



# PROGRAMS 2016-18

### MIT CENTER FOR ART, SCIENCE & TECHNOLOGY

2016-18 PROGRAMS

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Cover image: Cellist Maya Beiser, the Inaugural Mellon Distinguished Visiting Artist at the MIT Center for Art, Science & Technology (CAST), performs *Stillness Moves*, solo cello workshop performances, on December 1 and 2, 2017. Credit: L. Barry Hetherington.

## THE ARTS AT MIT

are rooted in experimentation, risk taking and imaginative problem solving.

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#### Acknowledgments

## FROM THE DIRECTORS

MIT is known for predicting the future, and even (somewhat immodestly), for claiming to invent it on a regular basis. It may be instructive, therefore, to look back to the future we predicted for the Center for Art, Science & Technology (CAST) when it was established six years ago, to understand and assess where we are today.

We began in 2012 with the relatively straightforward idea of recognizing and sustaining the robust artistic culture embedded in one of the world's leading research universities in science and engineering. Creating a supportive infrastructure, curating the campus and facilitating MIT's wellestablished cross-disciplinary culture were guiding principles. In the meantime, we have seen a distinct evolution in CAST's four principal areas of activity: integrating the arts across the curriculum; embedding visiting artists in ongoing teaching and research; encouraging the experimental phase of artistic creation; and disseminating creative work made at MIT to the public at large.

With support from CAST, more than thirty courses have deployed visiting artists in co-creation with students, from arrangements and commissions of new music for student ensembles in the performing arts to the development of videos, installations, exhibitions and new technologies for artistic expression. During the last two years, faculty increasingly have adapted a case study method to reveal the lessons of entire artistic careers. In project-based courses, they have incorporated studio practice as a formal expression of student learning and a counterpart to the typical research papers or experiments.

Department of Urban Studies and Planning (DUSP) professor Anne Whiston Spirn, for example, has been inspired by Newton Harrison and Helen Mayer Harrison's pioneering work as eco-artists and proponents of action research during their forty-year career in urban renewal and agricultural, forest and watershed restoration. Newton Harrison regularly participated in Spirn's class, Ecological Urbanism, and in field trips with her research team to the West Philadelphia Landscape Project—a community intervention that works to improve water quality and rebuild the neighborhood using landscape literacy as a cornerstone. Artist B. Stephen Carpenter II likewise has a socially engaged art practice focused on water specifically, on increasing access to potable water in politically marginalized communities in the United States and abroad. In an effort to encourage entrepreneurship in the water sector among MIT students and to provide a teaching model for K-12 educators, DUSP professor Lawrence Susskind developed a series of seminars, workshops and performances featuring Carpenter's work for MIT's OpenCourseWare platform.

The exploratory trip and seminar, Landscape Experience, took an entire body of contemporary land art in the vast southwest of the United States as a case study, in an experience that culminated in a variety of projects—sculptural installations made with specimens collected in the desert, hybrid combinations of visual art and written research and a collectively produced video, *The Travelogue of the Undocumentable*. Vision in Neuroscience and Art, a new class in the Department of Brain and Cognitive Sciences, asked students to create artworks that demonstrated some aspect of the science of vision, in the belief that materially revealing the workings of perception in an exhibition-quality artifact can be a significant contribution to the study of neuroscience.

MIT students have long had the opportunity to learn from experienced leaders in government, business and other external organizations, and now the visiting artists program—once typified by one-off appearances—has integrated artists working at the top of their fields into teaching and research at the Institute on an unprecedented level. By stressing collaboration with ongoing research and creative projects at MIT, faculty have found multiple ways to embed artists—in labs, rehearsal rooms, fieldwork and as central participants in the symposia and publications that disseminate CAST's work well beyond campus.

In addition, CAST has increased its commitment to faculty creative projects and research trajectories, with new, dedicated streams of funding. Faculty grants have supported the development of J. Meejin Yoon's *FloatLab*, a learning laboratory and art installation on the Schuylkill River in Philadelphia; Azra Akšamija's engineering and design studio in a community center for Al Azraq refugee camp in Jordan; and Rania Ghosn's thought-provoking monument to the environmental crisis created by plastic debris, which was inspired by the Pantheon and located on the Rose Kennedy Greenway in Boston. Clusters of research on topics that require career-spanning exploration and iteration are emerging: particularly around climate change; sound studies that bridge music composition, performance and acoustical engineering; transmedia technologies such as animation and data visualization; and poetic, improvised, or playfully irrational variations on coding.

In the process, faculty are articulating the role of artistic research at MIT, where there is widespread certainty about the value of laboratory-based scientific and engineering research, but less clarity about the saliency of studio- and ensemble-based practices in a research university environment. When peer review takes place upon or after public presentation, rather than prior to it, when qualitative—as much as quantitative—assessment is valued, and when artists just as often seek to transform existing social and cultural conditions as to achieve consensus about them, it is important to create multiple platforms for the discussion and dissemination of creative work on campus. As a result. CAST has taken on more of a presenting role than we perhaps originally envisioned, and our spectrum of programs has expanded from symposia to exhibitions, performing arts series and publications, which have been well received far beyond the Institute's borders.

Active Matter, which emerged from the design studio and research summit led by designer and Self-Assembly Lab founder Skylar Tibbits two years ago, was published by MIT Press in September 2017, making it the second book generated from CAST convenings. The 2017 symposium, "Being Material," revisited the book's foray into this new field characterized by physical materials that can assemble themselves, transform autonomously and react to external stimuli and information. As the title suggests, the gathering pivoted from Nicholas Negroponte's prediction in 1995 that "being digital" would have us entering a realm of bits rather than atoms, into cross-field investigations of five different material lineages (Programmable, Wearable, Livable, Invisible and Audible) to explore unexpected convergences of digital and physical materials in multiple realms—including art, biotechnology, design, engineering, fashion and music.

On the exhibition front, the MIT Museum hosted the North American premiere of *The Enemy* in October 2017, a virtual reality installation that immersed the audience in conversations between enemy combatants in several longstanding, global conflicts. *Manufacturing Mischief*, a satirical play by artist Pedro Reyes featuring Institute Professor Noam Chomsky in puppet form, premiered on campus and appeared thereafter at Carnegie Mellon University, the Power Plant in Toronto and The Tank in New York City.

And after four seasons, *MIT Sounding* has established MIT as a hub for musical innovation that is accessible to the general public as well as our educational community. Notably, *Blackstar*, Evan Ziporyn's adaptation of David Bowie's final album, has been performed by the Barcelona Symphony Orchestra and is touring multiple venues in the United States.

As CAST expands and refines its mission, it is providing an increasingly sturdy—though flexible and adaptable—platform for art-science research and cultural expression at MIT, demonstrating that art making and curation are fundamental forms of creative expression and knowledge production applicable to any discipline.

Evan Ziporyn Kenan Sahin Distinguished Professor of Music, Music and Theater Arts, Faculty Director, CAST and Artistic Director, *MIT Sounding* 

Leila W. Kinney Executive Director of Arts Initiatives Executive Director, CAST



# ABOUT CAST

### CAST MISSION STATEMENT

The MIT Center for Art, Science & Technology (CAST) creates new opportunities for art, science and technology to thrive as interrelated, mutually informing modes of exploration, knowledge and discovery. CAST's multidisciplinary platform presents performing and visual arts programs, supports research projects for artists working with science and engineering labs, and sponsors symposia, classes, workshops, design studios, lectures and publications.

## CAST'S ACTIVITIES INCLUDE:

#### CROSS-DISCIPLINARY CLASSES

Soliciting and supporting cross-disciplinary curricular initiatives that integrate the arts into the core curriculum and create new artistic work, materials, media and technologies for artistic expression.

#### PUBLIC OUTREACH

Disseminating to the public the creative and intellectual production supported by the Center through performances, exhibitions, installations, videos, publications and a biennial symposium.

#### RESIDENCIES

Producing a Visiting Artists Program that emphasizes research and development of creative work, cross-fertilization among disciplines and extensive interaction with MIT faculty, students and researchers.

#### SUPPORT

Assisting in the presentation and curation of art relevant to the research of engineers, scientists and the MIT community as a whole; supporting faculty, students and postdoctoral researchers whose work advances the mission of the Center.

#### **FUNDERS**

The Center for Art, Science & Technology is funded through 2020 by a grant from the Andrew W. Mellon Foundation. CAST also receives generous support from Dasha Zhukova; Michael and Sonja Koerner; Joan and Paul Gluck; the late Fay Chandler; Ron and Carol Kurtz; Terry and Rick Stone; and Peter Athens. Additional support comes from Philip S. Khoury, Associate Provost with responsibility for the arts; Melissa Nobles, Kenan Sahin Dean, School of Humanities, Arts, and Social Sciences; Hashim Sarkis, Dean of the School of Architecture and Planning; and the Council for the Arts at MIT.

## 2012-18 CAST PROGRAM STATISTICS

- **4,390+** students enrolled in classes, attended workshops and symposiums, or participated in performances
- **95+** MIT faculty and staff collaborated with visiting artists
- Visiting artists engaged with students during **194** class visits and individual meetings
- **31,000+** people attended **111** public programs in person, and another **4,580** joined via live web streams
- 14 collaborative projects appeared in significant festivals or exhibitions in Amsterdam, Basel, Cairo, Berlin, New York, Paris, São Paulo, Tel Aviv, Tokyo and Toronto



#### PROJECTS BY ARTISTIC DISCIPLINE

OFFICE OF THE PROVOST List Visual Arts Center MIT Museum

SCHOOL OF ARCHITECTURE AND PLANNING (SA+P) Art, Culture and Technology Architecture Community Innovators Laboratory Urban Studies and Planning History, Theory and Criticism of Architecture and Art Media Laboratory

#### PARTNERS AT MIT

SCHOOL OF ENGINEERING Aeronautics and Astronautics Civil and Environmental Engineering Computer Science and Artificial Intelligence Laboratory Electrical Engineering and Computer Science Glass Lab Mechanical Engineering Materials Science and Engineering

SCHOOL OF HUMANITIES, ARTS, AND SOCIAL SCIENCES (SHASS)

Anthropology Comparative Media Studies/ Writing History Global Studies and Languages Linguistics Literature Music and Theater Arts Science, Technology and Society

SCHOOL OF SCIENCE Biology Brain and Cognitive Science Earth, Atmospheric and Planetary Sciences Edgerton Center Laboratory for Multiscale Regenerative Technologies McGovern Institute Physics

STUDENT LIFE Concourse Program Hillel Program

SLOAN SCHOOL OF MANAGEMENT MIT Leadership Center Martin Trust Center

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# "BEING MATERIAL" SYMPOSIUM



# "BEING MATERIAL"

A convergence of bits and atoms



/ SYMPOSIUM: "BEING MATERIAL," APRIL 21-22, 2017

"Being Material," the MIT Center for Art, Science & Technology's second international symposium, brought together a diverse group of artists, scientists and scholars to explore the current, and sometimes unexpected, convergence of the digital and material worlds across disciplines. Organized around four panel sessions and a concert—Programmable, Wearable, Livable and Invisible, and Audible—the symposium showcased recent developments in materials systems and design, placing this work in dialogue with kindred and contrasting philosophy, art practice and critique.

In addition to examining how materiality has reasserted itself since Nicholas Negroponte, MIT Media Lab cofounder, asserted in his 1995 book *Being Digital* that we were moving from the world of "atoms to bits," the speakers stressed how porous the digital-material divide has become and addressed the broader social, environmental and political ramifications of the digital revolution. "One of the lessons we learned [at the symposium] is that our machines have people inside them," says symposium co-convener Stefan Helmreich.





Conveners

eci n'est pas une pomme

STEFAN HELMREICH Elting E. Morison Professor of Anthropology and Program Head, MIT

LEILA W. KINNEY Executive Director of Arts Initiatives and MIT CAST

SKYLAR TIBBITS Assistant Professor, Department of Architecture, MIT and Founder and Co-Director, Self-Assembly Lab, MIT REBECCA K. UCHILL Postdoctoral Fellow and Lecturer, Department of Architecture, MIT

EVAN ZIPORYN Kenan Sahin Distinguished Professor, Music and Theater Arts and Faculty Director, CAST, MIT

HONORARY CHAIR Ron Kurtz '54, '59, SM '60



"Social relations and economic relations are built into the technologies that we create, even when those are at scales we cannot see. Programmable matter, even at the nanoscale, has to be thought of sociologically, culturally and politically."

These humanistic concerns were a dominant theme in all four sessions. The Programmable session examined the democratization of technology whether working with less costly, ubiquitous materials for greater access globally, like Manu Prakash's folding microscope, or designing computer programs like Casey Reas and Ben Fry's Processing programming language to liberate creators from the whims of market-driven software manufacturers. The Wearable panel focused on the intersection of the digital and material as it pertains to the body, including developments in fashion design, such as the use of reactive and electronic textiles in Hussein Chalayan's collections; in portable devices, such as webcams, backpack cameras or fitness trackers; and in provocative projects like artist Lucy McRae's ingestible perfume that allows the user to sweat fragrance. The Livable panel reflected on "the earthly and often unintended consequences of human structures of design, as well as the material conditions of social inequality as they are produced in the context of war, resource extraction and displacement," according to moderator Bettina Stoetzer. The Invisible panel investigated the politics of what we see or don't see, given the technologies of cloaking, surveillance, data capture and machine vision.

Previous page, left top: The Livable panel, (from left) Bettina Stoezer, Bill Maurer, Tal Danino, Claire Pentecost, and Rebecca Uchill. Credit: L. Barry Hetherington.

Previous page, left middle: Skylar Tibbits. Credit: L. Barry Hetherington. Previous page, left bottom: Manu Prakash's *Foldscope*, an origami paper microscope. Designed to be extremely portable and durable, *Foldscope* brings hands-on microscopy to new places. Credit: Foldscope Instruments, Inc.

Previous page, right: Lisa Parks in conversation with artist Trevor Paglen. Credit: L. Barry Hetherington. Above: MIT Media Lab PhD candidate Cindy Hsin-Liu Kao (left) gives a demonstration of *DuoSkin* devices that enable users to control their mobile devices, display information and store information on their skin. Credit: L. Barry Hetherington.

Right: "Being Material" co-conveners (from left) Stefan Helmreich, Skylar Tibbits, Rebecca Uchill, Evan Ziporyn and Leila Kinney offer their final thoughts at the end of the two-day event. Credit: L. Barry Hetherington. In many ways, Negroponte's claim was tremendously prescient, but in other ways, materiality has reasserted itself in unexpected ways. Negroponte himself opened the two-day event with a reflection on the pioneering work in the MIT Media Lab and a future scenario in which biotechnology will be the "new digital." The work of panelists Tal Danino and Christina Agapakis, both synthetic biologists and creators of bioart, supports this prediction. Danino programs bacteria to detect cancer cells and to create screen prints; Agapakis designs custom microbes and artifacts, such as cheese made from bacteria found in Olafur Eliasson's tears and on Hans Ulrich Obrist's nose.

## "If yesterday we programmed computers and machines, today we program matter itself."

– Skylar Tibbits

The commingling of bits and atoms has implications for every facet of life. The speakers at the symposium work in a wide range of materials and fabrication techniques, and all shared how this merger or interplay of the digital and physical realms impacts their work. Trevor Paglen spoke about what he considers a "paradigmatic transformation" in our culture—the emergence of images made by and for machines and technologies of nonhuman machine vision. Paglen explains, "[machines] see in profoundly different ways than we see," able to mine trillions of images with uncanny efficiency.

Symposium co-convener Skylar Tibbits argues that we are seeing "pure materials that have amazing capabilities that we haven't seen before-elegant solutions that aren't robotic, device-heavy computers or 'smart' objects," that change our notion of what is digital. Tibbits expanded on Negroponte's forecast to include work in such materials as fluids, textiles, wood, plastic and foam, which he believes will shape the future of design along with biotechnology. Tibbits claims that, "physical materials are not just responding to digital properties. They are not just something we make through digital fabrication; they have digital properties embedded in them." Many of the speakers demonstrated through their work that computation is not being imposed on matter; rather, as MIT researcher Nadya Peek pointed out, "we discovered computation as much as we invented it."

The work presented at the symposium is at the forefront of a materials revolution. If Negroponte's and Tibbits's predictions are correct, then future research in biotechnology and materials science will continue on the path to discovering the digital properties and potential within our material world, and these programmable materials will become a major artistic medium as well.





Visiting Artist Tomás Saraceno's Aerocene at MIT Killian Court. Credit: Sham Sthankiya.



## PEDRO REYES'S MANUFACTURING MISCHIEF

Exploring the human dimension of technology with puppets



/ CLASS: THE REVERSE ENGINEERING OF WARFARE: CHALLENGING TECHNO-OPTIMISM AND REIMAGINING THE DEFENSE SECTOR (AN OPERA FOR THE END OF TIMES), ACT 4.S33, FALL 2016

/ PERFORMANCE: *MANUFACTURING MISCHIEF:* A PUPPET PLAY BY PEDRO REYES, APRIL 26–27, 2018

The philosophical implications of technology, economics and politics are issues that have always been debated in MIT's classrooms, conferences and dorm rooms. Does Ayn Rand's marketbased capitalism provide workers and citizens with more freedom than Karl Marx's capitalism, or less? Is Elon Musk's technocratic approach to public policy more or less effective than a democratic one? What does the rise of Trump tell us about the importance of commitment to a political ideology in the first place? And imagine if Noam Chomsky, one of MIT's most famous public intellectuals, could help to answer some of these questions by moderating a debate between all of these prominent figures from different times and places?

Pedro Reyes, the Dasha Zhukova Distinguished Visiting Artist at MIT CAST, devised a way for all of these figures to meet at last and discuss their ideas. As puppets.



PEDRO REYES CAST Visiting Artist

MIT PROGRAM IN ART, CULTURE AND TECHNOLOGY

THE TANK NYC



Previous page, left top: Puppets including (from left) Karl Marx, Donald Trump, Noam Chomsky, Elon Musk and Ayn Rand. Credit: Sham Sthankiya.

Previous page, left bottom: The character of Noam Chomsky in Pedro Reyes's puppet play *Manufacturing Mischie*f. Credit: Sham Sthankiya. Previous page, right: Pedro Reyes with puppet of Noam Chomsky. Credit: Sham Sthankiya.

