, Open Style Lab's body of work includes accessories, wearable technology, innovative textile applications, and an exhibition.


Swipe, a 3-D printed accessory to assist people with limited dexterity or symptoms of paralysis in their arms and hands (such as patients with Parkinson's disease, ALS, Multiple Sclerosis, and Arthritis) to swipe a New York City metrocard (New York, New York, 2018).


#### MEET THE JURY

The 2019 National Design Awards Jury, comprised of a diverse group of designers and educators from around the nation, convened at Cooper Hewitt in early spring to select the award winners.



Back row (L to R):  
Marlene M. Liriano,  
Caroline Baumann,  
Brad Cloepfil,  
David Hocker.  
Front row (L to R):  
Scott Stowell,  
Joichi Ito, Mary Ping,  
Whitney Delgado,  
Giorgia Lupi.

National Design Awards is made possible by generous support from . Additional support is provided by Design Within Reach, Facebook, and Bloomberg Philanthropies. National Design Award trophies are created by The Corning Museum of Glass. ndagallery.cooperhewitt.org is powered by Behance, part of Adobe, Inc.

National Design Week is made possible by major support from . Additional support is provided by Altman Foundation, Siegel Family Endowment, and the Richard and Jean Coyne Family Foundation.

NATIONAL  
DESIGN  
AWARDS

20  
YRS

NATIONAL DESIGN  
AWARDS GALA  
OCT 17 2019

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2019 NATIONAL  
DESIGN AWARD  
WINNERS

LIFETIME ACHIEVEMENT  
SUSAN KARE

DESIGN MIND  
PATRICIA MOORE

CORPORATE & INSTITUTIONAL  
ACHIEVEMENT  
MIT D-LAB

ARCHITECTURE DESIGN  
THOMAS PHIFER

COMMUNICATION DESIGN  
TOBIAS  
FRERE-JONES

FASHION DESIGN  
DEREK LAM

INTERACTION DESIGN  
IVAN POUPYREV

INTERIOR DESIGN  
IWAMOTOSCOTT  
ARCHITECTURE

LANDSCAPE ARCHITECTURE  
SCAPE  
LANDSCAPE  
ARCHITECTURE

PRODUCT DESIGN  
TINKER HATFIELD

EMERGING DESIGNER  
OPEN STYLE LAB

COOPER  
HEWITT

Smithsonian Design Museum

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#NDA20YRS

Proceeds support Cooper Hewitt's  
work to educate, inspire, and  
empower people through design.

BIODESIGN:

MAKING TRACKS IN BIOTECHNOLOGY AND SUSTAINABILITY



01



02

By Charles Johnson

Activewear is an often-heard term in the fashion industry, but few have really considered just how “active” clothes and shoes themselves could one day become.

Sportswear design must anticipate the strains of everyday workouts and the requirements of size and fit for maximum support for the wearer. German sports company PUMA's cutting-edge studio PUMA Innovation—where I lead a team of eighteen biomechanics, engineers, material specialists, and designers—explores human performance across disciplines. The design team collaborates with some of the world's

most respected science labs to research biologically active materials that will allow shoes to uniquely adapt to the feet of their wearer. Biodesign, as PUMA calls it, offers the possibility of designing together with nature, rather than approximating it.

The theory behind biodesign is that a shoe would be bought as a blank canvas, but quickly adopt a perfect fit, unique to each individual user, once it is worn.

In 2018, at Milan Design Week, we first presented an exploratory biodesign concept, which included apparel, accessories, and a “breathable shoe.” Honing in on the shoe, we unveiled an evolution of that specific design in 2019, calling it BioEvolution. We collaborated both years with Milan-based design firm Innovation By Design, to shape an experience installation at the event’s Superstudio.

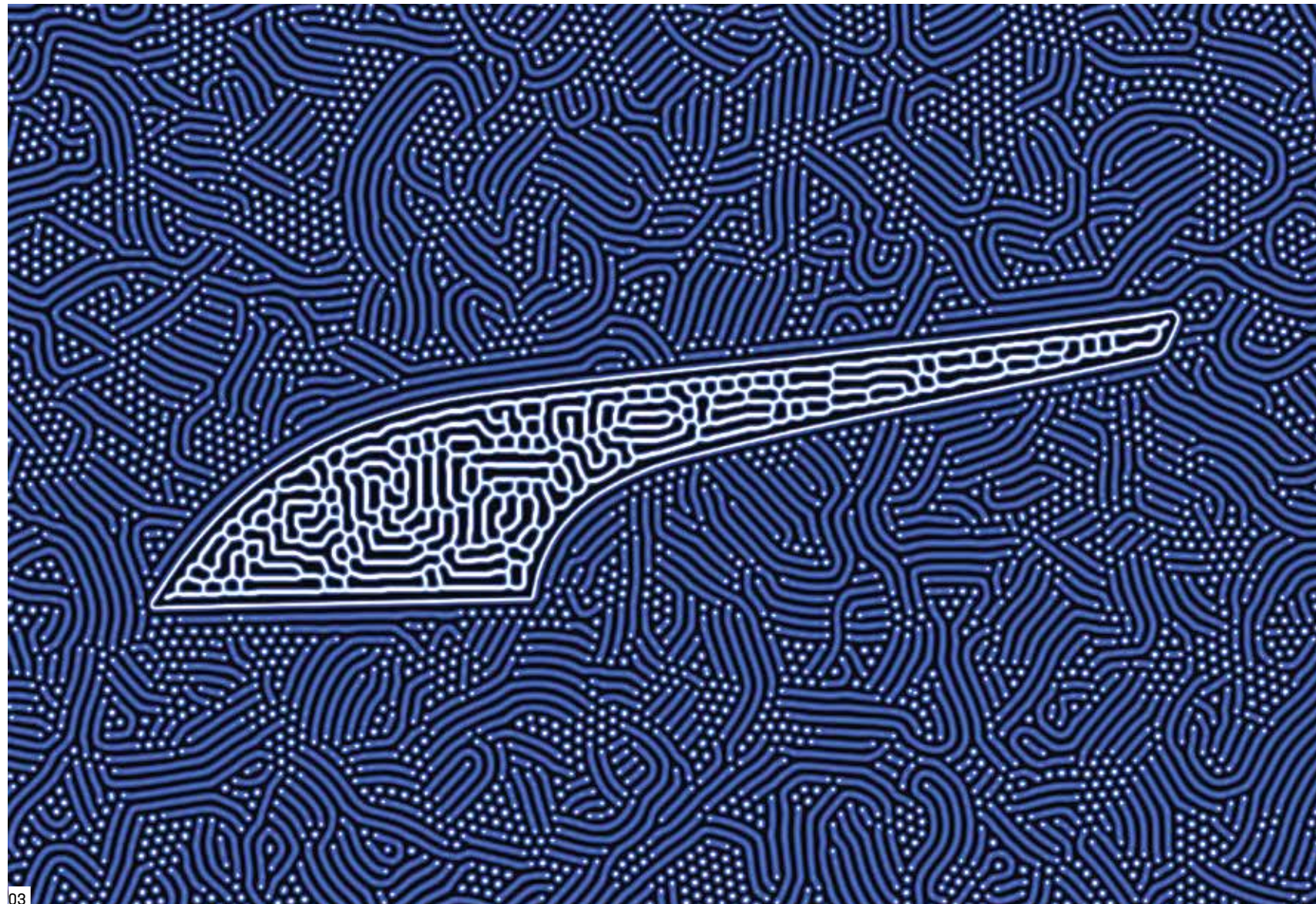
The BioEvolution project features a biologically active layer of the shoe upper that acts like a dense nanosensor net, and at a microscopic level maps the areas of the foot that produce heat and sweat. This mapping then creates a matching ventilation pattern; in other words living microorganisms selectively remove material to create a unique fit. We are able to truly design to the functional requirements of the athlete because the product can respond to their unique physical build.

