

TRANSFORM

Beyond Pixels,
Towards Radical Atoms

MIT ILP Conference

April 13, 2017

石井 裕

Hiroshi Ishii
MIT Media Lab



@ishii_mit



ishii.mit





ARS ELECTRONICA
Linz, Austria





ARS ELECTRONICA

RADICAL ATOMS

AND THE ALCHEMISTS OF OUR TIME

Linz, September 8 - 12, 2016

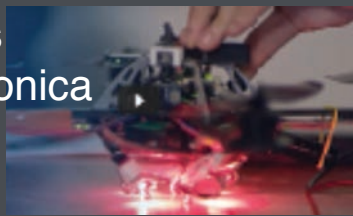
Ars Electronica Festival 2016

Radical Atoms Exhibition

September 2016 ~ Linz Austria

guests
projects

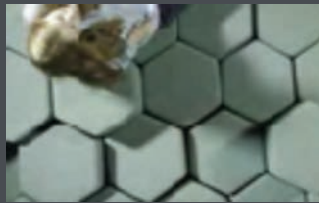
100 Drones
Ars Eeectronica
Futurelab



Infinite Cube
ART+COM



Lift-Bit
Carlo Ratti
Associati



Active Wood
Self-Assembler Lab



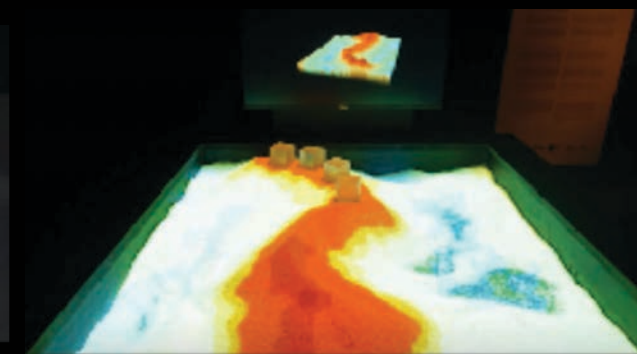
musicBottles



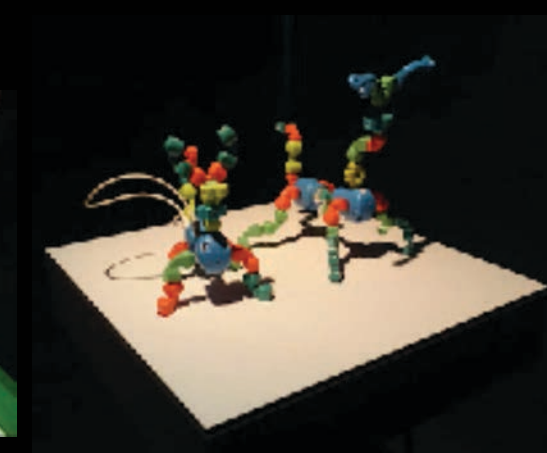
ZeroN



Perfect Red



SandScape



topobo



inFORM



bioLogic



LineFORM



PneUI



jamSheets



Media Lab, Responsive
Environments Group

Rovables



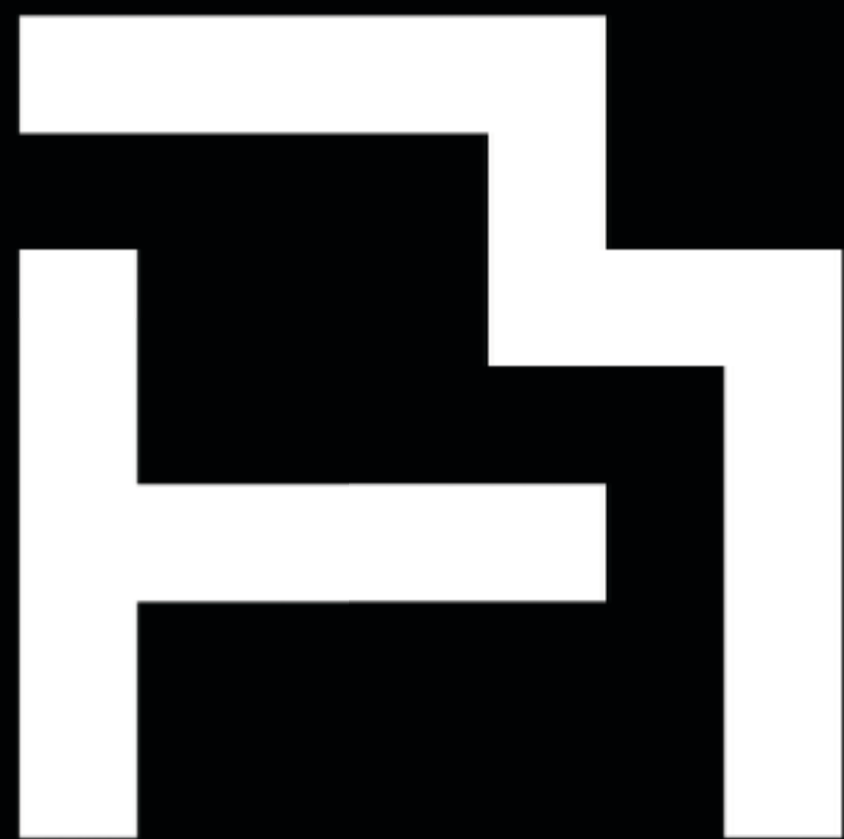
Hiroshi Ishii
Tangible Media Group
MIT Media Lab

Radical Atoms Exhibition @ Ars Electronica Center, Sep. 2016





2016 Linz



**tangible
media**

1992

ClearBoard-1
NTT Human Interface Labs
CHI 92, CSCW 92

1992



ClearBoard-1

NTT Human Interface Labs
CHI 92, CSCW 92

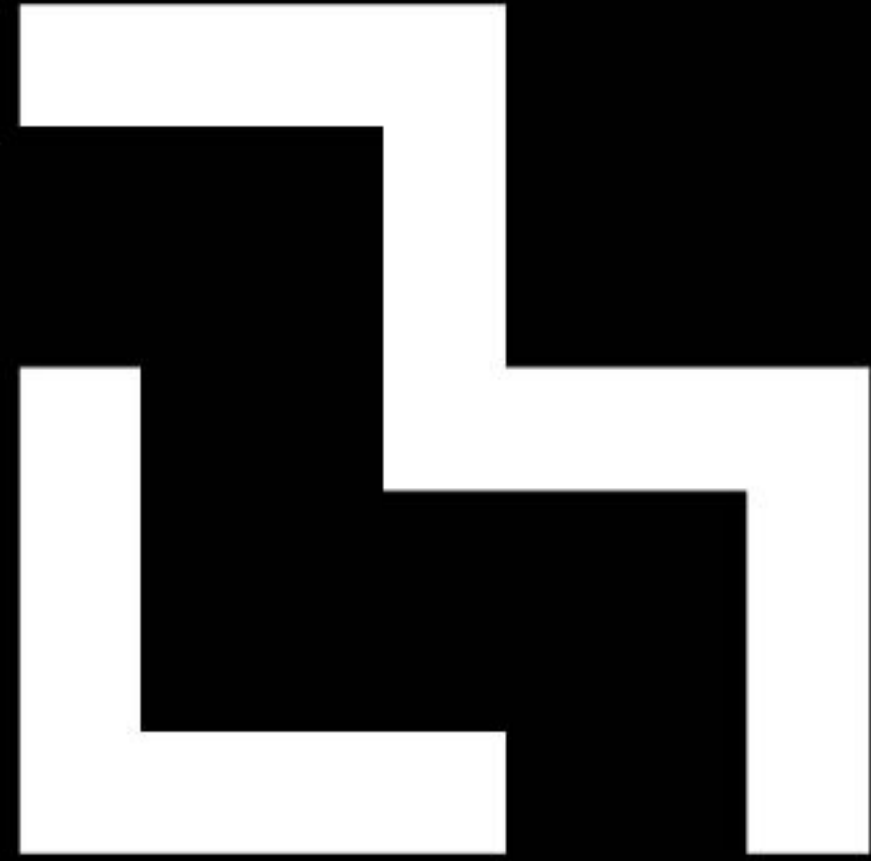


ClearBoard: Seamless Collaboration Media
Hiroshi Ishii & Minoru Kobayashi @NTT 1992

ClearBoard-1
NTT Human Interface Labs
CHI 92, CSCW 92

1995

Tangible Media
MIT Media Lab

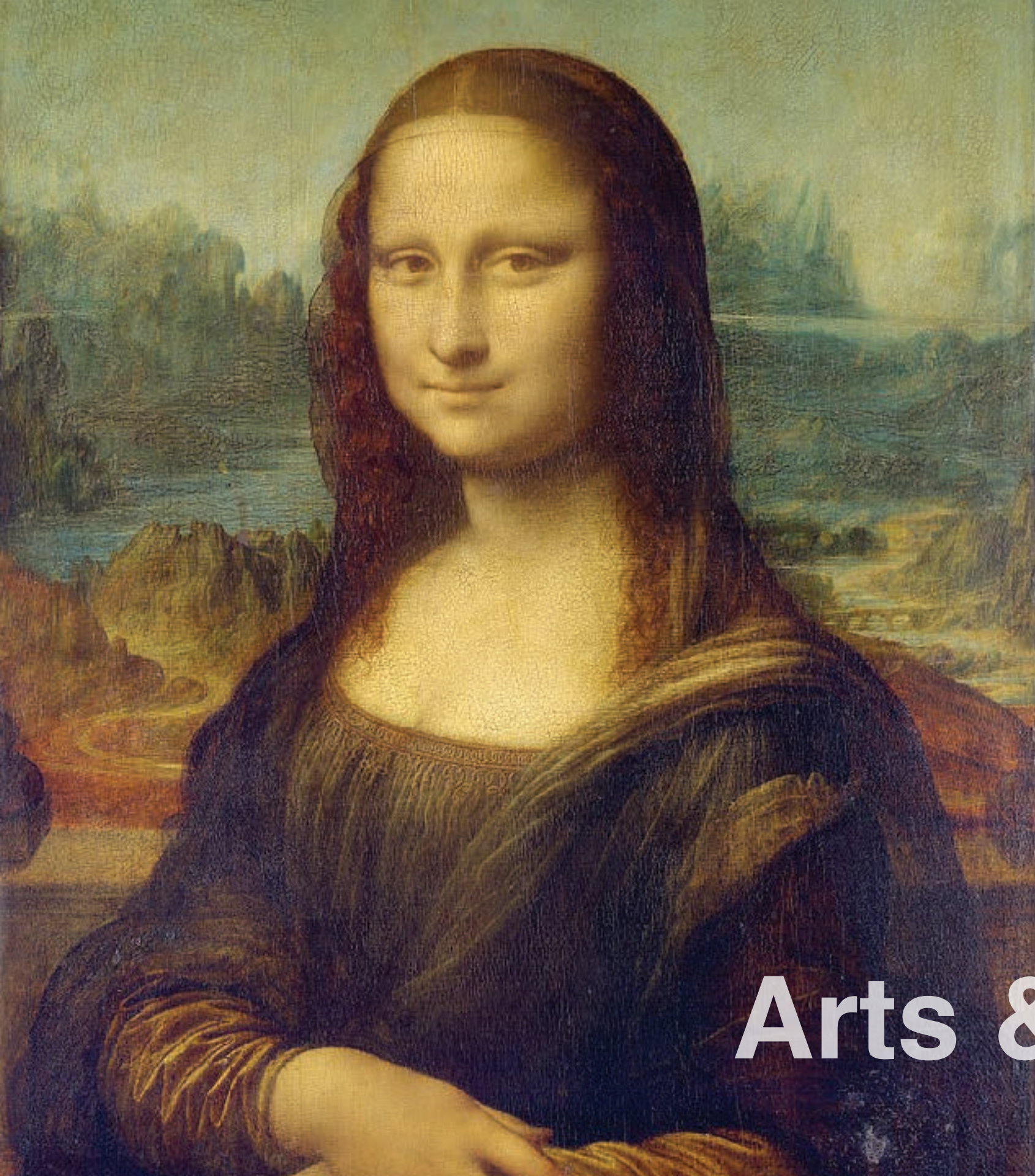


mit
media
lab

TRANS-Disciplinary

Finding opportunity in conflict between disciplines
Breaking down old paradigms to create new archetypes

“auf-heben”



Arts & Sciences



Music & Technology

MirrorFugue III Xiao Xiao



MirrorFugue III Xiao Xiao



Milano

Design Week

LEXUS DESIGN AMAZING 2014 MILAN

April 8-13, 2014

Tangible Media Group

MIT Media Lab

TRANSFORM

Tangible Media Group led by Prof. Hiroshi Ishii
from MIT Media Lab.





TRANSFORM
Tangible Media
MIT Media Lab

MIT
Media
Lab

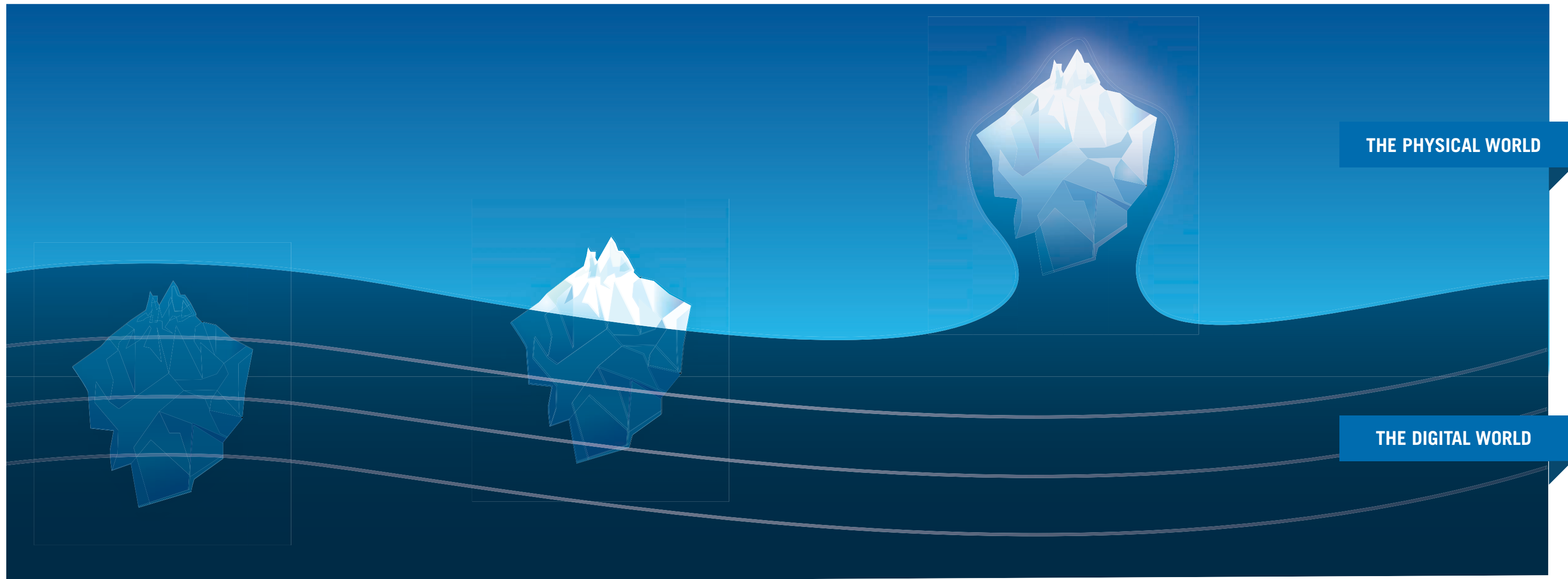
GUI

PAINTED
BITS

TUI

TANGIBLE
BITS

RADICAL ATOMS



A Graphical User Interfaces only let users see digital information through a screen, as if looking through a surface of the water. We interact with the forms below through remote controls such as a mouse, a keyboard or a touch screen.