Above: Puppets, puppeteers and Pedro Reyes. Credit: Sham Sthankiya. Right: The character of Karl Marx in Reyes's puppet play *Manufacturing Mischief*. Credit: Sham Sthankiya. *Manufacturing Mischief*, a puppet play that premiered at MIT in April 2018 before moving to venues in New York City, Pittsburgh and Toronto, came about as the culmination of Reyes's artist residency at MIT. Reyes has integrated theater into his repertoire since 2008, often using handmade puppets from Japan, inspired by the Bunraku tradition. Reyes's puppet plays include *The Permanent Revolution*, on the life of Leon Trotsky, and other political satires featuring key figures in the history of economics and philosophy, such as Karl Marx and Adam Smith.

A puppet version of MIT professor emeritus Noam Chomsky is the star of *Manufacturing Mischief*. Reyes has long admired the linguist and cultural critic and met with Chomsky to discuss the ideas in the show as part of his residency. The play features Chomsky as the voice of reason when a plot device called the Print-a-Friend animates Ayn Rand, Karl Marx and a tiny Donald Trump. Much of the dialogue in the play was taken directly from Chomsky's writings, including his thoughts on Elon Musk and Steve Jobs, who also appear as characters. The play is a comic cautionary tale centered on the moral dimension of technology—a familiar theme in Reyes's work—and the insidious spread of certain ideas. "Some of the fears one may have about the destruction of labor due to automation, or how technology accelerates the inequality gap, or blocks to democracy because of artificial intelligence, have been addressed by Professor Chomsky," says Reyes, "so it was a big inspiration to use some of his writing in developing the play."

"The play reminds us to consider the social costs of embracing a technology."

#### - Pedro Reyes

On the unconventional medium for a work about philosophy, Reyes explains: "Puppets allow you to break a lot of rules and make these silly encounters.... The advantage of using puppets to talk about philosophy is that you do not have to delve into the personalities of the philosophers. You can go more directly into the ideas."



# LANDSCAPE EXPERIENCE

Nature is never finished



/ CLASS: LANDSCAPE EXPERIENCE 4.S67, FALL 2016

/ FILM SCREENING AND LECTURE: "THE TRAVELOGUE OF THE UNDOCUMENTABLE," LAVINE LECTURE, LIST VISUAL ARTS CENTER, NOVEMBER 6, 2016

Landscape Experience, a seminar taught by art history professor Caroline Jones and MIT CAST postdoctoral fellow Rebecca Uchill, combined the academic exploration of land as a genre, theme and medium in art and architecture. Focusing largely on work in the United States, the course sought to understand how the use of land in art and architecture is bound into complicated entanglements of property and power and the inheritances of non-US traditions, and how the term "landscape" serves a range of political and philosophical positions. The course launched with a late summer road trip through the vast southwestern United States.

The group visited several significant landscape installations, including *Sun Tunnels, Double Negative, The Lightning Field, Spiral Jetty* and Donald Judd's artworks in Marfa, Texas. They also stopped along the way at such sites as Thiokol Rocket Garden, the Navajo Nation Council Chambers, the White Sands Test Facility and the Golden Spike National Historic Site, the ceremonial site of the joining of the US Transcontinental Railroad. Side trips to these places allowed students to view the art installations in the context of the sociopolitical and military history of the areas where the works are situated.

While the students had seen these works in photos or videos before their trip, no mere representation could compare to being immersed in the art on site-experiencing the monumental scale, changing light and expansive distances. Jessica Varner, a PhD student in the class, recalls approaching Nancy Holt's Sun Tunnels and comparing it to Robert Smithson's Spiral Jetty: "The Sun Tunnels appeared on the horizon, appearing to sit lightly on the ground in the midst of a vast valley surrounding it," says Varner. "Their relatively diminutive reveal was an inverse of the massive scale of Smithson's heavy, constructed spiral. Four culvert-like tubes were placed in proximity to each other, large enough to crawl inside, but seemingly minuscule in the Utah desert expanse."

CAROLINE A. JONES Professor of Art History, History, Theory and Criticism of Architecture and Art, MIT

REBECCA K. UCHILL Postdoctoral Fellow and Lecturer, Department of Architecture, MIT



Previous page, left: Installation view of Rainar Aasrand and Stephanie Lee's *No Lake Missing* (2016), table of "field samples," light, and film projection. Credit: Duygu Demir.

Previous page, right: Nancy Holt's *Sun Tunnels*, 1973–76. Credit: Jessica Varner. Above: Reviewers, faculty and students examine architecture student Xhulio Binjaku's *Planting Monuments*, a project consisting of individual forget-me-not plantings to commemorate US nuclear testing in the Southwest and illustrations visible on far wall in the lobby of the Wiesner building, MIT. Credit: Sharon Lacey. Right, top: Detail of Samuel Schneider's *Conditional Release*. Performance, text and installation of dry ice tower and sheet of glass. Credit: Sharon Lacey.

Right, bottom: Robert Smithson's *Spiral Jetty*, Great Salt Lake, Utah, 1970. Credit: Jessica Varner. Sitting in the Cowboy Bar and Café, the watering hole in Montello, Nevada once frequented by Holt and Smithson, students in the seminar had a chance to talk to the regulars. One man, it turns out, had worked with the crew that constructed *Sun Tunnels*, and shared the fact that it is a popular meeting spot for locals. Varner says the conversation clarified for her that "the works we experienced were not exclusively part of historic, technical or art landscape scholarship. Instead, they were a living, breathing part of the here and now, meant to be experienced for as long as they would last."

When they returned to the classroom at MIT, the students had the particular challenge of synthesizing the experience—collapsing time and space—to produce their own work. The results ranged from video to sculptural installations made with specimens collected in the desert, soil samples from campus, seeds or dry ice. Others produced hybrid projects that combined visual art, research and writing.

"No amount of detailed planning prepares travelers for the thrill, road time and exhaustion of the actual journey."

- Jessica Varner

Most addressed the impossibility of containing the landscape. Collectively, the students produced a video about the trip, *The Travelogue of the Undocumentable*, in which they attempted to record their feelings, the sounds, the smells, the fleeting light, their own relative smallness—in short, all the things about a place that can only be gained





## GOING OFF-ROAD WITH MUGARITZ

Exploring creativity in the lab and the kitchen



/ SCREENING: OFF-ROAD, NOVEMBER 2, 2016

/ PANEL DISCUSSION: "COOKING UP IDEAS: A CONVERSATION WITH MUGARITZ," NOVEMBER 2, 2016

At Mugaritz, a two-Michelin-star restaurant in northern Spain, the creative process almost surpasses the culinary goal. Consistently ranked among the best restaurants in the world, what makes Mugaritz stand out is the commitment to experimentation fostered by its founder, Andoni Luis Aduriz.

Pedro Reis, professor of mechanical engineering at MIT, believed that Mugaritz's commitment to rigorous exploration would resonate across disciplines at MIT. He invited Aduriz and Dani Lasa, Mugartiz's director of R & D and creativity, to campus for "Cooking Up Ideas: A Conversation with Mugaritz," a broad discussion about creativity with chefs, mathematicians, musicians, engineers and architects. Discussion topics ranged from creative constraints to how collaboration breeds innovation to the interaction between process, problem solving and creativity. The panel discussion was followed by a screening of *Off-road. Mugaritz, feeling a way*, a new documentary about the restaurant. *Off-road* director Pep Gatell observes that gastronomy, like any creative endeavor, requires "years of trial and error, discipline, work, knowledge and a bit of luck." Unlike previous documentaries about Mugaritz, which Aduriz described as too sterile and idealistic, *Off-road* presents the creative process honestly. Making work is difficult, making excellent work is more difficult, and the hardest part of all, Aduriz says, "is making excellence shareable." Mugaritz has three kitchens: a production kitchen, a service kitchen and a creative kitchen, where twentyfive to thirty chefs formulate new ideas.

"Real creativity doesn't just come from solving a problem that's been presented to you, but from rethinking the problem." – Caitlin Mueller

"When you take the off-road and not the welltraveled road, it is much more painful, but it is exciting, and it is worth it, even knowing that I am going to fail by trying to take this route," says a chef from Mugaritz in the documentary.



PEDRO REIS Gilbert W. Winslow Associate Professor of Mechanical Engineering and Civil and Environmental Engineering, MIT

EVAN ZIPORYN Kenan Sahin Distinguished Professor, Music and Theater Arts and Faculty Director, CAST, MIT

ANDONI LUIS ADURIZ Chef and Founder, Mugaritz

JOHN BUSH Professor, Department of Mathematics, and Associate Department Head, MIT BEN HOUGE Associate Professor, Berklee College of Music

DANI LASA Director of Research and Development and Creativity, Mugaritz

GARETH MCKINLEY Professor, Department of Mechanical Engineering, MIT

GIGLIOLA STAFFILANI Abby Rockefeller Mauze Professor, Department of Mathematics, MIT

CAITLIN MUELLER Assistant Professor, School of Architecture and Planning, MIT



OFF-ROAD DOCUMENTARY SCREENING AND PANEL DISCUSSION ABOUT CREATIVITY WITH MIT FACULTY



<image>

Previous page, left: (from left) Dani Lasa, Ben Houge and Gigliola Staffilani at "Cooking Up Ideas: A Conversation with Mugaritz." Credit: Allison Dougherty.

Previous page, right: Mugaritz's Eucalyptus smoked loin of lamb with its cultivated fur. Credit: José Luis López de Zubiría / Mugaritz. Above: Chef Andoni Luis Aduriz and others from Mugaritz join MIT faculty for a forum on creativity across disciplines, and to screen the 2015 documentary about the restaurant, *Off-road. Mugaritz, feeling a way.* Credit: Allison Dougherty. Right, top: John Bush (left), professor of applied mathematics and associate department head and Gareth McKinley, professor of teaching innovation, School of Engineering. Credit: Allison Dougherty.

Right, bottom: Evan Ziporyn (right) speaks about creativity from the perspective of music composition in the panel discussion: "Cooking Up Ideas: A Conversation with Mugaritz." Credit: Heidi Erickson.

When Reis first met the Mugaritz chefs several years ago, he was struck by similarities between the restaurant's approach and that of his Elasticity, Geometry and Statistics Laboratory, which is dedicated to the fundamental understanding of the mechanics of thin structures, such as rods, plates and shells, in order to transform structural deformations into novel functionalities. In 2014, he invited members of the Mugaritz R & D team to present in the MMEC (Mechanics: Modelling, Experimentation, Computation) seminar series, cosponsored by CAST. Their demonstration, "Mugaritz; A Natural Science of Cooking: Senses, Structures, Textures and Emotions," focused on the properties of food beyond taste, including its structure and its social and cultural significance.

During their follow-up visit in fall 2016, Lasa reiterated these points, emphasizing that cuisine appeals to other sensory systems, not merely taste. He also compared his work at Mugaritz to that of engineers, scientists, mathematicians and architects—people for whom, he said, creativity is tied to usefulness.

"The Mugaritz experience is translatable to the MIT environment," says Reis, where labs rely on the collective creativity of research teams to find novel solutions and where innovation results from working within constraints. When viewing *Off-road*, Reis invited the audience to substitute "MIT" for "Mugaritz." It was easy to spot the parallels, such as the level of focus and intensity, the reverence for process and the pursuit of excellence.

The documentary offered aphorisms that transcend disciplines: "Creativity and innovation hurt"; "The world is divided into people who have dreams and people dedicated to ruining those dreams"; and words to live by, "You cannot be an a\*\*hole and achieve excellence." The nods and knowing laughs in the audience suggested that the less-traveled road is a familiar path at MIT.





## BECOMING AEROSOLAR

Tomás Saraceno's Aerocene, on and above terra firma



/ EXHIBITION: *AEROCENE*, GRAND PALAIS, PARIS, COP21, DECEMBER 2015

/ EXHIBITION: AEROCENE, MIT KILLIAN COURT, APRIL 2018

One of Tomás Saraceno's signature projects is *Aerocene*, a multidisciplinary thought experiment that takes its most striking form in a series of inflatable sculptures, which float off the ground powered solely by the heat of the sun. He returned to MIT in April 2018, in a visit that coincided with the Cambridge Science Festival and MIT's "Climate Changed" symposium, for a wide-ranging panel discussion and a demonstration of his Explorer kit: the new, backpack-sized addition to his floating fleet.

Saraceno has collaborated with MIT meteorologist Lodovica Illari and Bill McKenna, a researcher in Illari's lab in the Department of Earth, Atmospheric and Planetary Sciences (EAPS), to study the jet stream and determine potential flight paths for his aerosolar inflatables. In recent years, Saraceno and Illari—his primary collaborator at EAPS—have presented their work at the COP21 climate summit in Paris, where Saraceno's sculptures were suspended from the glass and steel ceiling of the Grand Palais, and at the



"We like to think of ourselves as living on the Earth's surface, but we are living at the bottom of an ocean of air."

– Tomás Saraceno

DANIEL CZICZO Professor, Department of Earth, Atmospheric and Planetary Sciences, MIT

JOHN FERNÁNDEZ Director, Environmental Solutions Initiative, MIT

GLENN R. FLIERL Professor, Department of Earth, Atmospheric and Planetary Sciences, MIT

The Long

LODOVICA ILLARI Senior Lecturer, Department of Earth, Atmospheric and Planetary Sciences, MIT

ROBERT JAFFE Morningstar Professor of Physics, MIT

BILL MCKENNA Researcher, Department of Earth, Atmospheric and Planetary Sciences, MIT

TOMÁS SARACENO CAST Visiting Artist Previous page, left top: Tomás Saraceno (right) and Joaquin Ezcurra fill the solar sculpture with air for the *Aerocene* performance. Credit: Sham Sthankiya.

Previous page, left bottom: (from left) Bill McKenna, Joaquin Ezcurra and Gianluca Meneghello use the solar sculptures to take measurements of weather variables and pollutants in the atmosphere's boundary layer. Credit: Sham Sthankiya. Previous page, right: MIT EAPS prepares for the *Aerocene* test flights on MIT Killian Court. Credit: Sham Sthankiya.

Below: Glenn Flierl (left) and Saraceno demonstrate the Aerocene flight simulator software in MIT Memorial Lobby. Credit: Sham Sthankiya. Right: The MIT community and general public take part in flights of solar sculptures that become buoyant and lift off the ground powered only by the heat of the sun. Credit: Sham Sthankiya.




World Economic Forum in Davos, where they used an interactive display to showcase their Float Predictor software, developed by oceanographer Glenn Flierl.

At MIT, they led a thought-provoking panel moderated by Professor John Fernández, director of MIT's Environmental Solutions Initiative, on the enormous problems for the atmosphere created by carbon and other emissions, and alternative scenarios for the future. Over the course of two partly sunny days, a crew made up of researchers from Studio Saraceno and EAPS launched the billowing, solar-powered floating sculptures. Anchored by tethers like massive kites, they hovered over Killian Court and an audience below. Students had a chance to learn more about the science underlying the test flights from a display and spot talks in Lobby 10 by the artist and scientists involved.

"We are trying to reimagine how human beings will navigate around the world," says Saraceno, describing the lofty goal of his *Aerocene* project. These "climate-conscious sculptures," made from silver and transparent Mylar, are designed to travel around the earth without helium, batteries or solar panels. Instead, they glide on wind currents and are kept afloat by solar and infrared radiation. The air-fueled sculptures prompt us to "speculate on how mobility shapes the way we live on the earth," explains Saraceno.

"Mobility is responsible for a lot of carbon in the air.... We need to rethink how we fly."

- Tomás Saraceno

"The project requires critical optimism," says McKenna, who worked with Saraceno on many phases of the project—in Cambridge, the Solomon Islands and Paris. "You have to find a balance between the best atmospheric conditions and maximizing solar and infrared radiation." Although aerosolar flight won't replace jet travel anytime soon, Saraceno and his collaborators around the world are pushing the frontiers of experimentation toward its realization.

### RANIA GHOSN'S *BLUE MARBLE CIRCU*S

Rethinking architecture and design with an eye toward Earth



/ EXHIBITION: *BLUE MARBLE CIRCUS*, DESIGN BIENNIAL BOSTON, ROSE KENNEDY GREENWAY, AUGUST 10–OCTOBER 8, 2017

Suspend disgust at the thought of trash: make it a compelling subject for designers and the broader public. That's Rania Ghosn's tactic for getting more people to improve our built environment and ask the necessary questions about landfills, oil rigs, space debris and other unpleasant externalities.

"Maybe aesthetics can have the capacity to change the way we perceive systems and the value we ascribe to them," says Ghosn. After all, she points out, climate change is both a physical and a cultural crisis.

Ghosn received a Fay Chandler Faculty Creativity Seed Grant from MIT CAST to create *Blue Marble Circus* for the 2017 Design Biennial Boston. Recognizing architects with innovative practices, the juried biennial program commissions a series of four small-scale installations on the Rose Kennedy Greenway Conservancy. Blue Marble Circus is a monument to industrial humanity's plastic footprint, which—although at a planetary scale—remains outside our geographical imagination. The installation appropriates Rome's ancient Pantheon, known for its spherical "architecture of the cosmos," to take aim at the dissonance between our individual worries and the vast environmental transformations the Earth is undergoing. The geodesic artwork appropriates "Blue Marble" from an iconic symbol of the environmental movement: the 1972 photo of Earth taken aboard NASA's Apollo 17.

"DESIGN EARTH aims to speak to the scale of environmental transformation of the Earth so we can clear that geostationary orbit." – Rania Ghosn

RANIA GHOSN Assistant Professor, Department of Architecture, MIT and Founding Partner, DESIGN EARTH

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"The Pantheon is, of course, a departure point," says Ghosn. "*Blue Marble Circus* also references the sphere on the shoulders of Atlas, the very early representations of the world, which often took the form of a circle and projections, and famous architectural buildings, especially in the period of French Revolutionary architecture. The piece even flirts with the images of the atomic bomb tests, which in their formal language are very similar."

The blue, shrink-wrapped globe is also a camera obscura, an optical device that projects site-specific views of the surroundings into its chamber. All white inside, its plastic material expression invites another planetary imagination, with greenhouse gases and greenhouse agriculture as subject matters for architecture. The blue miniature is hence an aesthetic invitation to relearn, like Atlas, how to carry the world—and all there is above it—on our shoulders.