With the BioEvolution project, PUMA seeks to one day create products that adapt to both the human body in motion and its environment. While athletes are an important target group for a sports company, a better fitting shoe should also benefit others.

The BioEvolution design is still in prototype stage and no commercial version of the shoe is planned at present, but the technology has already moved from being a mere pipe dream to producing tangible results. Design using what is found in nature opens up so many possibilities. Creatively we are in uncharted waters.

Our PUMA Innovation team first researched biologically active materials and related technologies, which led to the current biodesign methodology, when we embarked on a project with MIT Design Lab in June 2017. The breathable shoe concept presented in 2019 is the first result of a collaboration with research organization Fraunhofer Institute for Interfacial Engineering and Biotechnology—Europe’s largest application-oriented research organization.

In building upon the earlier biodesign exploration, we sought partners who could alter materials with bacteria. Our studio had no way of internally creating the microorganisms



required so we briefed the experts at Fraunhofer Institute on what was needed, and what functionality was expected from the shoe. The scientists then proceeded to develop the metabolic processes required for the project. Innovation By Design helped to turn their science advancements into expressions of products. When we first started talking about biodesign it seemed unreal, so futuristic. It goes in the exact opposite direction of convention. Now the technology to advance these ideas has become increasingly real.

By working across the sectors of design and science, the team engaged in a new design process. We integrated laboratory work and test results into our workflow, as the science behind BioEvolution occurs at a microscopic level. When considering the external appearance of the shoe, our product

designers went for a pattern that mimics what is seen when looking at bacteria through a microscope. The product looks like it does what it does.

In an industry where sustainable practices are top priority, the design team, working at our headquarters in the small German town of Herzogenaurach, partners with nature in other forms. We have also been tasked with finding new solutions to reduce the company’s environmental footprint.

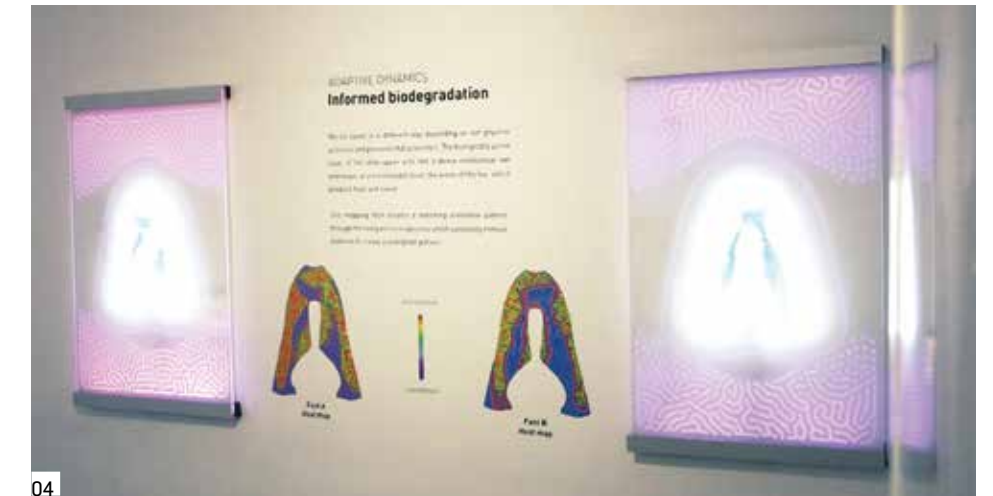
This year, the company announced a project together with the United States company First Mile, to create a sportswear collection made from recycled plastic bottles, collected in low-income communities in Haiti, Honduras, and Taiwan.

The collection made by PUMA and First Mile will be available in stores in 2020 and will consist of shoes and apparel. However, the group’s overall

sustainability strategy is aimed not only at presenting individual collections but at creating a positive environmental impact throughout its product range.

PUMA has been a sustainability pioneer for many years, and in 2010 became the first company to issue an Environmental Profit & Loss statement, which put a price on the company’s environmental impact. In 2018, PUMA was instrumental in bringing the fashion industry together to sign a climate pledge at the United Nation’s Climate Conference in Katowice, Poland.

Most recently, we announced that PUMA would procure 90 percent of its cotton and polyester from more sustainable sources by 2020, after earlier targets for



these materials were reached two years ahead of schedule.

This move will save a significant amount of natural resources in the production process. The 10,000 tons of cotton the company procured from more sustainable sources in 2018 is estimated to have saved the equivalent of some 15.5 million bathtubs of water. Drawing inspiration from nature is not just a competitive advantage, it is an essential design tool.

Charles Johnson is Global Director for Innovation at PUMA Group in Herzogenaurach, Germany.

**DESIGN USING WHAT IS FOUND IN NATURE OPENS UP SO MANY POSSIBILITIES. CREATIVELY WE ARE IN UNCHARTED WATERS.**

**01**  
Feet first—PUMA’s BioEvolution shoe

**02**  
Future application—the Biodesigned sport suit

**03**  
PUMA’s Formstrip logo embedded in the BioEvolution pattern

**04**  
BioEvolution exhibit at the Superstudio in Milan

**05**  
A different kind of palette. Bacteria swatches created for BioEvolution.



# UNIVERSITIES COLLABORATE WITH NATURE

Universities are a hub for paradigm-shifting work, where agile cross-disciplinary teams are studying and modeling nature's systems for a more harmonious and sustainable world. The challenges of the present and the ambiguity of the future offer higher educational institutions a unique opportunity to develop nature-inspired, human-centered, socially relevant curricula. Design as discipline offers a framework for educators, students, and professionals to collaborate. What follows is a sampling of ongoing projects from universities around the country that can impact and affect students and surrounding communities at a range of levels.



