

ARTS
CENTER FOR
ART, SCIENCE &
TECHNOLOGY
AT MIT



PROGRAMS 2012-14



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Projects Funded by CAST, September 2012 through May 2014.

Cover image: *Water on the Roof* took place in the radome of MIT's Green Building, home to MIT's Department of Earth, Atmospheric and Planetary Sciences. The roof of the building hosts an array of meteorological and radio communication instruments, including a white spherical radome that encloses long-distance weather radar. Photo: Andy Ryan.

FROM THE DIRECTORS

MIT has always been a center for art, science and technology – a meeting place and a converging point. The Institute's complex ecosystem is sustained by the renewable interplay of ideas and action: reality abstracted into theory, theory tested and proven in the real world.

It is a symbiosis that has changed the world, more than once. Art – as a discipline in its own right, as a way of thinking and doing – has always been present and necessary. Although it may not always be the first thing that comes to many people's minds in association with MIT, art has long been woven into the fabric of MIT. Art is mapped right onto the floor plan, sometimes literally, as in the Sol LeWitt glass and terrazzo floor, *Bars of Color within Squares*, in the Green Center for Physics. The aptly named "Infinite Corridor" – the backbone of MIT's main complex – leads not just to science labs and engineering workshops, but also to architectural studios and music practice rooms; across campus and going back a few years, modern linguistics was developed down the hall from the model railroad and solar car clubs. MIT is a place where the founder of the Free Software movement also helps to start a Balinese gamelan, where a physics professor builds the world's largest analog synthesizer in his basement and where an artificial intelligence visionary ends each day with piano improvisations in the style of J.S. Bach. It is a place where accomplished musicians, poets and visual artists may also happen to be pursuing degrees in cognitive science or astrophysics. Today, in the world at large, it is increasingly acknowledged that a mutually enriching interaction among art, science and technology drives innovation; it has been part of MIT's ethos right from the start.

If MIT is a center, why does it need *this* center? What does MIT's Center for Art, Science & Technology (CAST) – founded less than two years ago – bring to campus life, or to the conversation that goes on worldwide?

CAST was established to enhance and develop the ways in which the arts can flourish in MIT's already cross-disciplinary culture, and to demonstrate how this interaction can benefit academic and creative communities at large. CAST has taken the creative culture of the Institute as a whole and provided it with a solid and supportive framework, bolstering the implicit connection between the rigors of artistic practice and those of the laboratory and the design studio. The Center seeks to provide proof of concept to the idea, as our mission statement puts it, that "art, science and technology can thrive as interrelated, mutually informing modes of exploration, knowledge and discovery." Through its initiatives, CAST affirms, energizes and reinforces the inherent synergy between these modes of thought and action.

Always keeping in mind MIT's motto – *Mens et Manus*, mind and hand, learning by doing – as a guiding force, CAST has in the past two years undertaken a series of initiatives and solicitations, in effect an ongoing dialogue with the MIT community. The first results of this call and response are the 17 projects funded in whole or part by CAST since its inception in September 2012.

To integrate the arts into the curriculum, we support the development of new classes that reach across disciplines and majors. To enrich and encourage artistic collaboration, we bring unexpected partners together, by first making contact with master practitioners and starting a conversation about potential relationships, or by bringing to campus artists whose work will resonate strongly here. To reach the broader MIT community, we cast a wide net, soliciting calls for proposals from faculty, staff and students, helping to shape the most vital of these into viable projects and then doing whatever is necessary to support their realization. We have already seen truly inspiring results, as the pages that follow will illustrate. During its two-year history (it feels like a whirlwind), CAST has supported academic courses,

artist residencies, workshops, lecture-demonstrations, seminars, films and concerts. This multiplicity of platforms and formats is no surprise on a campus teeming with artistic life. Nurturing this creative efflorescence and sharing it with the world is both CAST's greatest challenge and greatest opportunity.

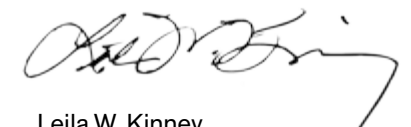
In seeking to foster exchange and collaboration among artists, engineers and scientists, CAST starts with the belief that art, science and technology are not three distinct entities, but instead more porous manifestations of the idea-action symbiosis. They are perhaps better thought of as atmospheric systems that are continually permeating one another, imbuing and tingeing the MIT environment in unexpected and compelling ways. Some examples from the pages that follow: Tomás Saraceno – CAST's first Visiting Artist – takes inspiration from spider webs and devises strikingly original 3D models from them. Research scientist Skylar Tibbits envisions objects that reshape themselves in response to their environments and eventually become self-replicating. In Tod Machover's opera *Death and the Powers*, robotics is addressed both conceptually and materially, as subject matter and as part of the stage set itself. In *Resonating MIT*, an architectural necessity like a stairwell is transformed into a sounding body. In *The Glass Band*, the ancient technology of glass blowing is combined with ideas from areas as diverse as topology and avant-garde improvisation. In Katerina Cizek's 21st-century documentaries, streams of generated data are turned back on themselves to become self-portraits in film, poetry and visual art.

One can see different versions of this intermingling in every project that CAST supports. MIT has always been a living laboratory for the intersection of art, science and technology; with CAST the campus itself is our laboratory, and we strive to make that process more conscious, more porous and more available to the MIT community as a whole, to the Boston area and to the world beyond. Some of these projects are culminations and summations by artists and engineers who have made discoveries or creations and are sharing them with students; others are points of departure barely out of the starting gate. As in all labs, some of the experiments will not change the world, but even so the endeavor itself can be absorbing and necessary, leading to potential breakthroughs. A large number of CAST-supported projects are already yielding results: new works of art, new discoveries, new technologies, new problems, new ideas and in turn new areas to explore and investigate in the years to come.

In a way, the largest experiment is CAST itself. After two years, we are proud of how much work and dialogue it has already encouraged and helped engender. Even more, we are excited and optimistic – and most of all curious – about what is to come in the future. In the coming academic year, we will continue supporting new courses, residencies, interactions and conversations. We will also expand our scope through two major public initiatives, the "Seeing / Sounding / Sensing" symposium in September and a yearlong sound- and time-based performing art series, *MIT Soundings*. It is already clear that 21st-century art forms will not be constrained by discrete disciplines, autonomous media or singular material processes. In other words, they can and will thrive at a place like MIT, where constraints only exist to be unleashed.



Evan Ziporyn
Kenan Sahin Distinguished Professor of Music
Faculty Director, CAST



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



CAST Visiting Artist, Julia Ogrydziak '96, in the "Shell" from Capacitor's *Okeanos*. Photo: RJ Muna.

ABOUT CAST

CAST MISSION STATEMENT

The MIT Center for Art, Science & Technology (CAST) facilitates and creates opportunities for exchange and collaboration among artists, engineers and scientists. A joint initiative of the Office of the Provost, the School of Architecture and Planning (SA+P) and the School of Humanities, Arts, and Social Sciences (SHASS), the Center is committed to fostering a culture where the arts, science and technology thrive as interrelated, mutually informing modes of exploration, knowledge and discovery.

CAST's activities include:

CURRICULA

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

RESIDENCIES

Producing a Visiting Artists Program that emphasizes the creative process, 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.

PROGRAMS

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

RESEARCH

Supporting faculty, graduate students and postdoctoral researchers whose work advances the mission of the Center.

FUNDERS

The Center for Art, Science & Technology is funded by a four-year grant from the Andrew W. Mellon Foundation, with additional support from Philip S. Khoury, Associate Provost with responsibility for the arts; Deborah K. Fitzgerald, Kenan Sahin Dean, School of Humanities, Arts, and Social Sciences; and Adèle Naudé Santos, Dean Emerita of the School of Architecture and Planning; the Eugene McDermott Award in the Arts at MIT; and the Council for the Arts at MIT.

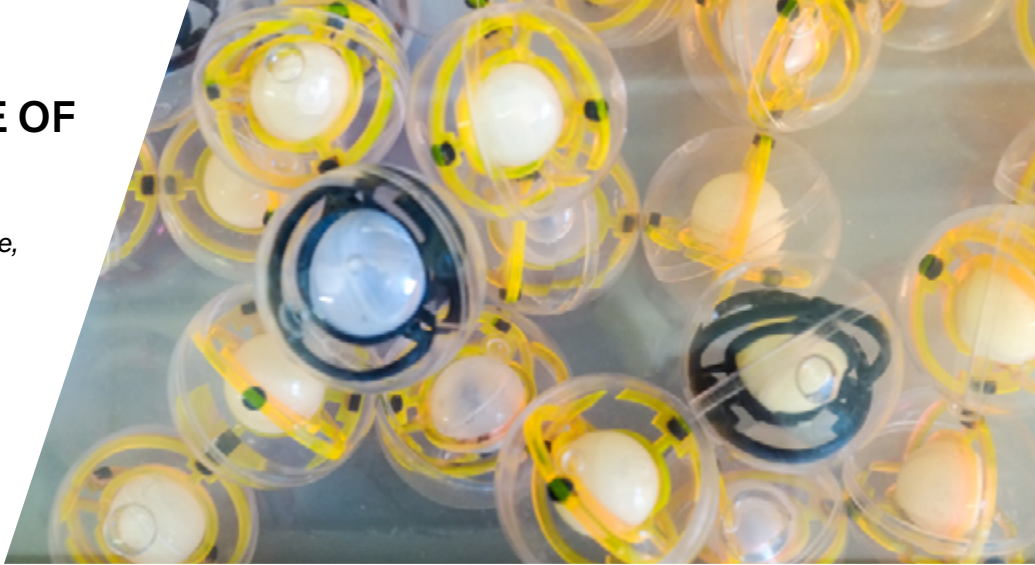


ART & DESIGN

Tomás Saraceno's *On Space Time Foam*, installed at the HangarBicocca, Milan in 2012, served as the basis of his residency at MIT. Photo: Alessandro Coco.

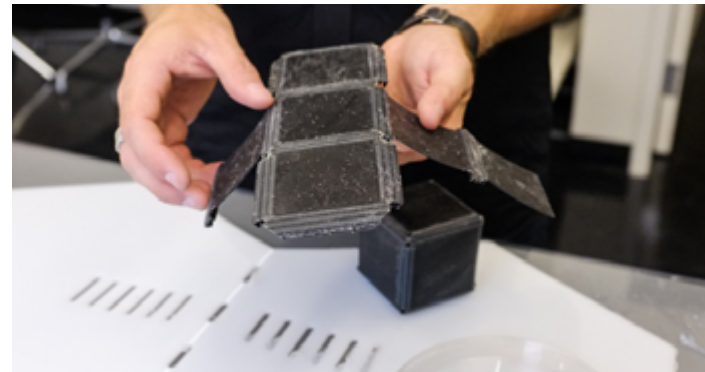
ARCHITECTURE OF THE FUTURE

MIT architects unite science, design and engineering



/SCREENING: *ADVANCES IN ARCHITECTURAL GEOMETRY*

/SYMPOSIUM: "ADVANCES IN ARCHITECTURAL GEOMETRY" SEPTEMBER 27-30, 2012



Top: A detail from Skylar Tibbits' *Fluid Crystallization* project, which investigates hierarchical and non-deterministic self-assembly with large numbers of parts in a fluid medium. Photo: Elizabeth Woodward.

Middle: Skylar Tibbits demonstrates self-assembling materials. Photo: Elizabeth Woodward.

Featured in the film is the work of Architecture faculty members:

- JOHN FERNANDEZ
- MARK GOULTHORPE
- SHEILA KENNEDY
- JOEL LAMERE
- WILLIAM O'BRIEN JR.
- NADER TEHRANI
- SKYLAR TIBBITS
- J. MEEJIN YOON

Video: *Advances in Architectural Geometry*



Part of a "video panorama" at the "Advances in Architectural Geometry" symposium at the Centre Pompidou in Paris, *Advances in Architectural Geometry*, curated by Skylar Tibbits, surveys the spectrum of tools and materials at MIT that are transforming the sectors of design, building, manufacturing, shipping and public transport. Lighting up the film is the work of Architecture faculty members John Fernandez, Skylar Tibbits, William O'Brien Jr., Joel Lamere, Nader Tehrani, J. Meejin Yoon, Sheila Kennedy and Mark Goulthorpe. From buildings that can assemble themselves to oscillating "smart" walls, MIT architects are opening new pathways to design and manufacture complex urban forms.

Previous page, left bottom: Student in MIT Architecture Studio. Photo: Christopher Harting.