A Tangible User Interface is like an iceberg: there is a portion of the digital that emerges beyond the surface of the water - into the physical realm - that acts as physical manifestations of computation, allowing us to directly interact with the 'tip of the iceberg.'

Radical Atoms is our vision for the future of interaction with hypothetical dynamic materials, in which all digital information has physical manifestation so that we can interact directly with it - as if the iceberg had risen from the depths to reveal its sunken mass.

vision





Vision

Needs

Technologies

Photo courtesy of Nobukazu Kuriki

Lifespan

Vision

> 100 years

Needs

~10 years

Technologies

~1 year

Photo courtesy of Nobukazu Kuriki

physical

p

tangible bits

d

digital

painted bits

Tangible Bits

embody digital information to
interact with directly with hands

1980s
GUI
painted bits

GUI

1990s
TUI
tangible bits

1997

TUI



bottles

musicBottles (classical)



Origin: Weather Bottle



present for my mother

soy sauce bottle
in her kitchen





石井 和子

Kazuko ISHII

1926 - 1998

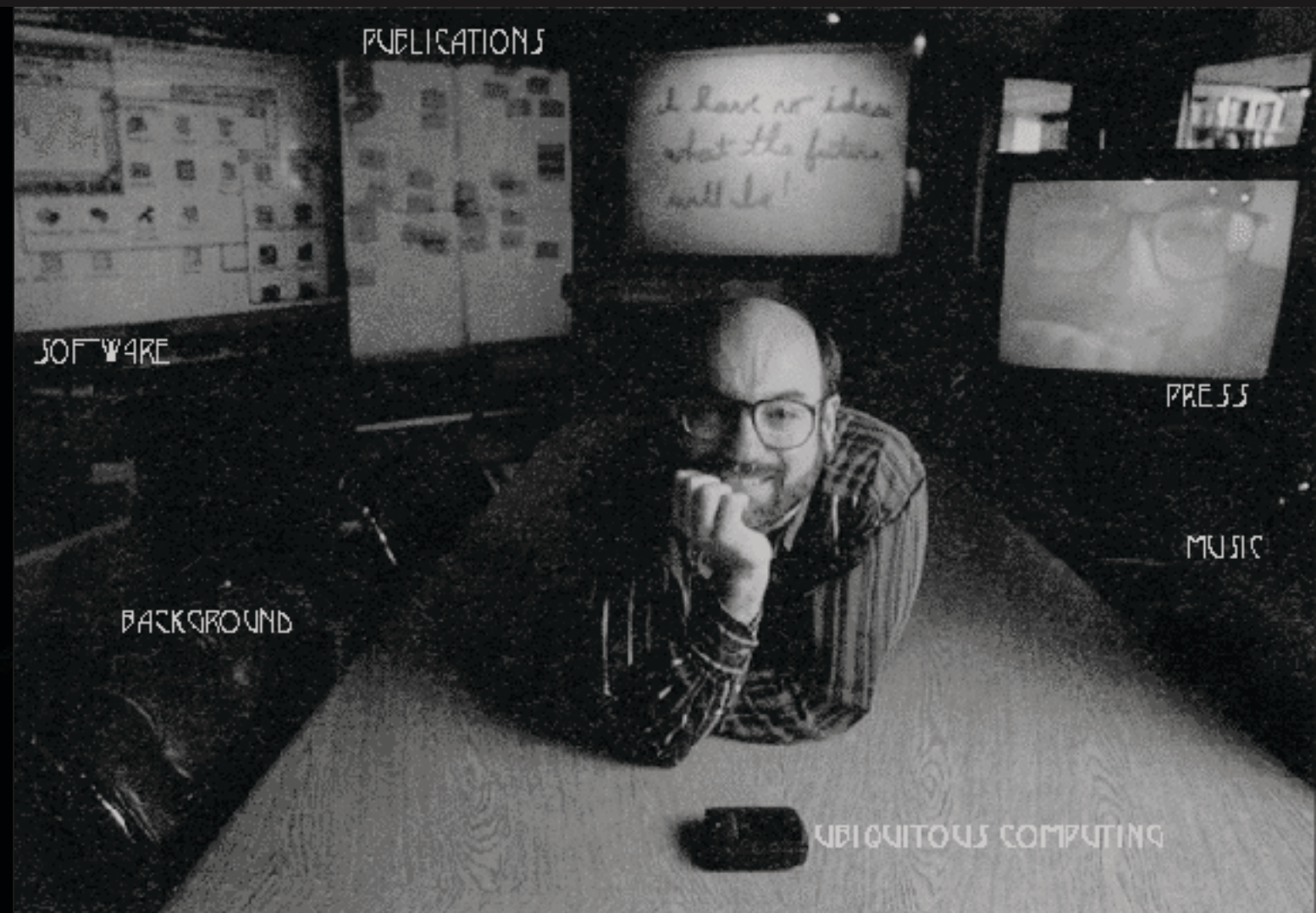
Mark Weiser 1952 – 1999

Ubiquitous Computing 1991



The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.

~Mark Weiser



Bottles: A Transparent Interface as a Tribute to Mark Weiser

IEICE TRANS. INF. & SYST., VOL.E87-D, NO.6 JUNE 2004



Bottles: A Transparent Interface as a Tribute to Mark Weiser

Hiroshi ISHII¹*, Nonmember

SUMMARY This paper first discusses the misinterpretation of the concept of "ubiquitous computing" that Mark Weiser originally proposed in 1991. Weiser's main message was not the ubiquity of computers, but the transparency of interface that determines users' perception of digital technologies embedded in our physical environment seamlessly. To explore Weiser's philosophy of transparency in interfaces, this paper presents the design of an interface that uses glass bottles as "containers" and "controls" for digital information. The metaphor is a perfume bottle: Instead of text, the bottles have been filled with music — classical, jazz, and techno music. Opening each bottle releases the sound of a specific instrument accompanied by dynamic colored light. Physical manipulation of the bottles — opening and closing — is the primary mode of interaction for controlling their musical contents. The bottles illustrate Mark Weiser's vision of the transparent (or invisible) interface that weaves itself into the fabric of everyday life. The bottles also exploits the practical aspects of glass bottles that are tangible and visual, and evoke the smell of perfume and the taste of exotic beverages. This paper describes the design goals of the bottle interface, the arrangement of musical content, the implementation of the wireless electromagnetic tag technology, and the feedback from users who have played with the system.

Key words: Mark Weiser, ubiquitous computing, pervasive computing, invisible computing, transparent interface, tangible interface, tangible bits, bottles, music/bottles, weather bottles

1. Introduction

"Ubiquitous" has become a popular buzzword used by virtually every media in Japan today. Unfortunately, however, Mark Weiser's original concept of "ubiquitous computing" [19] was not well understood, and was often misused as a label for the old idea such as "anytime & anyplace computing" or as an acronym of "mobile/wireless broadband services."

This paper first discusses the core message of Weiser's "ubiquitous computing" vision based on my personal communication with him, and then presents "bottles" as a tribute to him. The bottles illustrate Weiser's vision of *profound technologies* that disappear by weaving themselves into the fabric of everyday life.

2. Ubiquitous

2.1 Anytime & Anyplace?

The word *ubiquitous*, meaning "omnipresent," is often interpreted as "anytime & anyplace." However, the concept of "anytime & anyplace" is nothing especially new. This

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Manuscript revised February 20, 2004.

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a) E-mail: ishi1@media.mit.edu

ISHII: BOTTLES: A TRANSPARENT INTERFACE AS A TRIBUTE TO MARK WEISER

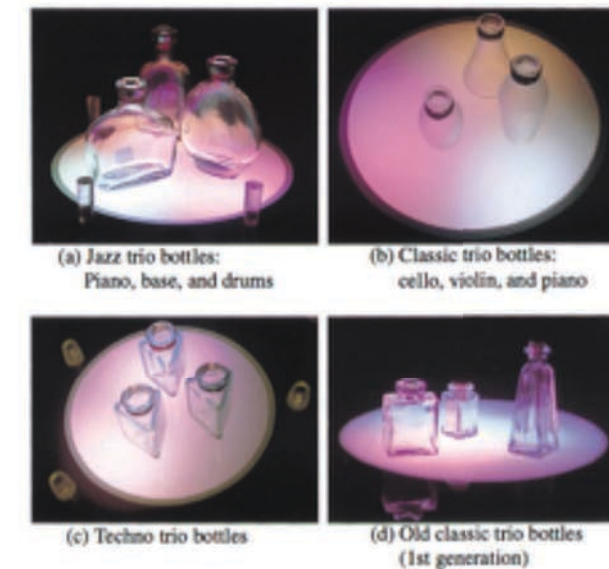


Fig. 5 musicBottles sampler.



Fig. 6 A weather bottle that contains the weather forecast of Sapporo-city.