01

01 Student's design for a notebook based on Life's Principles' patterns

## ARIZONA STATE UNIVERSITY

### NATURE'S NOTEBOOK

By **Michelle Fehler**, Assistant Professor, Visual Communication Design, The Design School, Herberger Institute for Design and the Arts

Biomimicry is an approach to sustainable innovation that is being taught to university students through the humanities in order to produce a generation of problem solvers with new tools to tackle tough challenges. In her course, Professor Fehler and her students explore the intersection of visual communication design and sustainability through questions like: How might we as designers observe and learn from nature's patterns to solve our most pressing sustainability challenges?

Fehler began their study by introducing Life's Principles (LP)—twenty-six concepts that summarize deep patterns behind the way evolved organisms have figured out how to successfully improve the systems of which we are a part. (cc) 2019 Biomimicry 3.8. One of the projects resulting from the nature-centered design approach was a response to the question: How would nature design a notebook for designers?

Zhenqui Wang (Master of Visual Communication Design Class, 2017) designed a life-centered notebook that features a diverse set of page designs that allow for either writing or sketching (LP: combine modular components), a built-in ruler (LP: use multifunctional design), an ever-changing cover design (LP: integrate the unexpected), as well as an unlimited expansion of pages due to the no-glue binding (LP: maintain integrity through self-renewal).



02

### SUSTAINABLE OFFICE REMODEL

By **The Biomimicry Center at Arizona State University**

The Biomimicry Center is a joint partnership between Arizona State University (ASU) and Biomimicry 3.8 (B3.8) that facilitates biomimicry education and research endeavors. Interdisciplinary partnerships include faculty, staff, and students from various schools across ASU.

When looking to redesign the traditional corporate-style office it had inhabited since 2015, the center's staff collaborated with architects from Tempe, Arizona-based Architekton to transform its environment to increase the productivity, sustainability, and health of the center's work spaces.

Using Life's Principles (see "Nature's Notebook" for LP) for inspiration, the team turned nature's strategies into its own. Shelving units, desks, mobile walls, and classroom tables are made of PureBond plywood life-friendly chemistry, which uses soy to create a nontoxic glue. The composition of this glue mimics the protein chemistry in the natural adhesives that blue mussels produce in order to cling to the rough, wet surfaces of shore-edge rocks.



04

## NORTH CAROLINA STATE UNIVERSITY

### PRO-ACTIVE RECOVERY COMMUNITY STRUCTURES (P.A.R.C.S.) FOR THE OUTER BANKS

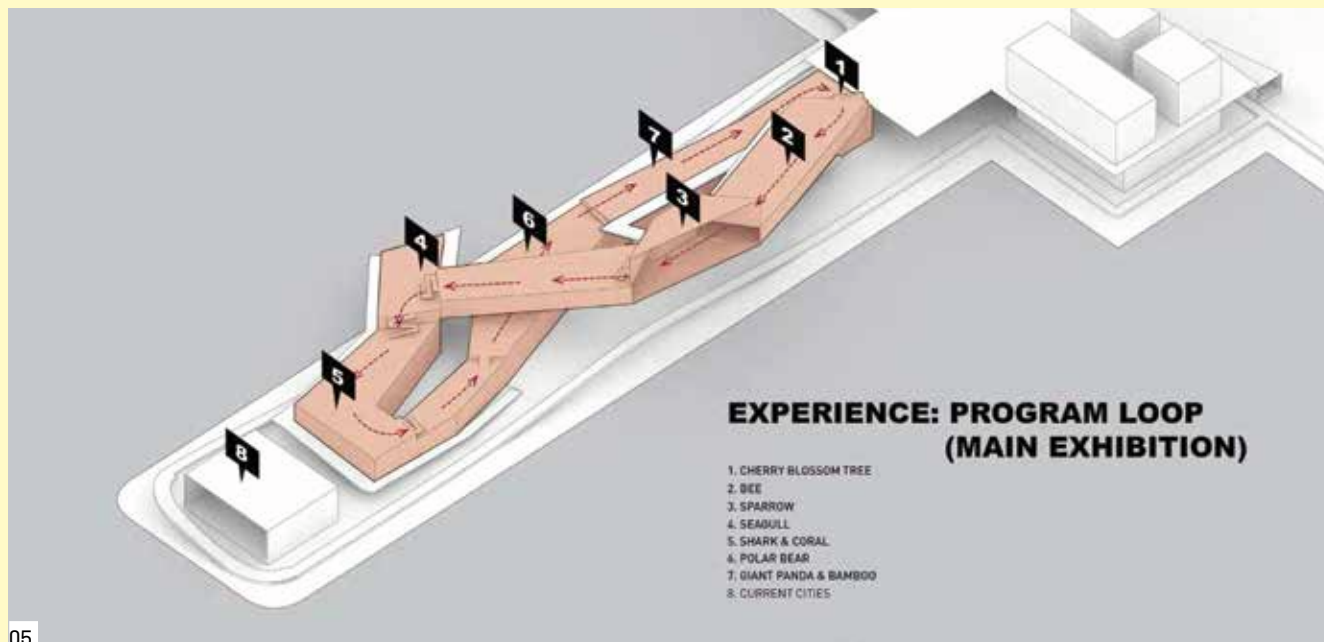
By **Andrew Fox**, Associate Professor, Landscape Architecture; Co-Director, Coastal Dynamics Design Lab  
**David Hill**, Head of the School of Architecture; Professor of Architecture; Co-Director, Coastal Dynamics Design Lab College of Design

Healthy estuary and coastal ecosystems undergo constant changes to maintain dynamic equilibrium. These diverse and ecologically sensitive environments are vulnerable to challenges from sea-level rise, human actions, and natural disasters. Holistic planning and design methods are needed to mitigate damaging natural forces, create more resilient communities, and sustain fragile marine ecosystems.

This NC State design studio organizes architecture and landscape architecture students into a laboratory for confronting these issues in a comprehensive and collaborative way. By engaging community and government stakeholders and consulting with researchers, students developed problem statements that enable implementation and future adaptation of multiple-scenario, holistic design propositions.



03



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The design schemes are based on a resilient and adaptive design concept called P.A.R.C.S. (Pro-Active Recovery Community Structures), and they provide innovative solutions for disaster mitigation and post-disaster recovery for residents of the Outer Banks.

Woodser Huts create a back-to-nature experience. These ecotourism cabins explore methods of resilient coastal design and consider the building as an act of stewardship. They could be used as vacation cabins and housing for post-disaster relief volunteers. Visitors would learn about the coastal landscape and ecology through inhabiting the building and realizing its function and form.