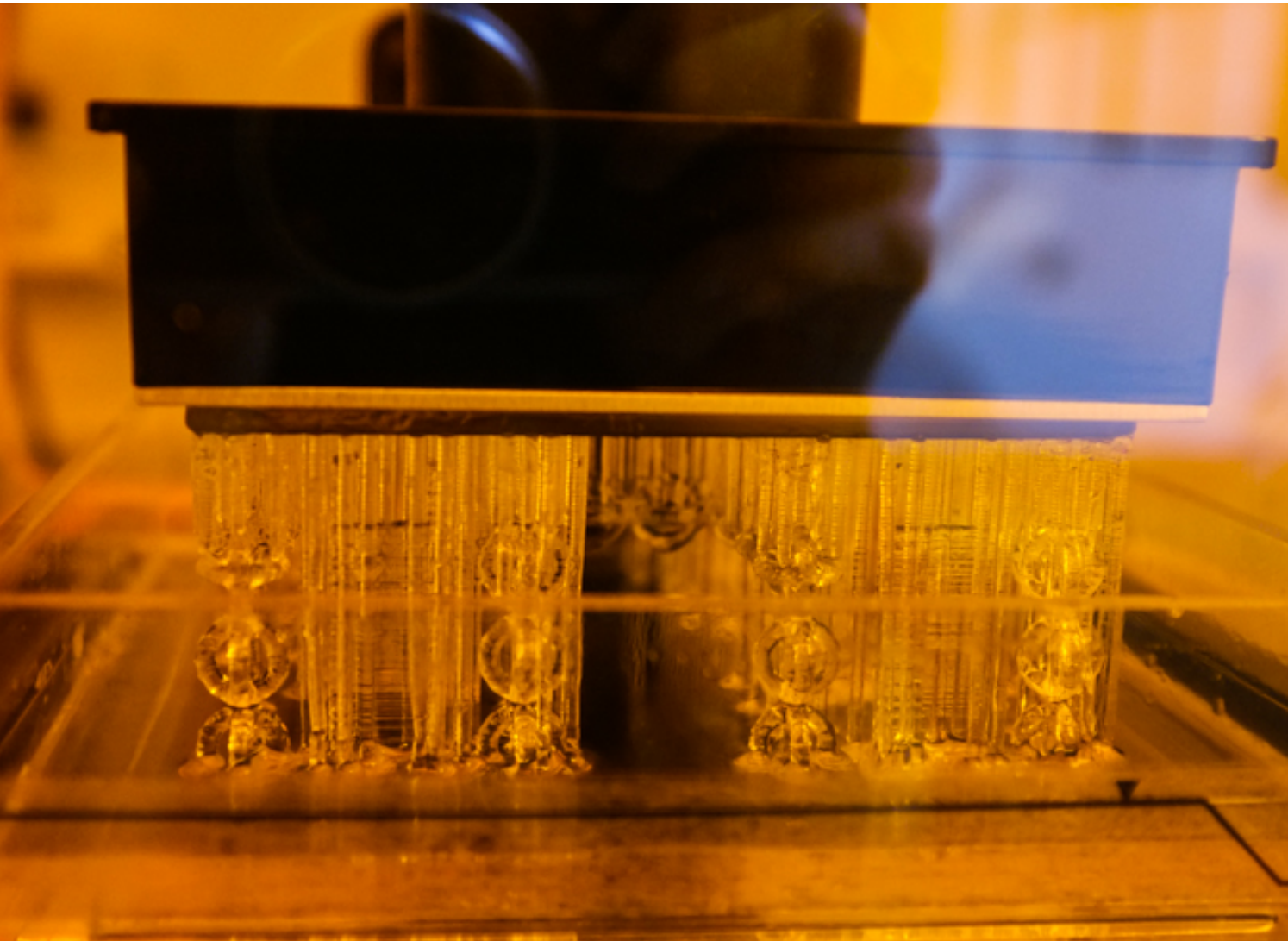
Previous page, right: Skylar Tibbitts' Self-Assembly Lab. Taking a cue from complex natural systems such as protein folding and DNA replication, the lab focuses on creating self-assembling technologies for large-scale structures in our physical environment. Photo: Elizabeth Woodward.

Below: 3D printing materials in Self-Assembly Lab. Photo: Elizabeth Woodward.

Right top: Foamed concrete beam, created in the MIT Building Technology Program, distributes material proportionately to stress and reduces weight of beam. Photo: Screen shot, *Architectural Geometry*.

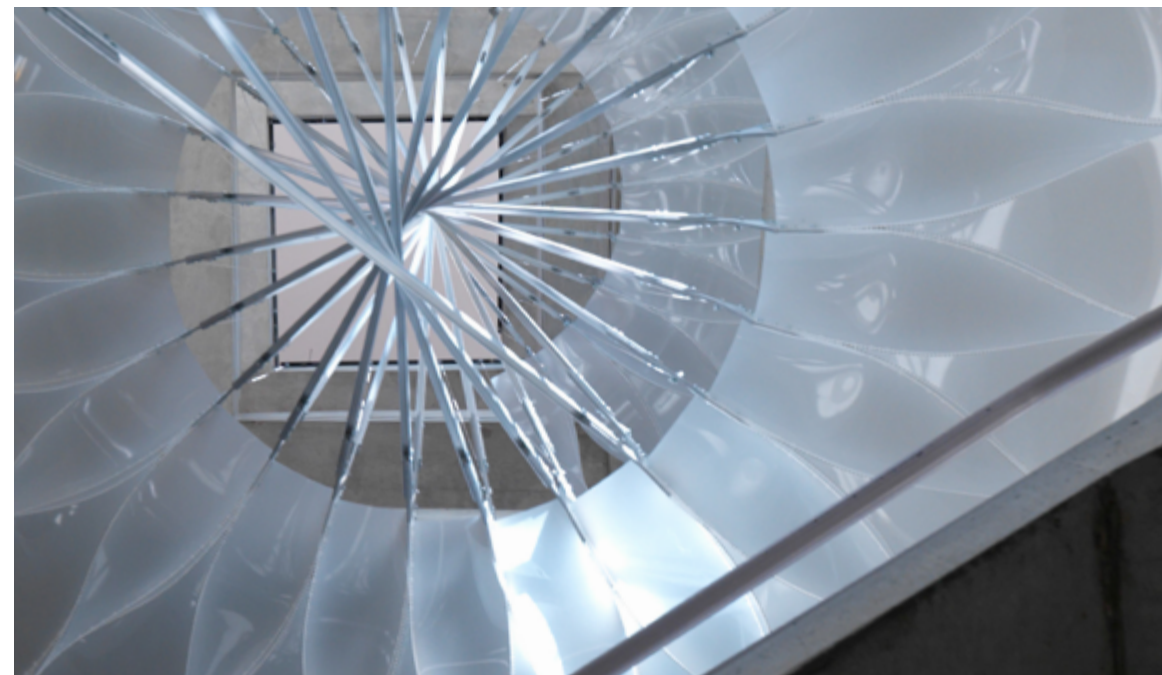
Right middle: 3D printed models created as investigation for installation, *Totems*, by William O'Brien Jr. Photo: Screen shot, *Architectural Geometry*.

Right bottom: Origami on a large scale, Joel Lamere and Cynthia Gunadi's *Overliner*, composed of folded translucent polypropylene sheets, highlights the spiraling geometry of MIT's Whitaker Building (E25). Photo: Andy Ryan.



“Instead of becoming the recipients of building industry culture, we can change the building industry with the kinds of experiments we’re doing in the School.”

— Nader Tehrani



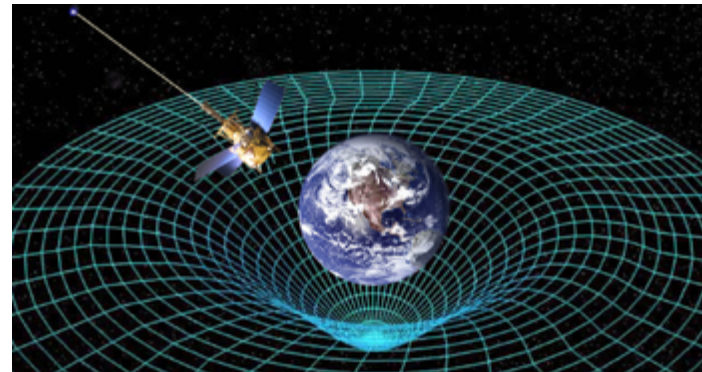
ON SPACE TIME FOAM

Tomás Saraceno's aerial installations are speculative models for new ways of living



/CONVERSATIONS:
NOVEMBER 12–20, 2012

/LECTURE: "MOVING
BEYOND MATERIALITY"
NOVEMBER 15, 2012



Top: Saraceno's *Cloud Cities* exhibited at Berlin's Hamburger Bahnhof in 2011. Photo: Studio Saraceno.

Middle: An illustration of Gravity Probe B orbiting the Earth to measure space-time, a 4D description of the universe including height, width, length and time. Photo: Wikimedia.

Bottom: A digital rendering of a floating biosphere in the Maldives Islands. Photo: Studio Saraceno.

"It's 99.9 percent air," says artist Tomás Saraceno of his work, *On Space Time Foam*, a multi-layered habitat of pressurized membranes suspended 24 meters above the ground in Milan's Hangar Bicocca. *On Space Time Foam* was at the center of the artist's residency as CAST's Inaugural Visiting Artist.

Trained as an architect and inspired by the utopian ambitions of such visionaries as Buckminster Fuller, Saraceno expresses an aerial vision of a more interconnected existence. His installations often mimic the morphology of molecules, spider webs, soap bubbles and neural circuits as he searches for the forms that configure life on Earth, constituting the most basic patterns of existence. Feats of engineering, these installations possess a delicate yet nimble strength.

With the help of scientists and engineers, Saraceno is moving closer toward making his speculative vision a reality. At MIT, he drew upon a vast array of expertise in departments across the Institute, discussing everything from nanoengineered materials to solar energy to weather patterns to the origins of the universe. He asked scholars in diverse disciplines to imagine with him what a different reality might look like.

Saraceno's work offers a new paradigm for thinking about humanity's relationship to the natural world and to one another. Activated by the presence of visitors within them, his installations make tangible the complex systems of interaction between humans and their environment. They reflect an increasingly interconnected world — environmentally, politically and socially — in which the smallest of fluctuations has far-reaching global consequences.

MARKUS J. BUEHLER
Department Head and
Professor, MIT Department
of Civil and Environmental
Engineering

DÖRTHE M. EISELE
Postdoctoral Associate, MIT
Center for Excitonics

JEROME I. FRIEDMAN
Institute Professor,
Emeritus, and Nobel
Laureate, MIT Department
of Physics

ANTÓN GARCÍA-ABRIL
Professor, MIT Department
of Architecture and Founder,
Ensamble Studio

ELIZABETH GOLDRING
Fellow, MIT Center for
Advanced Visual Studies
(2008-2012)

JEFFREY C. GROSSMAN
Carl Richard Soderberg
Associate Professor of
Power Engineering, MIT
Materials Science and
Engineering Department
and MIT Mechanical
Engineering Department

R. JOHN HANSMAN
T. Wilson Professor, MIT
Department of Aeronautics
and Astronautics and
Director, MIT International
Center for Air Transportation

LODOVICA ILLARI
Senior Lecturer, Synoptic
Meteorology, MIT Program
in Atmospheres, Oceans,
and Climate (PAOC)

ROBERT JAFFE
Jane and Otto Morningstar
Professor, MIT Department
of Physics

CAROLINE JONES
Professor, MIT Department
of Architecture

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

LES NORFORD
Professor and Associate
Head, MIT Department of
Architecture

OTTO PIENE
Professor Emeritus, MIT
Department of Architecture

NADER TEHRANI
Professor, MIT Department
of Architecture and Founder,
NADAAA

SKYLAR TIBBITS
Research Scientist, MIT
Department of Architecture

BRIAN L. WARDLE
Associate Professor, MIT
Department of Aeronautics
and Astronautics and
Director, Nano-Engineered
Composite Aerospace
Structures (necslab)
Consortium

ROSALIND WILLIAMS
Bern Dibner Professor of
the History of Science and
Technology, MIT Program
in Science, Technology and
Society

J. MEEJIN YOON
Professor and Head, MIT
Department of Architecture
Undergraduate Program

Photos: Lecture
Video: Lecture

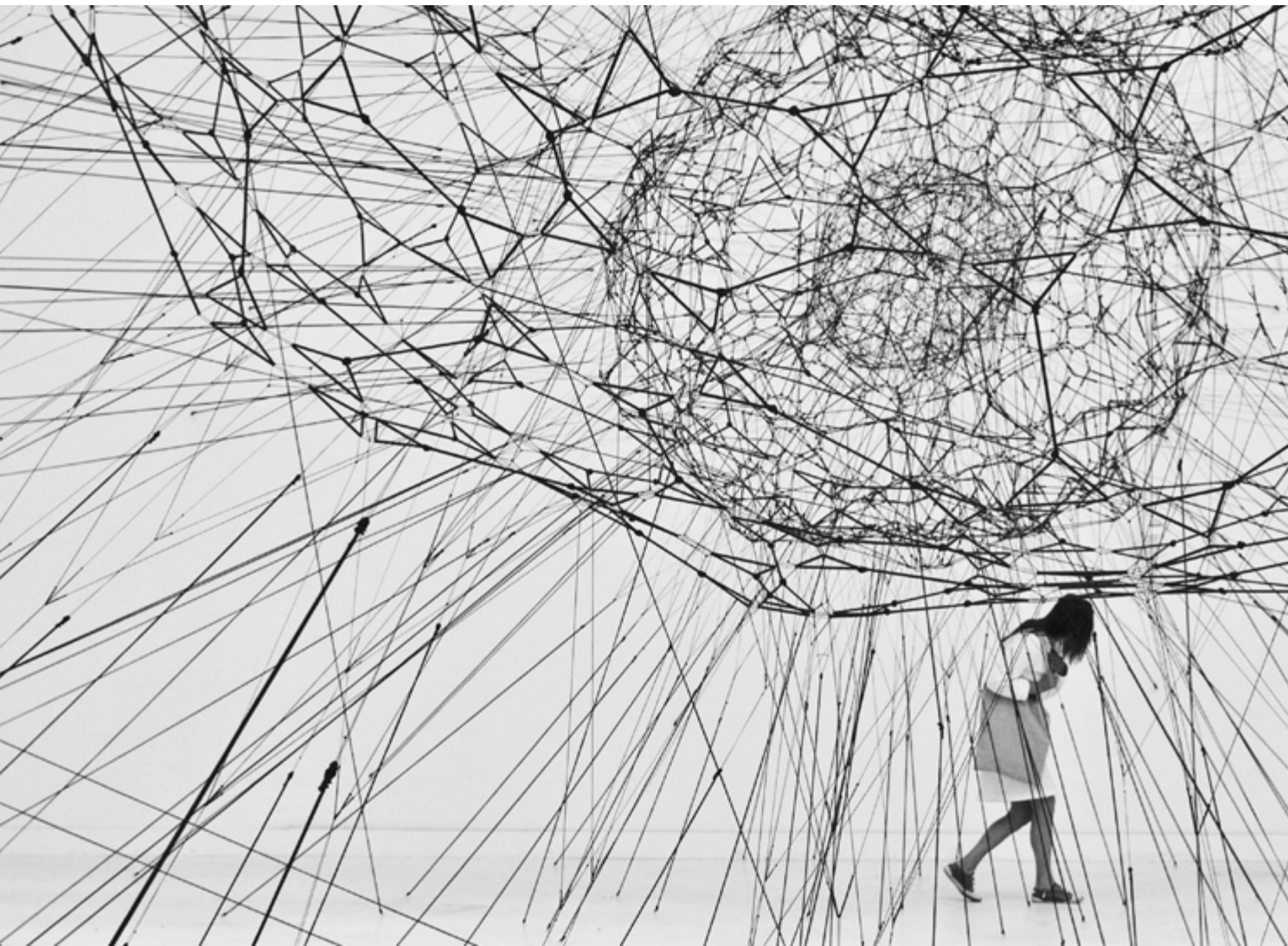
This butterfly effect was physically manifested in *On Space Time Foam*, which Saraceno imagines could form the basis of a floating biosphere above the Maldives Islands made habitable with solar panels and desalinated water. As visitors slide through these pressurized sacs of air, each layer with its own climate, their movement produces a reaction throughout the entire installation. When visitors cluster too close to one another, the force of their combined weight can lead to what Saraceno calls a “black hole of social interaction” as they collapse into one another, referencing the cosmological theories that inspired the piece. In his work, everything is connected.