I/O Brush
painter = color maker

I/O Brush

Kimiko Ryokai, Stefan Marti, & Hiroshi Ishii 2004



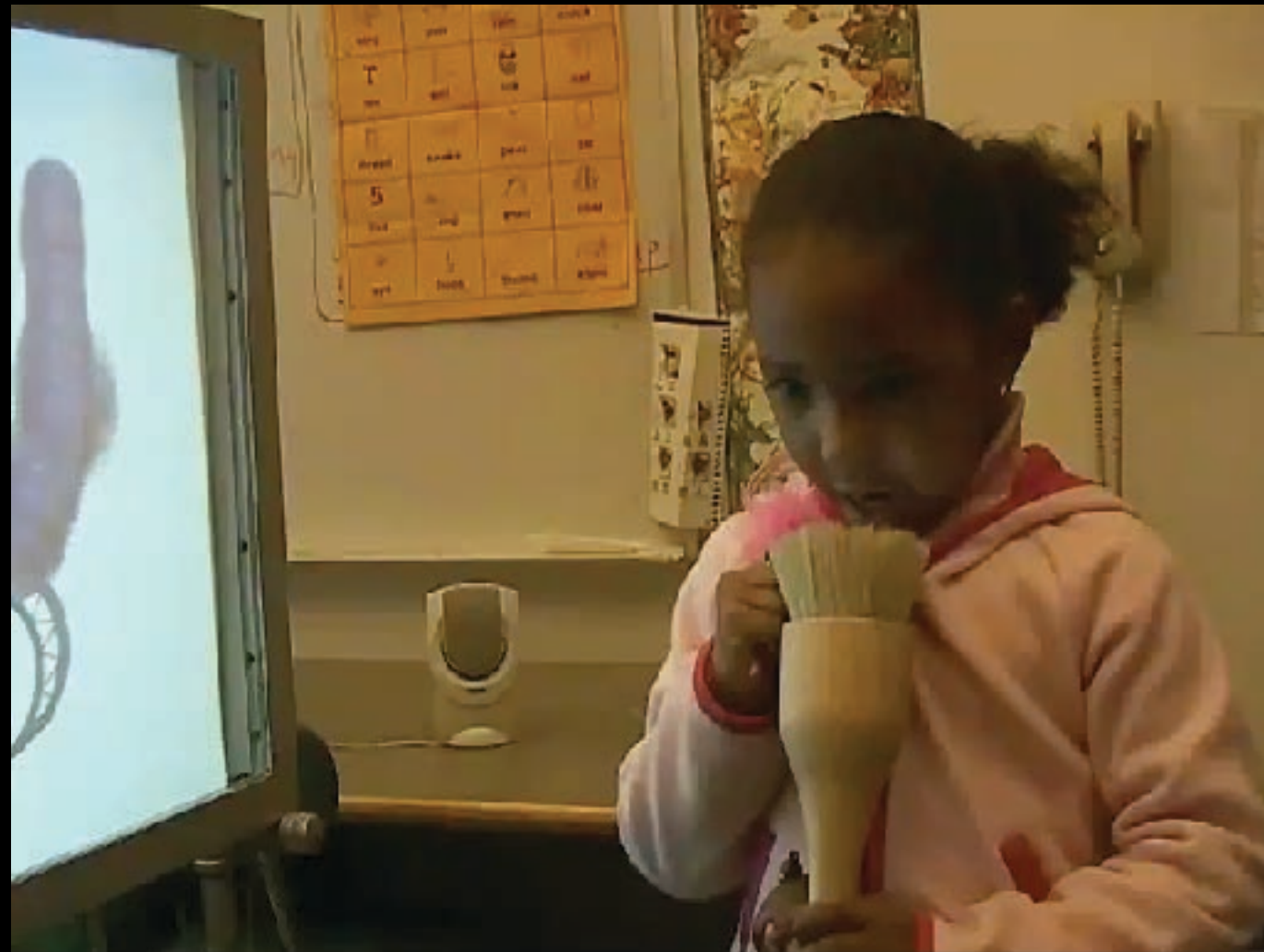
I/O Brush History Mode

Kimiko Ryokai, Stefan Marti, & Hiroshi Ishii 2004



I/O Brush History Mode

Kimiko Ryokai, Stefan Marti, & Hiroshi Ishii 2004



Capturing and weaving the (hi)story for every stroke



“The World as the Palette”
Colors in Barcelona

PingPongPlus

Ishii, Lee, Wisneski, Orbanes 1999

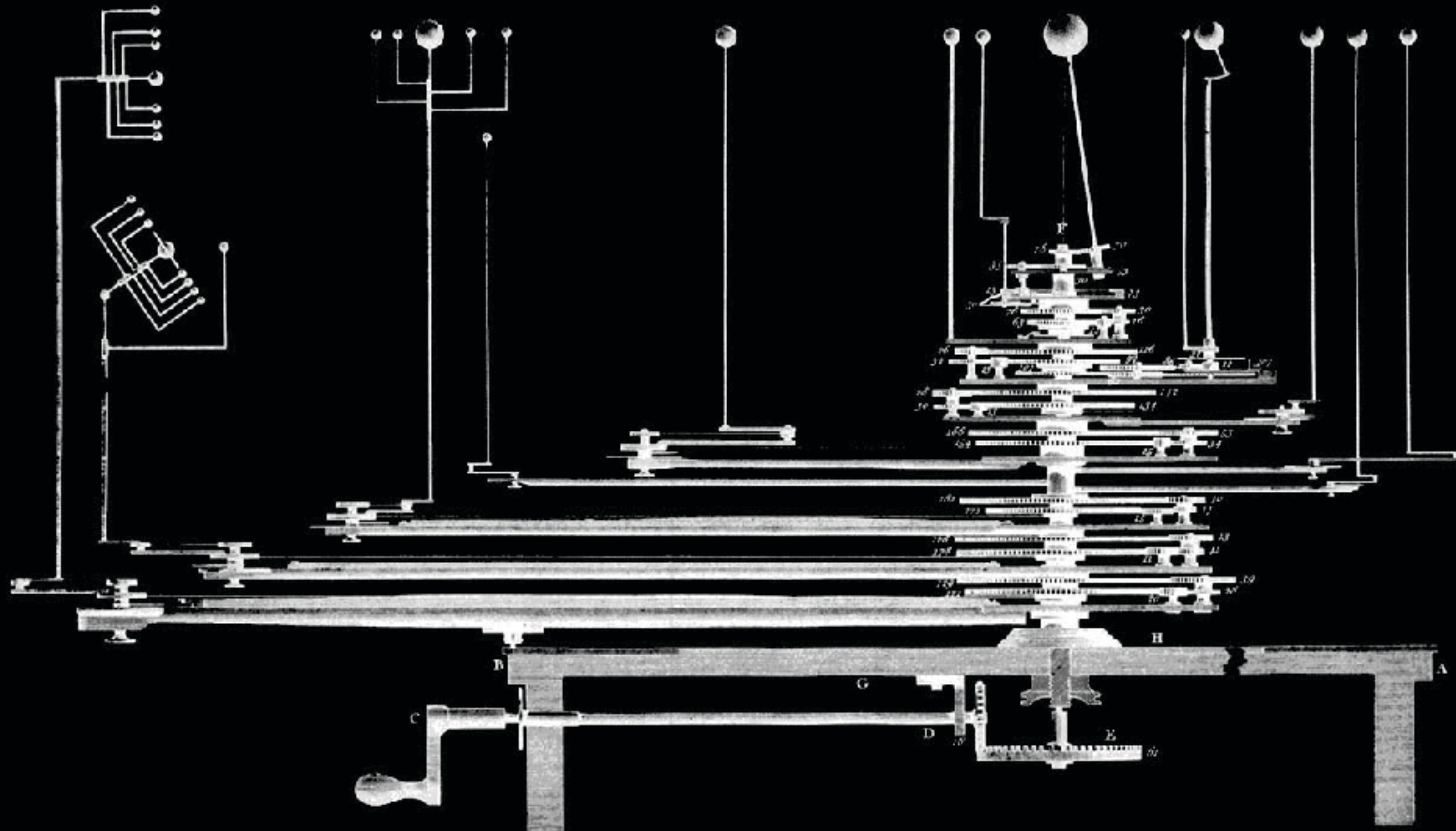
- ICC, Tokyo 2000
- Centre Pompidou, Paris 2003
- Victoria and Albert Museum, London 2005

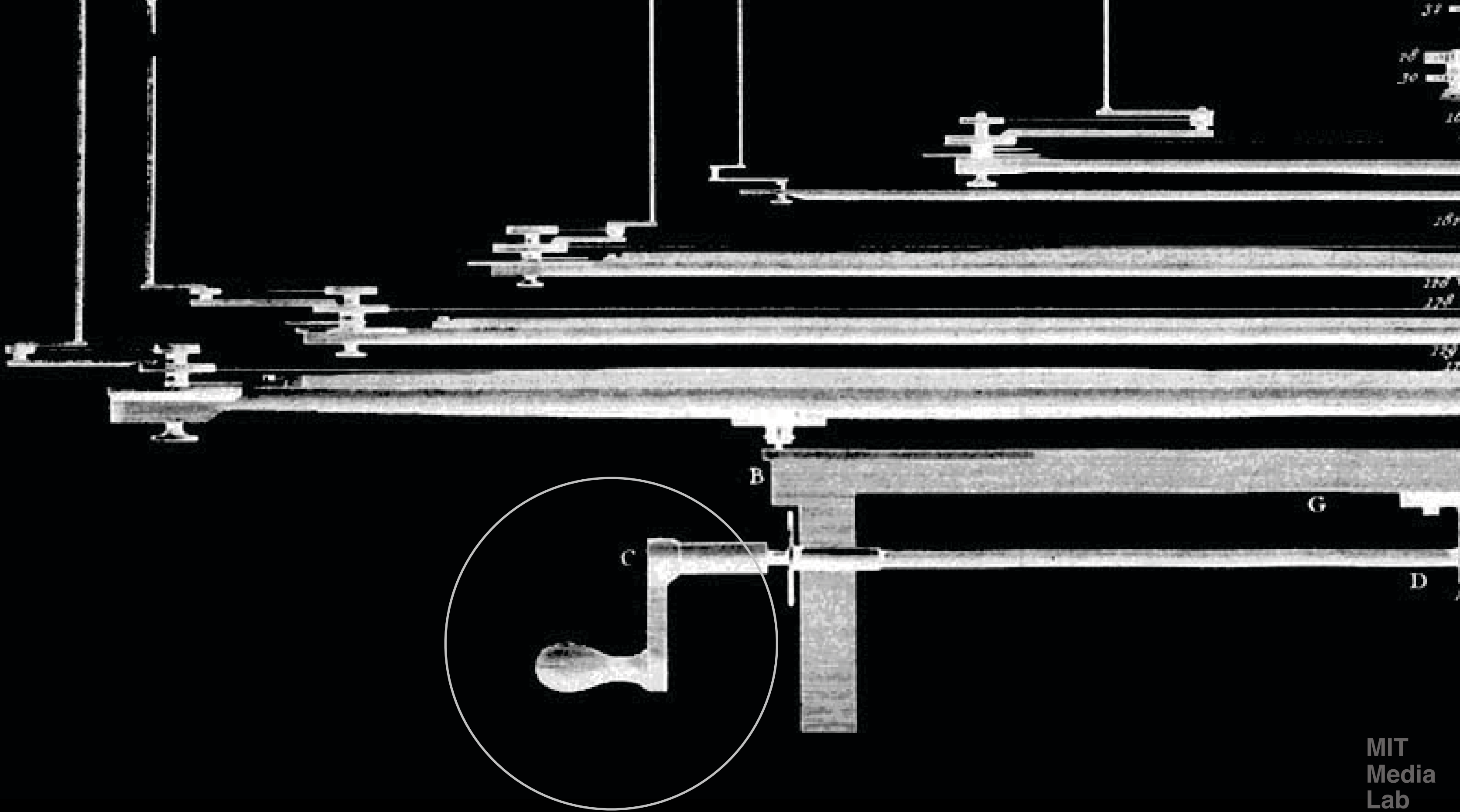


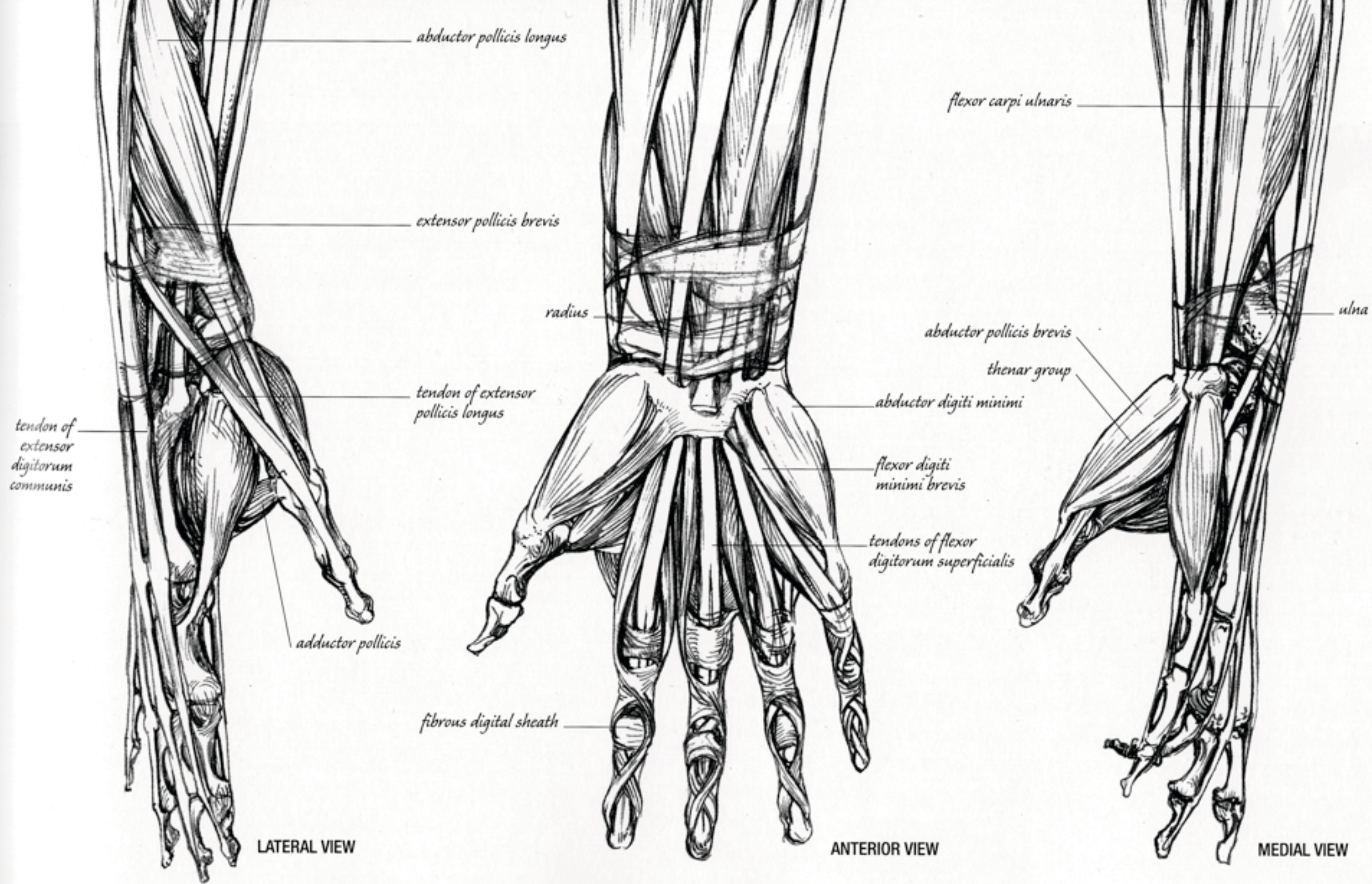


Orrery

Tangible Representation of Knowledge







hands

collaboration

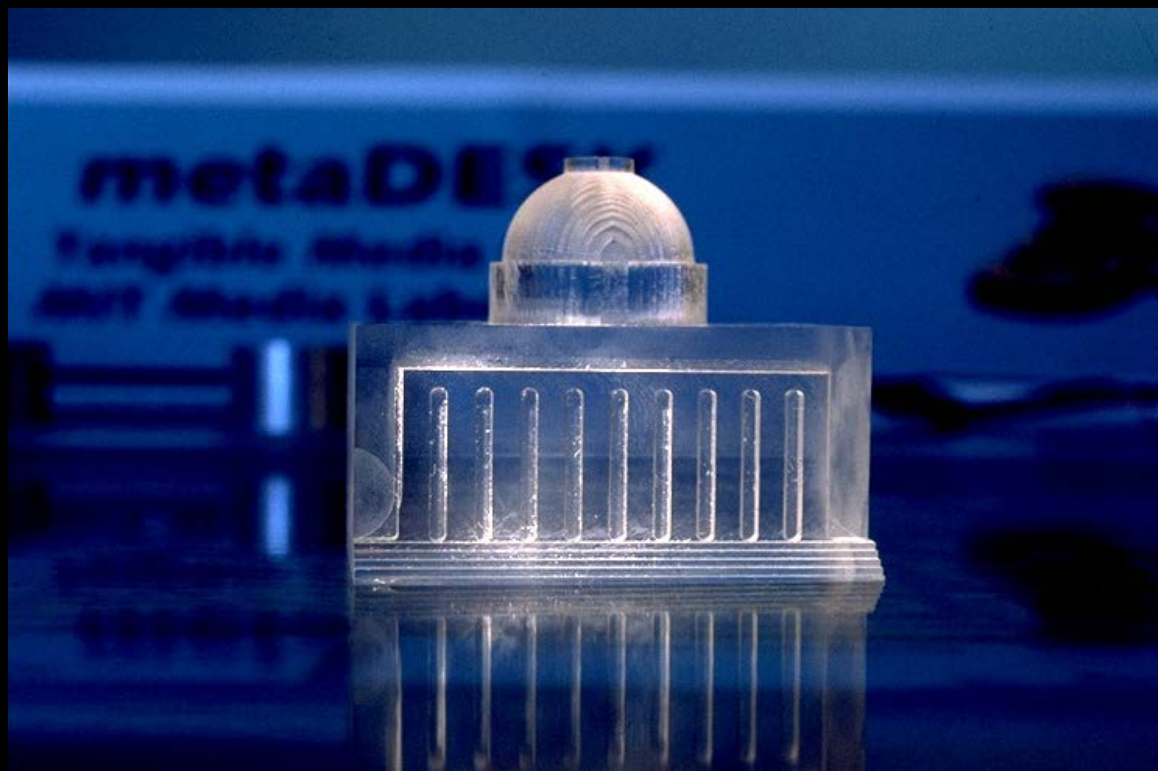


A Philosopher Giving a Lecture on the Orrery (sometimes called simply *The Orrery*) is a painting (oil on canvas, ca. 1766) by Joseph Wright of Derby depicting a public lecture about a model solar system, with a lamp—in place of the sun—illuminating the faces of the audience. http://en.wikipedia.org/?title=Portal:History_of_science/Previous_pictures#/media/File:Wright_of_Derby,_The_Orrery.jpg

1997

Tangible Bits
CHI '97 paper

Tangible Bits



March 1997

“Tangible Bits” paper
presented at CHI ‘97 in Atlanta

Published in the Proceedings of CHI '97, March 22-27, 1997, © 1997 ACM

Tangible Bits: Towards Seamless Interfaces between People, Bits and Atoms

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Tangible Media Group
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ABSTRACT

This paper presents our vision of Human Computer Interaction (HCI). “Tangible Bits.” Tangible Bits allows users to “grasp & manipulate” bits in the context of users’ attention by coupling the bits with everyday physical objects and architectural surfaces. Tangible Bits also enables users to be aware of background bits at the periphery of human perception using ambient display media such as light, sound, airflow, and water movement in an augmented space. The goal of Tangible Bits is to bridge the gaps between both cyberspace and the physical environment, as well as the foreground and background of human activities.