The huts are comprised of a durable three-part system. The structure is made out of reinforced fiberglass sections and wood lateral bracing. The interior is clad with wood, and the exterior is clad with fiberglass panels that move up and down to close the building during storms and at the end of tourist season. The open, flexible spaces contain sleeping lofts, a small kitchen, porches, and sitting areas. Each hut has a boat dock and spaces for hanging hammocks. Construction methods are appropriate for the coastal context. The cabins adapt to daily winds, and all of the wood and steel structure is elevated out of the tidal range to reduce deterioration.

## RHODE ISLAND SCHOOL OF DESIGN

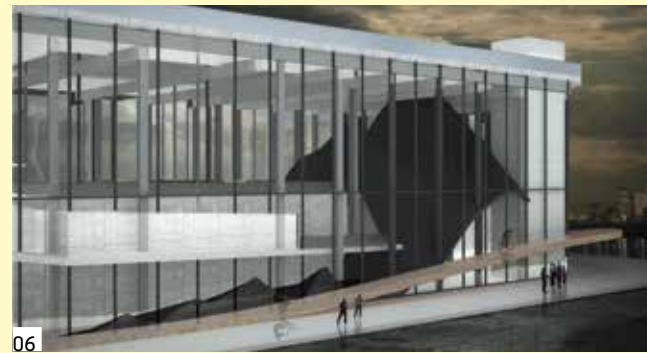
### CLIMATE MUSEUM: THE LOOP

By **Peter Yeadon**, Professor,  
Department of Industrial Design

The Climate Museum, founded in New York City in 2015, is currently without a permanent home or edifice.

Professor Yeadon provided students in his advanced design studio with an opportunity to design America's first climate change museum building.

The Loop is one team's response to the design brief, which laid out the goals for the museum, parameters around



06

the project, and course objectives. The site chosen was New York City's Pier 57 located in midtown Manhattan, a shoreline area along the Hudson River vulnerable to flooding from rising tides. The design aims to provide a space for people to think about climate change from various perspectives, giving people more of a comprehensive understanding of climate change while leaving space for visitors to reflect on their own experiences within the museum.

The semester-long course encouraged students to develop an awareness and knowledge of climate change and sustainable development and an appreciation of the broad design implications of global warming. They were tasked with developing design propositions that were reasonable and convincing arguments based on research and evidence, along with contemplating and developing design innovations that might help address important problems.

02

Turning to nature's strategies for inspiration, ASU's Biomimicry Center remodeled its office based on Life's Principles.

03

The context for the studios is the Outer Banks region of the North Carolina coast. The Outer Banks are a narrow strand of barrier islands that stretch 200 miles north to south along the coast, and at points, the banks separate from the mainland shoreline by up to 30 miles. A series of estuarine sounds lie to the east of the mainland, and the banks experience frequent Atlantic storms, including intense nor'easters and hurricanes.

04

The Woodser huts are inspired by the local boating community and draw on the expertise of local craftspeople who work with wood and fiberglass.



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09

### SHERIDAN SMALL HOMES

By **Jonathan Knowles**, Professor,  
Department of Architecture

Professor Knowles and his students developed two housing prototypes that will be an innovative solution to the housing deficit in Providence, Rhode Island, through the implementation of energy-efficient and cost-effective design. Their energy-efficiency strategy will exceed the U.S. Department of Energy's "Zero Energy Ready Home" benchmark through a reduction in energy required for heating, cooling, and ventilation, and will supply that energy from photovoltaic (PV) panels. The houses will be a net producer of energy, eliminating utility costs and providing energy security for future homeowners. Five of the prototypes are scheduled to be built in summer 2019.

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The Climate Museum's physical loop is designed for a visitor experience that traverses sea, ground, and sky habitats. Storytelling about the environment is facilitated by the building's form.

06

Rendering of external building elevation overlooking the river

07 Prototype 1: New Levels

08 Prototype 2: Light Box

At 850 square feet of livable space, these two prototype homes offer two bedrooms, two bathrooms each and are modeled to be clustered in order to maximize green space.

09

New Levels interior rendering of the living/dining areas

# PLASTICS:

## THE DESIGN STORY

By Penny Sparke

The story of plastics starts in the nineteenth century with the patents for a number of semisynthetic materials. The aim was to bring luxury goods—previously made of expensive, handcrafted, natural materials—within the reach of the socially mobile nouveau riche. The new products—jewelry, pin boxes, hair ornaments, picture frames, mirrors, combs, and many more—brought unbridled pleasure to their owners through conspicuous consumption, ownership, and the associated social status.

Now in the early twenty-first century, the multiple plastics that surround us on a daily basis are more likely to evoke guilt than pleasure. The painfully slow degradability of the fully synthetic plastics and the complex plastic blends from which our running shoes, shopping bags, computers, food packaging, picnic plates, automobile components, and a myriad of other items in daily use are constructed, have engendered huge environmental problems. With less than a fifth of the total amount being recycled, the rest is left to inflict untold damage on the planet's animal and plant life.

That dramatic turnaround in attitudes toward plastics happened in little over a century. It mirrored the general shift that occurred with the growing realization that the rampant consumerism that had driven social change and economic growth from the nineteenth century onward had a flipside, and that, in acquiring our material comforts, we were inadvertently destroying the natural environment on which we depend for our survival. From the 1960s onward, partly through writings such as Rachel Carson's 1962 book *Silent Spring*, which alerted us to the growing quantities of toxins in our environment,



01

and Vance Packard's study of two years earlier, *The Waste-Makers*, an outcry against built-in obsolescence, an awareness gradually grew about the damaging effects of the double-edged sword that was consumer capitalism.

Plastics have not always been the enemy, however. During the greater part of the twentieth century, we welcomed plastic products into our homes, offices, and cities on a massive scale. They were carriers of the message of modernity and they brought with them a link to the progressive world of advanced technology and the wonders of science. The widespread acceptance that they received was largely a result of the forms bestowed on them by industrial designers. Unlike handworked wood, for example, which can take on only certain forms, plastics lack an innate shape or



02



03

color and have a fluidity that gives them a huge flexibility.

Before they became the heroes of the modern world, however, plastics had performed a range of other roles. Natural plastics—amber, horn, wax, shellac (from the "lac" beetle), gutta-percha (from the Palaquium tree), ivory, and tortoiseshell, for example—went back to antiquity. Amber, usually used for jewelry, was mentioned by the ancient Greek Pytheas, in the fourth century BCE. Natural plastics were joined in the mid-nineteenth century by the semisynthetics, among them vulcanite (rubber with sulphur added), which was widely used for imitation jet jewelry; casein (made from milk curd), which took on many shapes and colors and which was also used widely as a substitute for more precious materials; and



04

celluloid, once again a favorite substitute, but the properties of which (apart from its flammability) also made it the perfect material for billiard balls and photographic and cinematic film. Semisynthetics acted either as stand-ins for natural materials or as utilitarian substances facilitating other new developments. When the first fully synthetic phenolic polymer—Bakelite—appeared in 1907, it followed the latter route, becoming the perfect material for the new electricity industry.