Design Earth is a collaborative practice led by Ghosn and El Hadi Jazairy, assistant professor of architecture at the University of Michigan and research scientist at the MIT Norman B. Leventhal Center for Advanced Urbanism. Established in 2010, Design Earth explores the geographies of technological systems, such as those of energy, trash and water. Previous page, left: *Blue Marble Circus* by Rania Ghosn and El Hadi Jazairy of DESIGN EARTH aims to create awareness of environmental issues. Credit: Jane Messinger.

Previous page, right: *Blue Marble Circus*. Credit: John Horner.

Below: *Neck of the Moon* is a project that proposes to clean up the orbital environment by compacting space debris into a new satellite planet that orbits Earth. Credit: Rania Ghosn.

### Neck of the Moon DESIGN EARTH

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vecks of the Moon cleans up the orbits environment by compacting targetoria space debuis into a new setting object that orbits the Earth. A targe toget with a rebots the Earth. A targe toget with a rebots the Earth. A targe toget with a high altitudes into planet take, the Earth's second mean. The new planet shares with its maneash as altitude Earth's avital rele in humanity's journey Earth a avital rele in humanity's journey

The project angulates cosmic: topographicalic, and vegetal features of the Earth. An umbilical time tels Lakia to the belly of the Catopasi volcano to casador. The conful sepace elevator is Consider with newly formed planet and couplies is with newlarals from Earth. It also beams the solar energy captured by Lakia back to Earth.

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# DISRUPTING OPPRESSION

B. Stephen Carpenter II examines access, privilege and the global water crisis



/ WORKSHOP: "MAKING SOMETHING FROM NOTHING: APPROPRIATE TECHNOLOGY AS INTENTIONALLY DISRUPTIVE RESPONSIBILITY," SEPTEMBER 28–30, 2017

/ WORKSHOP: "DOUBLE TAKING AND TROUBLEMAKING: SOCIALLY ENGAGED PRACTICE AS INTENTIONALLY DISRUPTIVE ART," OCTOBER 5–7, 2017

/ WORKSHOP: "WHEN CURRICULUM BECOMES ART PRACTICE: EDUCATIONAL EXPERIENCE AS INTENTIONALLY DISRUPTIVE PEDAGOGY," NOVEMBER 16–18, 2017

In today's social climate, which is often characterized by polarization and intolerance, B. Stephen Carpenter II believes that art can enable people to have civil conversations about difficult topics, such as race, segregation and poverty in the United States.

Lawrence Susskind, Ford Professor of Environmental and Urban Planning at MIT, invited Carpenter to examine issues of access, privilege and the global water crisis. During his residency, Carpenter delved into how the act of teaching—in addition to the practice of creating art—can be directed at disrupting systemic oppression.

"Socially engaged art often leads to a reappraisal of what people believe and what they value," says Susskind. "If handled effectively, it can produce a self-sustaining dialogue. In a democratic and planning context, this is always good." Carpenter's residency included three visits to campus: he led seminars that reflected on the theory and choices behind his practice; gave performances and lectures that invited the audience to participate in several of his better-known projects; and took part in community lunches and forums that were specifically aimed at inviting K-12 educators in Massachusetts to incorporate Carpenter's social engagement into their own teaching.

His work enlists bystanders as collaborators in order to move the artwork beyond passive commentary and into the realm of action. For instance, in *Double Water Fountains*, Carpenter invites strangers to photograph him drinking from the lower of two side-by-side water fountains, recalling Elliott Erwitt's photograph, *Segregated Water Fountain*, an image that serves as a cultural touchstone for the US civil rights movement, Jim Crow and segregation. The work collapses time and incorporates the photographer—a complete stranger—into conversations about access to public spaces and how past events haunt our present.

B. STEPHEN CARPENTER II Ida Ely Rubin Artist in Residence at CAST, MIT

LAWRENCE SUSSKIND Ford Professor of Environmental and Urban Planning, MIT

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Previous page, left: B. Stephen Carpenter II (right) instructs workshop participants in the construction of ceramic water filters. Using lowcost and readily available materials in conjunction with a fifty-pound, portable press, Carpenter produces water filters that make unsafe water potable. Credit: Heidi Erickson. Previous page, right: Carpenter models how the water filters are shaped using a fifty-pound, portable press. Credit: Sham Sthankiya. Above: Carpenter enlists Larry Susskind (right) and other workshop participants to sift sawdust to create a water filter. Credit: Heidi Erickson.

Right: A completed ceramic water filter soaks in water prior to use. Credit: Heidi Erickson. Carpenter's water filter project takes aim at the economic hurdles that prevent access to clean drinking water. Using low-cost and readily available materials, Carpenter produces filters that make unsafe water potable. "There is power in simplicity," says Carpenter. "These filters cost around \$25 and can last up to five years."

In his final workshop on campus, he focused on how participating in the creation of art can inform how we teach, define and appreciate art—and in doing so, how our perception of art changes our worldviews. By showcasing his previous MIT performances and lectures, Carpenter illuminated how each individual, whether an artist, student or teacher, has the opportunity to creatively apply their talents to disrupt problematic systems and allow space for positive change.

### "What kind of questions can we ask, not just about what someone else has made, but through the act of making itself?"

### – B. Stephen Carpenter II

"The collaboration with MIT," says Carpenter, "is pushing me to think more about how this work, and other social practice work, offers entry points to areas, questions or considerations of social, cultural, political and other lived experiences [that] other disciplines typically study, but only do so through their conventional modes and methods."



## SEEING, HEARING AND SENSING THE SCHUYLKILL RIVER

A platform for engagement with the environment



/ EXHIBITION: *FLOATLAB*, SCHUYLKILL RIVER, PHILADELPHIA, PENNSYLVANIA, FORTHCOMING

FloatLab, J. Meejin Yoon's installation for Bartram's Garden in Philadelphia, is at once a viewing platform, a floating vessel, and a lens through which the public can experience the ecology of the Schuylkill River, whose environmental health has been affected by every phase of energy development in America, from coal to oil, nuclear power, and natural gas today. Offering an eye-level view of the river, FloatLab provides unexpected visual and physical relationships with the water's surface. CAST's Mellon Faculty Grant allowed Yoon to work with environmental scientists at MIT and in the Delaware Valley watershed on educational programs for the installation, creating a programmatic loop that examines the relationships between environmental science, environmental experience and environmental stewardship.

*FloatLab* is conceived of as a learning laboratory in which to witness a fragile ecology, and its steel structure features a 75-foot-diameter circular footpath submerged in the river. Sections of the path dip well below the river's surface, allowing visitors to stand at eye level with the waterline. Hidden speakers play underwater recordings in real time to passersby, and lighting effects reveal fish patterns. This shift in perspective for the viewer, in addition to the underwater sounds, creates a physical space that indexes and measures the invisible properties of the water.

The project explores the potential to create awareness through mediated collective experience, using sound technology and an environmental art installation within the public realm to provide a platform for collective learning. Operating between the fields of environmental art and environmental science, FloatLab synthesizes disparate programs and concepts: industrial areas and botanical gardens, toxic remediation and ecological growth, science and art.

BARTRAM'S GARDEN, PHILADELPHIA PARKS AND RECREATION

MURAL ARTS PHILADELPHIA

WILLIAM PENN FOUNDATION

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J. MEEJIN YOON

MIT and CAST Mellon

Faculty Grant Recipient

Professor and Head,

Department of Architecture,



Previous page, left: Rendering of *FloatLab*. Courtesy of the artist.

Previous page, right: Rendering of *FloatLab*. Courtesy of the artist.

Above: Rendering of *FloatLab*. Courtesy of the artist.

Right, top: Rendering of *FloatLab*. Courtesy of the artist. Right, bottom: Sited within the Schuylkill River in Philadelphia, *FloatLab* is an educational platform to study and observe the transforming urban waterway. Courtesy of the artist. "I am interested in understanding if it is possible to reframe our understanding of natural resources by listening to the water system."

– J. Meejin Yoon





# A NEW RIVER FOR PHILADELPHIA

Teaching ecological urbanism



/ CLASS: ECOLOGICAL URBANISM 4.213/11.308, FALL 2017

/ LECTURE: "FROM PASSIVE TO PROVOCATIVE: WHEN GOOD PLANNING IS PRODUCTIVE TROUBLEMAKING," SEPTEMBER 19, 2017

/ LECTURE: "ECO-ART AND ACTION RESEARCH," SEPTEMBER 20, 2017

/ LECTURE: "ENVIRONMENT-SUSTAINABILITY" WITH THE MIT ENVIRONMENTAL SOLUTIONS INITIATIVE, OCTOBER 23, 2017

/ LECTURE: "THE TIME OF THE FORCE MAJEURE," OCTOBER 24, 2017

Among the leading pioneers of the eco-art movement, the collaborative team of Newton and Helen Mayer Harrison has worked for more than forty years with biologists, ecologists, architects, urban planners and other artists to uncover ideas and solutions that support biodiversity, often within the context of community development. Newton Harrison's years of interdisciplinary practice in the space between art, science and public policy, position him as a natural collaborator with Anne Whiston Spirn.

Harrison's distinctive form of so-called action research has inspired Spirn to use artistic methods to wed the insights of ecology with urban design and planning as a form of adaptation for local communities. In co-teaching 4.213/11.308 Ecological Urbanism, Harrison and Spirn worked with students on A New River for Philadelphia, a project that investigates how to re-create a river that was buried in a sewer in Philadelphia in the 1880s. The project represents an important new advance in thirty years of Spirn's action research. Students used methods developed by the Harrisons to identify a problem and the scale of inquiry, devise solutions and design strategies for implementation that bring forth a new state of mind.

The Harrisons' concept of art embraces an unusual range of disciplines. They are artists who function variously as historians, diplomats, ecologists, investigators and activists. Their work creates poetic narratives embedded in complex, largescale imagery. Their practice proposes solutions and engages the public with extensive mapping and documentation of these proposals in diverse contexts.

### NEWTON HARRISON CAST Visiting Artist

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ANNE WHISTON SPIRN Cecil and Ida Green Distinguished Professor of Landscape Architecture and Planning, MIT Previous page, left: Newton Harrison (right) gives public presentations tracing the eco-art movement to faculty and students. Credit: Pitchapa (Pim) Jular. Previous page, right: Harrison and Anne Whiston Spirn work with students on A New River for Philadelphia, a project that investigates how to re-create a river that was buried in a sewer in Philadelphia in the 1880s. Credit: Pitchapa (Pim) Jular. Below: Anne Whiston Spirn speaks to students in the course 4.213/11.308 Ecological Urbanism, on the project A New River for Philadelphia. Credit: Heidi Erickson.

Right: Newton Harrison on a class field trip to Philadelphia. Credit: Pitchapa (Pim) Jular.





During his residency, Harrison delved into the ecoart movement that he and Helen Mayer Harrison pioneered, which addresses environmental problems such as agricultural and forestry issues, watershed restoration and urban renewal, among others. Their first global warming works were done in the 1970s. Their visionary work has led to changes in governmental policy and has expanded dialogue around previously unexplored issues leading to practical implementations, such as *Baltimore Promenade* (1981) and *A Vision for the Green Heart of Holland* (1994–1995). "Our group is dedicated, not so much to climate change, but to slowing the sixth extinction." – Newton Harrison

Most recently, they formed a nonprofit organization associated with the Arts Division at the University of California, Santa Cruz. The organization, the Center for the Study of the Force Majeure, works to mediate the combined impact of global warming, ocean rise and increasing extinctions.

# COLLECTIVELY POWERED ANIMATRONIC FICTIONAL ANIMALS, A SIGNATURE HACK

Collective intelligence and the animal Internet



/ WORKSHOP: HACKING ARTS FESTIVAL, NOVEMBER 11-12, 2017

CAST visiting artist Agnieszka Kurant has long been fascinated by the synchronized nature of organisms, such as slime mold, certain colonies of bacteria and fireflies that flash in unison. For the 2017 Hacking Arts Festival, she combined her interest in collective behavior with a recent popular phenomenon, the animal Internet, to devise a signature hack—a new feature of the festival, designed to be a source of inspiration to students competing in the annual arts-focused hackathon.

The animal Internet refers to webcams placed by scientists in various locations that allow viewers to observe animals in their habitats. "Millions of people follow these animals, give them names, create Facebook pages or fan pages for them, and invent parallel lives for these creatures," says Kurant, adding that many people's primary contact with nature is mediated in this way. Together with Owen Trueblood, Ishaan Grover, Agnes Cameron, Gary Zhexi Zhang, Adam Haar Horowitz and Tim Robertson, Kurant developed a project influenced by animal webcams and ideas of collective intelligence. With her team, Kurant built two fictional species, a singular feathered creature and a swarm of robotic gerbils. She was struck by how little it takes—a few feathers here, some patches of fur there—to create the illusion of life in robots placed within a terrarium. When viewed alongside tigers and polar bears via livestream, these animatronic creatures are fairly convincing.

The fictional animals were operated by real people—one using Amazon Mechanical Turks (a crowdsourcing Internet marketplace that engages humans to perform tasks that computers are currently unable to do), and another driven by behavioral data collected on Twitter about current protest movements. In her work, Kurant wants to bring attention to this new working class, and in this project, the workers were represented as one collective unit, the feathered animal. Workers were asked to determine whether they felt sleepy, happy, unhappy or energized; the prevailing responses directed the animal's movement.

AGNIESZKA KURANT CAST Visiting Artist

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> STUDENT COLLABORATORS: Agnes Cameron Ishaan Grover Adam Haar Horowitz Owen Trueblood Tim Robertson Gary Zhexi Zhang

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Previous page, left: Robotic animals for use in *Animal Internet*. Credit: Keyla Blanco Gomez. Previous page, right: Agnieszka Kurant (left) and Adam Haar Horowitz (right) along with a Hacking Arts participant. Credit: Sharon Lacey.

Below: Agnieszka Kurant (left) and Gary Zhexi Zhang. Credit: Keyla Blanco Gomez. Right: Fictional animals operated by real people—one using Amazon Mechanical Turk workers and another using data collected from Twitter about current protest movements. Credit: Keyla Blanco Gomez.





The second set of animals were powered by a Sugarscape model (an artificially intelligent, agentbased social simulation), and fed with data scraped from Twitter pertaining to social behavior associated with various protest movements—from Catalan independence to Black Lives Matter to Occupy Wall Street. "We measured the temperature of these protest movements and whether they were positive or negative," says Kurant. "Then feeding this data back into this Sugarscape powers the movement of the swarm of animatronic gerbils."

"There is scarcely any part of nature untouched by human colonization and exploitation." – Agnieszka Kurant "There are protests movements all over the world and people are posting tweets," explains Ishaan Grover, who collected the data. "[We] calculate the average sentiment of people all over the world who are tweeting about protests and then that feeds into Sugarscape." Agnes Cameron, who built the Sugarscape model, explained that the semantic data taken from Twitter controls the environmental variables, which in turn control the gerbils' movement.

Animal Internet, as the collective's work became known, is "a manufactured model of the natural world created by humans and watched by other humans," says Kurant. Video of the work is currently exhibited on the San Francisco Museum of Modern Art's Open Space platform.

# AN ARTISTIC RESPONSE TO HUMANITARIAN CRISES

Artistic collaboration with refugees in the Al Azraq camp in Jordan



/ EXHIBITION: LIGHTWEAVER, ZAATARI CAMP, JORDAN, FALL 2017

/ WORKSHOPS: "LIGHTWEAVER," PROGRAM IN ART, CULTURE AND TECHNOLOGY, SPRING 2017

"Once I saw [the camp], I couldn't unsee it," says Azra Akšamija. She first visited the Al Azraq refugee camp in Jordan in 2016. Her impulse to help alleviate the suffering of people displaced—or otherwise traumatized—by the atrocities of war informs a range of artistic, educational and research projects and inspired the creation of the Future Heritage Lab (FHL) within the School of Architecture and Planning at MIT.

FHL explores creative responses to conflict and crisis, developing projects to address the emotional, cultural and practical needs of communities under threat. Akšamija thinks she and others in art and design disciplines can contribute to humanitarian efforts through both research and practice. She advocates for methods of co-creation in order to maintain agency for residents in the camp.

*Lightweaver*, a kinetic light sculpture, is a utilitarian and poetic response to everyday life in the camp, which is constrained by the austerity of corrugated steel shelters that are lit only by small solar lamps. The *Lightweaver* prototypes are playful lanterns and educational devices developed



AZRA AKŠAMIJA Associate Professor, Program in Art, Culture & Technology, Department of Architecture, MIT and CAST Mellon Faculty Grant Recipient

STUDENTS FROM MIT AND GERMAN-JORDANIAN UNIVERSITY

REFUGEES IN THE AL AZRAQ CAMP IN JORDAN

Previous page, left top: Rendering of plans for *Lightweaver*, a kinetic light installation by the Future Heritage Lab at the refugee camp Al Azraq, Jordan. Credit: Azra Akšamija.

Previous page, left bottom: The device employs light and a DIY pinwheeldriven machine to animate stories designed by their creators through a three-dimensional light weaving. Credit: Azra Akšamija. Previous page, right: The *Lightweaver* project expands the notion of shelter beyond physical protection: lighting becomes a means to preserve cultural memory and provide a sense of home and belonging for refugees. Credit: Azra Akšamija.

Below: *Lightweaver* is a utilitarian and poetic response to everyday difficulties of the camp stemming from the austerity of the shelters. Credit: Azra Akšamija.



in collaboration with the artists, engineers and inventors from the AI Azraq refugee camp. Stories from textiles are translated into these light displays as a means of preserving cultural memory and inspiring hope. In addition to transforming the shelter interior into an immersive cultural environment, the project involves training in basic electrical and mechanical engineering, embroidery, calligraphy and cultural storytelling.

Akšamija, who experienced the war in Bosnia in the 1990s, remembers how culture became an instrument to counter violence. "I know that culture kept people alive," says Akšamija. "During the siege of Sarajevo, people would organize exhibitions, risk their lives to do something artistic. Because art and culture kept them human and made them feel different from this destruction."