This paper describes three key concepts of Tangible Bits: interactive surfaces; the coupling of bits with graspable physical objects; and ambient media for background awareness. We illustrate these concepts with three prototype systems – the metaDESK, metaBOARD and ambientROOM – to identify underlying research issues.

Keywords

tangible user interface, ambient media, graspable user interface, augmented reality, ubiquitous computing, context and periphery, foreground and background

INTRODUCTION: FROM THE MUSEUM

Long before the invention of personal computers, our ancestors developed a variety of specialized physical artifacts to measure the passage of time, to predict the movement of planets, to draw geometric shapes, and to compute [10]. We studied these beautiful artifacts made of oak and brass in museums such as the Collection of Historic Scientific Instruments at Harvard University (Fig. 1).

We were inspired by the aesthetics and rich traditions of these historical scientific instruments, most of which have disappeared from schools, laboratories, and design studios and have been replaced with the most general of appliances: personal computers. Through grasping and manipulating these instruments, users of the past never have developed rich languages and cultures which valued haptic interaction with real physical objects. Also, much of this richness has been lost to the rapid flood of digital technologies.

We began our investigation of “looking to the future of HCI” at this museum by looking for what we have lost with the advent of personal computers. Our intention was to regain the richness of the physical world as HCI.

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© 1997 ACM 0-89591-902-0/97/03...\$2.50
Copyright 1997 ACM 0-89591-902-0/97/03...\$2.50

BITS & ATOMS

We live between two realms: our physical environment and cyberspace. Despite our dual citizenship, the absence of seamless couplings between these parallel constructs leaves a great divide between the worlds of bits and atoms. At the present, we are torn between these parallel but disjoint spaces.

We are now almost comically “wired” so that we can be here (physical space) and there (cyberspace) simultaneously [14]. Streams of bits leak out of cyberspace through a myriad of rectangular sensors into the physical world as photon beams. However, the interaction between people and cyberspace are now largely confined to traditional GUI (Graphical User Interface)-based boxes sitting on desktops or laptops. The interaction with these GUIs are separated from the ordinary physical environment within which we live and interact.

Although we have developed various skills and work practices for processing information through haptic interactions with physical objects (e.g., writing messages on Post-It™ notes and spatially manipulating them on a wall) as well as peripheral senses (e.g., being aware of a change in weather through ambient light), most of these practices are neglected in current HCI design because of the lack of diversity of input/output media, and too much bias towards graphical output at the expense of input from the real world [3].

Outline of this paper

To look towards the future of HCI, this paper will present our vision of Tangible Bits and introduce design projects including the metaDESK, metaBOARD and ambientROOM systems to illustrate our key concepts. This paper is not intended to propose a solution in any one single problem. Rather, we will propose a new view of interface and raise a set of new research questions to go beyond GUI.

FROM DESKTOP TO PHYSICAL ENVIRONMENT

In 1981, the Xerox Star workstation set the stage for the first generation of GUI [15], establishing a “desktop metaphor” which mimics a desktop on a mapped

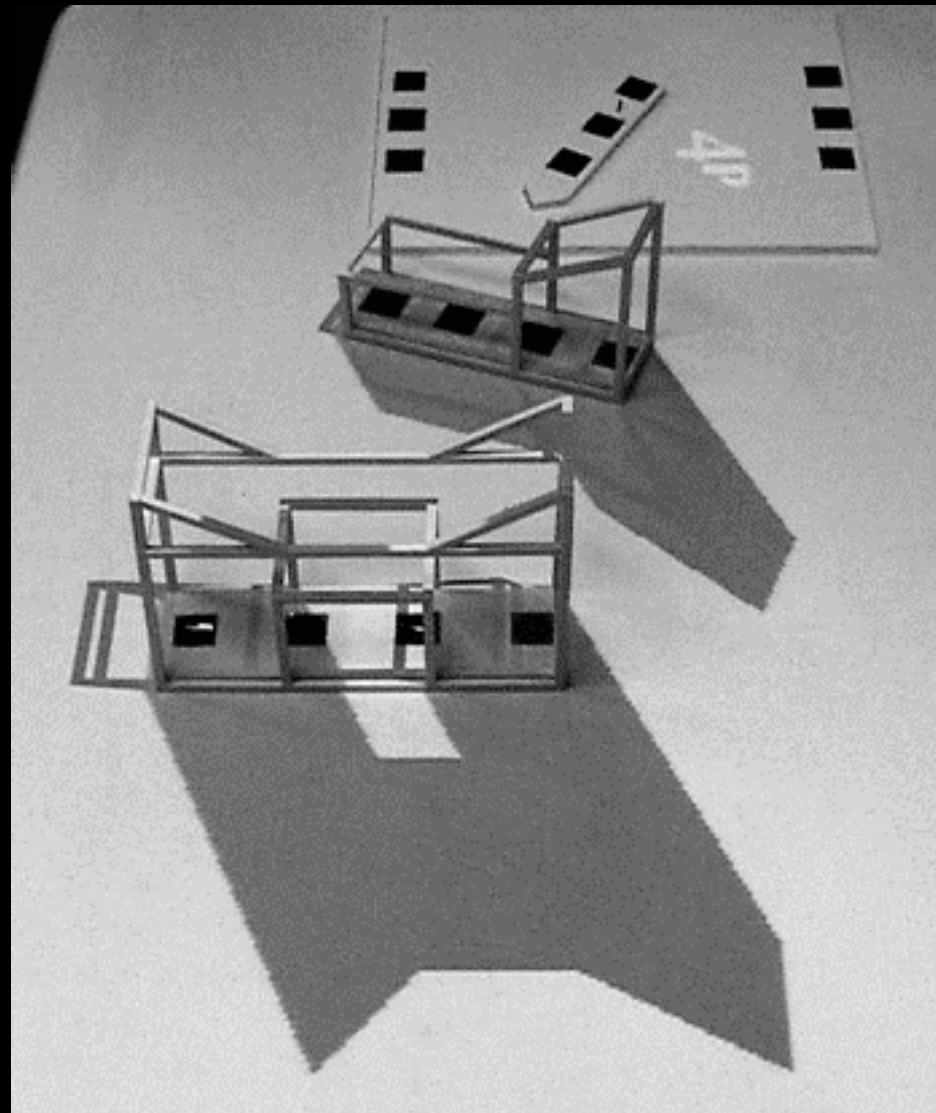


Figure 1. Sketches made in Collection of Historical Scientific Instruments at Harvard University

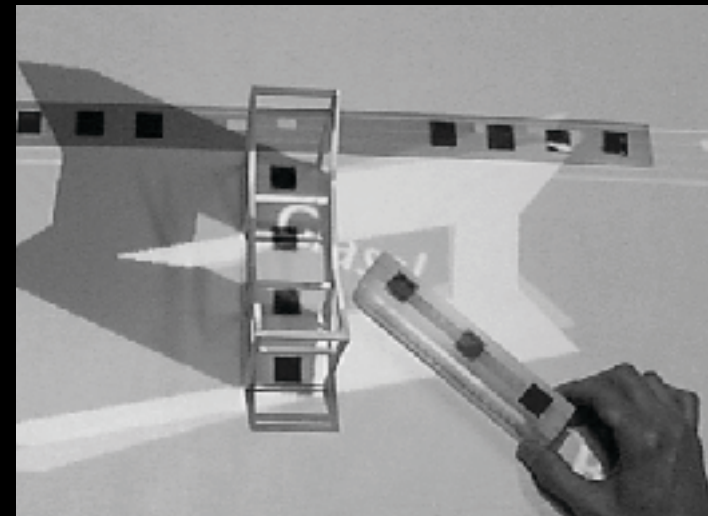
Urp:

Urban Planning Workbench

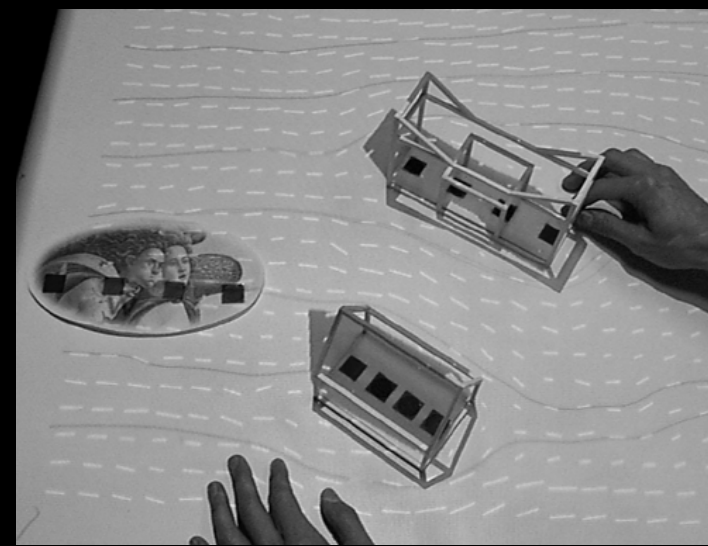
John Underkoffler and Hiroshi Ishii, 1997 - 1999



digital shadows



light reflections



wind



Illuminating Clay 2002



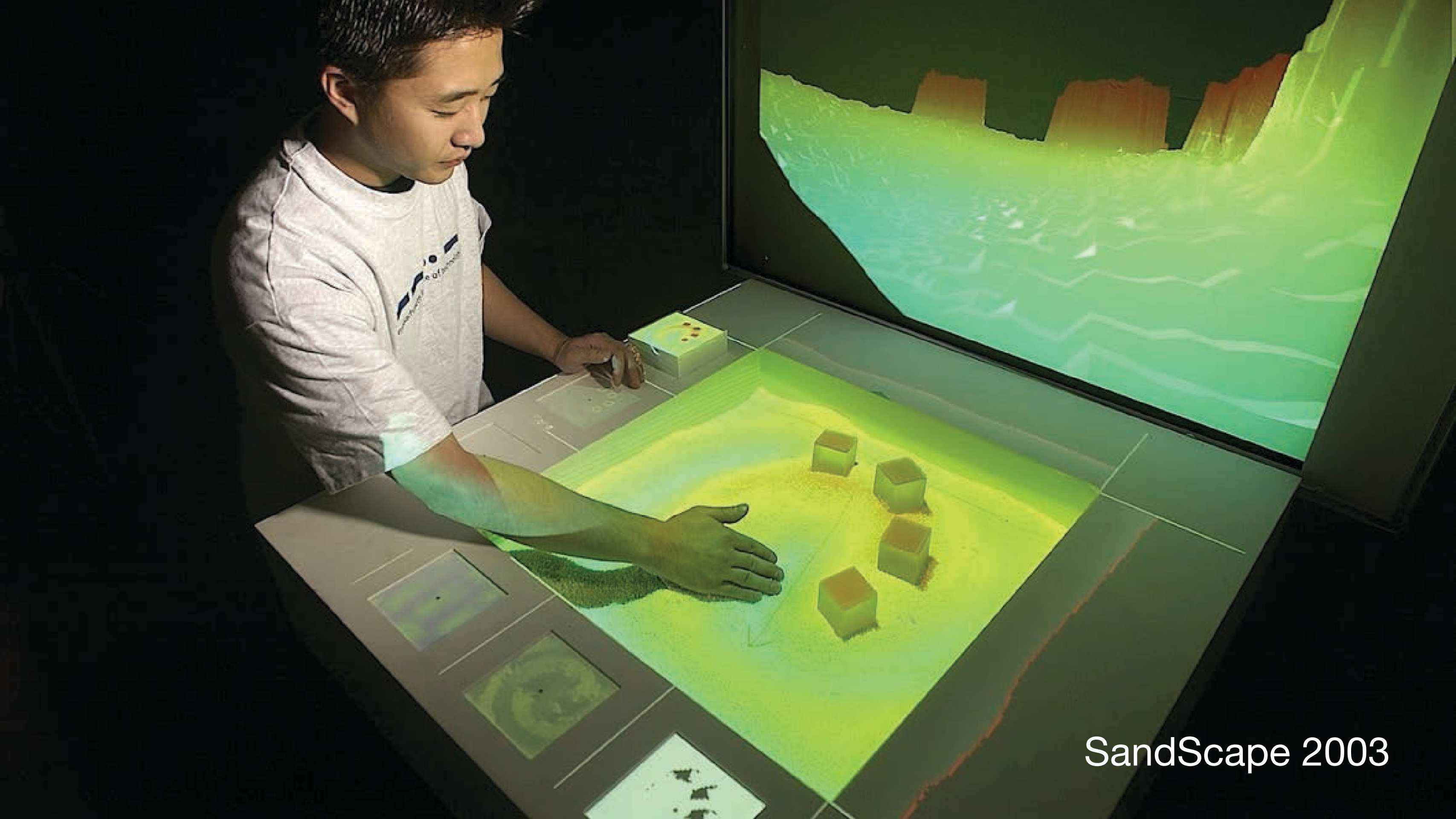
SandScape An illuminated experience for landscape design

SandScape is a series of tables, illuminated by ultra-compact fluorescent computer monitors, that visualize the process of landscape design. The process is a series of steps, from the initial site analysis to the final design. The process is a series of steps, from the initial site analysis to the final design. The process is a series of steps, from the initial site analysis to the final design.

SandScape is a series of tables that visualize the process of landscape design. The process is a series of steps, from the initial site analysis to the final design. The process is a series of steps, from the initial site analysis to the final design. The process is a series of steps, from the initial site analysis to the final design.

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All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, without the prior written permission of SandScape, LLC.