All that was to change in the 1920s, when industrial designers began to transform plastic products into magical objects. Emerging from the commercial backgrounds of advertising and window display, the new American designers—Norman Bel Geddes, Raymond Loewy, and Harold Van Doren among them—already knew how to meet the symbolic requirements of consumers. They created meanings and identities for a range of new plastic products emanating from the new technology-driven industries. In the words of Jeffrey Meikle, "Americans viewed plastics as miracle materials from which to shape the contours of a desired future."<sup>1</sup> Raymond Loewy's 1929 redesign for the Gestetner duplicator boasted a new Bakelite body-shell, which brought the object's mechanical parts together into a single visual entity. Bakelite was soon joined by a range of new phenolic plastics in a rainbow of colors, among them Catalin, which was used for toys and jewelry, and a

number of urea formaldehyde resins, among them Vinylite, which also introduced new possibilities for colored products. While plastics and design developed a natural synergy with each other, the former were also the perfect vehicle for the 1930s product style called "streamlining"—a modern aesthetic applied to automobiles, refrigerators, and a wide range of smaller mass-produced plastic objects with body-shells, such as radios—as its rounded forms meant that products could be removed from their molds with ease.

Plastic products suffered a setback in the immediate post-World War II years when, for a few years, consumers looked to the comfort provided by traditional goods and the authenticity of natural materials. It was a short-lived interlude, however, as designers once again came to the rescue of plastics and rehabilitated the materials as the symbols, once again, of modernity, progress, and optimism. That rehabilitation took place not in the United States, but in Italy, where an indigenous plastics industry had developed in the 1930s when economic nationalism prevailed. Postwar, through the visual innovation of its products, Kartell, the manufacturer of plastic products, became preeminent in the field, in 1953 employing designer Gino Columbini, who made mundane products like colanders and lemon squeezers look like enticing items of modern sculpture. The main challenge to Italian designers was to make large items, such as chairs, completely out of plastics.



05

**01** Birdcage (China), ca. 1901; Made by Liang Qichang (dates unknown); Buffalo horn (vertical bars), lacquered bamboo (horizontal hoops bracing bars), ivory, tortoiseshell (with substrate of silver leaf on vermillion on wood), cedar wood, various metals (brass, possibly paktong, white metal), jade, glazed porcelain; H x diam.: 86 x 39.4 cm (33 3/4 x 15 1/2 in.); Cooper Hewitt, Smithsonian Design Museum; Gift of Mrs. Herman Frasch, 1916-12-1-a/f

**02** Comb (Peineta) (Cuba), 19th century; Shaped and pierced tortoiseshell; H x W x D: 26 x 23.5 x 3 cm (10 1/4 x 9 1/4 x 1 1/16 in.); Cooper Hewitt, Smithsonian Design Museum; Gift of Belmont Freeman, for the family of Maria Magdalena Kjellesvig González de Freeman, 2018-41-1

**03** Radio Nurse Intercom Speaker, 1937-38; Designed by Isamu Noguchi (American, 1904-1988); Manufactured by Zenith Radio Corporation (Chicago, Illinois, USA); Molded Bakelite, metal; H x W x D (without cord): 19.8 x 17 x 16 cm (7 7/8 x 6 1/2 x 6 1/8 in.); Cooper Hewitt, Smithsonian Design Museum; Gift of Mel Byars, 1991-59-61

**04** Patriot Radio, 1940; Designed by Norman Bel Geddes (American, 1893-1958); Manufactured by Emerson Radio and Phonograph Corp. (New York, New York, USA); Cast phenolic resin (Opalon), molded urea plastic, molded cellulose acetate, embossed acetate, metal; H x W x D: 20.3 x 27.9 x 14 cm (8 in. x 11 in. x 5 1/2 in.); Cooper Hewitt, Smithsonian Design Museum; Gift of George R. Kravis II, 2014-10-1

**05** Baby Brownie Camera and Packaging, ca. 1934; Designed by Walter Dorwin Teague (American, 1883-1960); Manufactured by Eastman Kodak Company (Rochester, New York, USA); Molded Bakelite, metal, glass; H x W x D: 8 x 8.5 x 7.3 cm (3 1/8 x 3 3/8 x 2 7/8 in.); Cooper Hewitt, Smithsonian Design Museum; Gift of George R. Kravis II, 2014-25-4-a,b

<sup>1</sup> Jeffrey Meikle, "Plastics in the American Machine Age," in *The Plastics Age: From Modernity to Post-Modernity*, ed. Penny Sparke (London: Victoria & Albert Museum, 1990), 42.



06

Kartell took on designer Marco Zanuso to address that task and in 1964 the company launched a polyethylene child's chair (Fig. 06), which soon inspired others to follow suit, among them Vico Magistretti, who created the Selene chair out of ABS plastic for Artemide in 1967, and Joe Colombo, who designed chair model 4867 for Kartell in the following year. The minimalist aesthetic they developed, which featured sleek surfaces, organic curves, and bright colors, became *the* aesthetic for modern plastic products in the 1960s and returned to the materials the reputation for high quality and modern sophistication that they had previously enjoyed in the U.S. in the 1930s.

The oil crisis of 1973 marked the end of the easy accessibility of plastics. That decade also saw the beginning of a popular concern with

environmental issues, among them the release of toxins into the atmosphere, the depletion of natural resources, and the excessive production of damaging waste materials, including plastics, which were slow to degrade. While efforts were made to ensure that they could be recycled, the quantities in which they were used for everyday purposes, such as packaging, made that challenging. By the 2000s, the need for symbolism in everyday goods had been overtaken by an interest in ecology, and it became clear that plastics could not, like natural materials, return to the earth from which they had come. As a consequence, plastics ceased to be the miraculous messengers of modernity and became the enemy. Our relationship with them is unlikely to ever be the same again.