Since its launch in 2015, FHL has implemented five large-scale participatory global art projects; developed three MIT graduate courses; and established a global network of collaborators in the arts, education and humanitarian aid. FHL is also launching a satellite hub in the AI Azraq camp, in collaboration with local artists, designers and academics from Amman and from the camp. "It is incredibly inspiring to learn from refugees' experiences and their ingenuity to transform the most difficult living situation with minimal means."

### – Azra Akšamija

FHL aims to make an impact that goes beyond the classroom and beyond any one humanitarian crisis. To that end, Akšamija and her students initiated a code of ethics to equip other practitioners in the arts and cultural sector who work in a humanitarian capacity with a much-needed tool. The code evolved from dilemmas the class faced, and the topics reflect the course lessons—destruction, preservation, art, education, economy, fundraising and media.

Sera Tolgay, one of Akšamija's graduate students, describes the Al Azraq camp as "a sea of steel from afar, an ocean of inspiration from inside." As Akšamija and her students continue this crucial work, her foremost question remains: "How can we make a contribution to help these people survive this awful time they're going through?"

# PERCEIVING PERCEPTION

Vision in Neuroscience and Art



/ CLASS: VISION IN NEUROSCIENCE AND ART 9.S52/9.S916, FALL 2017

/ EXHIBITION: *PERCEIVING PERCEPTION*, MIT MUSEUM STUDIO AND COMPTON GALLERY, DECEMBER 2017–FEBRUARY 2018

Artists have often been at the forefront of identifying and exploring questions about perception that eventually become subjects of rigorous scientific study. Vision in Neuroscience and Art, a cross-disciplinary course in the Department of Brain and Cognitive Sciences sponsored by CAST, engaged students with core concepts in visual perception through the lens of both art and neuroscience.

The class explored core concepts in visual perception through hands-on studio practice using the MIT Museum Studio as a platform. A maker space that allows students the opportunity to create installations and exhibitions that exemplify scientific and engineering concepts and innovations, the studio facility includes a light lab of optical materials and custom instruments for working with light. Thus, it is the perfect home for a course that culminated in an exhibition, *Perceiving Perception*, at the MIT Compton Gallery.



SETH RISKIN Co-Director, MIT Museum Studio, MIT

SARAH SCHWETTMANN Graduate Student, Department of Brain and Cognitive Sciences, MIT

PAWAN SINHA Professor, Vision and Computational Neuroscience, Department of Brain and Cognitive Sciences, MIT



Previous page, left top: Carolyn Lanzkron's *Hidden Dimensions*, presents shadows cast by varied 3-D structures to demonstrate variability in form and illumination of a 2-D image. Credit: Heidi Erickson.

Previous page, left bottom: Through seminars and studio work, the course fosters interdisciplinary dialogue between art and visual neuroscience, and culminates in an exhibition of students' semester-long projects. Credit: Heidi Erickson. Previous page, right: Ben Miller's Signal, presents a volume of uniform light that varies in brightness and color over time, exploring how perception occurs between the eye and mind. Credit: Heidi Erickson.

Above: Seth Riskin (right) oversees installation of the exhibition *Perceiving Perception*. Credit: Heidi Erickson.

Right top: Vision in Neuroscience and Art is the first hands-on brain and cognitive sciences course of its kind. Credit: Heidi Erickson. Right bottom: Nina Manning's Surprisal Between Generative Structure and Emergent Form provides experiences of a 3-D form generated from a 2-D contour. Credit: Heidi Erickson.

The class pivoted around the notion that the act of visual perception creates an internal representation of the external world, while the act of artistic creation depicts an external representation of the internal world. Students worked in this bilingual framework throughout the semester, ultimately producing artworks that demonstrated some aspect of the science of vision (i.e., depth perception, constructive interference, color opponency or the electromagnetic spectrum). The instructors believe that the integrated study and practice of perception is a major advance in teaching the subject. "We can theorize about vision, run experiments and use fMRI, but vision from the inside, that is, awareness of perceptual processes, which is manifest through artistic creations, offers distinct insights," says Riskin. "Perhaps nowhere is this inside information needed more than in the study of the brain. Pawan, Sarah and I are passionate about the potential of this dialogue and collaboration, and we wanted to give students the opportunity to exercise the full scope of their intelligence that spans the sensory and semantic."

"The course brings together two fields that complement each other beautifully: visual art and vision neuroscience."

– Seth Riskin







A materials revolution



/ PUBLICATION: ACTIVE MATTER, MIT PRESS, 2017

Active Matter (MIT Press, 2017), edited by Skylar Tibbits, is an essential guide to a field that could shape the future of design. The book is a further exploration of the work presented at the "Active Matter Summit," a research symposium co-sponsored by CAST and the Self-Assembly Lab in 2015.

Active Matter, CAST's second publication, is the first book to explore and document this newly emerging field. An outgrowth of the 2015 "Active Matter Summit" at MIT, the book is focused on innovative physical materials that can assemble themselves, transform autonomously, and sense, react or compute based on internal and external information. Edited by Self-Assembly Lab founder Skylar Tibbits and published by the MIT Press, Active Matter collects more than forty contributors from seemingly unrelated disciplines in an attempt to blur disciplinary borders. The book includes pioneering research and groundbreaking experiments in designing and creating active, intelligent and dynamic materials, as well as visionary perspectives on future materials, design products, fabrication techniques and emerging industries.

Active matter offers the freedom to design and create customized materials with unique functionality to sense, assemble or compute.

Ranging from synthetic biology to computer science, materials science, robotics and even large-scale, architectures, Active Matter brings together leading academic researchers, industry practitioners, artists, designers, curators and other thought leaders who are paving the way for a new, programmable and highly dynamic physical world. Notable contributions include an interview with CAST visiting artist Tomás Saraceno, an essay co-authored by MIT Computer Science and Artificial Intelligence Lab director Daniela Rus, as well as pieces by J. Meejin Yoon and Eric Höweler; Neil Gershenfeld; and Neri Oxman. At once philosophical, playful, technical and speculative, Active Matter is an attempt to clarify and unify a field that could tie so many disconnected parts into a collective swarm.

"Active matter makes it possible to make any material a smart material."

– Skylar Tibbits



Assistant Professor, Department of Architecture, MIT and Founder and Co-Director, Self-Assembly Lab, MIT



Previous page, left: A special edition of *Active Matter* with heat and light sensitive insert . Credit: L. Barry Hetherington.

Previous page, right: *Active Matter*, edited by Skylar Tibbits and published by MIT Press. Credit: Heidi Erickson. Above: Skylar Tibbits presents his *Active Matter* book as part of the CAST Mellon Fellows presentations and *Active Matter* book launch in October 2017. Credit: L. Barry Hetherington. Right: *Active Matter*, published in September 2017 by MIT Press. Credit: Heidi Erickson.

#### The following is adapted from Tibbits's introduction to the book:

Beyond being an introduction and a roadmap, we hope the book will inspire future generations of students, researchers, entrepreneurs and policymakers. It truly feels like we are at a turning point in our relationship with matter. If over the past half-century we have experienced a software and hardware revolution, we are now experiencing a materials revolution. Just as one could previously with software and hardware platforms, we can now sense, compute and actuate with materials alone. It is becoming increasingly clear that materials are a platform for turning digital information into physical performance and functionality. If yesterday we programmed computers and machines, today we program matter itself.

ACTIVE MATTER

*The Enemy* by Karim Ben Khelifa, a groundbreaking interactive virtual reality exhibition and immersive experience, makes its North American premiere at the MIT Museum. Credit: Heidi Erickson.



### FACE TO FACE WITH *THE* ENEMY

Exploring conflict through virtual reality



/ CONFERENCE: "VIRTUALLY THERE: DOCUMENTARY MEETS VIRTUAL REALITY," MIT OPEN DOCUMENTARY LAB, MAY 6–7, 2016

/ PROTOTYPE DEMONSTRATION AND RESEARCH: *THE ENEMY*, SEPTEMBER 26–OCTOBER 7, 2016

/ CLASS VISITS: COMPARATIVE MEDIA STUDIES, ADVANCED IDENTITY REPRESENTATION CMS.628/CMS.828, SEPTEMBER 28, 2016

/ LECTURE: "*THE ENEMY*—FROM CONCEPT TO 'VIRTUAL' REALITY," MIT MUSEUM, SEPTEMBER 26, 2017

/ EXHIBITION: THE ENEMY, MIT MUSEUM, OCTOBER 5-DECEMBER 31, 2017

/ LECTURE: "THE ENEMY," MIT OPEN DOCUMENTARY LAB, OCTOBER 31, 2017

Visitors entering the MIT Museum to see *The Enemy*, a groundbreaking installation by artist and photojournalist Karim Ben Khelifa, were greeted by an empty, firstfloor gallery. After putting on a headset, however, they were transported to an entirely different setting, a stark white space featuring Ben Khelifa's portrayals of combatants in conflicts around the world.

A virtual reality (VR) project that introduces participants to combatants from opposing sides of contemporary conflicts, *The Enemy* was prototyped at MIT and had its North American premiere at the MIT Museum in fall 2017. Ben Khelifa's project began as a photography exhibition, but was reconceptualized at MIT in collaboration with D. Fox Harrell. Rooted in Ben Khelifa's experiences as a photojournalist, the installation combined interviews and photography with the latest research in artificial intelligence and cognitive science in order to explore VR's potential not only to engender empathy, but also to make us more self-aware. The subjects include soldiers from Israel and Palestine, combatants from the Congo and opposing gang members from El Salvador; animated avatars of each combatant step out of their portraits and into the same space as the viewer, who stands face-to-face with them as they tell their stories. Ben Khelifa hopes understanding oneself and one's enemy may thwart recruitment efforts and help end fighting.
KARIM BEN KHELIFA CAST Visiting Artist

D. FOX HARRELL Professor, Comparative Media Studies/Writing, ICE Lab, MIT

THE ENEMY



Previous page, left: Virtual reality equipment ready to be used in *The Enemy*. Credit: Heidi Erickson.

Previous page, right: *The Enemy* is an immersive virtual reality installation that brings the audience into conversations between enemies within longstanding global conflicts. Credit: Heidi Erickson. Above: Fox Harrell (left), and Karim Ben Khelifa discuss their collaboration on the virtual reality project *The Enemy*. Credit: Heidi Erickson. Right: Users at one of several demonstrations of *The Enemy.* "When we started the project," says Ben Khelifa, "it was clear for me that this would not be a sitting experience. My instincts told me it would be more powerful if you walk the space." Credit: Karim Ben Khalifa.

#### "One of the most profound museum experiences of my life." – Jared Bowen, WGBH

"We make sense of the world through stories, and we remember the world through experience. That's how it works as human beings," says Ben Khelifa. "I am telling a story and making people live an experience at the same time. I think the combination of the two might stick with you longer."

*The Enemy* is not oriented around spectacle; rather, it uses VR to create intimacy and journalistic naturalism. This concern for self-reflection is what sets *The Enemy* apart from other VR projects, and incidentally, what led him to collaborate with Harrell, who researches how one's identity can shift during gaming and interactive experiences. Regardless of your personal views of the politics surrounding each conflict, Ben Khelifa notes, the project forces you "to face a stereotype in one form or another.... Getting physically closer to that stereotype, to listen to it, is something that opens up the story in a very different way."

"[Karim] is modeling the grandest scale of discrimination and bias, which is a global conflict," explains Harrell. "And so we thought, can we use some of the models from these systems I've been developing to implement change within a VR system? So as you go through the installation, by the end, you are somebody different."



# HACKING VR/XR

Emerging immersive storytelling



/ CLASS AND LECTURE SERIES: CMS.S60 HACKING VR: EXPLORING OCULUS AND IMMERSIVE MEDIA PRODUCTION, SPRING 2017

/ CLASS AND LECTURE SERIES: CMS.339/839 HACKING XR: VR AND IMMERSIVE MEDIA PRODUCTION, SPRING 2018

Ever since Ivan Sutherland PhD '63 developed Ultimate Display in 1965—a forerunner to augmented reality (AR) and virtual reality (VR) that used tactile stimuli to mimic the physical world—MIT researchers have been engineering new forms of immersive media. Today, the MIT Open Documentary Lab continues to expand the multisensory palette available to documentarians and other storytellers.

During Hacking VR in spring 2017 and Hacking XR in spring 2018, renowned virtual reality creators explored how the medium is evolving and what works—or doesn't. The seventeen guest speakers surveyed historical developments and current innovation in virtual reality gear, software and storytelling techniques. The lectures complemented courses offered by the Open Documentary Lab, which were co-taught by William Uricchio and Sandra Rodriguez. "I think VR is part of a larger movement that we can call immersive entertainment," says Arnaud Colinart. "It's connected to the rise of television series like *The Walking Dead* or *Game of Thrones*—you don't want to leave this narrative universe." Colinart coproduced *Notes on Blindness*, a VR project that was developed alongside an Emmy-winning documentary based on philosopher John Hull's audio diaries recounting his vision loss.

One of the presentations, "The Art and Science of VR: A Conversation between Storytellers and Scientists," looked at Colinart's work and Kalina Bertin's *Manic* in light of the work of two researchers who explore the impact of VR on the brain—Mayank R. Mehta, professor of neurobiology and Heidi Boisvert, creative technologist and artist. The panelists addressed how VR affects our brains, how neurobiology can promote more effective storytelling and how VR can aid understanding of the body and brain.

WILLIAM URICCHIO Professor, Comparative Media Studies/Writing, and Principal Investigator, Open Documentary Lab, MIT

SANDRA RODRIGUEZ Lecturer and Visiting Scholar, Open Documentary Lab, MIT

DENIZ TORTUM Researcher Assistant, Open Documentary Lab, MIT

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LECTURERS

n Kalina Bertin, Heidi Boisvert, Jessica Brillhart, Eloi Champagne, Brian Chirls, Arnaud Colinart, Vicki Ferguson, Ersin Han Ersin, Hyphen-Labs, Mayank R. Mehta, Vincent Morisset, Karen Palmer, Olivier Palmieri, Viktor Phoenix, Karen Vanderborght, Fred Volhuer and Eleanor Whitley Previous page, left: Hyphen-Labs, an international team of women of color working at the intersection of technology, art, science and the future, discusses their work in the Hacking XR Lecture Series. Credit: Heidi Erickson. Previous page, right: Masterclass with Arnaud Colinart about his groundbreaking award-winning projects, exploring new challenges in ideation, production, postproduction and distribution. Credit: Heidi Erickson. Below: *In the Eyes of the Animal*, an immersive VR experience created by experimental design collective Marshmallow Laser Feast. Credit: Marshmallow Laser Feast.

Right: Masterclass with Vincent Morisset, one of the leading voices in innovation, interactive mediums and creative digital artwork. Credit: Heidi Erickson.





Throughout the series, several speakers predicted that VR will proliferate not only in medicine and surgical training, but in many other industries—from architecture to journalism to education. Individual lectures focused on such topics as WebVR, 360 video, interactive and mixed-reality productions, strategies and workflows for developing linear and interactive productions, advancements in research on simulator sickness and the influence of gaming trends on VR.

While the speakers shared concrete techniques and tools that were particularly useful for practitioners, their specificity was anything but myopic. Rather, collectively these lectures presented a broad vision for the medium of VR, which will radically reshape our narrative experience. VR is unlike cinema, television or any communications platform, says Eloi Champagne. "It's a computing platform," he suggests, which is why it offers so many possibilities for art and society. "It's a medium that puts you in a really interesting mindset.... You're looking with bigger eyes." – Vincent Morisset

# LIVING POETRY

The Xenotext



/ LECTURE: "THE POETICS OF PROTEIN 13: THE WRITING OF GENETIC SONNETS," NOVEMBER 1, 2016

/ POETRY READING: "THE UNKILLABLE POET: EXCERPTS FROM *THE XENOTEXT* (BOOK 1)," NOVEMBER 3, 2016

Visiting Artist Christian Bök has spent the last fifteen years working to create an unkillable poem, *The Xenotext*, which may shed light on long-term storage methods for texts, and, he says wryly, may counter the notion that "poetry is dead."

Bök has collaborated with MIT in the past, and has worked with computational poet Nick Montfort, a professor in the Comparative Media Studies/Writing program. During his residency, Bök composed a new sound poem together with Montfort titled *Type*, delivered a public lecture and a poetry reading and participated in several classes and a session of Montfort's research group.

For his ongoing *Xenotext* project, Bök uses what he refers to as a "chemical alphabet" to encipher a poem into the genome of *Deinococcus radiodurans*, a bacterium capable of outlasting terrestrial civilization.

To create the code, he ascribed letters of the alphabet to the three-letter combinations of A (for adenine), C (for cytosine), G (for guanine) and T (for thiamine) that describe the order of nucleotides in a DNA molecule.

Once integrated into the organism, Bök's poem acts as a set of instructions that cause the bacterium to manufacture a protein. The response is itself another text. The *Xenotext* therefore acts as both a repository for texts and a poetry-writing machine. The set of poems is at once dystopian and aspirational, pastoral and futuristic.

Others have experimented with storing information in DNA, but in none of those precedents has the organism known that a message is embedded in its genome. Because Bök wanted the organism to respond, he says, "I've written it in such a way that the organism can read the gene sequence and interpret it as a set of instructions for building a protein whose sequence of amino acids is itself an encipherment for a completely different poem."

CHRISTIAN BÖK CAST Visiting Artist

NICK MONTFORT Professor, Comparative Media Studies/Writing, MIT



Previous page, left: Christian Bök. Courtesy of the artist.

Previous page, right: Installation view of *Protein 13* at The Power Plant, Toronto, Ontario, 2013. Courtesy of Christian Bök. Above: Bök speaks with MIT students during a fall 2016 class visit. Credit: Katherine Higgins. Right: Bök delivers a lecture at MIT entitled, "The Poetics of Protein 13: The Writing of Genetic Sonnets." Credit: Katherine Higgins. Since the host organism is an extremophile bacterium, capable of surviving all kinds of hostile environments, it does not mutate easily. Its resilience in the face of freezing, scorching or radiation makes it a durable archive for texts.

"By putting my poem into this organism," says Bök, "I'd effectively be writing a book that might outlast terrestrial civilization, and it could be, theoretically, on the planet Earth when the sun explodes." "I'm just trying to write a book that lasts forever—kind of an immortal aspiration."