Previous page, right: Tomás Saraceno's *On Space Time Foam*, exhibiting at the Hangar Bicocca in 2012, served as the basis of his residency at MIT. Photo: Alessandro

Below: Tomás Saraceno, *Galaxies Forming along Filaments Like Droplets along the Strands of a Spider's Web*, 2009. Photo: Alessandro Coco.

Right top: *Silk Pavilion* was created by the MIT Media Lab's Mediated Matter Group led by Neri Oxman. The structure is made of fibers produced by silkworms. Oxman met

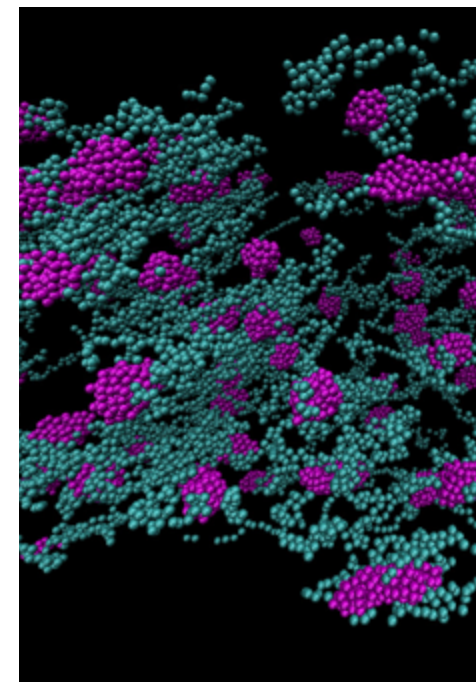
with Saraceno during his visit to MIT to discuss bio-inspired materials and forms. Photo: Steven Keating.



“I am trying to make people engage with and tune in with each other.”
— Tomás Saraceno



Above middle: Nader Tehrani, Tomás Saraceno and Antón García-Abril in the panel discussion *Moving Beyond Materiality*. Photo: L. Barry Hetherington.



Left: This diagram depicts the molecular structure of an artificial version of spider silk produced by Markus Buehler. Buehler is Professor of Civil and Environmental Engineering at MIT who is collaborating with Saraceno on modeling a 3D spider web. Photo: Markus Buehler.

To be sure, the artist is more of a composer than an urban planner. Saraceno calibrates densities — whether that of a bead of moisture in the air or the weight of a passing footstep — and, in doing so, reminds audiences of the world's overwhelming sensitivity and intricacy.

“DESIGN ACROSS SCALES”

Multimedia class creates new paradigm for design education

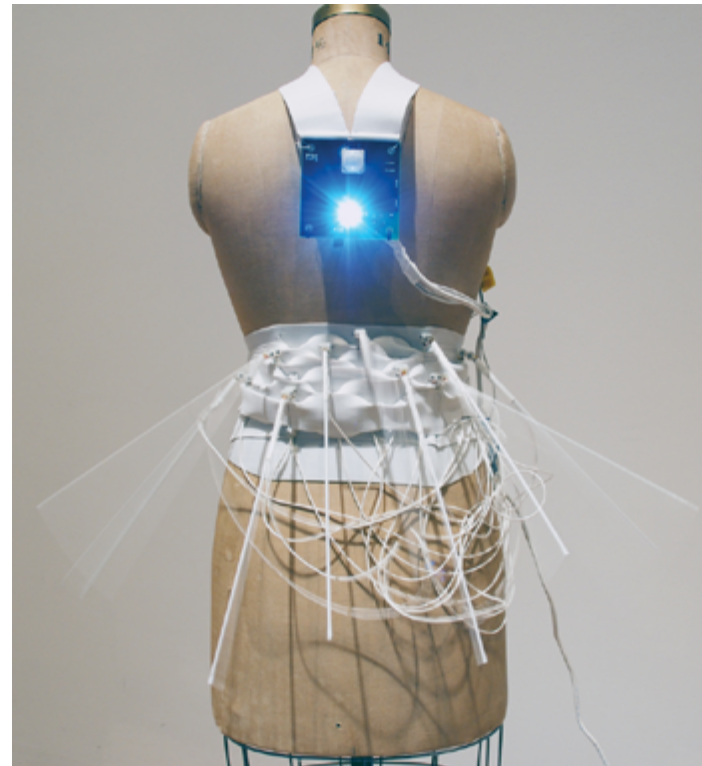


/CLASS: “DESIGN ACROSS SCALES” | SPRING 2013 AND 2014

“Design Across Scales,” co-taught by MIT Professor J. Meejin Yoon and Associate Professor Neri Oxman, is a class that teaches the kind of forward-reaching design that not only improves upon the world, but also reimagines it entirely.

For one assignment, Oxman and Yoon asked students to design something that makes something and then make something with it. Students were encouraged to harmonize the relationship between tool and function, user and design across scales. The somethings included devices for everything from folding paper airplanes to planning cities to creating the perfect mold for ice.

Some tools were more provocative than utilitarian — prompting that destabilizing yet wondrous sense that nothing should ever be taken for granted; that the world as we know it is always being made and remade. Yoon and Oxman believe design is not a discipline but a critical methodology. In the class, they wanted students to learn “how textile dyes can affect cancer research or how biomaterial 3D printing processes can inspire new construction technologies.”



Top: The semi-automated knitting machine, *MaidMade*, by MIT Media Lab researcher Jifei Ou, helps users create knitting patterns with different kinds of materials such as yarn and wire. Photo: Jifei Ou.

Middle: Piano wire-spikes are actuated by motion sensors in J. Meejin Yoon’s *Defensible Dress*. Photo: J. Meejin Yoon/MY Studio.



NERI OXMAN
Sony Corporation Career
Development Associate
Professor of Media Arts and
Sciences

J. MEEJIN YOON
Professor and Head, MIT
Department of Architecture
and Founder of MY Studio

Photos | Video

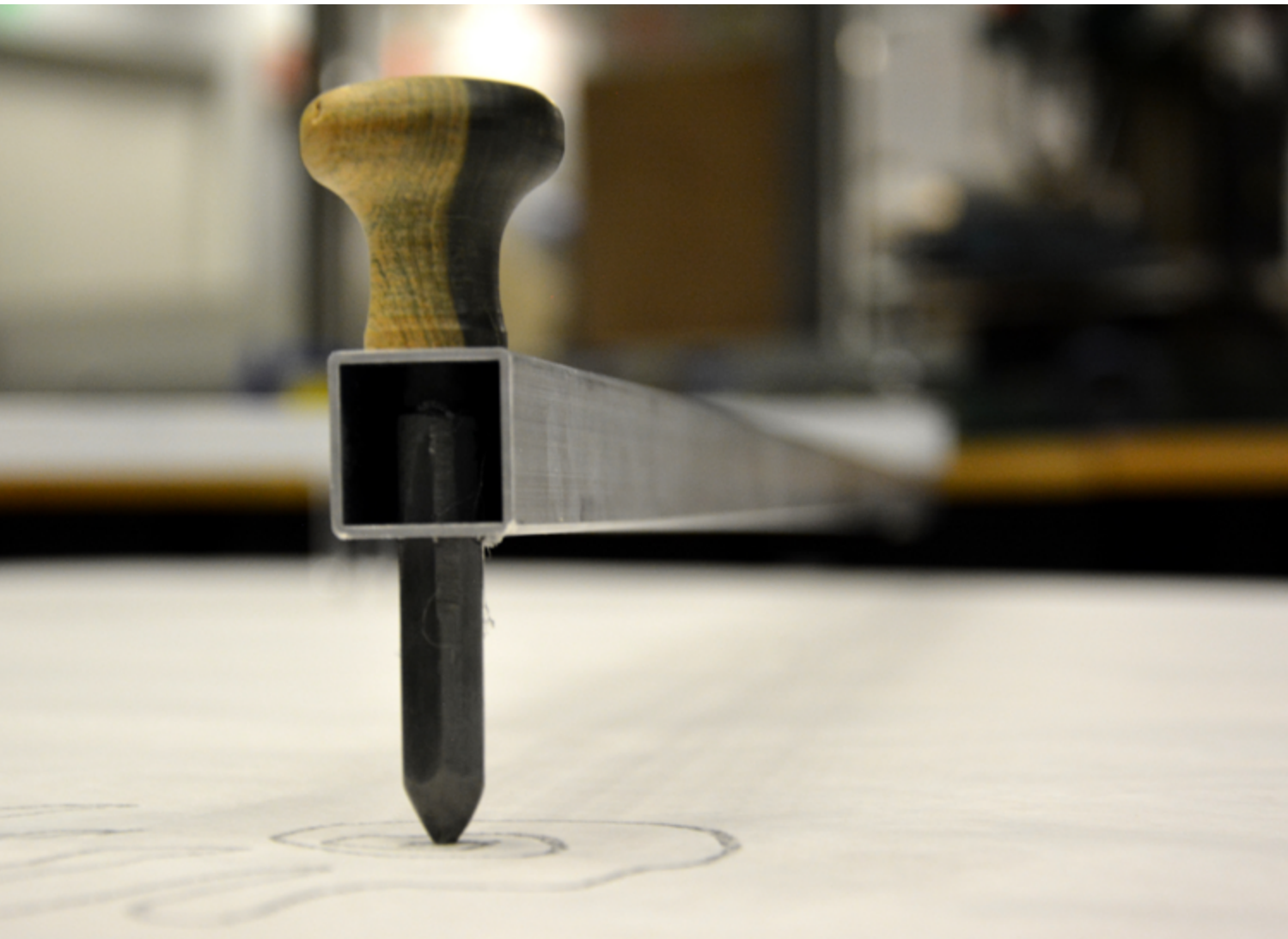
“The race to cure cancer, the Mars landing mission and the challenge to design sustainable cities and buildings require, perhaps more than ever, an interdisciplinary skill set and an ability to operate across multiple scales with creativity,” Yoon and Oxman say. Organized around various aspects of design practice — visualization, fabrication, computation, material ecology, interaction, architecture, games and performance — “Design Across Scales” encourages thinking and doing across these disciplines.

Previous page, right: A robot-controlled tool to weave silk thread around a steel frame by MIT researcher Markus Kayser. Photo: Mediated Matter Group.

Below: A drawing machine, *Pantograph*, created by MIT Media Lab graduate student Sophia Brueckner. Photo: Sophia Brueckner.

Right top: In flooding a 3D contour map of the United States with dyed

water, the data visualization *6039 A.D.* shows the potential devastating effects of rising sea levels over time. Created by MIT students Alexis Jay Sablone, Vivian Dien and Taylor Farnham. Photo: Alexis Jay Sablone.



“The race to cure cancer, the Mars landing mission and the challenge to design sustainable cities and buildings require, perhaps more than ever, an interdisciplinary skill set.”
— Neri Oxman and J. Meejin Yoon



Design thinking has become increasingly integral to science and engineering, as the field — no longer solely about the production of physical objects — now encompasses everything from the creation of buildings, tools, data, experiences, networks, materials and even DNA. From the molecular to the urban to the cosmic, MIT students are using design to change the world at every level.

Above middle: Neri Oxman. Photo: Mikey Siegel.

Left: J. Meejin Yoon. Photo: J. Meejin Yoon/MY Studio.

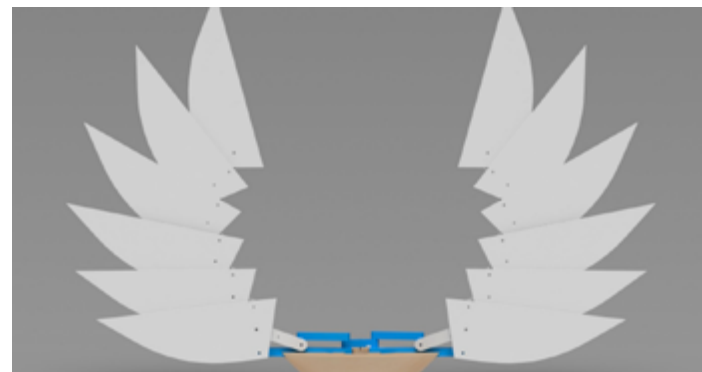
REINVENTING INVENTION

Chuck Hoberman helps students invent new transformable mechanisms



/CLASS: "MECHANICAL INVENTION THROUGH COMPUTATION" SPRING 2013

/EXHIBIT: MECHANICAL INVENTION THROUGH COMPUTATION MAY 21-JUNE 20, 2013



Top: *Hoberman Arch* premiered at the 2002 Summer Olympics. Photo: Wikimedia.

Middle: The transformable design of this collapsible tetrahedral kite, inspired by the designs of Alexander Graham Bell, allowed for a simple deployment and self-optimization midflight. The kite self-assembles through the use of digitally fabricated pre-tensioning members. Photo: Matthew Arbesfeld, James Coleman and Nadya Peek.

To invent is a creative act. Poised at the intersection among the technical, the scientific and the expressive, the work of invention has given rise to innumerable game-changing innovations, and yet the process of invention itself has remained unchanged for decades.