SandScape 2003



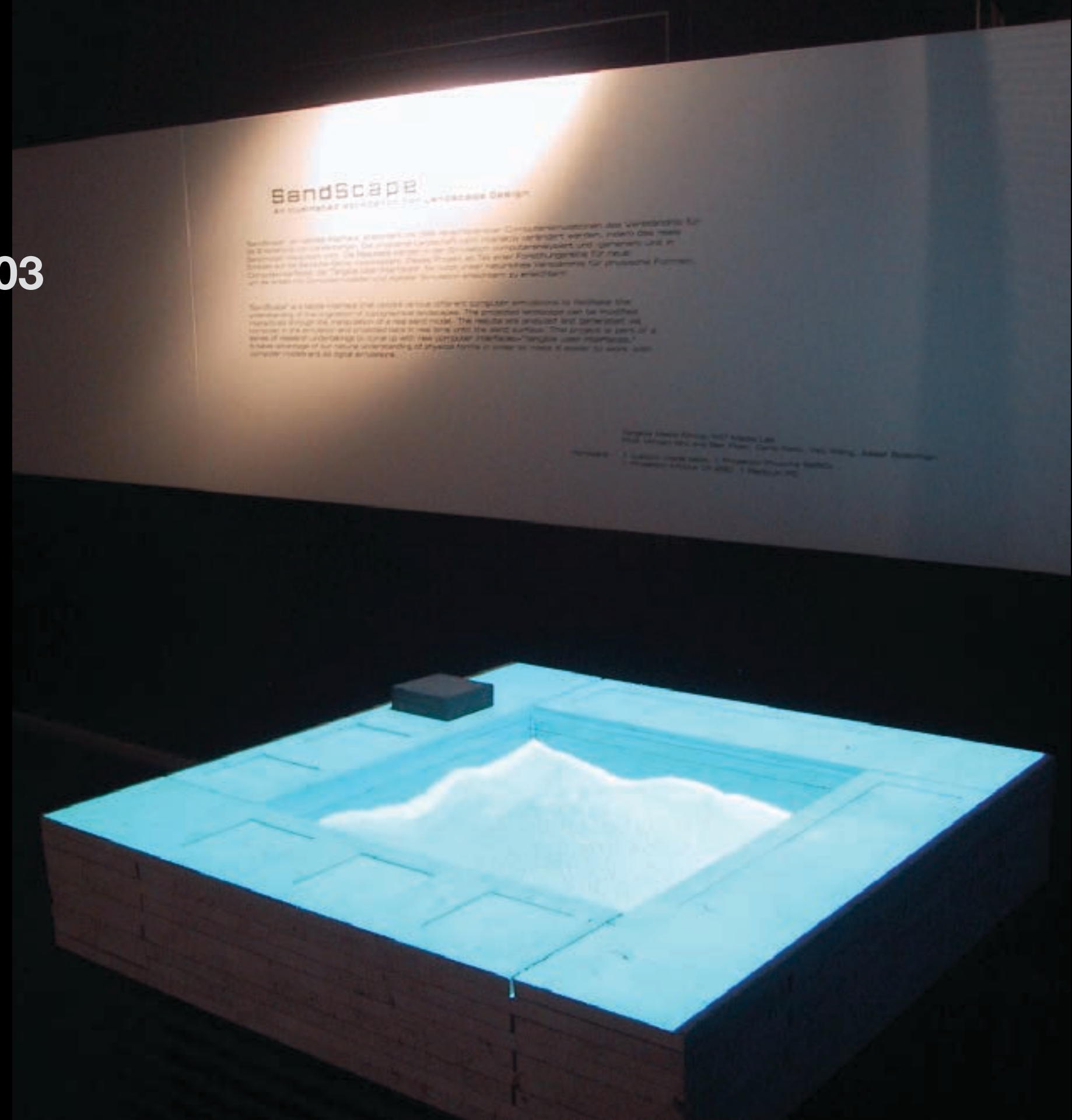
SandScape 2003

SandScape

Ars Electronic Center 2003

Hiroshi Ishii,
Carlo Ratti,
Ben Piper,
Yao Wang, and
Assaf Biderman

Tangible Media Group
MIT Media Laboratory



radical atoms
2012

tangible bits
1997

Radical Atoms

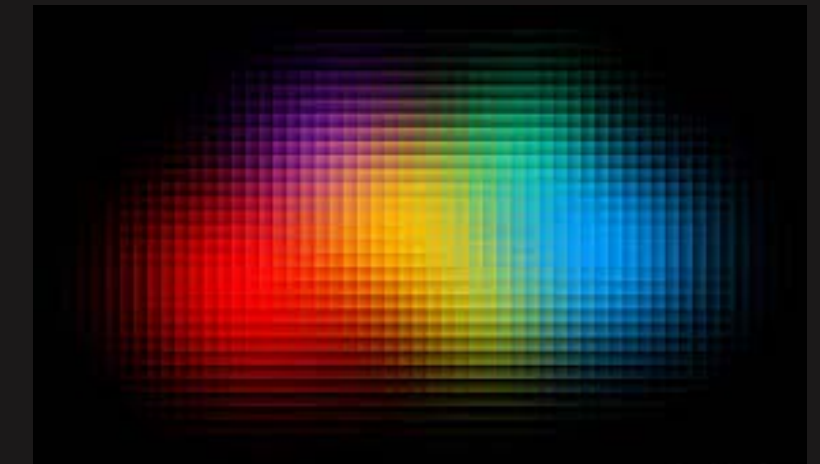
Dynamic Future Material that
Transform, Conform & Inform

Two Material Options Exist Today

- 1. Frozen Atoms:**
inert, rigid, passive physical materials
- 2. Intangible Pixels:**
dynamic, virtual and intangible pixels (bits)
trapped behind a 2D flat screen

Introducing The Third Material

- 3. Radical Atoms:**
dynamic, physical and computational
materials that transform, driven by bits



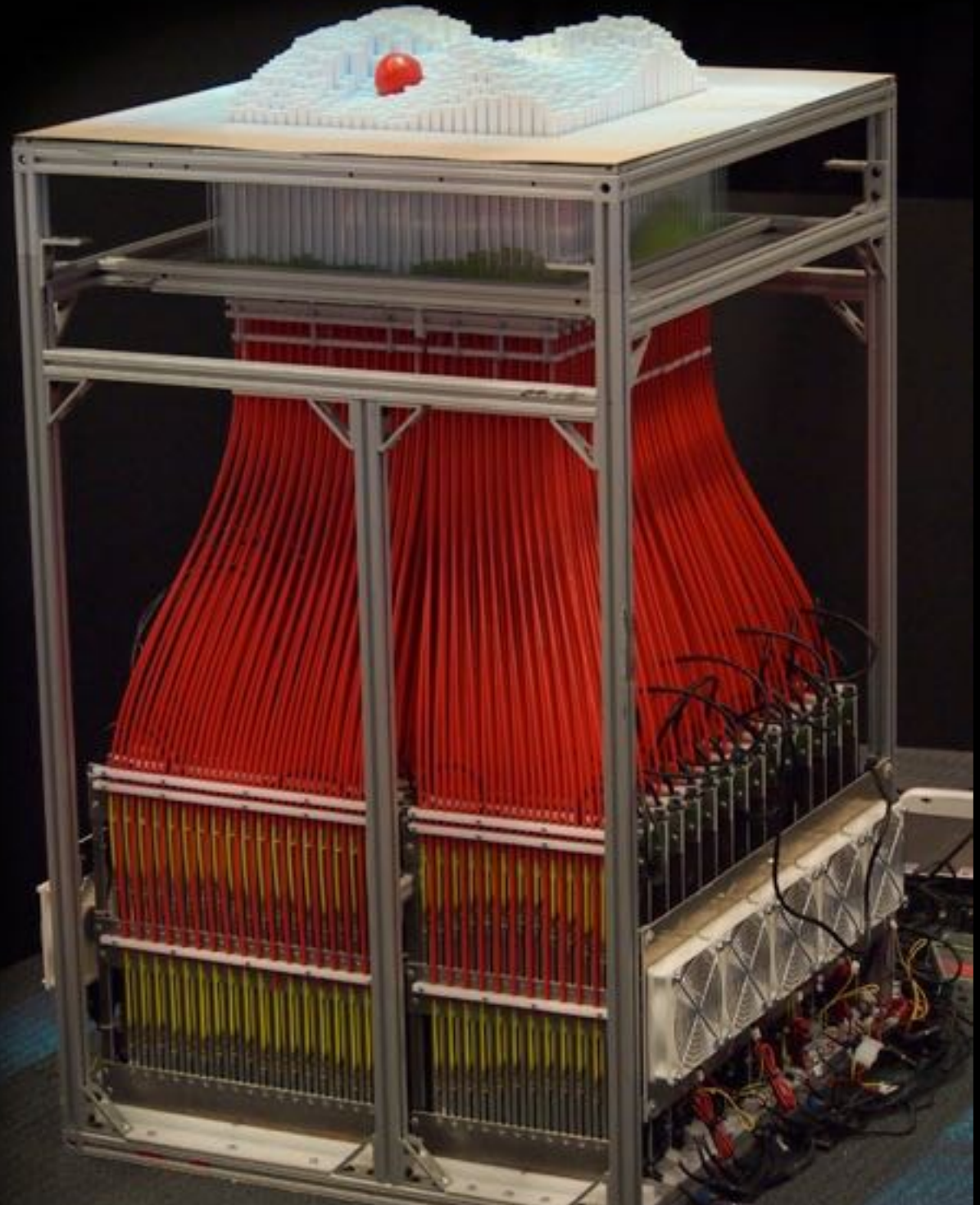
TimeScape

based on Relief

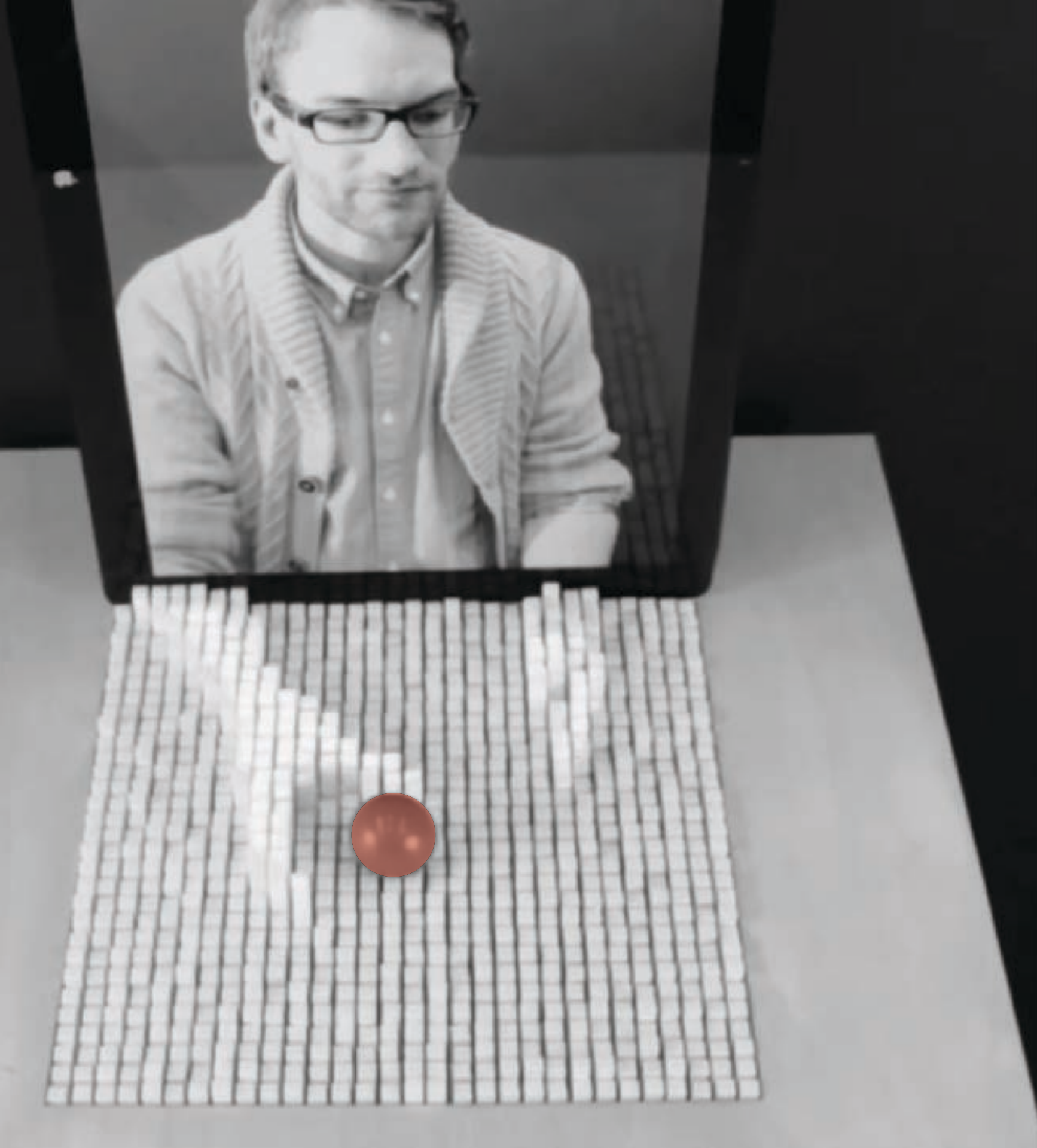


Daniel Leithinger, Jinha Lee, Sean Follmer, Austin Lee, Matthew Chang & Hiroshi Ishii

inFORM 2013



Sean Follmer, Daniel Leithinger, Alex Olwal, Akimitsu Hogge, Hiroshi Ishii



inFORM

Daniel Leithinger, Sean Follmer, Hiroshi Ishii

Fast Company Innovation by Design Awards: Winner - Experimental

Red Dot Award: Best of the Best - Design Concept

Laval Virtual 2014 Award - INDUSTRIAL DESIGN & SIMULATION

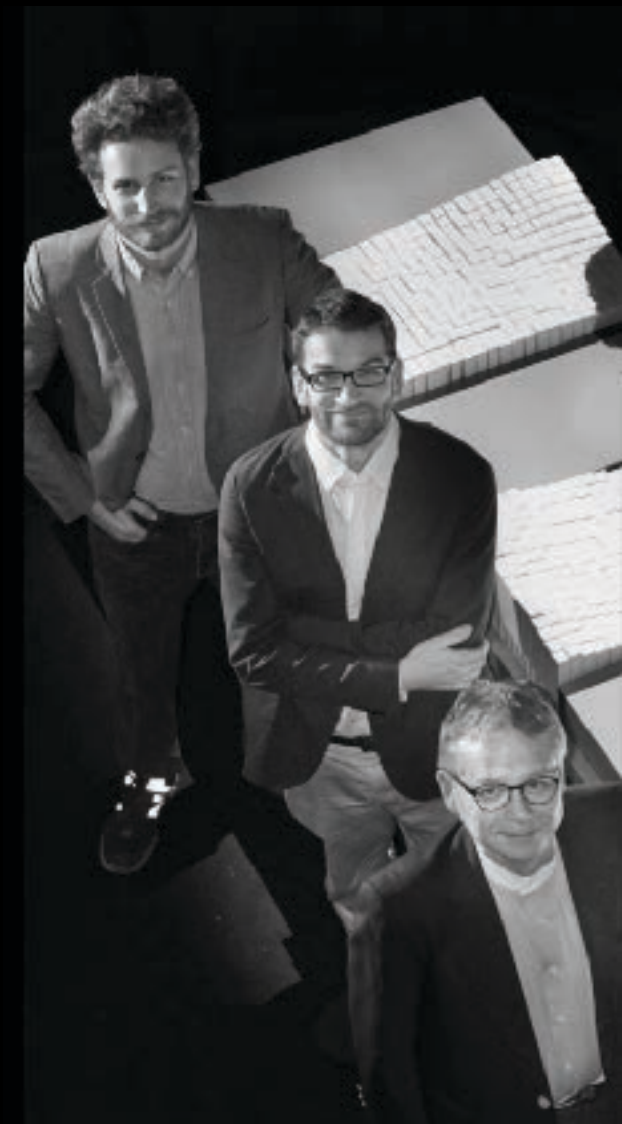
Core 77 Award - Interaction Student Winner