– Christian Bök



Jacob Collier and the MIT Festival Jazz Ensemble, with additional musicians, present the premiere of an experimental piece crafted by Collier at "Imagination Off the Charts," at MIT in December 2016. Credit: L. Barry Hetherington.

# SOUND & PERFORMANCE

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## *MIT SOUNDING* SERIES

A coming together of contemporary and global music



/ EVAN ZIPORYN, KENAN SAHIN DISTINGUISHED PROFESSOR, MUSIC AND THEATER ARTS AND FACULTY DIRECTOR, CAST, MIT

It has become something of a tradition for MIT Sounding to be anchored by great contemporary experimenters, composers and performers who through their music have changed the ways we think about music, how it works and what it is. Past years have featured the work of pioneering sound artist Alvin Lucier, father of minimalism Terry Riley and guiet epicist Morton Feldman. The 2016–17 and 2017-18 seasons, the third and fourth series of concerts curated by Evan Ziporyn, were no exception. Look no further than the two inaugural concerts in September 2016. The first, a performance in Killian Hall by the English pianist Simon Smith, featured the seldom-performed piano music of Karlheinz Stockhausen, a singular icon of twentiethcentury modernism known both for his combative ultramodernism and outlandish theatrics.

Five days later in the same venue, the second concert of *MIT Sounding* 2016–17 could not on the surface seemed more different: a performance by the Kaynak Pipers Band, a traditional Bulgarian bagpiping ensemble, played centuries-old music

seldom heard outside the Rhodope Mountains. Stockhausen and Bulgarian bagpipers: It's hard to imagine a more acute study in contrasts. They represent the two polar extremes of the season, which showcased everything from symphonic rock to Japanese koto (combined with Balinese gamelan) to jazz saxophone legend Joe Lovano.

But the initial impression of difference is misleading which is exactly the point, says Ziporyn. He points out that Stockhausen's early electronic music from the late 1950s and early '60s pioneered the use of found sounds and global music samples, decades ahead of electronica and hip-hop. And to many listeners outside the central Bulgarian highlands, there is something equally avant-garde and radical about the music of the Kaynak Pipers, with their lopsided time signatures and embrace of what classical musicians describe as dissonance. Ziporyn's intent was to lay bare the ever-blurring boundaries between contemporary and world music.

In the first concert, Smith performed a careerspanning selection of Stockhausen's *Klavierstücke* (Piano pieces), which run the gamut from subtle studies of timbre and resonance to bombastic displays of virtuosity and extended techniques,

NIK BÄRTSCH MAYA BEISER DON BYRON SARAH CAHILL ANAT COHEN JACOB COLLIER DUOJALAL ERAN EGOZY JOHNNY GANDELSMAN

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JOHN HARBISON FREDERICK HARRIS SUMIE KANEKO KAYNAK PIPERS BAND JASON LEVINE JOE LOVANO FRADRECK MUJURU AND ERICA AZIM

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BILLY NOVICK JAMSHIED SHARIFI SIMON SMITH LUCIANA SOUZA WITH GUILLERMO KLEIN MARCUS THOMPSON

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Prevoius page, left: Cellist Maya Beiser performs David Bowie's *Blackstar* with CAST faculty director Evan Ziporyn and the Ambient Orchestra during the Terry and Rick Stone Concert. Credit: Justin Knight. Previous page, right: Johnny Gandlesman and members of Gamelan Galak Tika perform Lou Harrison's *Suite for Violin and American Gamelan* at the Institute of Contemporary Art/Boston as part of a centennial celebration of Harrison. Credit: L. Barry Hetherington. Above: Jacob Collier performs at MIT Kresge Auditorium with the MIT Festival Jazz Ensemble, and JC Project Orchestra and Chorus. Credit: L. Barry Hetherington. vocalizations and explorations of the inside of the piano in search of hidden sonorities. Ziporyn describes Stockhausen as "revolutionary, explosive and influential," a visionary who shares as much with today's electronic innovators as his avant-garde peers.

On December 10, 2016 jazz prodigy Jacob Collier, best known for his inventive YouTube videos, brought his genre-spanning, Internet-age music to the stage for his first college residency. The scope of his visit was indicative of a hallmark of both MIT Sounding and the CAST-sponsored visiting artists program: multiple levels of collaboration with students, ranging from developing new technologies to master classes, coaching sessions and simply making music together. While at MIT, Collier debuted a new keyboard harmonizer developed exclusively for his solo performances by MIT Media Lab graduate student Ben Bloomberg. From there his performance expanded, ending with over one hundred musicians on stage, including the MIT Wind Ensemble, MIT Festival Jazz Ensemble, and dozens of other students. Similarly, the MIT Symphony Orchestra worked with two MIT professors: MacArthur Prizewinning composer John Harbison and Guitar Hero inventor Eran Egozy; the MIT Vocal Jazz Ensemble collaborated with the iconic Brazilian jazz singer Luciana Souza; and the MIT Wind Ensemble commissioned and performed a new work by famed Argentinian composer and pianist Guillermo Klein, who performed with the ensemble at the premiere.

In March 2017, the annual Rick & Terry Stone Concert featured Distinguished Visiting Artist Maya Beiser performing Evan Ziporyn's reimagined version of David Bowie's final album Blackstar. The concert itself was both a tribute to the late glam rock idol's work and a continuation of Beiser and Ziporyn's long-standing collaboration, first with the Bang on a Can All-Stars in the 1990s, and more recently on Uncovered, their critically acclaimed album of rock 'n' roll covers, which was presented at MIT Sounding during the 2015–16 season. Beiser's residency also included Stillness Moves, a collaboration with Associate Professor Skylar Tibbits (co-director of the School of Architecture's Self-Assembly Lab) and theater designer Josh Higgason, a technical instructor in Theater Arts. In December 2017, they presented two workshop performances of the work in MIT's new black box theater in building W97.

MIT Sounding also provided a venue for beloved Institute Professor Marcus Thompson, a highly esteemed violist, who commemorated the fiftieth anniversary of his debut performance in Boston with an expansive recital, ranging from the baroque viola d'amore works to Morton Feldman's Rothko Chapel, in collaboration with the MIT Chamber Chorus and top area musicians. The season ended with the freewheeling Great Clarinet Summit, in which worldrenowned jazz clarinetists Don Byron, Anat Cohen and Billy Novick joined faculty clarinetists Ziporyn and Egozy, MIT undergraduate Ini Oguntola, and several student ensembles; the concert concluded with the world premiere of a play-along piece by MIT alumnus (and recent Tony winner) Jamshied Sharifi, involving dozens of audience members who brought their own clarinets.

MIT Sounding's representation of music from non-Western traditions was equally diverse and iconoclastic. Some of the featured artists, such as the Kaynak Pipers Band and the mbira (thumb piano) players Fradreck Mujuru and Erica Azim, are maintaining age-old traditions from Bulgaria and Zimbabwe. In true MIT mens et manus style, Mujuru not only gave instrumental instructions but held workshops in instrument building and a dozen MIT students built their own mbiras in the course of his residency. Others approach their chosen traditions with omnivorous experimentation-for instance, the jazz-trained Japanese koto and shamisen player Sumie Kaneko, who collaborated with MIT's Balinese music ensemble Gamelan Galak Tika in December 2016, or the one-of-a-kind partnership between classical viola and Middle Eastern percussion that is duoJalal. Gamelan Galak Tika also presented a centennial celebration of composer Lou Harrison at the Institute of Contemporary Art/Boston, performing the composer's cross-cultural music on instruments built by Harrison and his partner, William Colvig.

As unfamiliar as this music may sound to mainstream ears, "it's all about what your vantage point is," says Ziporyn. And in the case of the *MIT* Sounding series, "the vantage point is just being here, now—and being able to incorporate anything."

## MAKING MUSIC YOU CAN SEE

Maya Beiser and MIT's Self-Assembly Lab



/ MIT SOUNDING PERFORMANCE: DAVID BOWIE'S BLACKSTAR, MAYA BEISER WITH THE AMBIENT ORCHESTRA, TERRY AND RICK STONE CONCERT, MARCH 3, 2017

/ PERFORMANCE: *JUST ANCIENT LOOPS*, SOLO CELLO PERFORMANCE, "BEING MATERIAL" CAST SYMPOSIUM, *AUDIBLE*, APRIL 21, 2017

/ MIT SOUNDING PERFORMANCE: STILLNESS MOVES, SOLO CELLO WORKSHOP PERFORMANCE BY MAYA BEISER, DECEMBER 1–2, 2017

Maya Beiser, CAST's first Mellon Distinguished Visiting Artist, is an innovative force in new music, known for expanding the technical and expressive range of the cello well beyond its traditionally classical boundaries. This has involved multiple artistic strategies: sampling her cello and weaving multiple layers into an incandescent tapestry, or using nonmusical components, such as video projections, dramatic lighting, narrative, costume and setting. "I'm very much a visual person," says Beiser. "I see music kind of as much as I hear music." Beiser's residency at MIT included three very different performances, each of which could only have come to fruition at MIT.

The first, in March 2017, was a tribute to the late David Bowie, a performance of his final album *Blackstar* recast as a cello concerto by Evan Ziporyn and Jamshied Sharifi. Ziporyn and Beiser share a decades-long collaborative history; most recently, Ziporyn produced and arranged her 2013 album Uncovered, reinterpretations (un-covers) of classic rock tunes by Led Zeppelin, King Crimson, Janis Joplin, and Jimi Hendrix, as well as examinations of seminal blues tracks by Howlin' Wolf and Muddy Waters.

The daunting task of embodying Bowie's voice fell to Beiser and her cello. Ziporyn knew she was more than up to the job: "She has that kind of distinctive voice that you normally think of as being associated with soloists in jazz and popular music," says Ziporyn. "There's no anonymity in her playing."

One month later, as part of the *Audible* concert of CAST's "Being Material" symposium, Beiser performed Michael Harrison's rapturous *Just Ancient Loops*, with video by Bill Morrison. Harrison composed the intricate, twenty-two-track work using an elegantly expanded version of Pythagorean just intonation, layering cello resonances and textures into patterns and grooves.

#### David Bowie's Blackstar

**AMBIENT ORCHESTRA** 

ERAN EGOZY Professor of the Practice, Music and Theater Arts, MIT

LAUREN FLOOD Mellon Postdoctoral Fellow, MIT

NATHAN GUTIERREZ Undergraduate, MIT

FLORIAN HOLLERWEGER Visiting Faculty, Music and Theater Arts, MIT

BRENDAN LANDIS Guitarist and Sound Artist

JAMSHIED SHARIFI Composer

EVAN ZIPORYN Kenan Sahin Distinguished Professor, Music and Theater Arts and Faculty Director, CAST, MIT

MAYA BEISER CAST Mellon Distinguished Visiting Artist, MIT

#### Stillness Moves

BECCA MCCHAREN-TRAN Chromat, Architectural Swim and Athletic Wear, NYC

JOSHUA HIGGASON Technical Instructor, Music and Theater Arts, MIT

SKYLAR TIBBITS Assistant Professor, Department of Architecture, MIT and Founder and Co-Director, Self-Assembly Lab, MIT



Previous page, left: Audience member at the *Blackstar* concert uses a new app called NoteStream, which was developed by MIT students and MIT Professor of the Practice in Music Technology Eran Egozy, MIT alum and founder of Harmonix. Credit: Justin Knight. Previous page, right: Beiser performs Just Ancient Loops with video by Bill Morrison during the CAST "Being Material" symposium. Credit: L. Barry Hetherington.

Above: Evan Ziporyn conducts the Ambient Orchestra performance of *Blackstar* at the Rick and Terry Stone Concert held in March 2017. Credit: Justin Knight. Right top: Maya Beiser gives a solo cello workshop performance, *Stillness Moves*, in a reactive environment with materials designed by MIT's Self-Assembly Lab, where lighting designs by Joshua Higgason of MIT Music and Theater Arts respond to and interact with her music. Credit: L. Barry Hetherington.

Right bottom: Close-up view of the responsive sculptural apparel designed for Maya Beiser by New York-based Chromat. Credit: Heidi Erickson. Beiser ended her residency with a third public presentation at MIT's new black box theater in Building W97. In collaboration with MIT's Self-Assembly Lab and theater designer Josh Higgason, Beiser created *Stillness Moves*, a work in progress, using programmable, shape-shifting materials developed in the lab. The became a stage set that was literally responsive, changing with the music in response to direct stimuli. Beiser herself merged with the surrounding via her garment, which too incorporated programmable material. Beiser's custom garment was designed by Becca McCharen-Tran of Chromat, a swim and athletic wear company.

Stillness Moves represented an opportunity to "create a space where the entire environment responds to the music," says Beiser. "It's a natural evolution for me because I've always been interested in the idea of creating an experience that is immersive."



"It has a behavior of its own. You have to kind of dance with it and figure out what it wants to be." – Skylar Tibbits



#### FINDING THE NUANCE IN STOCKHAUSEN'S GRAND VISION

Pianist Simon Smith performs a selection of the Klavierstücke



/ LECTURE: COMPOSER FORUM, SEPTEMBER 21, 2016

/ MIT SOUNDING PERFORMANCE: SIMON SMITH CONCERT, SEPTEMBER 23, 2016

Simon Smith remembers vividly his first encounter with the work of Karlheinz Stockhausen. The piece was *Trans*, a 1971 composition for orchestra and recorded sound by the perpetual enfant terrible of German postwar music. "It was immediately like nothing I'd ever heard before," says Smith. "Once the tape starts and all this weird stuff starts going on, you're just being taken on this wild ride."

Smith performed a selection of Stockhausen's rarely-performed *Klavierstücke* (Piano pieces) at MIT. The pieces—nineteen in all, of which Smith performed ten—are both subtle and daring in their experimentations. Though Stockhausen is today mainly remembered for the flamboyance of his life and music, the *Klavierstücke* reveal the fecundity and breadth of his musical vision: at times probing and delicate, at others fiery and explosive, occasionally peculiar, but never pedantic. Stockhausen was fascinated by the finest particularities of sound: its behavior in space, its microscopic topography, its exquisite mysteries. He often explored these ideas in his groundbreaking electronic compositions and in works for massive, seemingly impossible ensembles: three orchestras playing simultaneously, or a string quartet performing aboard four helicopters aloft. The Klavierstücke burrow into the piano's acoustic possibilities. "He really delves into very fine nuances of touch or piano resonance or pedaling," says Smith. "A lot of people think in the piano, you just press the key down and you get a note, and that's it." But in the Klavierstücke, Stockhausen mines the minutiae of a single notehow it differs with the pedal down versus halfway down, for instance, or with other keys pressed silently to bring out sympathetic resonances.

The pieces require challenging extended techniques, including vocalization, inside-the-piano effects, and kitten-on-the-keyboard virtuosity, but the outcome can be sublime. Smith calls "Klavierstück VII" a "brilliant example," adding, "it has this crystalline purity, and everything is so finely worked and thought about. And it's really kind of concentrated music."



Previous page, left: Audiences at Simon Smith's September 2016 concert are "taken to a different place," Smith says. "A whole new environment where things are going to happen which you wouldn't necessarily expect." Credit: Lenny Martinez. Previous page, right: Smith says, "The first set of four pieces are 1950s modernist classics; the second set (V-X) explores an ever-widening range of pianistic and compositional techniques over more ambitious timescales, and often surprise with their sensuous beauty." Credit: Lenny Martinez. Below: Simon Smith brings his courageous and prodigious musicality to MIT for a rare all-Karlheinz Stockhausen program. Credit: Lenny Martinez.

Right: Simon Smith performs a selection of pieces capturing the evolution of Karlheinz Stockhausen's creative vision, from his stunning explosion of total serialism in the 1950s to his later expansive, quasi-theatrical work. Credit: Lenny Martinez.





"It's beautiful in the way a Chopin nocturne is beautiful—it's that same fixation on timbre and delicacy of playing and nuances of playing."

The *Klavierstücke* offer Smith an opportunity to combat what he sees as popular misconceptions about Stockhausen, among them that his was "dry, academic music" in which beauty was overshadowed by ideas. "I'm hard pressed," says Smith, "to think of a more emotionally-driven composer." "I like the idea of challenging people's conception of what Stockhausen's music is, so I feel like a bit of an evangelist."

- Simon Smith

### A CENTURIES-OLD TRADITION COMES DOWN FROM THE MOUNTAINS

Bagpipes from the shepherds of the Rhodope region of Bulgaria



/ MIT SOUNDING PERFORMANCE: KAYNAK PIPERS BAND CONCERT, SEPTEMBER 28, 2016

For many people, the word "bagpipe" conjures a familiar image, that of a kilted Scotsman, pipes silhouetted regally against the green Scottish moor. But the bagpipe came to the Scots via the highlands of other lands: bagpipes are ubiquitous throughout folk traditions in Europe and the Middle East. The kaba gaida, native to the Rhodope region of Bulgaria, is one of several Bulgarian bagpipes. It is the mission of Cvetelin Andreev's band, the Kaynak Pipers, to not only keep the kaba gaida tradition alive, but to spread it throughout the world.

Kaba gaida is a shepherd's instrument. In Andreev's telling, it is a tool for whiling away lonely hours on the mountaintop. Andreev describes the playing the kaba gaida as almost meditative—despite its rock club-level decibels. "The bagpipe gives the shepherd something like mindfulness, something to make his day meaningful," says Andreev. "So this is something we try to keep—that this instrument is something to make you calm, to help you grow personally."

Above and right: Kayak Pipers Band Credit: Courtesy of the artists. The Kaynak Pipers Band—three bagpipers and two percussionists—play centuries-old music exclusively from the Rhodope region. Because the mountains are so isolated, the kaba gaida—unlike its Scottish equivalent—has remained largely unchanged by modern technology. "The materials used for making the gaida are wood and horn and skin from animals," says Andreev. Because natural materials react more strongly to changes in temperature and humidity than plastic does, the instruments can be devilishly difficult to tune. "You have to have a lot of patience and devotion to make it play," explains Andreev.

#### "It's an instrument to bring you to the present moment." — Cvetelin Andreev

The kaba gaida is pitched lower than other Bulgarian bagpipes, at once husky and quintessentially piercing. Many of the tunes are slow, winding and meterless—the meandering hum of a lone shepherd on the move. Others are quick and notey and perfect for dancing, as long as you're ready to move in the complex, mixed meters that are the signature of Bulgarian music. Melodically, the music includes a highly evolved sense of ornamentation. "In ornamentation, you're not limited," says Andreev. "The old masters, the way they play, you can hear sounds from nature. They imitate birds, they imitate the way the river . . . bumps on the stones."