07

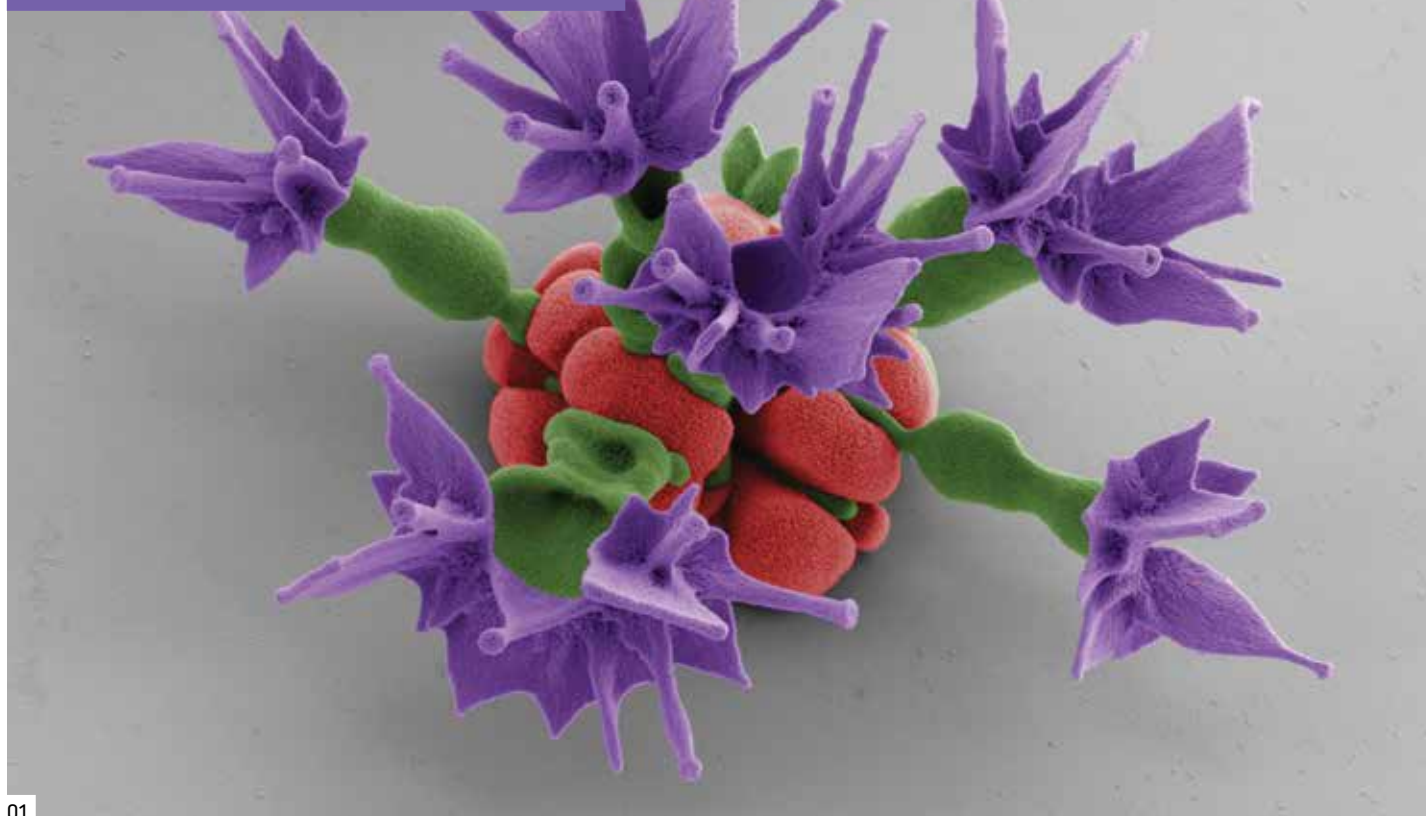
Penny Sparke is professor of design history at Kingston University, London. She received her PhD in Design History in 1975 and taught the subject from 1975 to 1999. She has given keynote addresses, curated exhibitions, and broadcast and published widely. Her publications include *The Plastics Age: From Modernity to Post-Modernity* (1990) and *An Introduction to Design and Culture, 1900 to the Present* (4th edition 2013).

**06**  
Child's Chair, 1964; Designed by Marco Zanuso (Italian, 1916–2001) and Richard Sapper (Italian, 1932–2015); Manufactured by Kartell S.p.A. (Milan, Italy); Polyethylene

**07**  
Model 4860 Stacking Side Chairs, 1967; Designed by Joe Colombo (Italian, 1930–1971); Manufactured by Kartell S.p.A. (Milan, Italy); Injection-molded ABS plastic, rubber; H x W x D: 72 × 43.3 × 43 cm (28 3/8 × 17 1/8 × 16 7/16 in.); Cooper Hewitt, Smithsonian Design Museum; Gift of Dr. Herbert Appel, 1986-115-1.2

# WYSS INSTITUTE:

## TAKING LESSONS FROM NATURE



01

Cooper Hewitt talks to Don Ingber, founding director of the Wyss Institute for Biologically Inspired Engineering at Harvard University, and Joanna Aizenberg, founding core faculty and lead of the Adaptive Material Technologies Platform at the Wyss Institute. The Wyss Institute (founded 2009) has developed a new model for innovation, collaboration, and technology translation within academia, breaking silos to enable collaborations that cross institutional and disciplinary barriers. Wyss faculty and staff engage in high-risk research that leads to transformative breakthroughs for medicine and the environment by combining approaches from the design, art, and technology sectors.

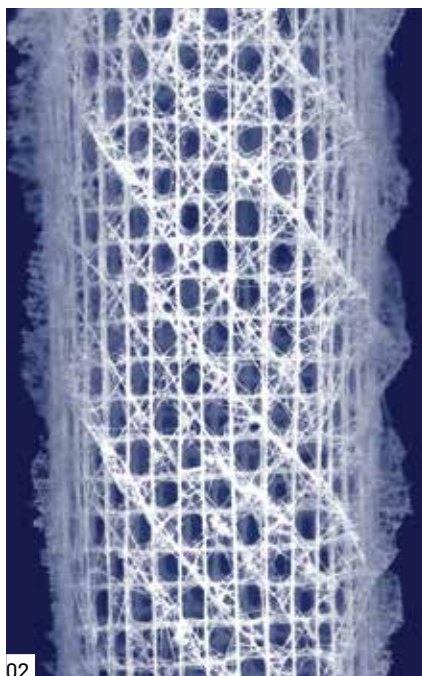
**COOPER HEWITT:** Was the Wyss Institute always meant to be a place for collaboration across disciplines?

**DON INGBER:** Yes. Absolutely. The original challenge was to envision the future of bioengineering across Harvard and all of its affiliated hospitals. If you look back on bioengineering over the last fifty years, enormous advancements were made by applying engineering principles to solve medical problems—dialysis machines, respiratory ventilators, endoscopes, stents, and pacemakers are just a few examples.

During the past ten to twenty years there's been a breakdown of the boundaries between living and nonliving systems, and many of us were already collaborating across these different fields. We realized that we'd uncovered enough about how nature builds, controls, designs, and manufactures from the nanoscale up so that we're now at a point where we can leverage biological design principles to develop new engineering innovations—this is what we termed “biologically inspired engineering.”