IDSA IDEA Award Bronze

Dr. Sean Follmer

Dr. Daniel Leithinger

Prof. Hiroshi Ishii





Cooper Hewitt Design Museum inFORM Exhibition

Dec. 2014 - May 2015, New York



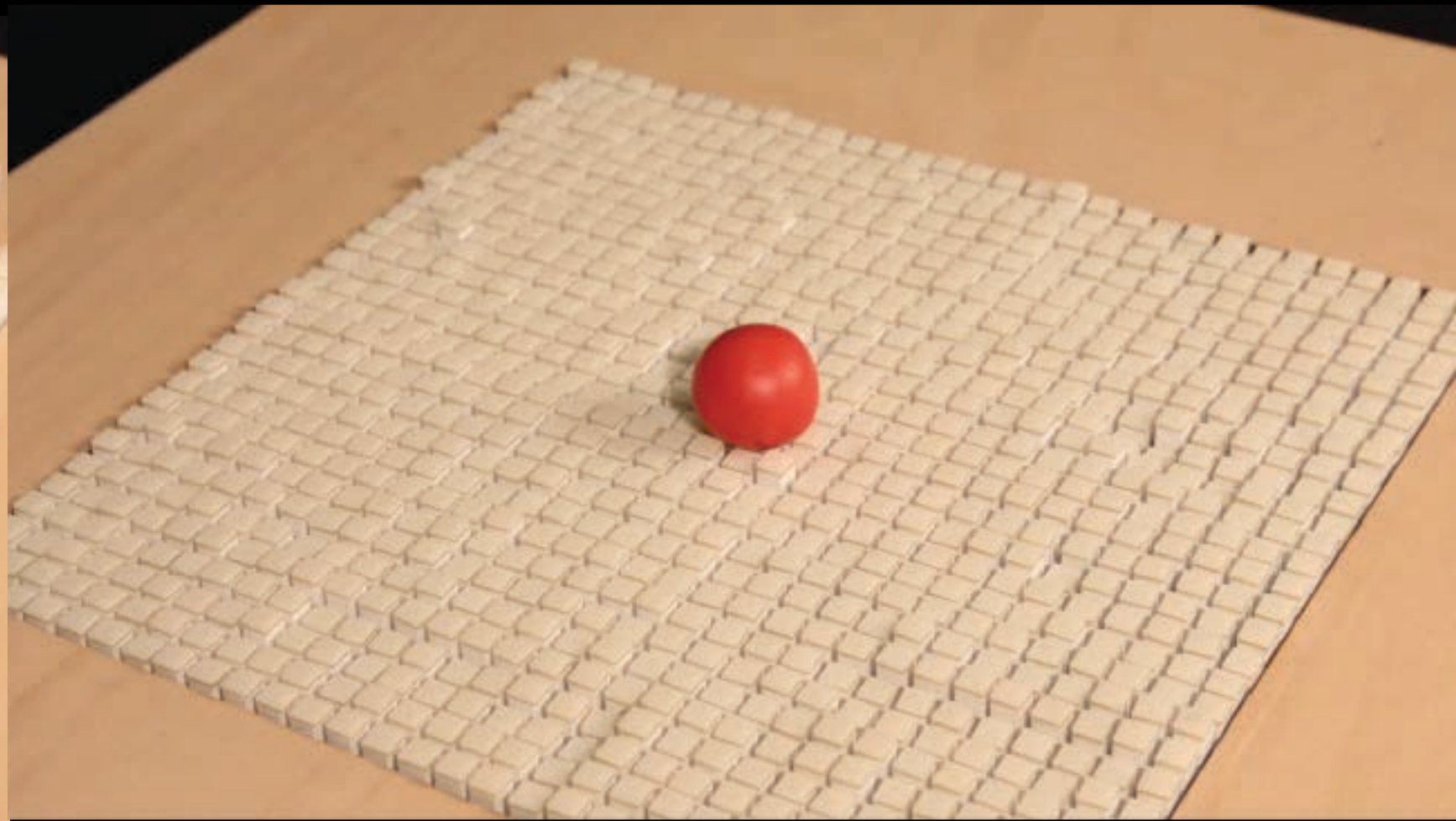
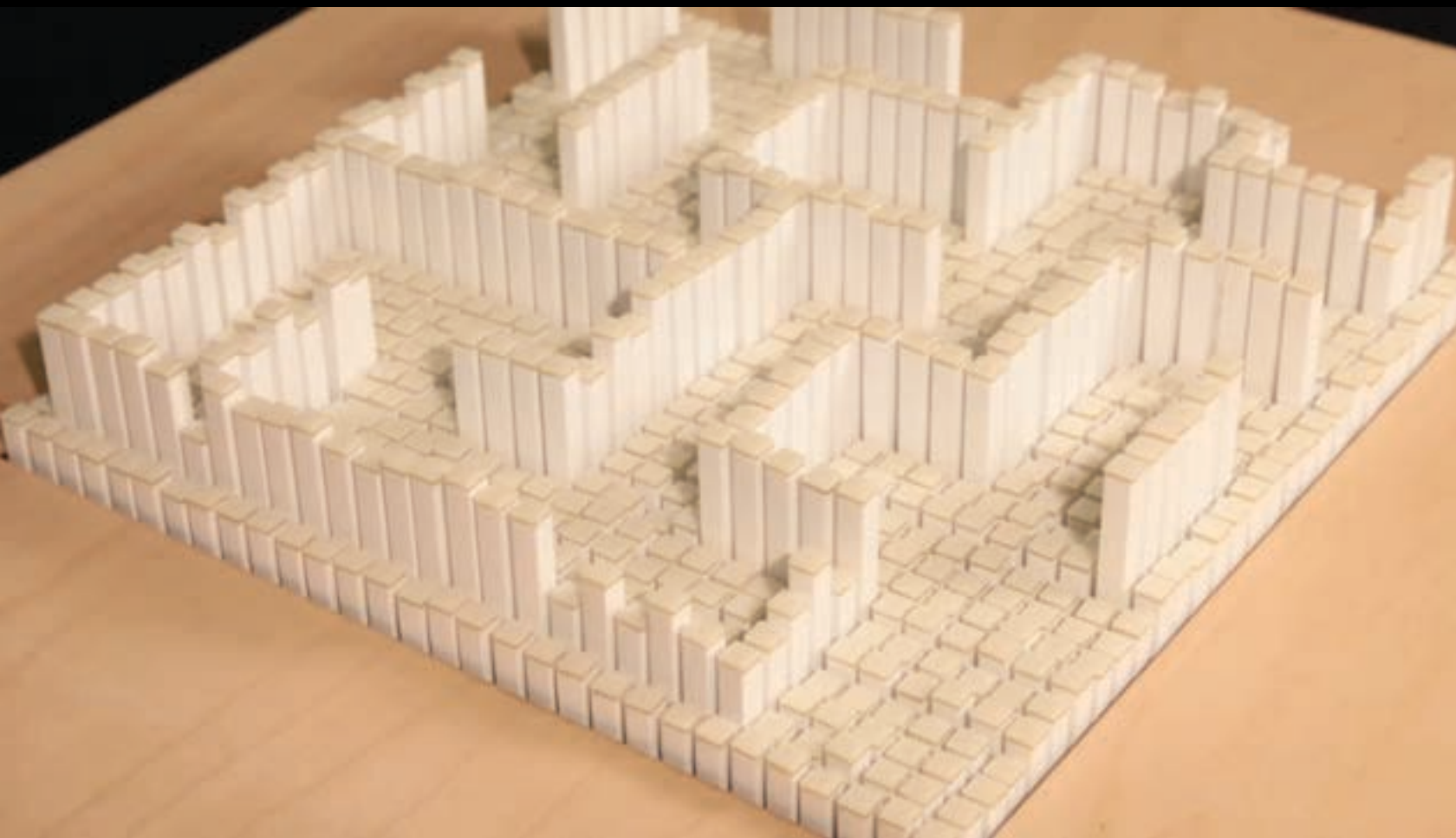
Daniel Leithinger,
Dr. Sean Follmer
Philipp Schoessler,
Jared Counts,
Ken Nakagaki,
David Doan,
Basheer Tome and
Prof. Hiroshi Ishii



Hiroshi Ishii
Tangible Media Group
MIT Media Lab

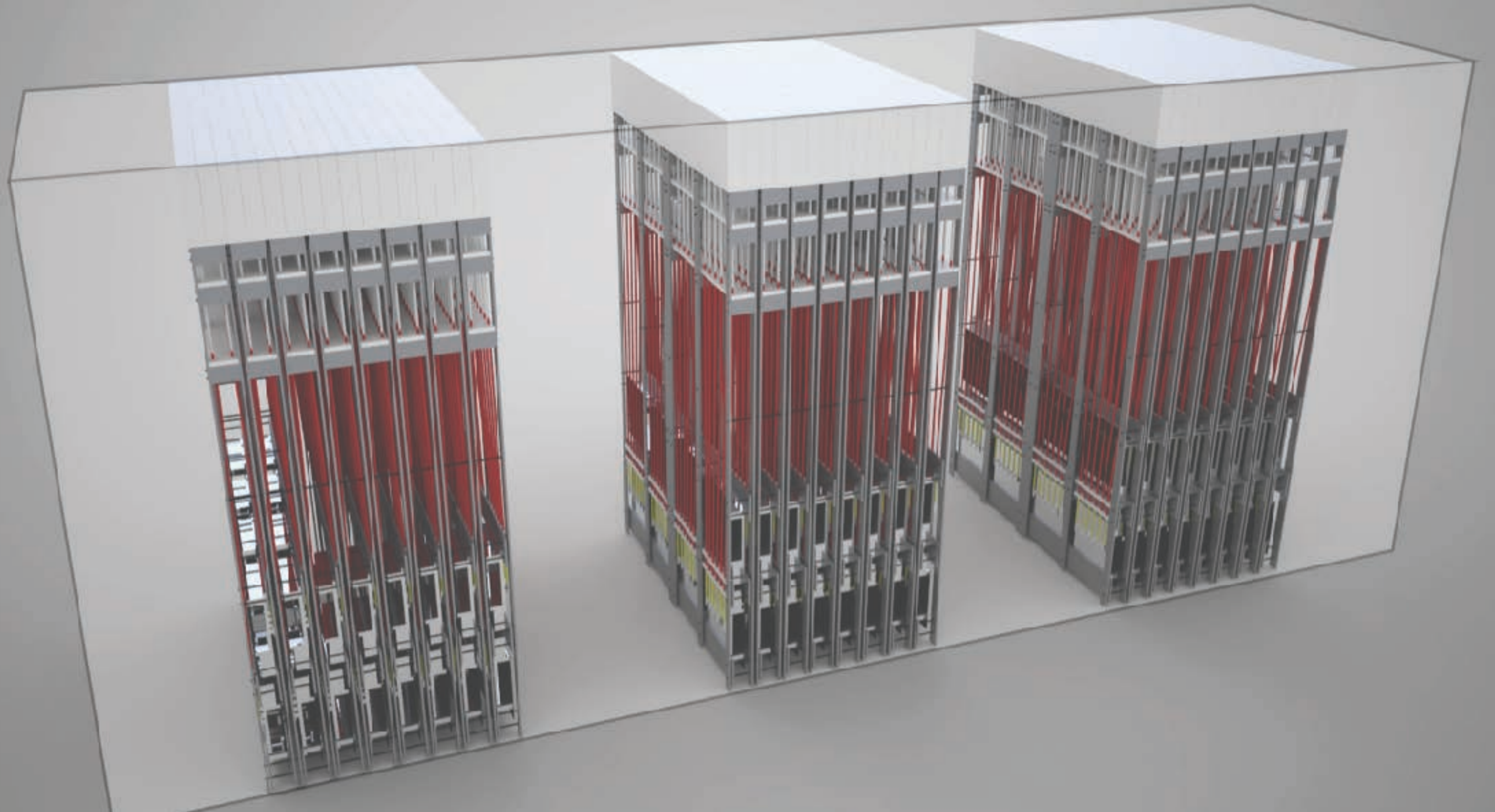
“ESCHER” Motion Design

by Philipp Schoessler in Nov. 2013



inFORM ENGINES

Designed by Daniel Leithinger & Sean Follmer, and Rendered by Amit Zoran



Triptych



Francis Bacon

The three panels of the triptych were sold separately in the mid-1970s.[9] Bacon was unhappy that the panels had been split up, writing on a photograph of the left-hand panel that it was "meaningless unless it is united with the other two panels."

TRANSFORM

Tangible Media
MIT Media Lab





TRANSFORM
Tangible Media
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**April 8-13, 2014 in Milan
5000 visitors interacted**

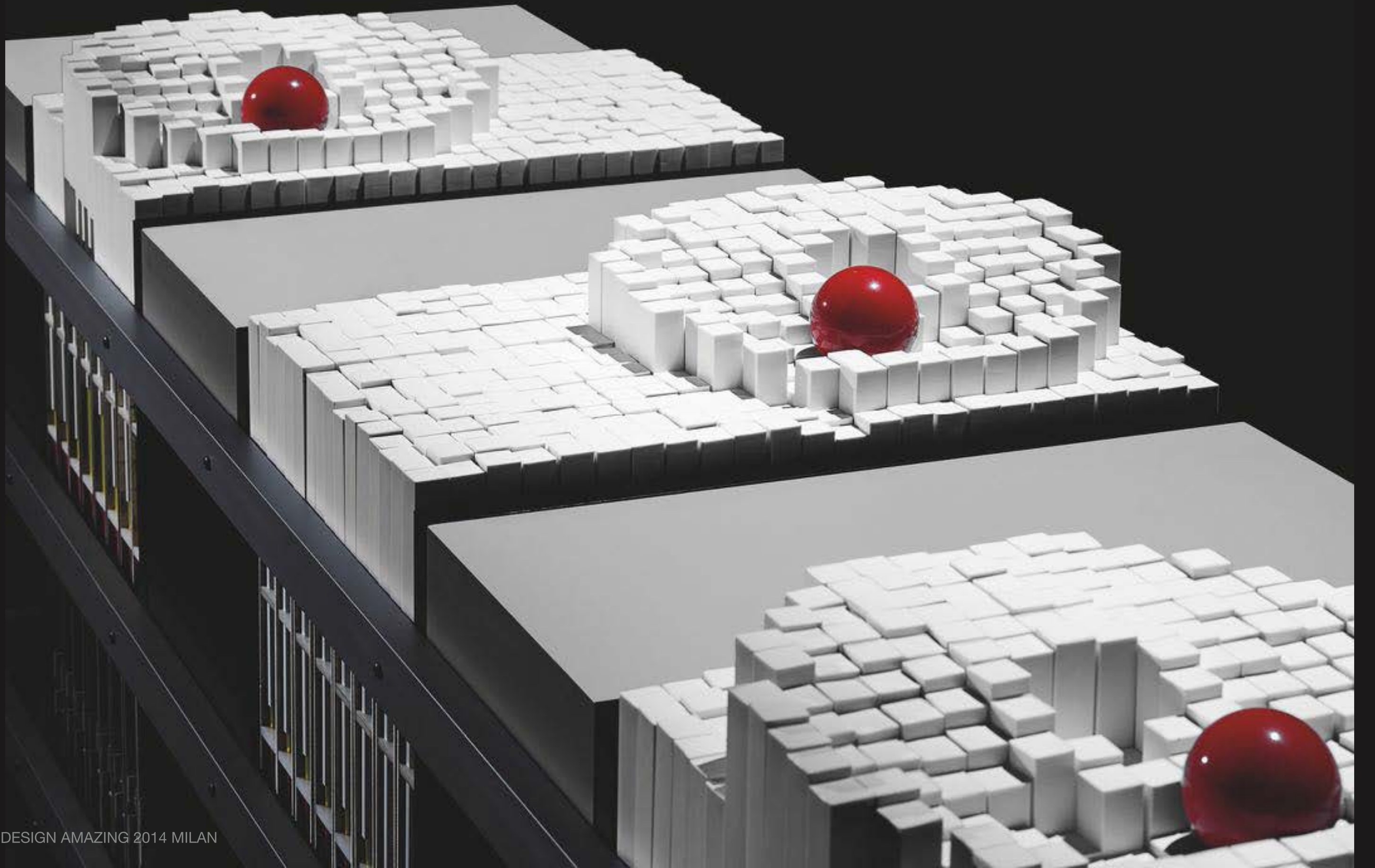
~100 said "Amazing!"