Andreev is keenly aware of the fact that the kaba gaida may seem like a relic in the face of modernity. Many of the cultural practices that the bagpipe was traditionally used to celebrate, such as the harvest, are no longer widely observed; the majority of Bulgarians are neither farmers nor shepherds. But Andreev sees a purpose for the Kaynak Pipers Band nonetheless. "The bagpipe is helping [people] to connect with each other," says Andreev, "it's an instrument to bring you to the present moment."

> KAYNAK PIPERS BAND CAST Visiting Artists

EVAN ZIPORYN Kenan Sahin Distinguished Professor, Music and Theater Arts and Faculty Director, CAST, MIT

#### JOE LOVANO PAYS TRIBUTE TO GUNTHER SCHULLER

Jazz legend honors a friend's searching spirit



/ MIT SOUNDING PERFORMANCE: STREAMS OF EXPRESSION AND LOVE— JOE LOVANO CELEBRATES GUNTHER SCHULLER AT MIT, OCTOBER 4, 2016

Back in 2014, post-bop jazz saxophonist Joe Lovano met his friend and mentor, composer Gunther Schuller, for dinner in Boston. At eighty-eight, Schuller was in the midst of a particularly fertile period: that year alone he premiered two works in Boston. "Gunther was so excited about these premieres and these pieces-he was speaking like a little kid," remembers Lovano. "He told me that he was finally feeling like his sound was coming through. That when people hear his orchestrations or his compositions, they know it's him without reading in the program.... And he was almost ninety years old! It was amazing."

Schuller passed away one year later, in 2015; at MIT, Lovano honored that searching spirit in a tribute concert, a little over a year after Schuller's death. The program included compositions by Schuller, Lovano and MIT professor of music Peter Child, and featured performances by Lovano, jazz vocalist Judi Silvano, violinist Young-Nam Kim, MITaffiliated bassist Keala Kaumeheiwa and drummer Frederick Harris.

The MIT concert kicked off with Child's "Moonsculptures," composed for Lovano and Kim. Following that, Lovano, Silvano, Kaumeheiwa and Harris performed excerpts from Lovano's 1995 Grammy-nominated album Rush Hour, for which Schuller had originally provided orchestrations. The evening also contained compositional tributes from Lovano and Harris. Both incorporated the late composer's magic row-a particular twelve-note melodic pattern that Schuller created in the 1970s and employed in all of his subsequent compositions. "You hear this certain melodic invention throughout [Schuller's] music," says Lovano. "Whether he was writing for full symphony orchestras in a real modern classical way, or if he was writing for more jazzinspired pieces."

Harris first invited Lovano to perform as a guest artist with the MIT Festival Jazz Ensemble in 2002. He describes Lovano as "one of a very select few who have the ability to be so expressive and so powerful. Not loud, but musically powerful." Harris was especially impressed by Lovano's approach with the ensemble's student musicians. "He didn't play down to them," says Harris. "He made them play like he plays."

PETER CHILD Class of 1949 Professor of Music, MacVicar Faculty Fellow, Music and Theater Arts, MIT

FREDERICK HARRIS Director, Wind and Jazz Ensembles, Music and Theater Arts, MIT EILEEN HUANG Music and Theater Arts, MIT

KEALA KAUMEHEIWA Music and Theater Arts, MIT

JOE LOVANO Gary Burton Chair in Jazz Performance, Berklee College of Music and CAST Visiting Artist



Previous page, left: MIT Affiliate and Bassist Keala Kaumeheiwa. Credit: Lenny Martinez.

Previous page, right: Joe Lovano honors his mentor and collaborator, the late Boston musical titan Gunther Schuller, at the *Streams of Expression and Love* concert at MIT's Killian Hall. Credit: Lenny Martinez. Above: Joe Lovano's longstanding collaboration with MIT faculty and students dates back to a 2002 performance of works by Senior Lecturer Mark Harvey with the MIT Festival Jazz Ensemble under the direction of Frederick Harris. Credit: Lenny Martinez. Right top: Joe Lovano, vocaljazz great Judi Silvano and cellist Katherine McShane perform at MIT's Killian Hall on October 4, 2016. Credit: Lenny Martinez.

Right bottom: Violinist and Schuller devotee Young-Nam Kim (left), artistic director of the Chamber Music Society of Minnesota, and his son Daniel Kim (right), new Boston Symphony Orchestra violist, perform in a celebration of Gunther Schuller at MIT. Credit: Lenny Martinez.



"If you play like it's an exercise, then that's what it's going to be." — Joe Lovano



#### CELEBRATING THE SHONA MBIRA TRADITION

Fradreck Mujuru and Erica Azim bring Zimbabwe's national instrument to Cambridge



/ MIT SOUNDING PERFORMANCE: FRADRECK MUJURU AND ERICA AZIM, OCTOBER 30, 2016

/ WORKSHOP: CHILDREN'S DRUM WORKSHOP LED BY LAMINE TOURÉ, OCTOBER 30, 2016

"MIT students like to make things," says Patricia Tang, who hosted Fradreck Mujuru in her Making African Instruments Project. Mujuru's instrumentmaking workshops gave students a rare chance to learn two ancient, living crafts: building the Shona mbira and learning how to play it. Thumb pianos are commonly found throughout sub-Saharan Africa, and the mbira dzavadzimu is the mainstay of Zimbabwean Shona culture: its repertoire and instrumental design are distinct in their intricacy. Mujuru is considered a master both as a musician and as a builder. "It's a very limited number of artisans who have this skill, and it's not something that's usually shared with the rest of the world," says Tang. "By helping to make these instruments, [students] learn so much about the culture they come from."

Erica Azim met Mujuru in Zimbabwe in 1991. Over the years, the two forged a deep musical friendship rooted in the intimate interplay of the mbira's lilting





ERICA AZIM CAST Visiting Artist

FRADRECK MUJURU CAST Visiting Artist

PATRICIA TANG Associate Professor, Music and Theater Arts, MIT

LAMINE TOURÉ Lecturer, Music and Theater Arts, MIT Previous page, left top: Participants in Professor Patricia Tang's Making African Instruments Project fabricate instruments with Fradreck Mujuru (center). Credit: James Addison.

Previous page, left middle: A workshop participant experiments making sound with an assembled mbira, a type of African lamellaphone, or thumb piano. Credit: James Addison.

Previous page, left bottom: Metal keys are shaped before mounting on the gwariva, a hardwood soundboard. Credit: James Addison.

Previous page, right: Fradreck Mujuru demonstrates the shaping of the sound board, traditionally made from the mubvamaropa tree (*Pterocarpus angolensis*). Credit: James Addison. Below: Performer and master craftsman Fradreck Mujuru is widely considered the greatest living maker of the intricately designed and spiritually potent mbira dzavadzimu (thumb piano of the ancestors). Credit: James Addison.

Right: By helping to make these instruments, Professor Patricia Tang says that students "also are going to learn so much about the culture they come from." Credit: James Addison.



"[Mbira music] touches me at every level. The level of your soul, your heart, your body, your mind. Everything."

– Erica Azim

polyrhythms. Mujuru is widely regarded as one of the greatest mbira players alive, and Azim is a respected teacher and scholar of the instrument in the United States. The mbira dzavadzimu features two rows of keys made of salvaged metal and mounted on wood, which is itself then mounted inside a large gourd, which acts as a resonator. Shells or bottle caps affixed to the instrument buzz gently in time to the player's cross-rhythmic pluckings. The keys produce bell-like tones that ping-pong off of one another in intricate, cyclical countermelodies.

"Mbira music is played for all kinds of things, but its most important function is for all-night ceremonies called bira, which call out ancestor spirits," says Azim. "The instrument is used as medium," says Mujuru, "so that when we talk to [the ancestors], we get guidance from them."



For many Zimbabweans, the mbira provides a link to a traditional culture that was almost wiped out by colonialism. "The whites came and tried to discourage the Shona people [from practicing] their Shona culture, and their traditions," says Mujuru. But, he explains, because the mbira has always been "part of the Shona people," the instrument and its music survived.

For Azim's part, nothing beats jamming with another mbira player, especially one as good as Mujuru. Together, they embark on extraordinary flights of interlocking improvisation, which weave a melodic tapestry woven in tight tandem. "You're just in the moment together, and you're really improvising on the one thing that the two of you have created together," says Azim. "You don't listen to my part and his part. You listen to the whole thing."

#### CONNECTING JAPAN, BALI AND THE AVANT-GARDE

Sumie Kaneko and Gamelan Galak Tika in concert for MIT's World Music Day



/MIT SOUNDING PERFORMANCE: GAMELAN GALAK TIKA FEATURING SUMIE KANEKO, DECEMBER 3, 2016

Japanese koto and shamisen player Sumie Kaneko—who holds a degree in traditional Japanese music from Tokyo National University as well as a jazz vocal degree from Berklee College of Music—is an omnivorous musician with a diverse cast of past collaborators: jazz musicians, classical percussionists and contemporary dancers. But performing with Gamelan Galak Tika for MIT's World Music Day marked the first time she performed with a Balinese gamelan ensemble.

The Balinese gamelan is a collection of mainly percussive instruments—gongs, metallophones and drums—that, with the help of a large group of mallet-wielding individuals, produces rhythmically complex and, to unfamiliar ears, sometimes cacophonous melodies. While gamelan music is an integral part of Balinese Hindu worship dating back to antiquity, it is also ripe for experimentation and innovation. At the World Music Day concert, Kaneko and Gamelan Galak Tika performed Evan Ziporyn's "Aradhana," a piece originally composed for gamelan and pipa, a Chinese lute. In adapting the piece for Kaneko, Ziporyn hoped to harness the textural contrasts between the shamisen, a three-stringed instrument with a banjo-like twang, and the koto, which resembles a horizontal zither with a purer, more resonant tone. "The piece has two different sound worlds," says Ziporyn. "The first half is all about clarity and resonance, which the koto provides. In the second half, I'm using acoustic non-Western instruments to make a type of noise music—so the shamisen's jangly sound is perfect."

Kaneko also performed a selection of traditional material as well as the world premiere of a solo piece written for her by Ziporyn, part of a suite based on Buddhist poems and ideas. The title, "Shiki Soku," is a reference to Buddhist scripture that translates to "form is emptiness."
SUMIE KANEKO CAST Visiting Artist

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EVAN ZIPORYN Kenan Sahin Distinguished Professor, Music and Theater Arts and Faculty Director, CAST, MIT



Previous page, left: Kaneko premieres a new arrangement of Evan Ziporyn's *Aradhana*, which was substantially revised to fit with koto and shamisen and is dedicated to Kaneko. Credit: L. Barry Hetherington.

Previous page, right: Master koto and shamisen player Sumie Kaneko performs with Gamelan Galak Tika during the World Music Day showcase. Credit: L. Barry Hetherington. Above, and right top: Rambax, MIT's Senegalese drumming ensemble, performs in Lobdell Hall as part of MIT World Music Day. Credit: L. Barry Hetherington. Right bottom: Kaneko's appearance as part of MIT's World Music Day features new works by Christine Southworth and Evan Ziporyn (right) and solo works from her acclaimed new album, *Dead of the Night*. Credit: L. Barry Hetherington. Gamelan music is built around intricate polyrhythms that crisscross in and out of phase with one another, and Ziporyn's piece is tricky. That, says Kaneko, is one of the great pleasures of playing with the gamelan ensemble. "Aradhana," she says, is a "thrilling composition. It's very challenging for me." For Kaneko and Ziporyn, experiencing such moments with musicians from other backgrounds is the whole point. Both say that collaborating is one of the things they like best about their vocation. "You realize there are all sorts of different ways to approach music," says Ziporyn. "And that opens you up."





#### JACOB COLLIER HARMONIZES WITH MIT

Infusing technology with humanity



/ CLASS VISITS: REHEARSAL WITH THE FESTIVAL JAZZ ENSEMBLE, SEPTEMBER 28, 2016 AND MASTERCLASSES AND REHEARSALS, DECEMBER 6–10, 2016

/ LECTURE: "THE CREATIVE PROCESS OF JACOB COLLIER," DECEMBER 7, 2016

/ MIT SOUNDING PERFORMANCE: IMAGINATION OFF THE CHARTS—JACOB COLLIER AT MIT, DECEMBER 10, 2016

Jacob Collier, the twentytwo-year-old singer and multiinstrumentalist, is known for viral YouTube videos, multitrack one-man shows, and a 2017 debut album that garnered two Grammy awards. Famously, he mainly works alone, in the music room of his childhood home in London. But his MIT residency presented him with a welcome change—over 150 eager student collaborators.

Frederick Harris, who spearheaded the residency, says, "with few exceptions, Jacob's been rather isolated in his musical creativity, yet he yearns to collaborate." During a whirlwind week, Collier worked with the MIT Festival Jazz Ensemble; Media Lab PhD student Ben Bloomberg; MIT alumnus Jamshied Sharifi and a specially assembled orchestra and chorus composed of music students from MIT, Berklee College of Music, New England Conservatory, University of New Hampshire and Boston Arts Academy.



BEN BLOOMBERG Opera of the Future Research Group, Media Lab, MIT

JACOB COLLIER CAST Visiting Artist

FREDERICK HARRIS Director, Wind and Jazz Ensembles, Music and Theater Arts, MIT

JAMSHIED SHARIFI Composer Bloomberg, a graduate student at the MIT Media Lab, manages a custom live performance system that allows for a transformation of Collier's layered solo video productions into live oneman-show performances. Credit: L. Barry Hetherington.

Previous page, left bottom: Ben

Previous page, left top: Jacob Collier performs at MIT Kresge Auditorium with the MIT Festival Jazz Ensemble and JC Project Orchestra and Chorus. Credit: L. Barry Hetherington. Previous page, right: Collier with the MIT Jazz Ensemble and JC Project Orchestra and Chorus perform an experimental piece crafted by Collier. Credit: L. Barry Hetherington. Below: Below: Collier presents a new arrangement of Brian Wilson and Gary Usher's *In My Room* with a select ensemble of MIT vocalists. Credit: L. Barry Hetherington.

Right: "At its best, technology enables human beings to be more human," says Collier. Credit: L. Barry Hetherington.





"Any place could bring Jacob to perform," says Harris. "It's what our students are doing with him. how they're interacting, that's the crux of the residency." The culminating concert, Imagination Off the Charts, featured new arrangements by Collier and Sharifi, as well as a new improvisational piece built around an app created by Bloomberg and Peter Torpey. Bloomberg and Collier met online in 2014, and shortly after began an ongoing collaboration. Together they developed scalable performance systems and customized instruments, allowing Collier to transform his elaborate video productions into live, one-man shows. The new system developed for the MIT performance allowed Collier to use iPads to send information to the musicians in real time, essentially letting him play the Festival Jazz Ensemble like a harmonizer. The resulting piece, "Sonic Bloom Mountain," was fittingly named after Bloomberg.

The jubilant performances—from the vocalists, orchestra members and the singularly talented Collier, all playing to a rapt audience—were one measure of the residency's success. But, as Harris points out, the behind-the-scenes activities, the months of thoughtful planning, intense rehearsals, arduous transcription work and technical invention, are what made the residency meaningful to the students and the artist alike. At the concert, Collier thanked not only his collaborators but also "MIT as a concept." "I've always felt a kinship with this idea of celebrating the introvert.... At MIT, there's a sublime understanding of the people who think inwards first. And I would count myself amongst that group of people. So I'd like to celebrate that idea."

"Imagine a Prince, a Michael Jackson, a Wynton Marsalis, a Yo-Yo Ma. Imagine to be able to work with that kind of young artist when they're just at the precipice like this."

- Frederick Harris

"This is Jacob's first-ever college residency," says Harris. "So I'm trying to set the bar pretty high. The fact that we can have this relationship early on which I hope continues—is very magical."

# MINIMALISM MEETS FUNK IN NIK BÄRTSCH'S MOBILE ENSEMBLE

Ritual groove music



/ MIT SOUNDING PERFORMANCE: NIK BÄRTSCH'S MOBILE, JANUARY 5, 2017

"A lot of groove music is dance music or is entertainment music, which is not good or bad, but it has certain consequences," says pianist and composer Nik Bärtsch. "I was always interested in groove music as an art form." Bärtsch performed with his MOBILE ensemble at MIT as part of the *MIT Sounding* series. The quartet plays what Bärtsch dubs "ritual groove music," a nod to the music's repetitive structure and funk-inflected rhythms. The term is also designed to ward off less appealing descriptions. "It's dangerous when you call it minimal jazz or something," says Bärtsch. "It gives the total wrong impression."

Though Bärtsch's compositions are deeply informed by jazz, MOBILE's music sounds less like jazz's offspring and more like its cousin—same gene pool, different family. Minimal music is part of the bloodline, but Bärtsch arguably owes more to funk's propulsive swing. His music is at once cerebral and visceral, both instinctively felt and intensely meticulous.



NIK BÄRTSCH CAST Visiting Artist

SHA Saxophonist and Bass/ Contra Bass Clarinetist

KASPAR RAST Drummer

NICOLAS STOCKER Percussionist



Previous page, left top: (from left) Nik Bärtsch, Sha and Kaspar Rast perform in the *MIT Sounding* series. Credit: James Addison. Previous page, left bottom: Special guest Adrian Rigopulos joins MOBILE for the concert in MIT's Killian Hall. Credit: James Addison.

Previous page, right: Swiss composer and pianist Nik Bärtsch. Credit: James Addison. Above: MOBILE member Nicolas Stocker on percussion. Credit: James Addison.

Right: Percussionist Kaspar Rast (right) and clarinetist Sha (left). Credit: James Addison. Bärtsch's arrangements are not vehicles for improvisation, jazz-adjacent though they are. Rather, his pieces are composed of precisely overlapping rhythmic parts that move in and out of sync. One small alteration in a single part—the precise plink of a lone piano key, an extra tap on the high hat—changes the whole tenor of the piece.