The aim of the course, *Mechanical Invention Through Computation*, co-taught by Visiting Artist Chuck Hoberman and MIT professors Erik Demaine and Daniela L. Rus from the Computer Science and Artificial Intelligence Laboratory (CSAIL), was to build upon traditional methods of invention using new computational tools. While bringing together art and computation for mechanical innovation, MIT students in architecture, visual arts, computer science, mathematics and mechanical engineering had the unique opportunity to learn from this master in the field.



ERIK DEMAINE
Professor, MIT Department of Computer Science

CHUCK HOBERMAN
Visiting Artist and Founder, Hoberman Associates

DANIELA L. RUS
Professor of Electrical Engineering and Computer Science and Director, CSAIL

Photos: Student Projects
Video: Breathing Skin
Video: Expanding Grid
Video: LEGO Expanding Bowl

A brilliant inventor and artist in the field of folding mechanisms, Hoberman is best known for the Hoberman sphere, a plastic toy that can expand and contract in a hypnotizing fashion. In the past two decades, his company Hoberman Associates has created such large-scale transforming structures as the *Hoberman Arch*, which premiered at the 2002 Summer Olympics, and the 3,800-square-foot 120,000-pound unfolding video screen for U2's 360° tour in 2009-11.

The resulting student projects ranged in scale and function, from pin joints that could only be seen with a microscope to large retractable tables. There was a DIY expandable lamp created completely from off-the-shelf materials; a foldable trapezoidal kite modeled after one designed by Alexander Graham Bell; a winged Phoenix-like sculpture based on a J.G. Ballard science fiction story; and a skirt that used "inflatable origami" to change size and shape. Every project was the result of continual prototyping with different types of designs and materials, employing methods both digital and physical.

Previous page, left bottom: *Zero Orbit* is a kinetic, sonic sculpture inspired by J.G. Ballard's short story *Singing Statues*. Photo: Sophia Brueckner.

Previous page, right: *Lumen* is a transformable lamp emitting different levels of light as it expands and contracts. Generated from a parameter-driven and modifiable SolidWorks model, *Lumen* is accessible to anyone interested in designing their own lamp from

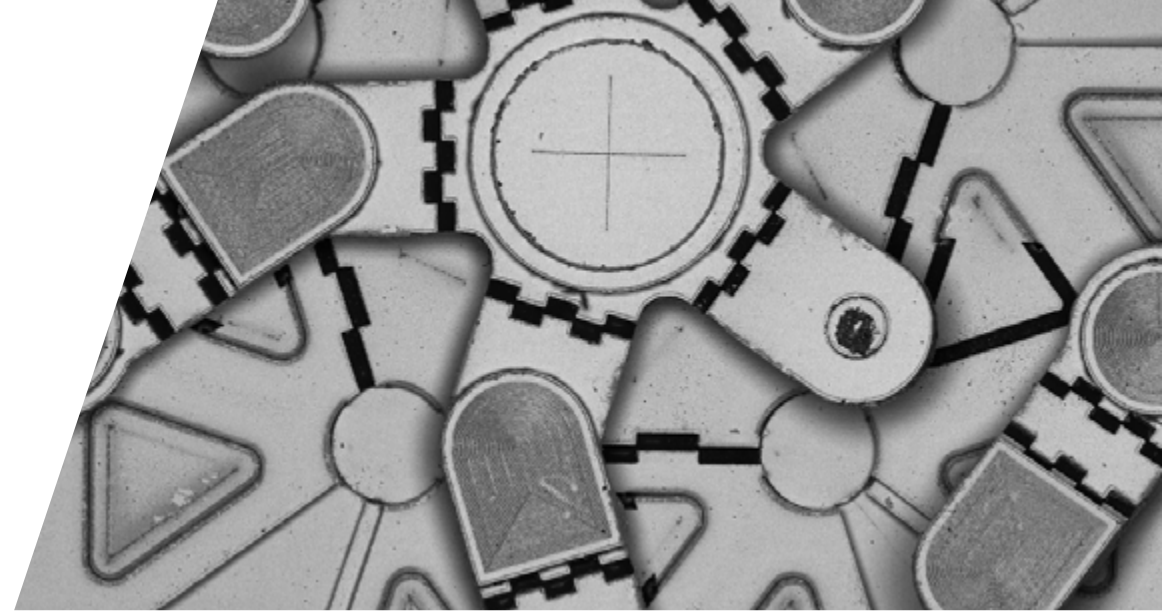
off-the-shelf materials. Photo: Tiffany Tseng, Katy Gero and Paulina Mustafa.

Below: The *ExpandaBot's* expanding wheels allow the robot to rapidly adapt to various kinds of terrain. Photo: Sarah Southerland, Bianca Homberg, Jason Gao and Shiyu Wei.

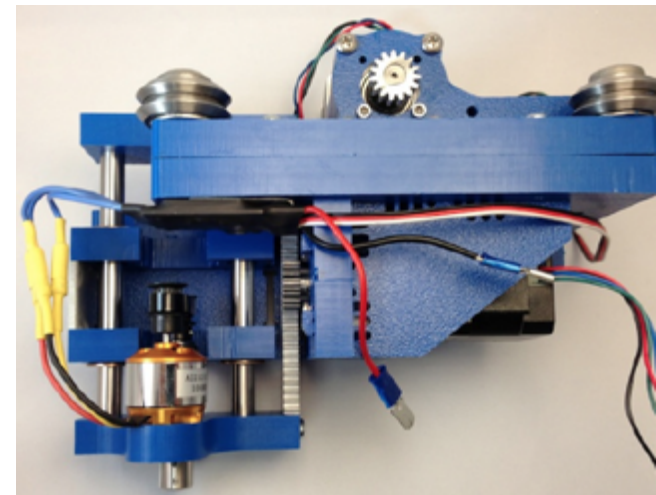
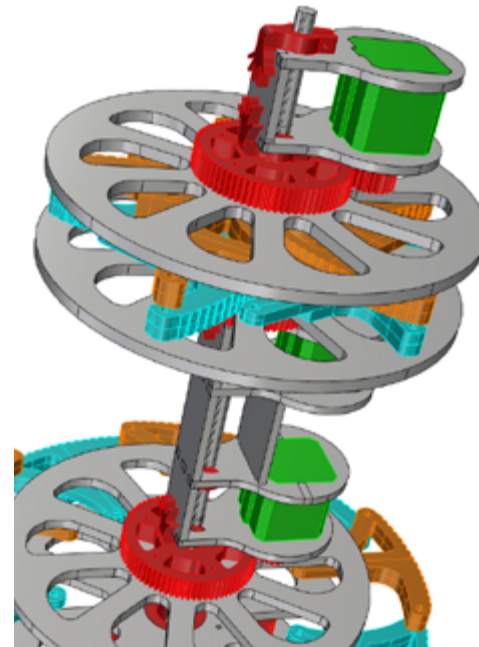
Right top: A microscopic view of a pin joint created from a 2D laminate process. This new digitally fabricated

mechanism translates a single rotary motion to an out-of-plane folding motion with no additional scaffolding material. Photo: Michelle Rosen and Zhi Ern Teoh.

Right middle: The *Foldafab* is a portable and modular computer-controlled router, capable of packing down to fit in a duffel and expanding to fit a wide variety of stocks and objects. Photo: Will Langford and Sam Calisch.



“The inventive process itself is ripe for innovation.”
— Chuck Hoberman



This kind of mechanical intelligence is the wave of the future, as programming meets material to create supple and versatile new forms. In a world defined by flux, we increasingly require products and structures to be flexible, dynamic and responsive to their changing environments. This course helped prepare the next generation of inventors for this challenge.

Left: Computational tools for parametric design and electronic control allowed for rapid exploration and electromechanical prototyping in the inventive process. Photo: Sarah Southerland, Bianca Homberg, Jason Gao and Shiyu Wei.

PUBLIC SPACE? LOST & FOUND

Symposium and exhibit explore
how artists can reclaim public
space



/SYMPOSIUM: "PUBLIC
SPACE? LOST & FOUND"
APRIL 18-19, 2014

/EXHIBIT: PUBLIC SPACE?
LOST & FOUND
APRIL 18-OCTOBER 30, 2014



"Urban Crisis" was spelled out in red letters on the screen behind Antoni Muntadas, a retiring professor in MIT's Program in Art, Culture and Technology (ACT). Muntadas' multi-decade art and activist practice was at the heart of the symposium, *Public Space? Lost & Found*, attended by over 500 people. The symposium featured 31 leading thinkers in the field, including Nader Tehrani, J. Meejin Yoon, Jennifer Allora, Ina Blom, Beatriz Colomina and Mark Wigley.

From photography and video to installations and urban interventions, Muntadas' work has served as a model for an engaged practice in which art and politics are intimately entwined. His exhortation, "Perception requires involvement," a phrase appearing often in his work, was a call to arms for a symposium geared toward seeking new ways to intervene in the public sphere.



Top: University of California, San Diego Professor of Visual Arts Teddy Cruz at "Public Space? Lost & Found" symposium. Photo: Elisa Young.

Middle: Visitors view *Public Space? Lost & Found* exhibit at MIT Media Lab. Photo: Elisa Young.

Bottom: Columbia professor Mark Wigley at "Public Space? Lost & Found" symposium. Photo: Elisa Young.



GEDIMINAS URBONAS
Associate Professor and the
Mitsui Career Development
Chair, MIT Program in Art,
Culture and Technology

Photos: Symposium

As exemplified by reform movements such as Occupy Wall Street and the demonstrations at Tahrir Square, public space is volatile and contested. The question posed by the symposium was: What role might artists and architects play in shaping public and social space? The symposium aimed to show how space — physical, social and virtual — can be rethought, rebuilt and redreamed to create a more democratic society in the face of increasing militarization, corporatization and ecological destruction.

Previous page, right: *Public Space? Lost & Found* exhibit at MIT Media Lab. Photo: Elisa Young.

Below: *Public Space? Lost & Found* exhibit featured large free-standing photographs with plywood supports exposed. Photo: Elisa Young.

Right top: Gediminas Urbonas addresses crowds at the opening of the *Public Space? Lost & Found* exhibit. Photo: Elisa Young.



“In the context of recent global struggles, it’s necessary to revisit ‘art on a civic scale.’”

— Gediminas Urbonas

Bottom: A scene from *Public Space? Lost & Found* exhibit. Photo: Elisa Young.

The themes of the symposium drew from Muntadas’ long career at MIT, in which he tirelessly investigated the relationships among mass media, the public sphere and private life. Muntadas came to MIT in 1977 as a research fellow at the Center for Advanced Visual Studies (CAVS), a decade after the pioneering interdisciplinary program was founded. His work embodied the Center’s commitment to civic art and belief in the social role of the artist.

The greatest strength of the symposium was its gathering of artists, architects, philosophers, urban planners and engineers in conversation, said Gediminas Urbonas. “To revisit the legacy of ‘art on a civic scale’ is a critical project, and Muntadas’ pedagogy, research and work have been central to this debate,” he notes.

The exhibition accompanying the symposium, installed in the lobby of the MIT Media Lab, featured documentation — such as posters, research materials and travel photos — of various public artworks created by 36 of Muntadas’ students since 2001. It was an homage to an artist and educator who inspired his students to critically engage with the world.



KINETIC SCULPTURE

Students create kinetic art for display in the MIT Museum



/ CLASS: "EXHIBITING SCIENCE"
SPRING 2014

/ EXHIBIT: *INVENTIONS: 2014*
STUDENT SHOWCASE
MAY 30–DECEMBER 31, 2014

It all begins with a feeling. For their first exercise at the beginning of the spring semester, students in "Exhibiting Science" — a class in MIT's Program in Science, Technology and Society — were instructed to write on a Post-it note their response to the question, "How does it feel to start a new semester at MIT?"

Each student then had to design a kinetic sculpture that used movement to embody their described feeling — whether of fear, anticipation or excitement. Using everything from bamboo to rubber bands to foam, students built kinetic art that translated energy into motion — either through force of gravity or elasticity of a material — to convey something evocative of an emotional state.



Top: A kinetic sculpture by Dana Gretton '16 at the MIT Museum's *Inventions: 2014 Student Showcase* features a kettle submerged in a tank of water that's pouring liquid into a small teacup — an act that highlights the permeability of boundaries between inside and outside. Photo: Elizabeth Woodward.

Middle: Anne Lilly's *To Conjugate* on display at *5000 Moving Parts*. Photo: L. Barry Hetherington.

ALLAN DOYLE
Co-Director, MIT Museum
Studio

JOHN DURANT
Director, MIT Museum
and Adjunct Professor,
MIT Program in Science,
Technology and Society

ARTHUR GANSON
Visiting Artist

ANNE LILLY
Visiting Artist

JOHN POWERS
Visiting Artist

SETH RISKIN
Co-Director, MIT Museum
Studio

“Exhibiting Science” was taught by MIT Museum Director John Durant and Museum Studio Co-Directors Seth Riskin and Allan Doyle. The theme derived from the MIT Museum’s *5000 Moving Parts*, an exhibition of kinetic sculptures featuring artists Anne Lilly, Rafael Lozano-Hemmer, John Powers, Takis (Panagiotis Vassilakis) and Arthur Ganson, in collaboration with sound artist Christina Campanella.

Previous page, right: A moveable centipede by Alex Gutierrez, an MIT graduate student in Electrical Engineering and Computer Science. Photo: Elizabeth Woodward.

Below: Arthur Ganson poses with his kinetic sculptures. His work is on permanent display at the MIT Museum. Photo: Joshi Radin.

With the exhibition as inspiration, students from “Exhibiting Science” created their own kinetic sculptures for display, mentored by Powers, Lilly and Ganson.

Unlike a typical engineering class, “Exhibiting Science” is not all about solutions. “It’s not about getting the problem sets right. Through the projects, students learn about themselves and find their voices to communicate about things that matter to them,” Riskin said.



“It’s where the art studio, the engineering lab and the public forum combine.”