**CH:** What sets Wyss Institute apart from other cross-disciplinary academic labs?

**DI:** The Institute's vision is that breakthrough discoveries cannot change the world if they never leave the laboratory. It was designed to confront the challenge of translating technology advances across the academic-industrial interface. The organizational model we've developed is specifically designed to overcome many challenges that have held back technology innovation and intellectual property generation in the past. It ensures



efficient translation of discoveries into products that enter the marketplace in order to improve human health and enhance sustainability.

**CH:** Joanna, can you talk about your work and how collaborations across disciplines factor into your process?

**JOANNA AIZENBERG:** Absolutely. When I joined Harvard, one of my initial ideas was to establish collaboration and interaction between the School of Engineering and the School of Design. Work on environmental issues was happening at both schools, but separately—not in any joint or common way, so that we might teach our students or think about these problems across disciplines.

**CH:** What were some of your first impressions working with and observing these two disciplines in collaboration?

**JA:** Architects and designers are working with materials, and engineers are creating the materials. The very innovative collaborative work was really being done outside of our own comfort zones. We speak different languages and teach students differently, so the only way that we can move effectively is through collaboration, thinking outside the traditional box.

This early work led to the establishment at Harvard of a new degree—Masters in Design Engineering (MDE)—where half of the classes are



in engineering sciences, in the School of Engineering, and the other half from the School of Design. The MDE engages a new generation of people who are thinking about design from a materials' properties perspective, not only aesthetically, but how we might improve practical and functional aspects that address environmental or energy-related questions.

**CH:** What obstacles might arise along the way?

**JA:** There are quite a number of obstacles. In sciences and technologies, every community has its own sources of support. Often there is an inability to find support for students and teams because the parameters for research grants aren't aligning with these new team structures. It was issues like these that led to the development of the Wyss Institute structure of supporting paths beyond research and publishing, to patents and commercialization in the market. The Wyss model brings an advanced technology team into the mix, therefore introducing a new focus for the work.

Another obstacle arising out of the cross-departmental teams is where to do the work. Development of large-scale projects, such as designing and fabricating prototypes, can be done at the School of Design, but they're unable to do things at a small scale (microscopically). Today, nearly every material we make has to

be designed from the very small scale up and for that, you need facilities for microscale and nanoscale fabrication. Wyss Institute-supported labs facilitate this joint work, providing the required technical support and facilities.

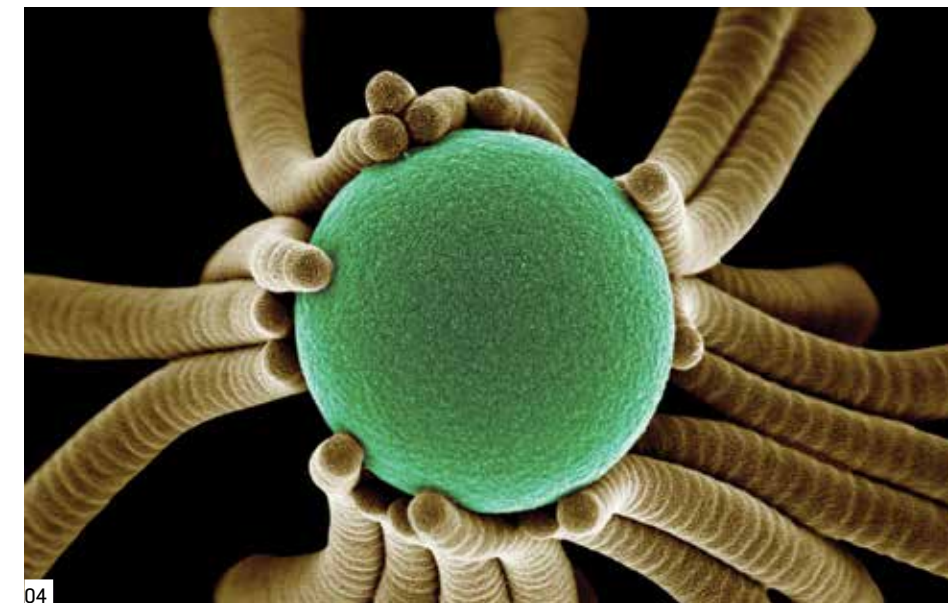
**CH:** The Institute is designed to bring fundamental and applied research to serve a broader purpose. How does this happen?

**JA:** It runs like a startup company. The advanced technology team are people working directly with scientists to make sure that a project we choose is not just a good idea, but that it can be brought to a prototype within a well-defined time frame. A good example is my Slippery Surfaces project, which was one of the first companies that was launched through the Wyss Institute. The first paper publishing our discovery came out in 2011 and the new company, which later brought it to market, was launched in 2013. That's a really short time. The business team quickly assesses needs for the product, market climate, and financials, so that the researchers can move on from work showing promise at the fundamental science level and simple prototypes to more doable, practically important, and scalable projects.

**CH:** What does the assessment model look like?

**JA:** Wyss Institute runs the team work through what's called the Validation Project. Concepts have one to two years to be brought to a level where they can graduate and become commercialized. We came up with an idea for a new material—a butterfly-inspired coating—that can clean air from volatile compounds at room temperature. The ability to purify contaminated air has value well beyond a publishable piece of work, as it also applies to catalytic converters. Catalytic converters ensure that the exhaust that comes out from our cars is not polluting the environment, and our project addresses recent serious problems with a number of car manufacturers that brought inefficient catalytic converters to market.

Joanna Aizenberg, PhD, is the Amy Smith Berylson Professor of Material Sciences at Harvard John A. Paulson School of Engineering and Applied Sciences, a Professor of Chemistry and Chemical Biology in the Department of Chemistry and Chemical Biology, and Co-Director of the Kavli Institute for Bionano Science and Technology.



My group developed the idea, patents were filed, and through Wyss were shared with the designers. At the end of the validation phase, a company was launched. The new company will commercialize these catalytic materials for a whole range of applications, but primarily for air purification from volatile organic compounds, including purification of exhaust from vehicles. It's a really nice path from discovery and patent to validation and launch.

Slippery Surfaces, the technology I mentioned earlier, is now being applied to a whole new area, different from what the company was launched on, which was the technology that prevents ice formation on airplane wings. Now SLIPS are being applied to a paint used on surfaces where barnacles and mussels accumulate, such as on bridges, ships, boats. The technology will hopefully lead to a new generation of coatings that will prevent biological fouling and its accumulation coming from the ocean. These coatings will not leach toxic chemicals into the environment that kill the living creatures, but will rather prevent their attachment by completely different means. This technology will positively impact our environment improving fuel use and the associated energy penalties of the current problems with bioaccumulation on marine vehicles.