Founded in 1997, MOBILE is best known for longform performances. They usually take place in vast, atmospheric settings: an old brewery or a huge stage by a lake. The players gather in a circle, the better to commune with one another in the thrall of Bärtsch's intensely rhythmic compositions. Even in the context of a more conventional ninety-minute set, such as the one the group performed at MIT, MOBILE is a study in meditative groove.

"You have a sentence with a few words, and you have a few strategies for how to combine them."

– Nik Bärtsch



### CONVERGING MUSICAL WORLDS

In duoJalal, a real-life marriage leads to a musical one



/ COMPOSER FORUM: KATHRYN LOCKWOOD AND YOUSIF SHERONICK, FEBRUARY 23, 2017

/ MIT SOUNDING PERFORMANCE: THE RUMI EXPERIENCE, FEBRUARY 23, 2017

duoJalal's music lives in the intricate interplay of melody and rhythm. When the two members of duoJalal met in 1998, musical worlds converged. Violist Kathryn Lockwood had launched a career in chamber music, while Yousif Sheronick excelled in an array of percussive traditions, from Brazilian folk to rock 'n' roll. But it wasn't until years later, long after they had fallen in love and gotten married, that the pair began to collaborate.

"I think there's this conception that Kathryn's going to play the melody and I'm just going to accompany her," says Sheronick. In reality it's much more of a dance, a fluid intermingling of propulsion and expression. Along with other such collaborations, duoJalal's 2016 album, *Shadow and Light: The Rumi Experience*, reflects the increasingly blurring boundary between classical and global music. "We used to joke that we would never play together, and little by little those worlds started colliding," says Sheronick. "And now you see a lot of classical composers wanting to use those [other] influences." The duo played selections from the album at their *MIT* Sounding performance, which featured Sheronick's wide-ranging abilities on a variety of instruments, from the vibraphone to the Egyptian riq to his specialty, the frame drum. "You find frame drums in every culture around the world because they're the simplest drum you can find" explains Sheronick. "All you need is a hoop and a drumhead." Sheronick subscribes to no orthodoxy—he draws on techniques from a number of hand drumming traditions, with transportive results. Here he evokes the harsh thrum of a moth's wings against a screen door; there the metallic plunk of raindrops on a gutter; now the deep thump of the heart in its chest.

Shadow and Light was inspired by the thirteenthcentury Persian poet Jalāl ad-Dīn Muhammad Rūmī, and contains works by Lev Zhurbin and MIT professor Evan Ziporyn inspired by specific Rumi poems. Sheronick describes how reading Rumi's work affected him: "I felt more part of life and part of a community. This is what his poetry seems to do. And what we love about it is it bridges cultures and religions, and it's not specifically Christian or Muslim or Jewish. It speaks to everyone."

KATHRYN LOCKWOOD CAST Visiting Artist

YOUSIF SHERONICK CAST Visiting Artist

EVAN ZIPORYN Kenan Sahin Distinguished Professor, Music and Theater Arts and Faculty Director, CAST, MIT



Previous page, left: duoJalal. Courtesy of the artists.

Previous page, right: duoJalal's Kathryn Lockwood (left) and Yousif Sheronick perform at MIT. Credit: James Addison.

Above: duoJalal presents work from their latest album, *The Rumi Experience*, designed to cultivate "sama," or deep listening. Credit: James Addison. Right, left: Violist Lockwood uses her background in chamber music and Sheronick's mastery of global percussion to create music that defies genre. Credit: James Addison. Right, right: Percussionist Sheronick uses subtle cues developed over time with partner Lockwood to allow them to improvise and flex the bounds of an existing piece in live performance. Credit: James Addison. The album also features adaptations of pieces by Giovanni Sollima, Shirish Korde, Somei Satoh and Zhao Jiping. But the Zhurbin and Ziporyn compositions form the core of the project. Ziporyn's contributions flicker with barely restrained fire, leaping from hushed portent to minor-key tumult. Zhurbin's pieces are a slower burn, by turns yearning and meditative.

At times virtuosic, Lockwood is a textural chameleon as well, possessed of a limber, expressive timbre. "The viola has that tone of the human voice, and I can always picture a really beautiful singer singing when she plays," says Sheronick. "She's definitely a great technical player, but not a lot of people have that warm quality to their tone and can add as much emotion to their playing." "What I found is that, if I was in a funky mood, I would read a little bit of Rumi poetry, and it would make me feel better."

#### - Yousif Sheronick

But the crux of duoJalal is, of course, it's duality—the dynamic relationship between viola and percussion, in which conflict is as crucial as amity. Lockwood's training imbued her with a loose, pliable sense of time, Sheronick's with a deep connection to groove. Sometimes, they find themselves at odds. But that negotiation across differences—genre to genre, culture to culture, person to person—is the source of duoJalal's strength.





### THE MISCHIEF AND WIT OF HAYDN AND HARBISON

MIT Symphony Orchestra pays homage to the Institute Professor



/ *MIT SOUNDING* PERFORMANCE: MIT SYMPHONY ORCHESTRA, MARCH 17, 2017

The program for the MIT Symphony Orchestra's (MITSO) March 2017 concert was inspired by John Harbison's formative encounter with the music of Joseph Haydn. "I was a string player as a kid," says Harbison, MacArthur Fellow and MIT Institute Professor. "I played violin, but I wanted to be a violist. And when I switched, it was the greatest summer of my life, because my teacher had an idea: we will meet every morning for two months, and we will play Haydn quartets."

Harbison struggled to master reading the viola's alto clef, but the newly-minted violist was undeterred. He had fallen in love, not just with the viola, but with Haydn's playful panache. That, says Harbison, is the beauty of Haydn. "[He] plays with form expectations which seem like they are going to be quite literally fulfilled, but then are suddenly quirked. This is the essence of Haydn's thinking. And if you go through a lot of his pieces in any medium, you begin to be ready, wary of his restlessness, [knowing] that something will happen that you really haven't heard him do before." Symphony no. 100, known as the Military Symphony, is one of Haydn's weightiest compositions. "The military in those days was serious business," says Harbison. "The sound of a military band or the sound of a corps drilling was not toy soldier world." The symphony's most affecting moment comes at the end of the second movement, when a hush falls over the orchestra and a lone trumpet calls out. It's a surprisingly simple passage, "the kind of thing only a second-rate player who only has military function would play," says Harbison.

"You won't reclaim Haydn until he is simply courageously restored to those repertoires where he lived for so long."

– John Harbison

And, just as Haydn gave the MITSO performers a musical workout, so too did Harbison's own work, the Double Concerto for Oboe and Clarinet, composed in 1985 with a student orchestra in mind.

ADAM BOYLES Director, MIT Symphony Orchestra

MIT SYMPHONY ORCHESTRA Previous page, left: Members of the MIT Symphony Orchestra perform in Kresge Auditorium. Credit: James Addison.

Previous page, right: Director Adam Boyle conducts the MIT Symphony Orchestra, an entity that dates back to 1884 when the first MIT Tech Orchestra appeared on campus along with the Banjo and Glee Clubs. Credit: James Addison. Below: Part of John Harbison's mission is to return Haydn to the mainstream. He blames the rise of historically informed performance—in which musicians play on period instruments and scores are interpreted with academic fastidiousness—for stranding Haydn in a kind of limbo. Credit: James Addison.

Right top: Haydn's music is difficult. "There is nowhere to hide in that music," Adam Boyles says. "It's very transparent in that regard." Credit: James Addison.

Right bottom: Adam Boyle conducts the MIT Symphony Orchestra in MIT's Kresge Auditorium on March 17, 2017. Credit: James Addison.





The concerto hinges on a furious ballet between the two soloists—in this rendition, MIT alumni Eran Egozy on clarinet and Paul Ragaller on oboe while the orchestra surges and retreats with frenzied alacrity. It's a study in theatrics, by turns stealthy and discordant. But MITSO director Adam Boyles cautions against reading Harbison's intensity as heavy.

"I just wish everyone who approached [Harbison's] music could just meet and talk with him for about half an hour. I think they would know the music immediately," says Boyles. "His work is filled with—just like Haydn's—a kind of wit and humor and musical savvy that is the man."



## VOCAL JAZZ, LATIN MUSIC AND POETRY COLLIDE

Works on Hope with Latin jazz luminaries Guillermo Klein and Luciana Souza



/ COMPOSER FORUM: GUILLERMO KLEIN AND LUCIANA SOUZA, APRIL 26, 2017

/ MIT SOUNDING PERFORMANCE: WORKS ON HOPE—LUCIANA SOUZA & GUILLERMO KLEIN WITH THE MIT WIND ENSEMBLE, MIT FESTIVAL JAZZ ENSEMBLE, AND MIT VOCAL JAZZ ENSEMBLE, APRIL 28, 2017

In the mid-1990s, Luciana Souza occasionally drove from Boston to New York to sit in on a Monday night session at the legendary Smalls Jazz Club in Greenwich Village. The gig lasted into the wee hours, and Souza usually only sang on a few numbers. But it was always worth it, she says, to become part of bandleader Guillermo Klein's tribe. "Being in that community," says Souza, "making that kind of music, meant something so deep to all of us."

So when Klein asked Souza to perform with him at MIT, she didn't have to think twice. The centerpiece of the concert was a new composition by Klein, "Works on Hope," which Souza performed with the MIT Wind Ensemble. Under the direction of Frederick Harris, the concert also featured the MIT Festival Jazz Ensemble and the MIT Vocal Jazz Ensemble performing, among other things, some of Souza's own compositions.





FREDERICK HARRIS Director, Wind and Jazz Ensembles, Music and Theater Arts, MIT

GUILLERMO KLEIN CAST Visiting Artist

LUCIANA SOUZA CAST Visiting Artist

LIZ TOBIAS Affiliated Artist and Vocal Jazz Ensemble Coach Previous page, left top: Guillermo Klein. Credit: James Addison.

Previous page, left middle: Luciano Souza. Credit: James Addison.

Previous page, left bottom: Members of the MIT Vocal Jazz Ensemble perform with Souza and Klein. Credit: James Addison. Previous page, right: Klein, Souza and the MIT Wind Ensemble perform the world premiere of "Works on Hope" under the direction of Frederick Harris (right). Credit: James Addison. Below: Klein's work is often vaunted for its seamless integration of his Latin roots with jazz's witty intricacies. But his admirers and collaborators say that his greatest gift is his singularity of vision. Credit: James Addison.

Right: Klein and Souza's MIT residency and a semester-long exploration of their music by the three MIT student ensembles culminates in a performance in Kresge Auditorium. Credit: James Addison.





Klein is a renowned composer within jazz circles, best known for his work with his limber and inventive band Los Guachos. He first came to MIT for a residency in 2001; five years later, he was commissioned to write a piece for the MIT Wind Ensemble. The result, "Solar Return Suite," which earned a five-star review in *Downbeat Magazine* when it was released on the group's 2015 album, *Infinite Winds*.

"[Luciana Souza] helped me internalize the story of her song 'No Wonder' so that when I sang it, it would be me sharing my own version."

– Talia Khan

When Harris invited Klein to return to MIT in 2017, he suggested involving a vocalist. Klein immediately thought of Souza. "I admire the way she sings, the tone of her voice, the honesty that she has as an artist," says Klein. "She gets very deep to the last drop, and I like that. There's no place to hide." In preparation for the MIT residency, MIT Vocal Jazz Ensemble coach Liz Tobias dedicated the entire semester to Souza's work, steeping the students in the singer's imaginative and exacting artistry. "[Souza's songs] not only required a solid vocal range, but also immense skill in scatting," says MIT undergraduate Talia Khan.

Klein based "Works on Hope" on the poetry of Juan Sasturain. The poem "La Esperanza es lo Ultimo" (Hope is the last thing) provided particular inspiration. For the piece, Klein devised a tricky tonal symmetry. Each note in the melody is paired with a particular note below—D with C-sharp, E-flat with C, for example—in an eccentric mirroring of mismatched intervals. "My deep goal was in the oddness of it," says Klein. "It's harmonious and it's beautiful. That doesn't mean sweetness. It means completeness, or it means some sort of arrival. Something that makes you feel like things make sense, somehow."

## MR. HARRISON'S GAMELANS

A tribute to Lou Harrison honors his love affair with Javanese music



/ MIT SOUNDING PERFORMANCE: SUITE FOR VIOLIN AND AMERICAN GAMELAN, CONCERTO FOR PIANO WITH JAVANESE GAMELAN AND BY THE NUMBERS, OCTOBER 12, 2017, INSTITUTE OF CONTEMPORARY ART/BOSTON (ICA)

The great American composer Lou Harrison tried his hand at many things: painting, calligraphy and poetry, to name but a few. He went through a great many musical phases as well, inspired by the experimental work of Charles Ives, Henry Cowell and his friend John Cage. Taking Cowell's example, he also explored Asian music, playing in Chinese opera orchestras in San Francisco in the 1950s. In the 1970s he became fascinated by the music of the Javanese gamelan, which became central to his music making.

Harrison's love affair with Javanese music was the focus for the opening concert of the 2017–18 season of the *MIT Sounding* series at the Institute of Contemporary Art/Boston. The concert wraps up a year replete with Harrison-themed celebrations worldwide, as the composer would have turned one hundred in May 2017.

The MIT program featured violinist Johnny Gandelsman and pianist Sarah Cahill, along with MIT's Gamelan Galak Tika ensemble. Gandelsman performed Harrison's incandescent *Suite for Violin* and American Gamelan, and Cahill performed the rarely-heard *Concerto for Piano with Javanese Gamelan*. Together, they also premiered *By the Numbers*, an homage to Harrison by Evan Ziporyn.





JOHNNY GANDELSMAN CAST Visiting Artist

SARAH CAHILL CAST Visiting Artists

EVAN ZIPORYN Kenan Sahin Distinguished Professor, Music and Theater Arts and Faculty Director, CAST, MIT Previous page, left top: It wasn't until the 1970s, when Lou Harrison began to explore the music of the Javanese gamelan, a type of percussion ensemble, that Harrison truly found himself. Credit: L. Barry Hetherington.

Previous page, left middle: Pianist Sarah Cahill performs at the Institute of Contemporary Art/Boston. Credit: L. Barry Hetherington. Previous page, left bottom: Johnny Gandelsman. Credit: L. Barry Hetherington.

Previous page. right: World premiere performance of *By the Numbers* composed by Evan Ziporyn. Credit: L. Barry Hetherington. Below: Gamelan Galak Tika and Sarah Cahill perfrom *Concerto for Piano with Javanese Gamelan* on Lou Harrison's Gamelan Si Betty, Credit: L. Barry Hetherington.

Right: Johnny Gandelsman and members of Gamelan Galak Tika perform *Suite for Violin and American Gamelan* on Lou Harrison's Old Granddad #4. Credit: L. Barry Hetherington.





In order to be performed, the violin suite and the piano concerto require unique sets of instruments designed and built by Harrison himself with his longtime companion, William Colvig. Both sets are on loan from influential gamelan composer and educator Jody Diamond, an affiliated artist at MIT.

The so-called American gamelan—dubbed Old Granddad #4 by Harrison—is made of metal piping and only resembles an Indonesian gamelan in the most superficial sense. "[Lou] was trying to make a percussion ensemble... that was beautiful and chimy in the way a gamelan is beautiful and chimy," says Diamond. And indeed, in *Suite for Violin and American Gamelan*, those metal pipes reverberate sonorously beneath the violin's sweet call.`

"It's kind of unsettling when you first play it. But therein lies the magic—in its own unique language, it sings."

– Sarah Cahill

By contrast, Harrison's Javanese gamelan—named Gamelan Si Betty, after its benefactor Betty Freeman—was built to resemble the court gamelan of central Java, though its keys are fashioned from aluminum instead of bronze. *Concerto for Piano with Javanese Gamelan* is similarly lithe and lyrical. But like all traditional Javanese gamelans, Gamelan Si Betty boasts its own special tuning system. To match the ensemble, the piano itself underwent a tuning transformation, a process that took MIT piano technician Victor Belanger two months and six tunings. (Following the performance, an audience member asked, "how many keys had to be retuned?" The answer: "All eighty-eight.")

The experience of performing with a gamelan ensemble is quite distinct as well. "There's no conductor, so it's all somewhat democratic," says Cahill. "I think that's why a lot of people like playing gamelan, because everyone's equal, and everyone has their own roles."

According to Diamond, that "cooperative aspect" is precisely what Harrison loved about gamelan music. And it's an attitude that he carried with him in all aspects of his life. "He was a wonderful person," says Diamond, who met Harrison in 1976 and worked with him until his death in 2003. "He made all his students feel like his colleagues. So, you know, a student would write a piece and he'd say, 'Oh, let's put that on the concert. Let's put your name on the poster.' He was so encouraging."

Harrison is often talked about as one of the first great innovators of East-meets-West, a bridge builder between musical worlds. But Diamond says that's wrong, that Harrison never went about trying to create fusion music—he simply wrote for gamelan, and couldn't help doing it his own way. "He took in musics and understood them in an essential, deep way, so that what came out wasn't imitative," says Diamond. "It was his integration of other musical ideas with his own creativity." FACULTY RECITAL MARKS THE FIFTIETH ANNIVERSARY OF THE ASSASSINATION OF MARTIN LUTHER KING JR.



A chance to reflect on progress, both personal and political / MIT SOUNDING PERFORMANCE: MARCUS THOMPSON FACULTY RECITAL, VIOLA & VIOLA D'AMORE WITH BILL CUTTER, ELENA RUEHR AND EVAN ZIPORYN, FEBRUARY 24, 2018

April 4, 1968 was a momentous day for Marcus Thompson. That was the day that the young violist made his debut in a recital at the Isabella Stewart Gardner Museum in Boston.

It was also the day of a tragedy felt worldwide: the assassination of Martin Luther King Jr.

Thompson learned of King's death not long before walking onstage. Needless to say, the news "was a very heavy burden to carry." But that day also marked the start of an illustrious career for the Juilliard-educated musician, who then as now, was one of only a small number of African-Americans to succeed in the world of classical music.

It was with these twin legacies in mind—King's and his own—that Thompson, now an Institute Professor at MIT, designed the program for his MIT Sounding recital at Kresge Auditorium in February 2018. "Fifty years later it just seemed like it was appropriate to do something that called attention to [King's] legacy," says Thompson. "Especially... since that legacy is being called into question by so many actions and attitudes."