— Seth Riskin



“I’ve just been finding that my mind has been opened up in ways that are very different from in a technical education,” said Dana Gretton, a sophomore who had been a fan of Ganson’s since viewing his work on YouTube in middle school. “The idea of having a visual vocabulary is really powerful,” he adds, noting that art offers a language for what is difficult to express in words.

Top: Visiting Artist Anne Lilly mentors students in *Exhibiting Science*. Photo: Allan Doyle.

Middle: Museum Studio Co-Director Seth Riskin experiments with light. Photo: Anya Ventura.

Bottom: Visiting Artist John Powers poses in front of his piece *lalu* at the opening of *5000 Moving Parts* at the MIT Museum, Fall 2013. Photo: L. Barry Hetherington.

The students’ sculptures took engineering far beyond the merely functional. With their creativity and imagination, the sculptures represented the students’ lives, memories, experiences and ambitions.

The semester culminated in an exhibition at the MIT Museum, *Inventions: 2014 Student Showcase*, a rare opportunity for students to display their work for thousands of visitors.

“AUTOMATISM IN ART AND ARCHITECTURE”

Students explore the many meanings of automatic behaviors



/CLASS: “AUTOMATISM IN ART AND ARCHITECTURE”
SPRING 2014

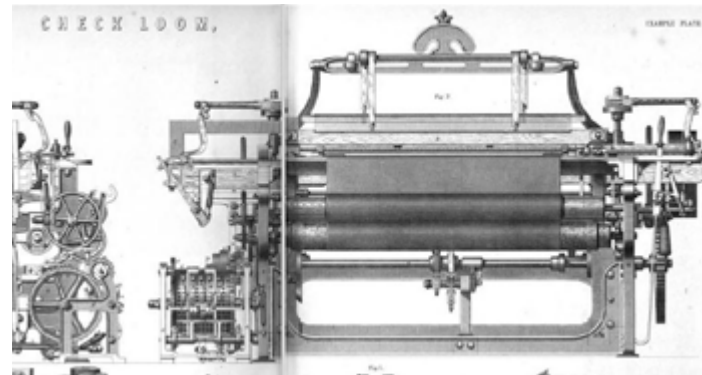
Taught by CAST postdoctoral fellow David Mather, this seminar focused on the concept of automatism. The class included undergraduate and graduate students from mathematics, anthropology, building computation, and art and architecture, representing an important opportunity for science and engineering students to gain meaningful knowledge about the historical and cultural context of their disciplines.

Top: *Scumak No. 2* by contemporary artist Roxy Paine, addresses the automation and computerization of contemporary life. Photo: Creative Commons.

Middle: Example Plate F from the 1860 book *The Practical Draughtsman's Book of Industrial Design* demonstrates the concept of automatism. Photo: Marcel Douwe Dekker via Creative Commons.

Bottom: Fritz Lang's 1927 silent film *Metropolis*. Photo: Wikimedia.

Right top: A drawing using the surrealist technique of automatic drawing. Photo: Natalia Figueroa via Creative Commons.



While automatism is closely associated with the creative methods of the French surrealists, the term also refers to a centuries-old concept connoting a spectrum of self-directed, mechanical or uncontrollable processes across many historical, social and cultural contexts. This interdisciplinary seminar focused on iterations of this deeply rooted historical concept, spanning the Parisian café concerts of the fin-de-siècle to contemporary robotics. Students studied works

by Étienne-Jules Marey, Loïe Fuller, the Italian futurists, Marcel Duchamp, Dziga Vertov, André Breton and the surrealists, Fritz Lang, Charlie Chaplin, Kurt Schwitters, Le Corbusier, Leni Riefenstahl, Guy Debord, Andy Warhol, Greg Lynn and Roxy Paine among others.

Through in-depth textual and visual analysis, the resulting typology of automatism provided a useful intellectual framework for describing, explaining and assessing creative and critical engagements with automatic processes, while fostering a greater appreciation for the myriad fears and desires such engagements inspire.

DAVID MATHER
CAST Mellon
Postdoctoral Fellow,
2013-14



MEDIA & FILM

DOCUMENTARY FOR THE 21ST CENTURY

Katerina Cizek's multimedia project documents the lives of highrise residents

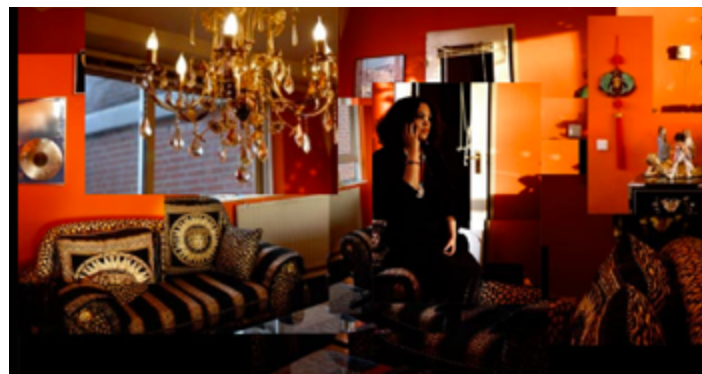


/CLASS: "PARTICIPATORY AND INTERACTIVE DOCUMENTARY WORKSHOP" JANUARY 27–30, 2014

/CONVERSATIONS OCTOBER 2013

Katerina Cizek's *HIGHRISE* explores the global phenomenon of vertical living — an experience that is increasingly becoming a way of life for a majority of people in the world. "We are an urban species," Cizek says. As an ambitious "multiyear, transmedia collaborative documentary project," *HIGHRISE* explodes traditional ideas about the documentary format.

Far from the single-channel film, documentary now includes interactive and multimedia formats, linear and non-linear structures, and an array of data that goes beyond sound and image. Enabled by networked and increasingly ubiquitous digital technologies and driven by the participatory turn, this experimental approach to documentary is driving new narrative forms and public engagement. Building upon MIT's long history of media innovation — exemplified by pioneers like Richard Leacock, Ed Pincus, Glorianna Davenport and others — Cizek's residency provided a rich framework to explore these new developments in technology, authorship, form and participation.



Top: Still from Cizek's documentary *A Short History of the Highrise* produced in collaboration with the *New York Times*.

Middle and Bottom: Scenes from Cizek's project *HIGHRISE*. Photo: Jaime Hogge, courtesy of the National Film Board of Canada.

Right top: Shanghai skyscrapers viewed from the 88-story postmodern Jin Mao Tower. Photo: Wikimedia.

"To be human in this century, more than ever before, is to be urban."

— Katerina Cizek

The current phase of Cizek's project, "Digital Citizenship," investigates how new communication and media technologies are reshaping the personal lives, political practices and citizenship claims of residents in skyscrapers around the world. The project charts how technologies such as computers, smartphones, game systems or mp3 players are changing the way people in highrises — many of whom are immigrants — relate to one another across time and space, engendering new forms of connection and isolation at once.

The residency revealed a powerful synergy between Cizek, a leading practitioner in the field, and the pioneering MIT Open Documentary Lab (OpenDoc Lab). Cizek worked with students and faculty at the OpenDocLab, Department of Urban Studies and Planning, MIT Community Innovators Lab (CoLab), MIT Media Lab and the MIT Center for Civic Media. They developed a digital survey tool that will enable her to gather all kinds of empirical information about residents' digital habits, such as whether they use smartphones or PCs, or whether they sacrifice other necessities to stay digitally connected.

Cizek's projects — spanning print, radio, TV web and video — often extend into the realms of social work and public policy as they build awareness, create new knowledge and facilitate communication across divides. Such projects, Cizek believes, empower participants to shape narratives about their own lives as they take advantage of new technologies. In the tradition of interventionist media, Cizek sees the power of documentary as "more than just observing and recording" — it is a tool for social justice. "*HIGHRISE* is an experiment in how documentary itself can drive or participate in social change rather than just document it," she says.

KATERINA CIZEK
Visiting Artist and Filmmaker-in-Residence, National Film Board of Canada

WILLIAM URICCHIO
Professor, MIT Comparative Media Studies and Principal Investigator, MIT Open Documentary Lab and the MIT Game Lab

SARAH WOLOZIN
Director, MIT Open Documentary Lab

LEARNING TO LOOK

MIT students photograph science in action



/CLASS: "OBJECTIVE NARRATIVES: PORTRAITS OF SCIENCE THROUGH MATERIAL CULTURE AND PHOTOGRAPHY" | FALL 2013

/EXHIBIT: *PROCESS* DECEMBER 2013



FELICE FRANKEL
Photographer and Research Scientist, MIT Center for Materials Science and Engineering

JAN KOSTECKI
Photographer and Staff Scientist, California Institute of Technology

ANNE McCANTS
MacVicar Faculty Fellow and Professor, MIT Department of History

ELLAN SPERO
PhD '14, MIT Program in Science, Technology and Society

ESSDRAS SUAREZ
Photographer

Wisps of steam rise from a coffee cup. A yellow yolk oozes from a cracked egg. An industrial water jet pumps out high-pressure beams of liquid. These photographs from the student exhibit, *Process*, displayed at the Wiesner Student Art Gallery, capped off the pilot course, "Objective Narratives: Portraits of Science Through Material Culture and Photography." Ellan Spero, who received her PhD in MIT's Program in Science, Technology and Society in 2014, led the seminar.



Top: *Garnet*, Kylie Kawano '14. Kawano captured the hidden beauty of the OMAX Water Jet machine in MIT's rapid prototyping lab, an industrial machine used to cut a variety of materials. Photo: Kylie Kawano.

MIT offered the course through the Concourse Program, a community dedicated to exploring the fundamental questions that lie at the intersection of science, social science and humanistic inquiry. Founded in 1970, Concourse serves about 90 students per year, and is designed to equip science and engineering students with a broader cultural perspective. With support from CAST, the program was able to integrate the arts into this important mission.

Previous page, left middle: 10^5 , Melissa Schumacher. Schumacher, a doctoral student in philosophy, documented time at different scales, on the order of 10 seconds. Inspired by the iconic Charles and Ray Eames film, *Powers of Ten*, Schumacher snapped pictures of phenomena occurring in the span of

1,000 seconds, 10,000 seconds, and 1 million seconds — from a few hours to a few days. Photo: Melissa Schumacher.

Previous page, left bottom: 10^1 -2&-1. Photo: Melissa Schumacher.

Previous page, right: 10^1 -2. Photo: Melissa Schumacher.

Below: 10^1 -3. Photo: Melissa Schumacher.

Right top: *Water Only*. Photo: Kylie Kawano.

Right middle: Visiting Artist Felice Frankel. Photo: Felice Frankel for Jensen and Gleason images.



“The goal is to articulate things that get hidden in an everyday landscape of science and technology.”
— *Ellan Spero*



The goal of *Objective Narratives* was to teach students how to leverage the power of photography to reflect, observe and communicate more thoughtfully about the material world around them. “I think photography is a great tool because it’s a conscious process of thinking about how to communicate what you observe to other people,” Spero says.

Along the way, students learned from photographers Felice Frankel, Essdras Suarez and Jan KostECKI through a series of inspiring and informative guest lectures. MIT Museum curator Deborah Douglas gave a tour of the Museum’s impressive collection of photography. Each guest delivered an important lesson on the art of seeing. “The goal is to articulate things that get hidden in an everyday landscape of science and technology,” Spero says, pointing to how the

exhibit engaged those aspects of daily life at their most ephemeral or intangible – the passing of time, for example.

What the exhibit revealed is that photography can provide a new way of looking at and perceiving the world. “One of my intentions for this class was to have moments of pause, to have moments of focus,” Spero says, “to use photography as a tool to say, ‘this part right here is what I think is special, and this is why.’”

CINEMATIC MIGRATIONS

Visiting Artists John Akomfrah
and Lina Gopaul explore film,
memory and identity



/CLASS: "CINEMATIC MIGRATIONS"
SPRING 2014

/SYMPOSIUM: "CINEMATIC
MIGRATIONS" | MARCH 6–7, 2014

/SCREENING: *THE MEMORY
ALBUM* | MARCH 7, 2014

/LECTURE AND SCREENING: *THE
STUART HALL PROJECT*
NOVEMBER 4, 2013

/LECTURE AND SCREENING: *THE
MARCH* | NOVEMBER 5, 2013

/LECTURE AND SCREENING:
TRANSFIGURED NIGHT
MARCH 3, 2014



Top: Lina Gopaul, Renée Green and John Akomfrah
present at the "Cinematic Migrations" symposium.
Photo: L. Barry Hetherington.

Middle: Lina Gopaul and John Akomfrah. Photo: L.
Barry Hetherington.

Bottom and Right: Lina Gopaul and John Akomfrah
present their work to MIT students. Photo: L. Barry
Hetherington.

The term "cinematic migrations" is expansive. It refers both to technological migrations, as moving images are displayed across a variety of screens and contexts — from large auditoriums to handheld devices — and to the sociopolitical and cultural migrations of people, cultures and ideas across geographic borders. The series *Cinematic Migrations* explored the possibilities for new cinematic languages to express what it means to live in a global postcolonial world, where people are entangled in history and have lived outside easily categorized identities.

Cinematic Migrations was initiated by artist and MIT professor Renée Green, whose pioneering works — spanning film to installation to publications — engage questions of identity, memory, history and place. The goal of *Cinematic Migrations* was to illuminate the "variety of practices that bring to the foreground the figure of the artist-thinker," says Green.



JOHN AKOMFRAH
Visiting Artist and Filmmaker,
Smoking Dogs Films

RENÉE GREEN
Professor and Director, MIT
Program in Art, Culture and
Technology

LINA GOPAUL
Visiting Artist and Producer,
Smoking Dogs Films

Photos

Anchoring these discussions were British filmmakers John Akomfrah and Lina Gopaul, two founding members of the seminal Black Audio Film Collective (BAFC), a group formed in Britain in the early 1980s that redefined black cinema. Combining a theoretical and political acuity with an avant-garde aesthetic, the Black Audio Film Collective continues to be an inspiration for today's artists, scholars and filmmakers. Since then, Akomfrah and Gopaul's award-winning documentaries, feature films, experimental videos and gallery installations have transformed filmmaking, both technically and culturally, as they explore the many facets of European migrants and the human experience.