TRANSFORM

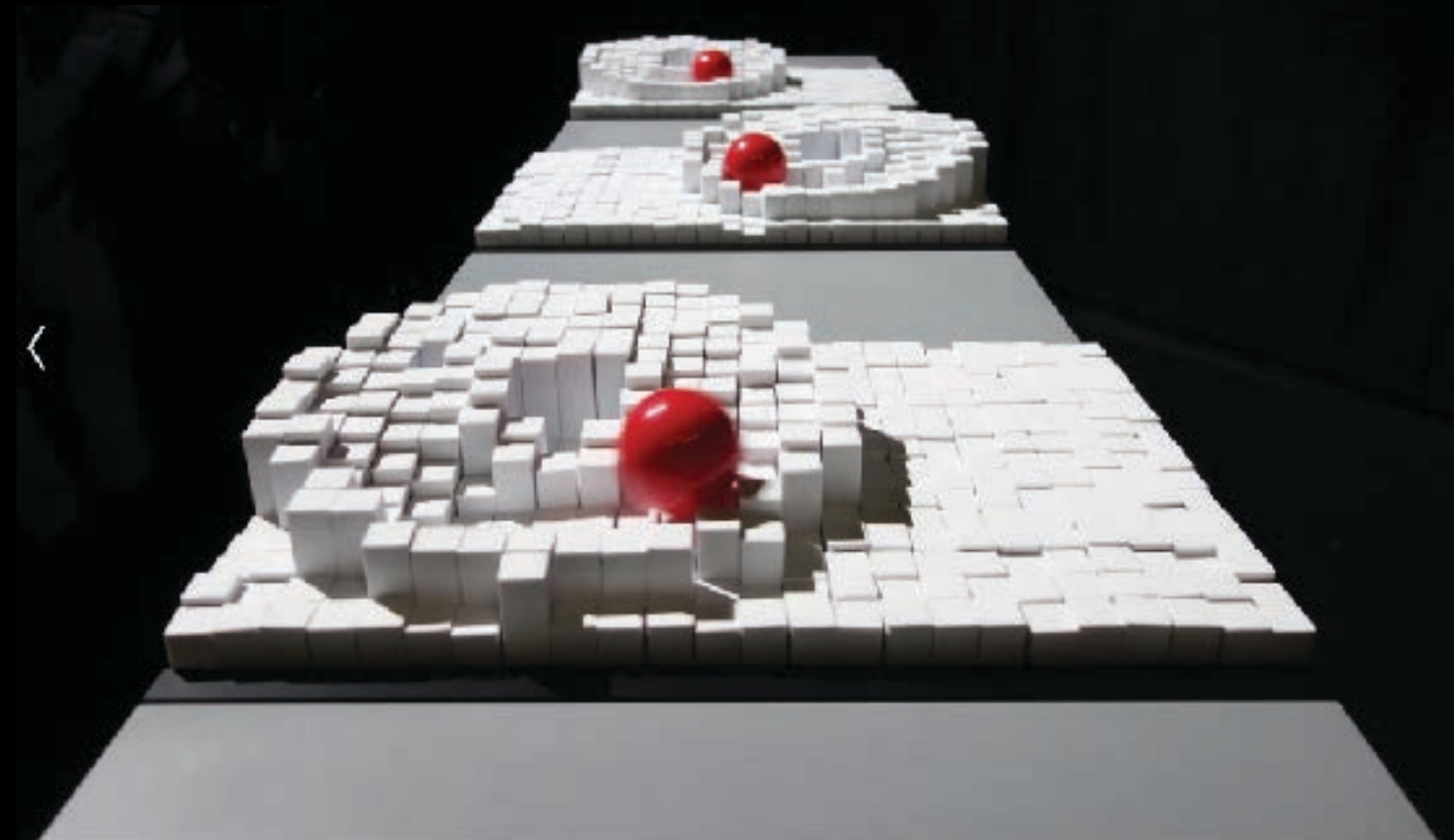
Lexus Design Amazing 2014 Milan
MIT Media Lab | Tangible Media Group





“Intriguing Elegance through Careful Juxtaposition
of Opposing Elements” - Lfinesse by LEXUS

Design vs Technology
Stillness vs Motion
Atoms vs Bits





Tangible Media Group | MIT Media Lab
@ LEXUS DESIGN AMAZING 2014 MILAN

the team



Prof. Hiroshi Ishii
Concept Design



Daniel Leithinger
Engine Design



Sean Follmer
Engine Design



Amit Zoran
Product Design

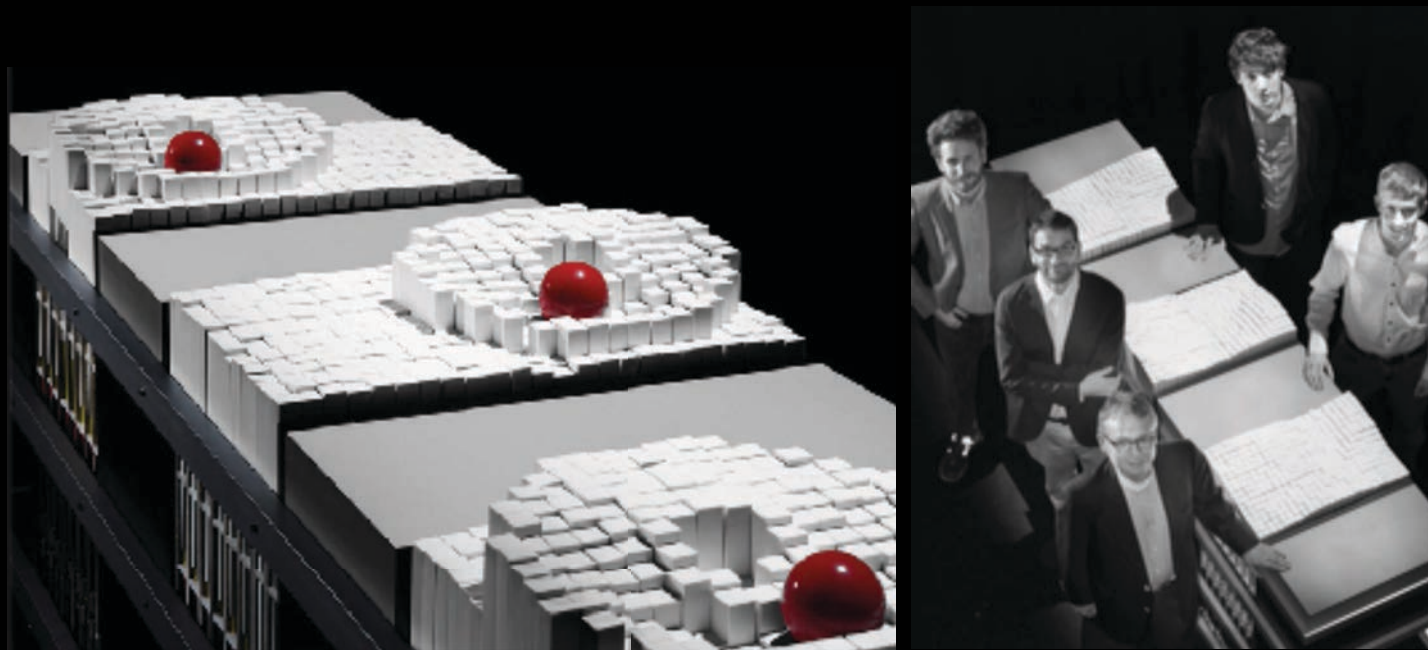


Philipp Schoessler
Motion Design

Milano Design Week 2014

TRANSFORM Exhibit

04/08-13/14, Milano, Italia



Prof. Hiroshi Ishii
Daniel Leithinger
Dr. Sean Follmer
Dr. Amit Zoran
Philipp Schoessler
Jared Counts



Platinum A'DESIGN AWARD 2015



Hiroshi Ishii
Tangible Media Group
MIT Media Lab

CHI 2015 Golden Mouse Award

TRANSFORM

AS ADAPTIVE AND DYNAMIC FURNITURE

LUKE VINK • VIIRJ KAN • KEN NAKAGAKI • DANIEL LEITHINGER
SEAN FOLLMER • PHILIPP SCHOESSLER • AMIT ZORAN • HIROSHI ISHII

Luke Vink, Viirj Kan, Ken Nakagaki, Daniel Leithinger, Sean Follmer, Philipp Schoessler, Amit Zoran, and Hiroshi Ishii
Tangible Media Group | MIT Media Lab

MATERIABLE



RENDERING DYNAMIC MATERIAL PROPERTIES IN RESPONSE TO
DIRECT PHYSICAL TOUCH WITH SHAPE CHANGING INTERFACES

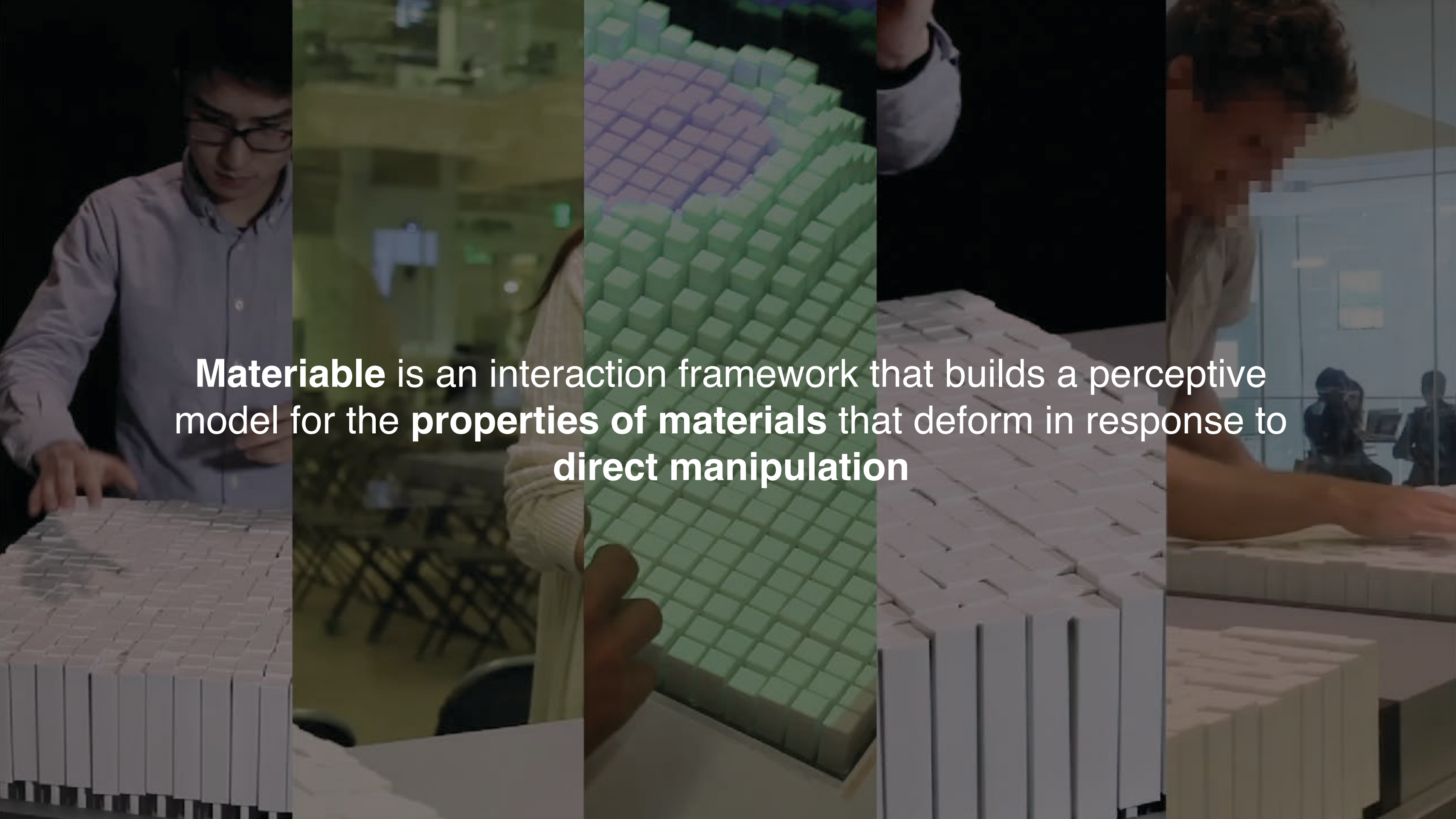
KEN NAKAGAKI* • LUKE VINK* • JARED COUNTS • DANIEL WINDHAM •
DANIEL LEITHINGER • SEAN FOLLMER • HIROSHI ISHII