"[Marcus Thompson] has an amazing sense of how to make a line, and how to make something move."

#### – Elena Ruehr

Collaboration with colleagues and students was at the heart of the recital. The program began with Vivaldi's concerto for viola d'amore, a baroque string instrument that bears a symbol known as the "flaming sword of Islam" in place of F-holes, revealing the multicultural lineage of the instrument.

Vivaldi was followed by Morton Feldman's ethereal and elegiac twentieth-century masterpiece *Rothko Chapel*, featuring the MIT Chamber Chorus under

BILL CUTTER Director of Choral Programs, Music and Theater Arts, MIT

ELENA RUEHR Lecturer, Music and Theater Arts, MIT

MARCUS THOMPSON Institute Professor of Performance, Music and Theater Arts, MIT

EVAN ZIPORYN Kenan Sahin Distinguished Professor, Music and Theater Arts and Faculty Director, CAST, MIT

Previous page, left: Marcus Thompson. Credit: L. Barry Hetherington.

Previous page, right: Marcus Thompson's Faculty Recital in MIT's Kresge Auditorium. Credit: L. Barry Hetherington. Below: Feldman's *Rothko Chapel* conducted by Evan Ziporyn (right). Credit: L. Barry Hetherington.

Right, left: The concert coincides with the anniversary season of Professor Thompson's recital debut at the Isabella Stewart Gardner Museum on April 4, 1968. Credit: L. Barry Hetherington.

Right, right: Elena Ruehr (left) and Thompson. Credit: L. Barry Hetherington.





the direction of MIT professor Evan Ziporyn. The program also featured the Boston premiere of MIT lecturer Elena Ruehr's "Shadow Light" for solo viola and string quartet.

The evening's final installment, Ralph Vaughan Williams's "Flos Campi," again featured the MIT Chamber Chorus, this time under the baton of their director, William Cutter. Like the Feldman piece, "Flos Campi" contains a choral part without lyrics. It's a pairing that Thompson hopes will spark



reflection and healing. "Music is beyond words," says Thompson. "A concert is about bringing people together to share an experience and to contemplate what's going on." Half a century after the death of King, Thompson still finds plenty to contemplate. And so he looks to that early recital as a model for going forward. After fifty years, he knows there is value in doing the work, no matter what tragedies and triumphs unfold around him.

# THE INSTRUMENT IS CODE

Jason Levine brings musical live coding to MIT



/ PUBLIC LECTURE: "COMBINING LIVE CODING AND REAL-TIME SOFTWARE FOR MUSICAL IMPROVISATION," APRIL 10, 2018

/ WORKSHOP: "LIVE CODING SINUSOIDAL TRAVERSALS THROUGH SOUND SORTED IN SPACE," APRIL 12, 2018

Thanks to the widespread availability of various digital production platforms, making electronic music has never been easier. A small contingent of technically-minded creatives, however, has rejected the laptop musician's typical suite of editing software and premixed tracks. Instead, they write the code themselves, all while performing in real time.

The technique is known as live coding, and it is a specialty of the musician Jason Levine, one of MIT's visiting artists in spring 2018. Like many of his ilk, Levine performs with his code projected on a screen behind him. Those lines of technical jargon may be incomprehensible to the average concert goer, but the visual gimmick is a powerful reminder of the risk involved when live coding. There is no troubleshooting when live coding, no chance to debug. Every mistake, from the serendipitous to the catastrophic, is exposed in the projected code. Some elements of music that come naturally to humans are difficult to code on the fly, and part of Levine's project has been to make his process more organic. With the help of a machine learning algorithm, he is able to organize his vast sample library into a kind of geography, one that can be instinctively traversed with minimal code. The result is groovy, warmly tactile music that stands in contrast to the cold, "sci-fi feel" of a lot of live coding, says Levine.

As part of his residency, Levine performed live at the MIT Museum. The public lecture and performance was a culmination of his work with the algorithms and experimental music he has developed over the last five years. He also worked with students in Professor Eran Egozy's course on music technology. Egozy hopes that learning to live code will inspire his students to make art. "One of the things that I think is most difficult for some MIT students is just this—thinking of themselves as creative people," says Egozy. Alternative standing Alternative standing the standard state and states standing started



JASON LEVINE CAST Visiting Artist

ERAN EGOZY Professor of the Practice, Music and Theater Arts, MIT



Previous page, left: Jason Levine during his public lecture, "Combining Live Coding and Real-Time Software for Musical Improvisation." Credit: James Addison.

Previous page, right: Jason Levine during his workshop, "Live Coding Sinusoidal Traversals Through Sound Sorted In Space." Credit: James Addison. Above: Workshop participants learn how to use the Extempore live coding language to synthesize sounds and create rhythmic patterns, and are encouraged to experiment with using code in an improvisational or artisanal mode in contrast to the traditional problem solving mentality associated with coding. Credit: James Addison. Right: Levine focuses on the interactive and generative qualities of coding to create real-time software systems for live performance. Credit: James Addison. Levine encouraged students to embrace their mistakes—quite the opposite of what programmers are usually taught to do. "If you make a math error in your code and it sounds cool, use that," says Levine. "To me those things are always more interesting than when you try to take an engineering idea and implement it. Because then you're just taking ideas from the past that you've seen." And that sentiment lies at the heart of Levine's practice. "It seems to me it's interesting when things don't work the way the creator intended," says Levine. "And it's beautiful."

"Not only are you controlling how these instruments play, but you can transform the instruments themselves. You can rebuild the instrument, because the instrument is code."

- Jason Levine



## THE GREAT CLARINET SUMMIT

Shining a light on an oftoverlooked instrument



/ MIT SOUNDING PERFORMANCE: THE GREAT CLARINET SUMMIT, MAY 11, 2018

The clarinet is not generally considered the most heroic of instruments. In classical music, that honor belongs to the violin. In jazz, it's the saxophone; in rock, the guitar.

But the clarinet once enjoyed a more noble pedigree in American music. That was during the heyday of big band swing and the reign of Benny Goodman, the legendary clarinetist known as the King of Swing. And, while the instrument's reputation has since dimmed, its champions know the truth. The clarinet contains greatness.

The *MIT Sounding* series shined the spotlight on the instrument at *The Great Clarinet Summit*, a concert at MIT's Kresge Auditorium featuring some of the most accomplished living clarinetists, along with the MIT Festival Jazz Ensemble in its final concert of the year.


FREDERICK HARRIS Director of Wind and Jazz Ensembles, Music and Theater Arts, MIT

BILLY NOVICK CAST Visiting Artist

JAMSHIED SHARIFI Composer

EVAN ZIPORYN Kenan Sahin Distinguished Professor, Music and Theater Arts and Faculty Director, CAST, MIT

DON BYRON CAST Visiting Artist

ANAT COHEN CAST Visiting Artist

ERAN EGOZY Professor of the Practice, Music and Theater Arts, MIT



Previous page, left top: Anat Cohen performs in *The Great Clarinet Summit.* Credit: Sham Sthankiya.

Previous page, left bottom: Eran Egozy performs "Abyss of birds" for solo clarinet from Oliver Messiaen's *Quartet for the End of Time*. Credit: Sham Sthankiya. Previous page, right: Community clarinetists raise their instruments prior to performing Jamshied Sharifi's *Ornament of the World* with the soloists, MIT Festival Jazz Ensemble and MIT Wind Ensemble. Credit: Sham Sthankiya. Above: (from left) Ini Oguntola, Lilly Clark, Dylan Sleeper, Billy Novick, Anat Cohen and Don Byron with the MIT Festival Jazz Ensemble. Credit: Sham Sthankiya.

Right: A community clarinetist plays along with the concert. Credit: Sham Sthankiya.



The event, says Frederick Harris, director of MIT's wind and jazz ensembles, is in many ways a defense of one of jazz's most oft overlooked instruments. The clarinet may be considered by some to be merely a child's starter instrument. That humble woodwind, however, "can play quite low, and it can play quite high," says Harris. "In some ways it's akin to a viola [in] range. Great players can get this incredible, almost inaudible sound."

"You can get the most intimate sound out of the clarinet, from the nature of it, and the most powerful sound."

- Frederick Harris

The Great Clarinet Summit featured a surfeit of soloists capable of just that. The concert featured Anat Cohen, a virtuoso who is widely recognized as one of the most vital clarinetists working today; Don Byron, a world-renowned clarinetist and composer as inventive as he is adept; and Billy Novick, the Boston area's premiere jazz clarinetist. They were joined by two of MIT's own clarinet heroes: Evan Ziporyn and Eran Egozy. Ini Oguntola, an MIT undergraduate, was also featured. Harris deftly put the participants in various combinations, with the MIT Festival Jazz Ensemble front and center. The MIT Wind Ensemble also made a guest appearance, accompanying Ziporyn as soloist in a movement from Byron's eclectic *Concerto for Clarinet and Wind Ensemble*.

The concert concluded with a new composition by Jamshied Sharifi designed to be playable by clarinetists of all levels, from the novice to the master. And participation was open to all—including the almost one hundred members of the audience who brought their own instruments with them. Harris hopes in part that the piece will inspire people to revisit an instrument that they may not have played since childhood. "The thing that drives me more than anything is education," says Harris. "I just dream of seeing these people hauling out their instruments from the closet."

## ANNA KOHLER'S *MYTHO? LURE OF WILDNE*SS

Playing with sensations



/ PERFORMANCE: *MYTHO? LURE OF WILDNESS*, BOSTON PLAYWRIGHTS' THEATRE, OCTOBER 28–29, 2016

/ PERFORMANCE: *MYTHO? LURE OF WILDNESS*, ABRONS ART CENTER, NEW YORK, DECEMBER 9–22, 2016

"It's a tender portrait of a scary thing," says Anna Kohler, describing *Mytho? Lure of Wildness*. Kohler's play explores the fearsome reality of getting old: "It's so easy for us to be sensuous beings when we're young, but what happens to sensuousness when we are old?" says Kohler. "To the skin? To the way that people perceive us, to our own image of ourselves?"

This production, directed by Caleb Hammond and funded by the first grant from the Fay Chandler Faculty Creativity Seed Fund, incorporated a range of avantgarde performance techniques and emerging technologies to create an immersive environment designed to bombard the senses. Kohler says the piece allows her "to play with sensations like facets on a jewel."

The play is set in the studio of a famous painter. The models who inhabit this luscious bohemia serve as archetypal women, who become pariahs merely because they aged. Kohler, who was an artist's model at L'Académie de la Grande Chaumière, the oldest painting academy in Paris, drew on personal experience. This multisensory production, however, also delivers fictional flights of fancy. *Mytho?* is punctuated with references to Bresson's films and Matisse's paintings, as well as the work of other artists.

The first half of the play recounts the visual discoveries of a famous painter inspired by Matisse. In the second half, painting becomes a baseline for interrelated vignettes. The painter paints amidst a flurry of activity—tango and belly dancing amongst other staged impressions that blur the lines between live action and video.

Kohler strove to make the theatrical experience similar to looking at a painting, where understanding narrative content matters less than the visceral reaction. "I really want the audience to be immersed completely," says Kohler. "And the desired effect ranges from goosebumps to involvement."

ANNA KOHLER Senior Lecturer, Music and Theater Arts, MIT

CALEB HAMMOND Lecturer, Music and Theater Arts, MIT



Previous page, left: Anna Kohler, actor and director. Credit: Caleb Hammond.

Previous page, right: Hapi Phace (left) and Anna Kohler in *Mytho? Lure of Wildness.* Credit: Caleb Hammond. Above: (from left) Anna Kohler, Anna Martel and Adam Strandberg. Credit: Caleb Hammond.

Right top: (from left) Adam Strandberg, Anna Martel and Anna Kohler. Credit: Caleb Hammond. Right bottom: (from left) Hapi Phace and Anna Kohler. Credit: Caleb Hammond.



"A theatrical work about what looking feels like, to the muse and to her creator."

– Hilton Als, The New Yorker



# *BEE BOY* UPLIFTS IN THE FACE OF INEQUITY'S STING

Giving voice to the voiceless



/ PERFORMANCE: *BEE BOY*, WORK IN PROGRESS SHOWING AND COMMUNITY DISCUSSION, MAY 4, 2017

Charlotte Brathwaite, along with her collaborators—Guillermo E. Brown (a.k.a. Pegasus Warning), Abigail DeVille, Rucyl and Obehi Janice—presented their work in progress in conjunction with a public conversation with community leaders around the social and environmental justice issues that the project addresses.

Brathwaite's project, *Bee Boy*, connects bee colony collapse to the destruction of human lives by institutional injustice and violence against black and brown bodies. "We decided if we're doing work about ending violence, we need to involve people who are working on that in their everyday lives," says Brathwaite, "from school principals to activists. Art and life are unquestionably connected for me." Bee Boy brings together disparate musical styles and cultural references. Brown, whose music is central to the multimedia performance, is something of a shape-shifter, musically. His sound is influenced by technologically-driven and avant-garde pieces, R & B, soul, hip-hop culture, classical music and many other genres. When he approached Brathwaite with the idea to collaborate on what would become Bee Boy, he wanted to draw inspiration from Alexander Pushkin's poem The Tale of Tsar Saltan, and Nikolai Rimsky-Korsakov's opera by the same name. In the opera's third act, a banished prince is transformed by the magic Swan-Bird into a bumblebee so that he can fly home to his father, who does not know he's alive. The opera's famous orchestral interlude, "Flight of the Bumblebee," is the basis of this experimental work. Structurally, the musical interlude is divided, slowed down, chopped up, remixed, reassembled and collaged with text, sounds, bodies and choral voices.

CHARLOTTE BRATHWAITE Assistant Professor, Music and Theater Arts, MIT

GUILLERMO E. BROWN (A.K.A. PEGASUS WARNING) Composer, Musician and Performer

ABIGAIL DEVILLE Visual Artist and Designer

RUCYL Sound Artist

" mail

OBEHI JANICE Associate Producer Previous page, left: Thabiti Brown, Cliff Notez and Brandon G. Green participate in a community panel discussion. Credit: Lenny Martinez. Previous page, right: Guillermo E. Brown. Credit: Lenny Martinez.

Below: Guillermo E. Brown. Credit: Lenny Martinez. Right: Charlotte Brathwaite. Credit: Lenny Martinez.





In addition, as the title (which borrows from the bell hooks story, *Be Boy Buzz*) suggests, hip-hop is a cultural touchstone for the piece. Like the spirituals, blues and jazz that preceded it, hip-hop creates something beautiful out of something difficult. "In its purest form, hip-hop speaks truth to power," says Brathwaite. "It reports on a less-than-perfect human condition to reveal new modes to overcome violence and oppression. If we really thought about connecting to each other . . . if you accept that there is a part of me that is in you, and I accept that there is a part of you that is in me, I think the levels of respect that we have for each other and for the environment would grow tenfold."

### "When some lose, we all lose." - Charlotte Brathwaite

Ultimately, the piece is hopeful. Brathwaite describes it as "a meditation on resilience, survival and the urge to transcend oppression." She adds, "in its final form, *Bee Boy* will honor life, the environment and humankind. It's about what we need to survive—love."

# SURROUND SOUND ON STEROIDS

"Dissolve Music" festival explores spatialized sound



/ SYMPOSIUM: "DISSOLVE MUSIC," WAREHOUSE XI, SOMERVILLE, MA, MARCH 7–9, 2018

"Dissolve Music" is the latest in a series of remixes of the academic conference and music festival, staged by Ian Condry in an effort to encourage innovative concepts of listening. As the New York Times described the scene: "By day, scholars, D.J.s, musicians and promoters offered papers, discussions and five-minute 'lightning talks,' covering topics like 'Multiperspectivity in Sound' and how ocean waves resemble radio waves.... And on Thursday and Friday nights, Mouse on Mars-Jan St. Werner and Andi Toma-delivered multiperspectivity in action, blurring playback and performance as they unveiled Dimensional People."

The electronic duo's recently released album uses an innovative spatial array of speakers and object-based mixing software developed by d&b audiotechnik to place sounds throughout a space. "Imagine that you can place the cello anywhere in space, and you can place the timpani drum anywhere in space," Condry told the *Boston Globe*. "Now

imagine that each of those instruments can run away from you, towards you, or around you. That's the kind of creative potential a system like this enables." More than a corrective to the simplistic binaries of stereo systems (the mistaken assumption that "two speakers equals two ears," says St. Werner), spatializing sound serves, according to Condry, as a corrective to the hierarchical directionality of academic lectures and musical spectacles. "In general, we have this experience of facing toward knowledge that comes directly at us from a single direction, but that's not how learning works," says Condry. "Surprising sounds and information can come from behind us or places we weren't looking. I like the surround sound system as a way to experience that."

"Music and sound can create new spaces for interaction and engagement."

- Ian Condry

IAN CONDRY Professor, Global Studies and Languages, MIT

JAN ST. WERNER Composer, Musician, Professor, Academy of Fine Arts, Nuremberg

REKHA MALHOTRA Graduate Student, Comparative Media Studies/Writing, MIT



Previous page, left: (from left) Rajna Swaminathan, Naseem Alatrash, Ganavya Doraiswamy and Utsav Lal. Credit: Caroline Alden. Previous page, right: Michiyoshi Sato. Credit: Caroline Alden.

Above: (from left) Rajna Swaminathan, Naseem Alatrash, Ganavya Doraiswamy and Utsav Lal. Credit: Caroline Alden. Right, top: Ganavya Doraiswamy. Credit: Caroline Alden.

Right, bottom: Ian Condry (left). Credit: Caroline Alden. The "Dissolve" festival invited participants to explore the diversity of experimental sound in the hope of disrupting common expectations and outcomes in several discrete fields. As Condry explains, "people from sound studies often reject music scholarship as old-fashioned and limiting. Music researchers tend to view sound studies as a rejection of their own long history of theorizing and debate. Artists tend to resist the inward, overly discursive approach to music and sound by researchers." By bringing together these at times combative groups, and encouraging disjuncture and difference, Condry hoped to generate controversy and insights beyond the normal realm of talk-centered events. In the spatial and sonic mix, Condry sees a metaphor for discursive freedom and a demonstration that active listening from multiple standpoints can open a pathway toward cultural change.





# ACKNOWLEDGMENTS

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