Below: John Akomfrah's *Transfigured Night* is a two-screen installation and reinterpretation of Richard Dehmel's

poem *Verklärte Nacht* that reflects on postcolonial histories. Photo: Madeleine Gallagher.

Right: Professor Renée Green at a lecture by Akomfrah and Gopaul. Photo: L. Barry Hetherington.



During visits spanning two academic years, Akomfrah and Gopaul led workshops, screenings, lectures and panels on documentary filmmaking, focusing upon one topic per semester: cinema and social activism; cinema in local and global contexts; cinema as art installation; and cinema and technological change. The artists also worked with MIT students to create a collaborative film, *The Memory Album*, that used found footage from the students' own lives.

In the workshop, students learned about the collaborative nature of filmmaking, the ethical questions raised by the concept of memory, film editing and the use of sound in film. Just as in Akomfrah and Gopaul's striking film essays, *The Memory Album* reinterpreted

the documentary format. It redrew the lines between official history and private memories, reshuffling cinematic imagery to form new connections that shed light on the contemporary conditions of wandering — the state of being between here and there, between past and present.

In the process, Green says, students learned about the practical and formal aspects of how a work is made. The result was an exciting amalgamation of the different perspectives and aesthetics represented in the workshop. "What is remarkable about the film is that all the voices that participated in the *Cinematic Migrations* workshop and the residency were included," says Green. "Greatest lesson learned? That the Institute is a place in which great interdisciplinary work can occur."



SOUND & PERFORMANCE

Visiting Artist Hauschka performs in the CAST Marathon Concert. Photo: L. Barry Hetherington.

THE GLASS BAND

Using old technology to build and play new musical instruments



/PERFORMANCE: CAST
MARATHON CONCERT
APRIL 5, 2013

/WORKSHOP
2012-13

On tour with Paul Simon in the late 1990s, musician Mark Stewart bought his first didgeridoo, a hollow wind instrument from Australia known for its sonorous quaver. Once home in New York, Stewart was walking in the Garment District when he noticed something. In a dumpster were the cardboard tubes, of all different sizes, used to hold bolts of fabric, echoing the familiar cylindrical shape of his new instrument.

PETER HOUK
Director, Glass Lab

MARK STEWART
Visiting Artist

Photos: Workshop
Photos: Marathon Concert
Video: Workshop



Top: Visiting Artist Mark Stewart with MIT students. Photo: L. Barry Hetherington.

Middle: Glass blowing in progress. Photo: Trevor Smeaton.

Bottom: Glass Lab Director Peter Houk performs at CAST Marathon concert. Photo: L. Barry Hetherington.

Right: CAST Marathon concert in MIT Kresge Auditorium. Photo: L. Barry Hetherington.



“Every single tube was a column of air waiting to be played,” Stewart recalls. He clambered inside at once and began to assemble and play these tubes in an impromptu performance. It was then he began to see the world as raw material, even its most quotidian shapes containing a wealth of sonic possibility. Everything, it appeared, was a potential didgeridoo.

At MIT, Stewart — multi-instrumentalist, singer, composer and instrument designer — worked with the Glass Lab on a new challenge. With Glass Lab Director Peter Houk, Stewart headed a yearlong workshop to explore new sounds through the design of glass instruments. The idea for the residency grew out of a project by MIT alumna Kaitlyn Becker '09 to explore the musical potential afforded by this challenging material.

Below: Glass Lab instructor Martin Demaine, Visiting Artist Mark Stewart and MIT student. Photo: L. Barry Hetherington.

Right: MIT alumna Kaitlyn Becker '09 performs at CAST Marathon concert. Photo: L. Barry Hetherington.



The partnership was a natural one. The Glass Lab is a place where “everything is worth exploring,” says Martin Demaine, Glass Lab instructor and the Angelika and Barton Weller artist in residence. Built in the late 1960s as part of the Department of Materials Science and Engineering, the Glass Lab’s popular non-credit workshops offer students the opportunity to observe firsthand the thermal principles learned in the classroom. Of the first meeting with Houk and others at the Glass Lab, Stewart recalls, “There was this feeling, ‘Why don’t we just build everything?’ I felt light-headed with possibilities.”

Capitalizing on the skills of the Glass Lab’s adroit practitioners from across MIT, Stewart’s residency enabled the aesthetic and technical aspects of instrument building in glass to come to fruition in a performance at the CAST

“There was this feeling, ‘Why don’t we just build everything?’ I felt light-headed with possibilities.”
— Mark Stewart

Marathon concert. There, members of the band unleashed the sheer, unexpected sensorial delight of this mercurial substance used by scientists and artists alike. The fragile sounds of the glass instruments, introduced one by one, segued into the final work of the program: an exuberant, multicultural, 100-person performance of Terry Riley’s seminal composition, *In C*.

COMPOSING FOR LOUDSPEAKERS

Early computer music pioneer John Chowning performs at MIT



/LECTURE: "SOUND SYNTHESIS AND PERCEPTION: COMPOSING FROM THE INSIDE OUT"
OCTOBER 11, 2012

/ PERFORMANCE: VOICES
OCTOBER 11, 2012

Late one night in 1967, composer John Chowning stumbled across what would become one of the most profound developments in computer music. "It was a discovery of the ear," says Chowning. While experimenting with extreme vibrato in Stanford's Artificial Intelligence Lab, he found that once the frequency passed out of the range of human perception — far beyond what any cellist or opera singer could ever dream of producing — the vibrato effect disappeared and a completely new tone could be perceived.

What Chowning discovered was frequency modulation synthesis: a simple yet elegant way of manipulating a basic waveform to produce a potpourri of new and complex sounds. Chowning's classically trained ear had sounded out a phenomenon whose mathematical rationale was subsequently confirmed by his colleagues in physics, and would populate the aural landscape with the kind of cyborg sounds that gave the 1980s its musical identity.

Chowning licensed and patented his invention to Yamaha, which released the DX7 synthesizer based on Chowning's FM synthesis algorithm — and the rest is history. With its user-friendly interface, the DX7 gave musicians an entrée into the world of programmers, opening up a whole new palette of possibility.

Top: John Chowning. Photo: Curtis Roads.

Right: John Chowning plays a Yamaha DX7, 1984. Photo: Chuck Painter/Stanford News Service.

JOHN CHOWNING
Professor Emeritus at Stanford and
Founding Director, Center for Computer
Research in Music and Acoustics
(CCRMA)

TOD MACHOVER
Muriel R. Cooper Professor of Music
and Media, MIT Media Lab



At MIT, Chowning performed the East Coast premiere of his new piece *Voices* featuring his wife, the soprano Maureen Chowning, and an interactive computer using the programming language Max/MSP. In *Voices*, he says, the "seemingly inhuman machine is being used to accompany the most human of all instruments, the singing voice." The piece summed up a lifetime of Chowning's musical preoccupations, his innovations in our understanding of sound and its perception, and the far-reaching

aesthetic possibilities in the dialogues between man and machine. One thing, in his mind, is clear: "Music has humanized the computer."

In the Media Lab, Chowning saw the dreams of his generation pushed forward, meeting the next generation of scientists, programmers and composers. "MIT is in many ways a unique institution," Chowning says, where "cutting-edge technology interacts with highly developed artistic sensibilities."

EXPERIMENTAL SOUNDS

Sound Series artists wed technology and engineering to musical creation



/CLASS: "MUSIC AND TECHNOLOGY"
SPRING 2013

/LECTURE-DEMOS: SPRING SOUND SERIES
SPRING 2013

/PERFORMANCES: EVIYAN PREMIERE WITH VICTOR GAMA
MARCH 2, 2013

MIT WIND ENSEMBLE WITH DON BYRON | MARCH 16, 2013

CAST MARATHON CONCERT | APRIL 5, 2013

50TH ANNIVERSARY JAZZ FESTIVAL GALA CONCERT
APRIL 27, 2013



The climax of the 2013 CAST Marathon, five full hours of genre-bending new music, concluded with one of the seminal compositions of the late 20th century, Terry Riley's hour-long *In C*. It may have been the first time that Senegalese sabar drums, a prepared piano, a didgeridoo, a battery of electric guitars, an accordion and panpipes made from test tubes all occupied one stage together. The concert itself was the culmination of the "Music and Technology" seminar, which brought to campus 12 sound and multimedia artists whose art is built variously around robotics, signal processing, acoustics, architecture, instrument building, anthropology, magnetic resonance, wearable objects, interactivity and family narrative. Cumulatively, the series reminded us that "technology" is not limited to the digital, but encompasses all the creative tools and techniques used to alter the natural environment.

Top: Gamelan master Dewa Alit performs at CAST Marathon concert. Photo: L. Barry Hetherington.

Middle: MIT student Otto Briner '15 plays instrument designed by Visiting Artist Victor Gama during "Music and Technology" seminar. Photo: Tracy Heather Strain.

Bottom: Visiting Artist Hauschka performs in CAST Marathon concert. Photo: L. Barry Hetherington.



CHRISTINE SOUTHWORTH
Composer and Lecturer,
MIT Music

EVAN ZIPORYN
Kenan Sahin Distinguished
Professor of Music

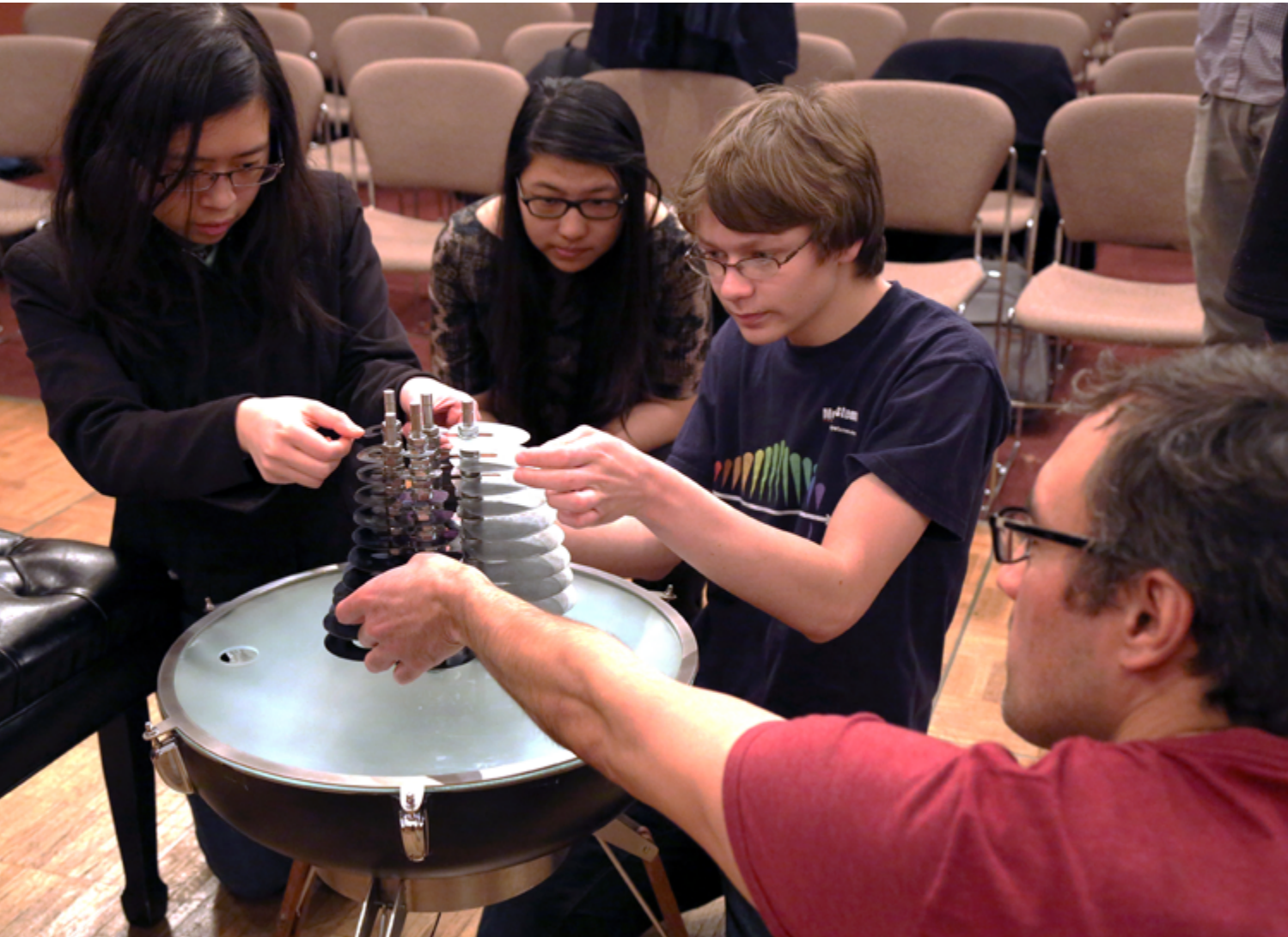
Photos: Marathon Concert

The seminar series, taught by composers Christine Southworth and Evan Ziporyn, featured lecture-demonstrations by 12 sound and multimedia artists: Suzanne Bocanegra, David Sheppard, Eric Singer, Victor Gama, Arnold Dreyblatt, Hauschka, Pamela Z, Tristan Perich, Christopher Janney, Trimpin, Andy Cavatorta and Julia Ogrydziak. At the confluence of sound, movement, sculpture, architecture and visual art, these artists reimagined the tools, machines, and techniques for creative expression. They blurred the lines between the technical and aesthetic, the electronic and organic, and composition and invention.

Previous page, right: Visiting Artists Pamela Z and Hauschka (Volker Bertelmann) perform duet at CAST Marathon concert. Photo: L. Barry Hetherington.

Bottom: MIT students play instrument designed by Visiting Artist Victor Gama during “Music and Technology” seminar. Photo: Tracy Heather Strain.