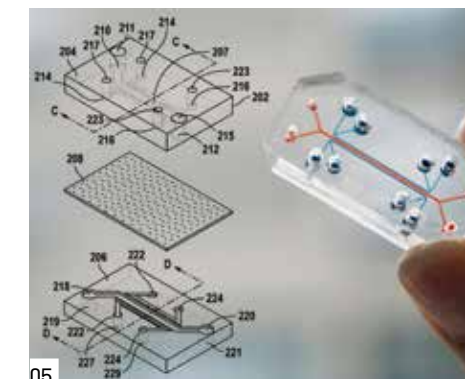
**CH:** Why do you see such resonance in collaborations involving materials science, technology, and design?

**JA:** The interactions of designers with scientists are essential for thinking

about how a new generation of adaptive materials—materials that can change their properties in response to the environment—is considered across the length scales, from nanoscopic to the practical macroscopic scale. Our work isn't necessarily mimicking a specific function that nature has evolved but rather our work is bio-inspired, in a sense that it creatively combines lessons from various organisms that can be applied to solve specific design challenges.

Nature can only work with proteins and subsets of very weak materials. We have cements and steels. Our materials are better. But they are not as "smart." We can now develop the whole range of manmade materials and provide them with smartness, designing them with the lessons from natural materials. I think this is where the future in design lies.

Donald E. Ingber, MD, PhD, is the Founding Director of the Wyss Institute for Biologically Inspired Engineering at Harvard University, the Judah Folkman Professor of Vascular Biology at Harvard Medical School and the Vascular Biology Program at Boston Children's Hospital, and Professor of Bioengineering at the Harvard John A. Paulson School of Engineering and Applied Sciences.



**01** Synthetic crystal flowers sculpted at the nanoscale using timed interventions in molecular self-assembly, 2013; Joanna Aizenberg (Russian, born 1960); Scanning electron micrograph image with false color

**02** Portion of the light-guiding, ultra-strong skeleton of a Glass Sea Sponge, 2003; Joanna Aizenberg (Russian, born 1960); Photograph

**03** The Gherkin, 30 St. Mary Axe, London, United Kingdom, 2003; Designed by Foster + Partners (London, United Kingdom, founded 1967)

**04** Synthetic cilia demonstrating the principle of self-assembly around a spherical nanosphere, 2009; Joanna Aizenberg (Russian, born 1960); Scanning electron micrograph image with false color

**05** Microfabricated Organ-on-a-Chip device that can replace animal testing when lined with human tissue cells, 2009; Donald E. Ingber (American, born 1956); Photograph of patent and device

Wyss Institute Selects is on view in the Nancy and Edwin Marks Gallery from July 12, 2019 to May 4, 2020 and is made possible by the Marks Family Foundation Endowment Fund.

## Designs from Nature—Cooper Hewitt Design Triennial



### 01 NATURE: COLLABORATIONS IN DESIGN \$40.00 / MEMBER \$36.00

Book design by Neil Donnelly Studio  
The companion book to the 2019 Cooper Hewitt Design Triennial including 65 international projects



### 02 TRIENNIAL TOTE BAG \$29.00 / MEMBER \$26.10

By Parley x Cooper Hewitt  
Each Parley Ocean Bag is created from approximately five plastic bottles recovered from coastlines by a global cleanup network



### 03 AIR-INK™ 15MM MARKER \$30.00 / MEMBER \$27.00

By Graviky Labs  
Invented by MIT spinoff Graviky Labs, the first ink made entirely out of air-pollution particulate



### 04 SHOP EXCLUSIVE CYMATIC SCARF \$225.00 / MEMBER \$202.50

By threeASFOUR x Travis Fitch  
A pattern developed from sound vibration images, celebrating their 3D-printed Biomimicry collection



### 05 BIOLITH™ NECKLACE \$100.00 / MEMBER \$90.00

By bioMASON, Inc.  
Sterling silver necklace featuring BioCement™ pendants, a green construction material grown with microorganisms



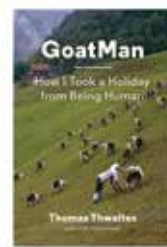
### 06 ZANDGLAS CARAFE \$300.00 / MEMBER \$270.00

By Atelier NL  
From the A World of Sand project, glassware made by melting rust-brown sands from Savelsbos State Forestry



### 07 LIQUID COLOR SCULPT VESSEL \$320.00 / MEMBER \$288.00

By Handmade Industrials  
One-off vessels made from biodegradable granules take shape by imposing physical restrictions on a flexible mold



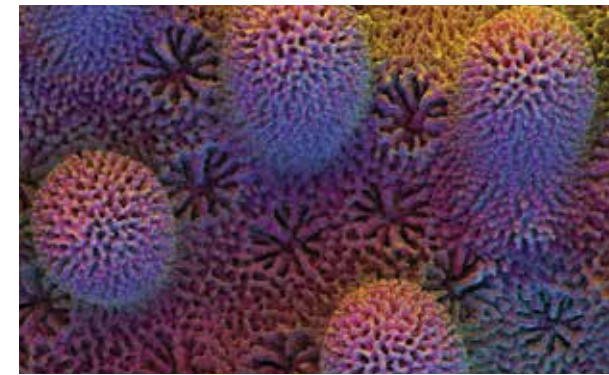
### 08 GOATMAN \$24.95 / MEMBER \$22.45

By Thomas Thwaites  
A hilarious and surreal journey through engineering, design, and psychology as Thwaites transforms himself into a goat



### 09 MADE BY RAIN PORCELAIN PLATTER \$280.00 / MEMBER \$252.00

By Alike van der Kruijs  
Following van der Kruijs's development of a technique for recording rain on fabric, this new series "draws" rain on porcelain



Polychromatic Scanning Electron Micrograph, 2019; Digital print; Skeletal details of the coral *Montipora* sp., field of view: 8.2 mm (ca. 175x magnification)

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### COVER IMAGE

BionicANT, 2018; Sebastian Schrof (German, born 1989), Elias Knubben (German, born 1975), Jochen Spohrer (German, born 1990), and Mart Moerdijk (Dutch, born 1988), Festo AG & Co. KG (Esslingen, Germany, founded 1925); Laser-sintered polyamide, steel, gold plate, batteries, sensor, processor, radio module, stereo camera; © Festo AG & Co. KG, all rights reserved

Festo's BionicANTs, robots designed to make autonomous decisions in conjunction with one another, demonstrate a technological version of the cooperative behavior observed in ants that has the potential for large scale implementation in manufacturing.



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*Design Journal*, Number Ten, Summer 2019  
Published by  
Cooper Hewitt, Smithsonian Design Museum  
2 East 91st Street  
New York, NY 10128-0669  
[cooperhewitt.org](http://cooperhewitt.org)

*Design Journal* is printed on FSC-certified recycled paper.

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Innovation By Design

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