Right: MIT Professor Evan Ziporyn introduces the Gamelan Galak Tika at CAST Marathon concert. Photo: L. Barry Hetherington.



Below: Visiting Artist David Sheppard lectures during “Music and Technology” seminar. Photo: Tracy Heather Strain.



“We learned just how many artists and how much artistic activity there already is at MIT. The energy and ideas that are produced when you stir the pot with a few outside guests are amazing.”

— Evan Ziporyn

Ziporyn and Southworth curated the series in the spirit of aesthetic adventurousness, as the lecture-demonstrations explored mechanical experimentation, improvisatory processes and the material, spatial and kinetic properties of sound. Students worked on semester-long instrument-building projects with the benefit of expert feedback and advice from the visiting artists, and ended the semester with a public demonstration of their work. At the final marathon, student musicians played side-by-side with prepared-piano master Hauschka and performance artist Pamela Z. “We learned just how many artists and

how much artistic activity there already is at MIT,” said Ziporyn. “The energy and ideas that are produced when you stir the pot with a few outside guests are amazing.”

Traversing the spectrum of contemporary musical practice, the “Music and Technology” seminar and the CAST Marathon concert celebrated the convergence of art and technology — from simple percussive acts to the most sophisticated gestural controls — to broaden our ideas of what a musical performance can be.

UP: THE UMBRELLA PROJECT

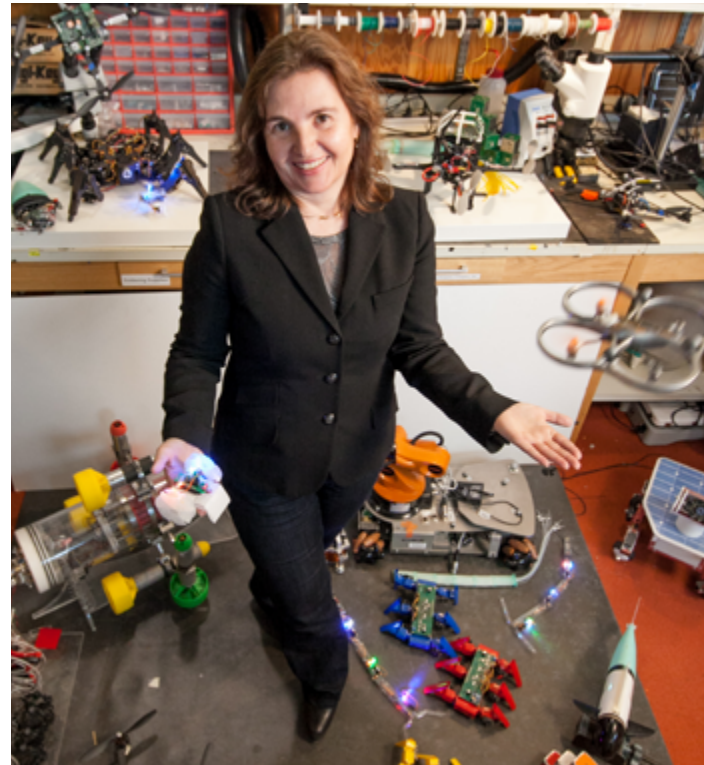
Dance company Pilobolus creates collaborative performance with MIT robotics



/PERFORMANCE:
UP: THE UMBRELLA PROJECT
MAY 19, 2013

The Umbrella Project (UP) was a collaboration between the MIT Computer Science and Artificial Intelligence Lab (CSAIL) and internationally acclaimed dance company Pilobolus, bringing together more than 250 members of the MIT community to participate in a large-scale live performance piece.

Each participant was provided an umbrella equipped with red, green and blue LED lights. Using hand controllers designed by researchers in the MIT Distributed Robotics Lab at CSAIL, performers, functioning like “human pixels,” could independently change the color of their umbrellas. Guided by the Pilobolus creative team, participants then used these umbrellas to create images projected in real time on a large outdoor screen – producing a colorful and ever-changing display that was both an experiment in group dynamics and live art.



Top: 250 members of the MIT community gathered on MIT's Jack Barry Field with LED umbrellas as part of UP: The Umbrella Project. Photo: Ho Yin Au Photography.

Middle: Daniela L. Rus. Photo: Courtesy of Daniela L. Rus.

Right: Umbrella Project participants. Photo: Ho Yin Au Photography.



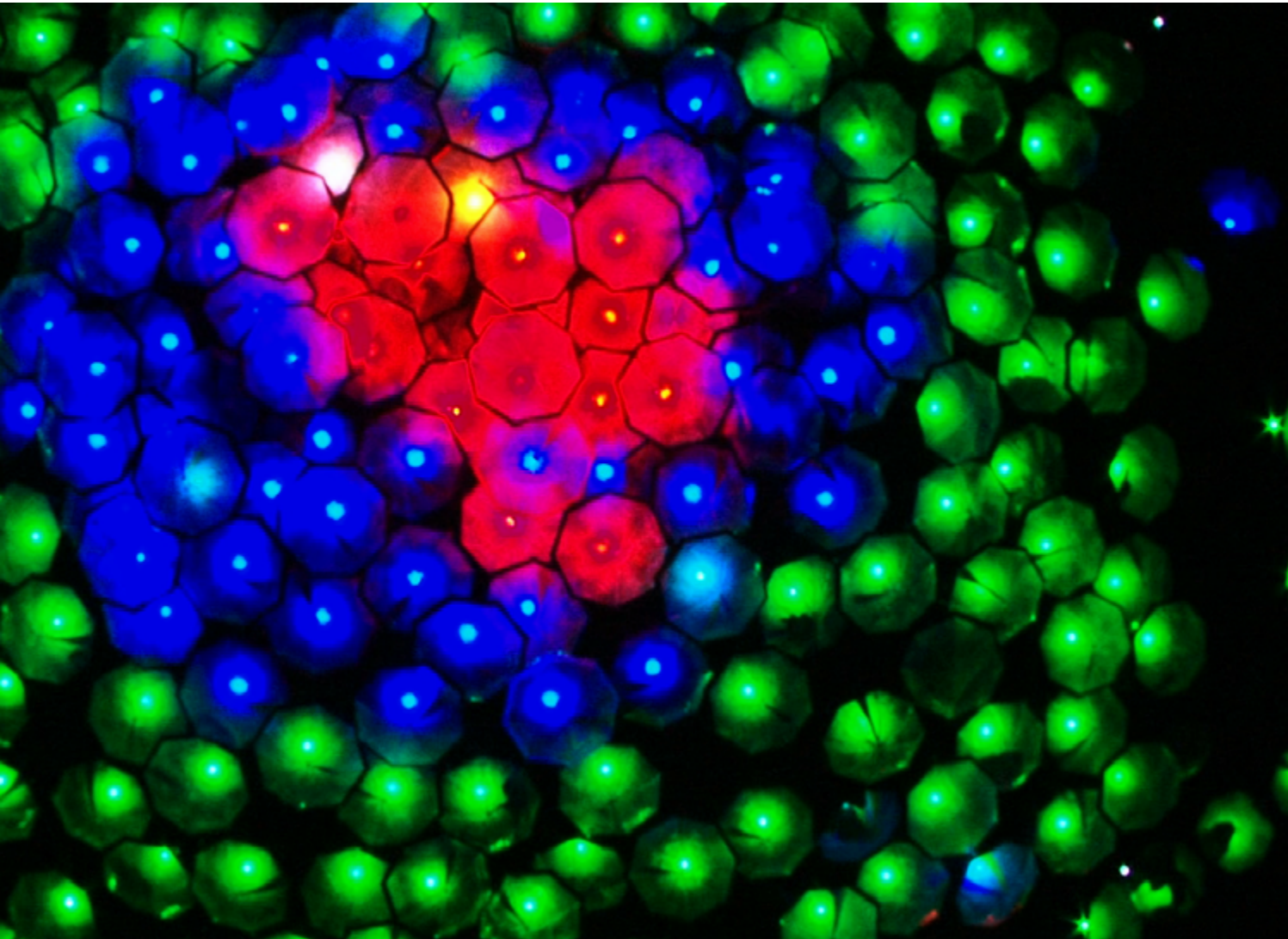
ITAMAR KUBOVY
Executive Director, Pilobolus
Dance Company

DANIELA L. RUS
Professor of Electrical
Engineering and Computer
Science and Director, CSAIL

Video: *The Umbrella Project*

In exploring this kind of collective behavior, *The Umbrella Project* advanced the study of “swarm intelligence” in the hopes that these insights could be applied to design more human-like robots. The project augmented the Distributed Robotics Lab’s research in creating algorithms that can help large groups of robots coordinate with one another to achieve a common task — whether it’s exploring Mars or searching for survivors in a collapsed building.

“We’ve discovered that Daniela Rus is interested in the same questions as we are regarding the power of groups and the idea that groups are more capable than the sum of their parts,” explained Itamar Kubovy, Executive Director of Pilobolus. “*UP* works to demonstrate this reality by giving a group of untrained strangers tricked-out umbrellas and 60 minutes to create something beautiful and moving.”



“There is a wealth of knowledge to be gained at the intersection of art and science that offers deep insight into human behavior, findings that are incredibly useful to the field of computer science.”

— Daniela L. Rus



Left: A birds-eye view of the composition created by *UP* participants. Photo: Creative Commons.

Both above: *The Umbrella Project* participants. Photos: Ho Yin Au Photography.

A ROBOT OPERA GOES VIRTUAL

*Global interactive simulcast of
Death and the Powers*



/APP: POWERS LIVE

/PERFORMANCE: DEATH
AND THE POWERS
FEBRUARY 16, 2014

Death and the Powers is already known for its pioneering use of technology, featuring an animatronic stage, a vast surround-sound system, nine singing robots and an immense chandelier that emulates the human voice and responds to physical touch. MIT Professor and composer Tod Machover and his team in the MIT Media Lab's Opera of the Future group have upped the ante even more: blending the human and the robotic, the virtual and the real, in a stunning sensory spectacle.



TOD MACHOVER
Muriel R. Cooper Professor
of Music and Media, MIT
Media Lab



© Jill Ste

From New York to San Francisco, audiences could experience and participate in Machover's acclaimed robot opera, *Death and the Powers*, through a global interactive simulcast — the first of its kind. When the simulcast debuted at the Dallas Opera House, remote audiences around the world were able to not only view the performance through live broadcast, but also actively engage with it.

Previous page, left top: MIT Media Lab, Opera of the Future. Photo: Elizabeth Woodward.

Previous page, left middle: Tod Machover. Photo: Elizabeth

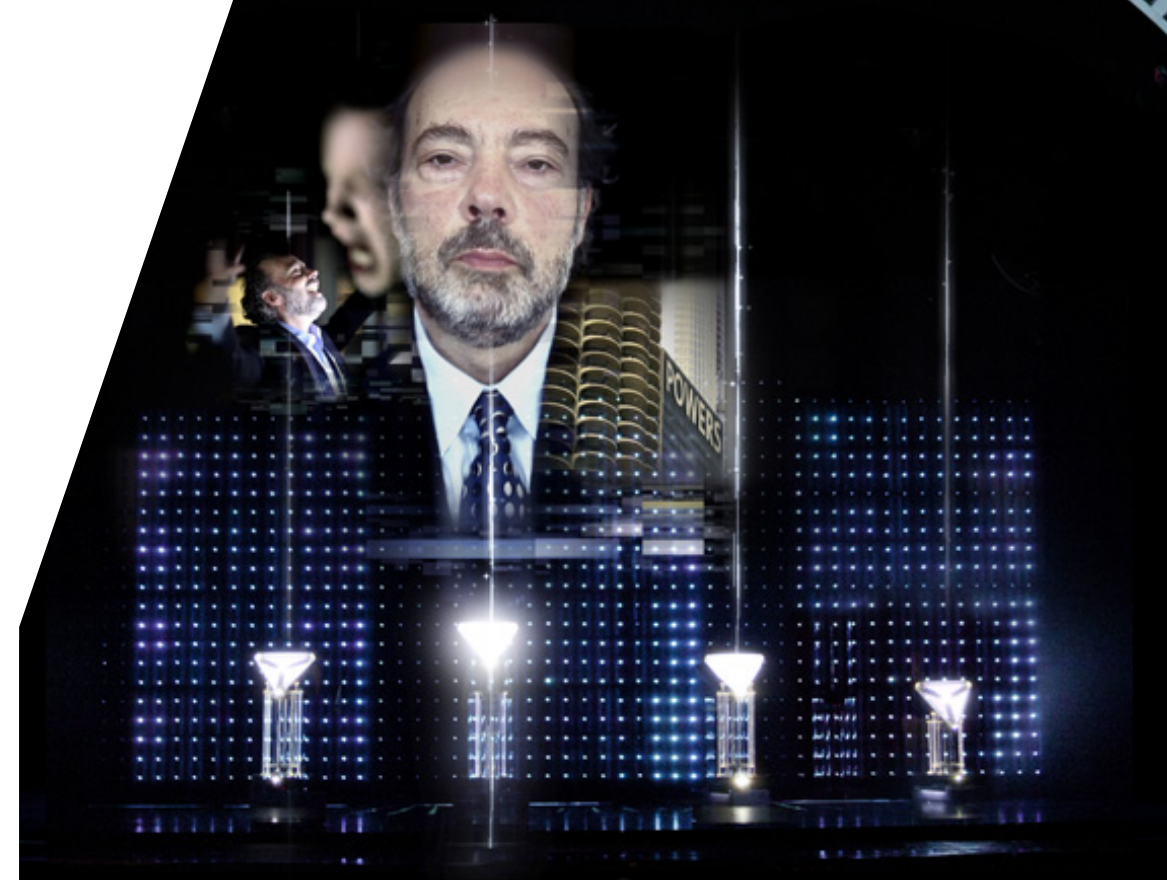
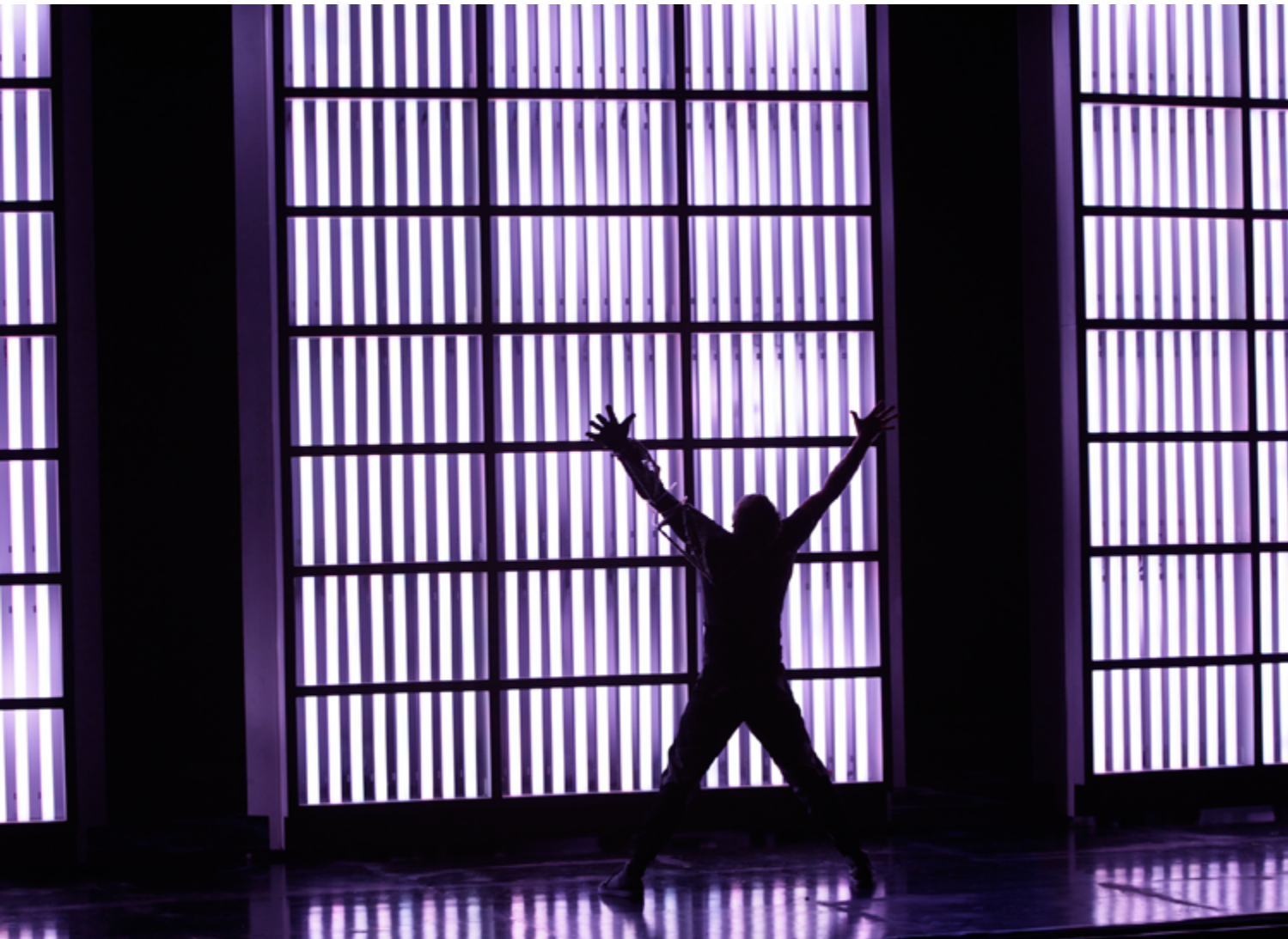
Woodward.

Previous page, right: *Death and the Power*. Photo: Jill Steinberg.

Below and left top: *Death and the*

Power. Photo: Matt Checkowski.

Left bottom: *Death and the Power* staged in Boston. Photo: Jonathan Williams, MIT Media Lab.



To participate in this interactive simulcast, audience members at each site downloaded the specially created app *Powers Live*. From here, the app granted viewers unique access into the world of protagonist Simon Powers, the successful businessman who hopes to prolong his existence by downloading his consciousness to his physical surroundings, a responsive environment called “The System.”

Audiences witnessed episodes from Simon's memory flash across the screen, peered through the “robot's-eye-view” of the multiple cameras placed throughout the set, and directed the shape and motion of the opera's signature computer-controlled chandelier, The Moody Foundation Chandelier, in real time through their devices. With the simulcast's debut at the MIT Media Lab attended by over 200 people, the project was a significant experiment in delivering immersive and interactive experiences to audiences around the world.

MUSIC FOR SINE WAVES AND INSTRUMENTS

Experimental ensemble Either/Or performs compositions from MIT and beyond



/CLASS: "MUSIC COMPOSITION"
SPRING 2014

/LECTURE: "MUSIC AND THEATER ARTS
COMPOSER FORUM" | APRIL 3, 2014

/PERFORMANCES: *MUSIC FOR SINE WAVES
AND INSTRUMENTS* | FEBRUARY 15, 2014

"WORLD PREMIERE FEATURING THE
COMPOSITION OF KEERIL MAKAN: *LETTING
TIME CIRCLE THROUGH US*" | APRIL 5, 2014

SONIC BODIES
SCANNER AND STEPHEN VITIELLO
FEATURING EITHER/OR
MAY 16, 2014

"NEW WORKS BY MIT UNDERGRADUATE
COMPOSERS" | MAY 17, 2014



KEERIL MAKAN
Associate Professor, MIT Music
and Theater Arts

Either/Or Ensemble:
ANTHONY BURR
JENNIFER CHOI
RUSSELL GREENBERG
TAKA KIGAWA
FWENDY LAW
DAN LIPPEL
DAVID SHIVELY

Photos: Concert

Either/Or is an experimental chamber ensemble that performs new American and European music rarely heard elsewhere. With their virtuoso skill and cutting-edge sensibilities, Either/Or introduced MIT students to new ways of thinking about, creating and performing new music. Working in tandem with Visiting Artists Scanner (Robin Rimbaud) and Stephen Vitiello, Either/Or also helped foster cross-disciplinary exchange around the emergent field of sound art, expanding the gray area between composition and installation, composer and performer, and music and sonic environment.



Either/Or was founded by percussionist David Shively and composer Richard Carrick in 2004. At MIT, members of the ensemble — including Shively, Anthony Burr, Jennifer Choi, Wendy Law, Russell Greenberg, Taka Kigawa and Dan Lippel — performed works by visionary composer Alvin Lucier, whose pieces remind listeners that sound is movement, and sound is energy, a physical fact exerting itself on the body and in space. “It all comes down to the physical quality of sound in the space and things happening slowly over time,” Shively says.

Previous page, left top: Jennifer Choi of Either/Or plays the violin in MIT Chapel designed by noted modernist Eero Saarinen. Photo: L. Barry Hetherington.

Previous page, left middle: David Shively of Either/Or plays organ in MIT Chapel. Photo: L. Barry Hetherington.

Previous page, right: Wendy Law of Either/Or plays cello in MIT Chapel. Photo: L. Barry Hetherington.

Below: David Shively of Either/Or performs Alvin Lucier’s *Silver Streetcar for the Orchestra* in MIT Chapel. Photo: L. Barry Hetherington.



“It all comes down to the physical quality of sound in the space.”
— David Shively



Above: Keeril Makan, Associate Professor of Music at MIT. Photo: Scott Irvine.

The ensemble also premiered Keeril Makan’s newest composition, *Letting Time Circle Through Us*, for violin, cello, piano, percussion, guitar and cymbalom. It explored the relationships between order and chaos, the linear and the cyclical. As it played with the listener’s experience of time, continually winding back to common refrains, the piece reflected Makan’s interest in Buddhist meditation and his openness to sonic experience.

Either/Or also worked extensively with Makan’s class over the course of the semester, culminating in a unique opportunity for the students to hear their own work performed in public by masterful players. Visiting Artists bring a fresh vocabulary to campus, Makan says, “and it’s inspiring for students to be around that and see what work is like at a professional level.”

RESONATING MIT

Students create soundwalk of MIT campus with Scanner and Stephen Vitiello



/CLASS: "SOUND INSTALLATIONS AND SONIC INTERVENTIONS" | SPRING 2014

/EXHIBIT: *RESONATING MIT SOUNDWALK*
MAY 13-17, 2014

/PERFORMANCE: *SONIC BODIES*
MAY 16, 2014

/LECTURE: "ARTIST TALK BY SCANNER AND STEPHEN VITIELLO" | FEBRUARY 10, 2014



From the underground tunnels to the palatial sky-lit dome, MIT is a campus rich in unusual spaces, each with its own particular acoustic and cultural resonance. In the course "Sound Installations and Sonic Interventions," 13 MIT and Berklee students creatively explored these locations through five site-specific sound installations at the intersection of music, art, architecture and sound engineering.

Led by artist and MIT Associate Professor Gediminas Urbonas, the course explored the ever-expanding, interdisciplinary field of sound art. Through this project, CAST initiated a dialogue among musicians, composers, and visual and performing artists, marking the first-ever collaboration among MIT's Music and Theater Arts Section, MIT's Program in Art, Culture and Technology and the Berklee College of Music.

Right: Visiting Artist Stephen Vitiello in *Sonic Bodies*. The performance explored the resonance of the body by placing the audience within a group of speakers that shifted and sculpted a sonic landscape. Photo: Lenny Martinez.

Instrumental to these investigations were Visiting Artists Scanner, Stephen Vitiello and members of the experimental ensemble Either/Or. These artists served as creative catalysts: advising students on their projects, performing original works and discussing their own pioneering work in sound.

NEIL LEONARD
Research Affiliate, MIT Program
in Art, Culture and Technology

SCANNER (ROBIN RIMBAUD)
Visiting Artist

GEDIMINAS URBONAS
Associate Professor and the
Mitsui Career Development
Chair, MIT Program in Art, Culture
and Technology

STEPHEN VITIELLO
Visiting Artist

Photos: *Sonic Bodies*
Photos: *Resonating MIT*

Previous page, left top: Installation in the radome of MIT's Green Building, home to the Department of Earth, Atmospheric and Planetary Sciences. The roof hosts an array of meteorological and radio communication instruments, including a white spherical radome that encloses long-distance weather radar. Photo: Andy Ryan.

Previous page, left middle: Student participates in *Music from Ambience* by Longrui Peng, Dalton Harts and Ni Cai. Photo: Andy Ryan.

Previous page, left bottom: Hanging sound sculptures, equipped with loudspeakers and microprocessors, project the sounds of Walker Memorial. Photo: Andy Ryan.

“As soon as these artists started coming in, everyone went off on a new tangent. Their opinions were what drove us forward and gave us new ideas,” says Chris Martin, MArch '15, who, together with Berklee students Audri Acuña and Zai Zhe, amplified a hidden metal staircase in the funhouse-like Stata Center by processing the resonances produced by the space's vibrations. **“It was exhilarating playing the staircase as if it were a giant metallic instrument,”** said Acuña.

Bottom: *Sonic Bodies* by Visiting Artists Scanner, Stephen Vitiello, David Shively (percussion) and Jennifer Choi (violin) of the Either/Or ensemble. Photo: Lenny Martinez.

Right top: Resonating speakers, microphones and voice provide feedback that vibrates the surface of the Ray and Maria Stata Center's most inconspicuous staircase. Photo: Andy Ryan.



“Being in a partnership made us braver.”

— Nisa Ari

Right: Gediminas Urbonas, Associate Professor of Art, Culture and Technology, Mark Goulthorpe, Associate Professor of Design and Visiting Artist Scanner experience *BexPhone*. Photo: Andy Ryan.



Another project by Carolina Lopez-Treviño, SB '15, and Berklee student Jonas Margraf brought to life the desk-lined gymnasium of Walker Memorial, infamous to undergraduates as the dreaded site of final exams. With its complex acoustics, Lopez-Treviño said the gymnasium is a place where “you can hear everything and nothing all at the same time.”

Sara Goheen, SB '14, and Berklee students Collin Russell and Pamela Hersche Gonzalez piped underwater sounds into the Green Building's radome, a fiberglass bubble enclosing the building's weather radar dish.

The course also presented a unique opportunity to bring together students from different disciplines. “Being in a partnership

made us braver,” says Nisa Ari, a doctoral candidate in art history, who collaborated with Berklee student Chelsea Southard. Together, they created *BexPhone*, a monument to the soon-to-be-demolished Bexley Hall, a famously eccentric MIT dormitory.

Scanner and Vitiello culminated their residency in an improvised and immersive sound performance, *Sonic Bodies*, accompanied by Either/Or members David Shively and Jennifer Choi. Surrounded by speakers, audiences were immersed in a rich and ever-shifting sonic landscape whose resonances could be felt within the body. “It was the perfect capstone to an amazing class,” said Urbonas.



ACKNOWLEDGMENTS

CAST EXECUTIVE COMMITTEE

Philip S. Khoury

Associate Provost and Ford International Professor of History

Deborah K. Fitzgerald

Kenan Sahin Dean, School of Humanities, Arts, and Social Sciences
and Professor of the History of Technology

Adèle Naudé Santos

Dean Emerita, School of Architecture and Planning and Professor of Architecture
and Urban Planning

CAST DIRECTORS

Evan Ziporyn

Faculty Director of CAST and Kenan Sahin Distinguished Professor of Music and

Leila W. Kinney

Executive Director of Arts Initiatives and MIT Center for Art, Science & Technology

CAST FACULTY ADVISORY COMMITTEE

Tod Machover

Muriel R. Cooper Professor of Music and Media, MIT Media Lab

J. Meejin Yoon

Professor and Head, Department of Architecture

Jay Scheib

Professor and Head, Theater Arts section

SPECIAL THANKS

CAST Visiting Artists and Program Participants

Heidi Erickson, Design and Production

Anya Ventura, Writing and Production

Program Support and Staff

Chris Boebel, Laura Anca Chichisan, Scott Campbell, Moa Karolina Carlson,
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