MIT Media Lab

CHI 2016

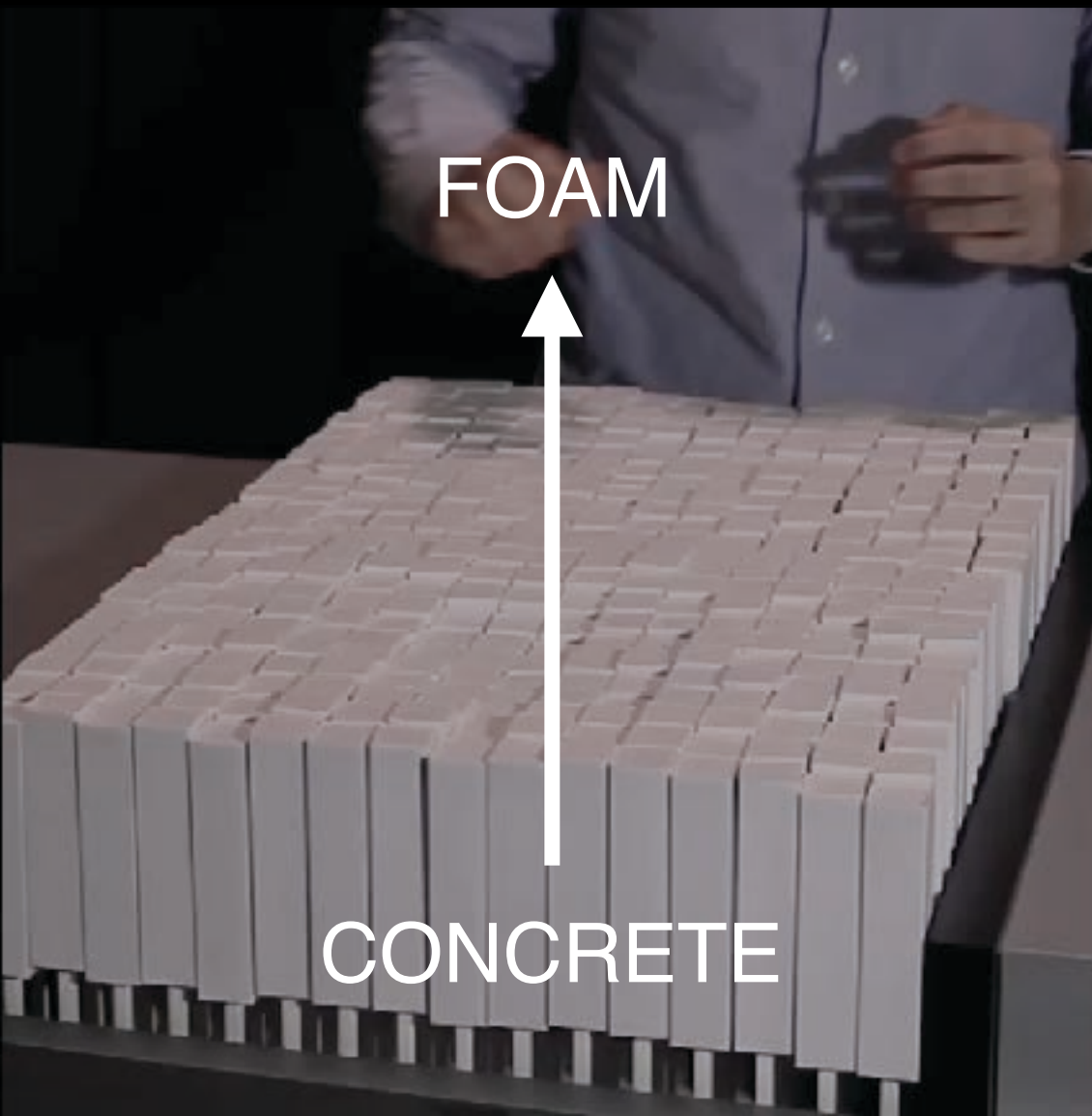
*Contributed Equally



Material is an interaction framework that builds a perceptive model for the **properties of materials** that deform in response to **direct manipulation**

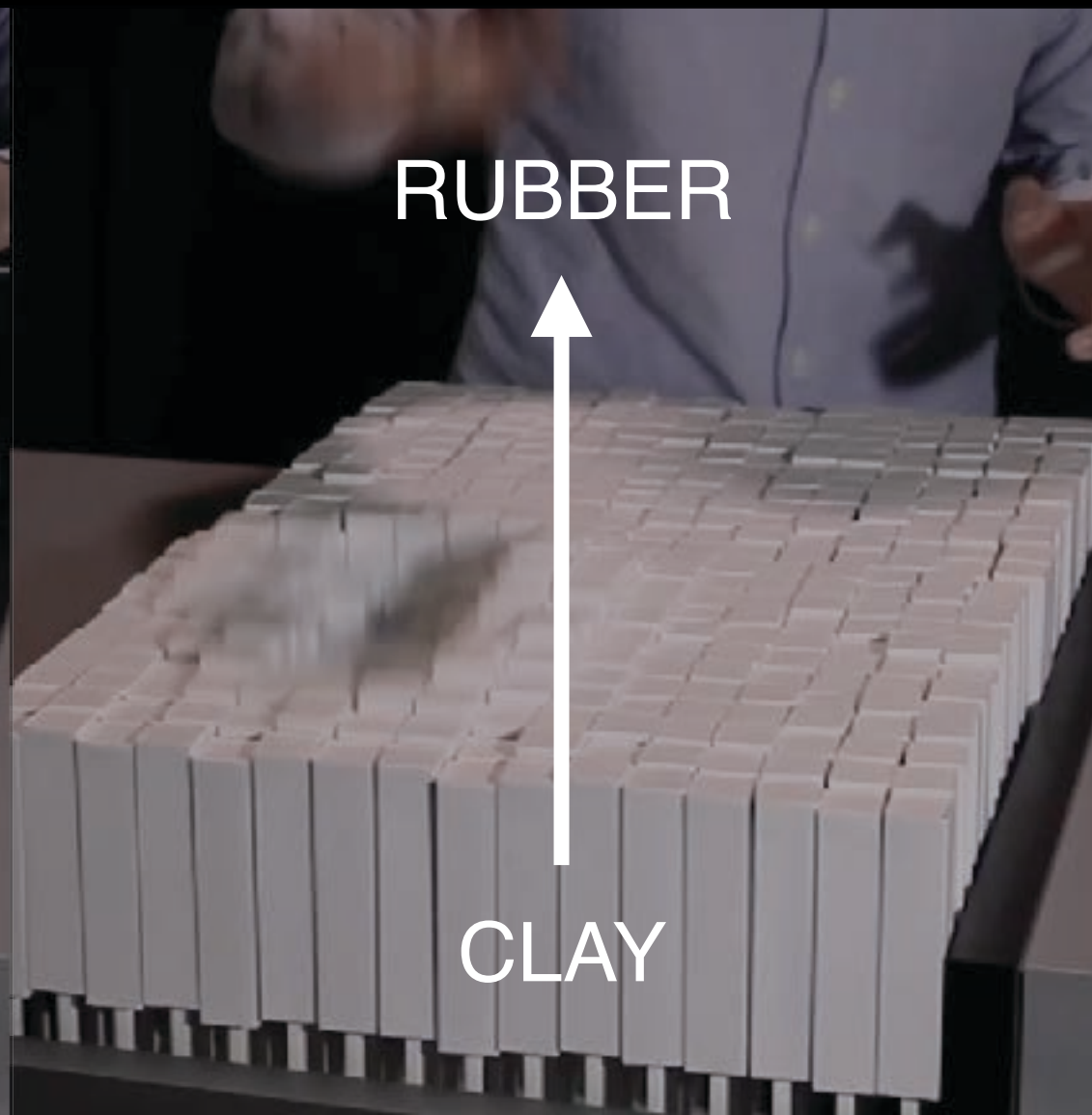
FLEXIBILITY

The extent to which a material can be **deformed** in response to an applied force



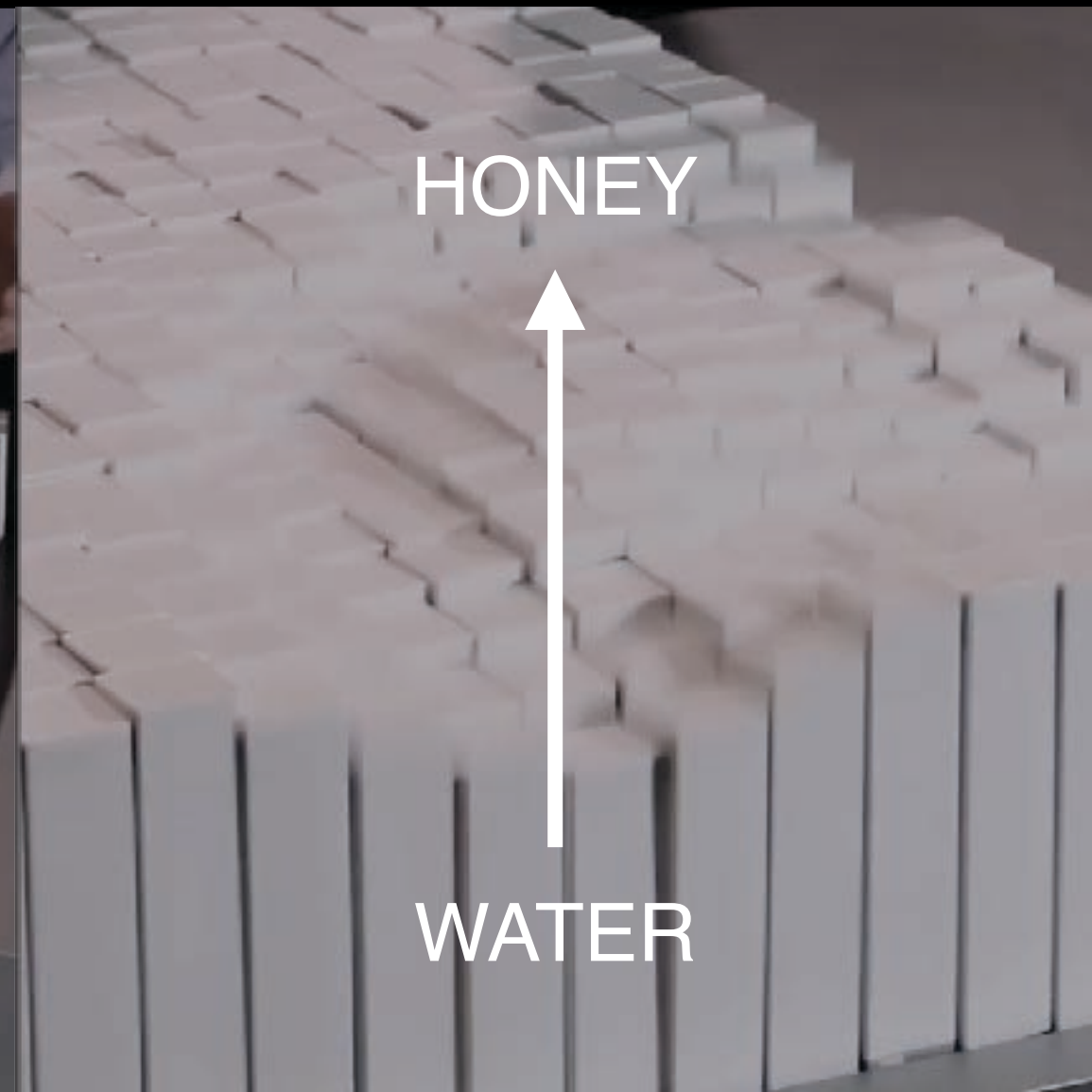
ELASTICITY

The ability for a material to **resist** an applied force and to **return** to its original shape



VISCOSITY

A measure of a fluid's **resistance to gradual deformation** by shear stress or tensile stress



Relief + Recompose

SHAPE
CHANGE
+
DIRECT
MANIPULATION



Leithinger et al. (TEI2010, UIST2011, CHI2011)

inForm + TRANSFORM

PHYSICAL
TELEPRESENCE
+
INTERMATERIAL
INTERACTION
+
DYNAMIC
AFFORDANCES

Follmer, Leithinger, et al. (UIST2013, UIST2014)

inForm @CH + TRANSFORM

MATERIAL PROPERTY
INTERACTION

Nakagaki, Vink, et al. (CHI 2016)

radical atoms
2012



tangible bits
1997

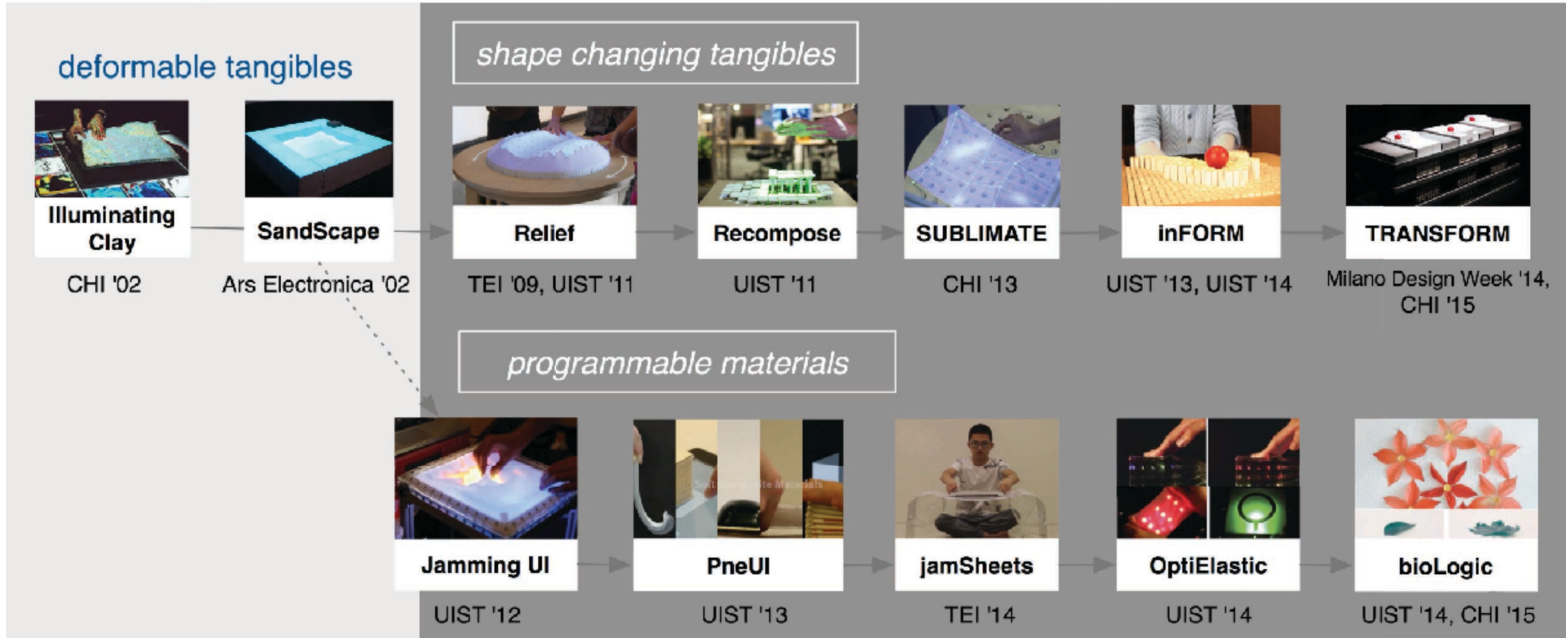


Radical Atoms

Dynamic Future Material that
Transform, Conform & Inform

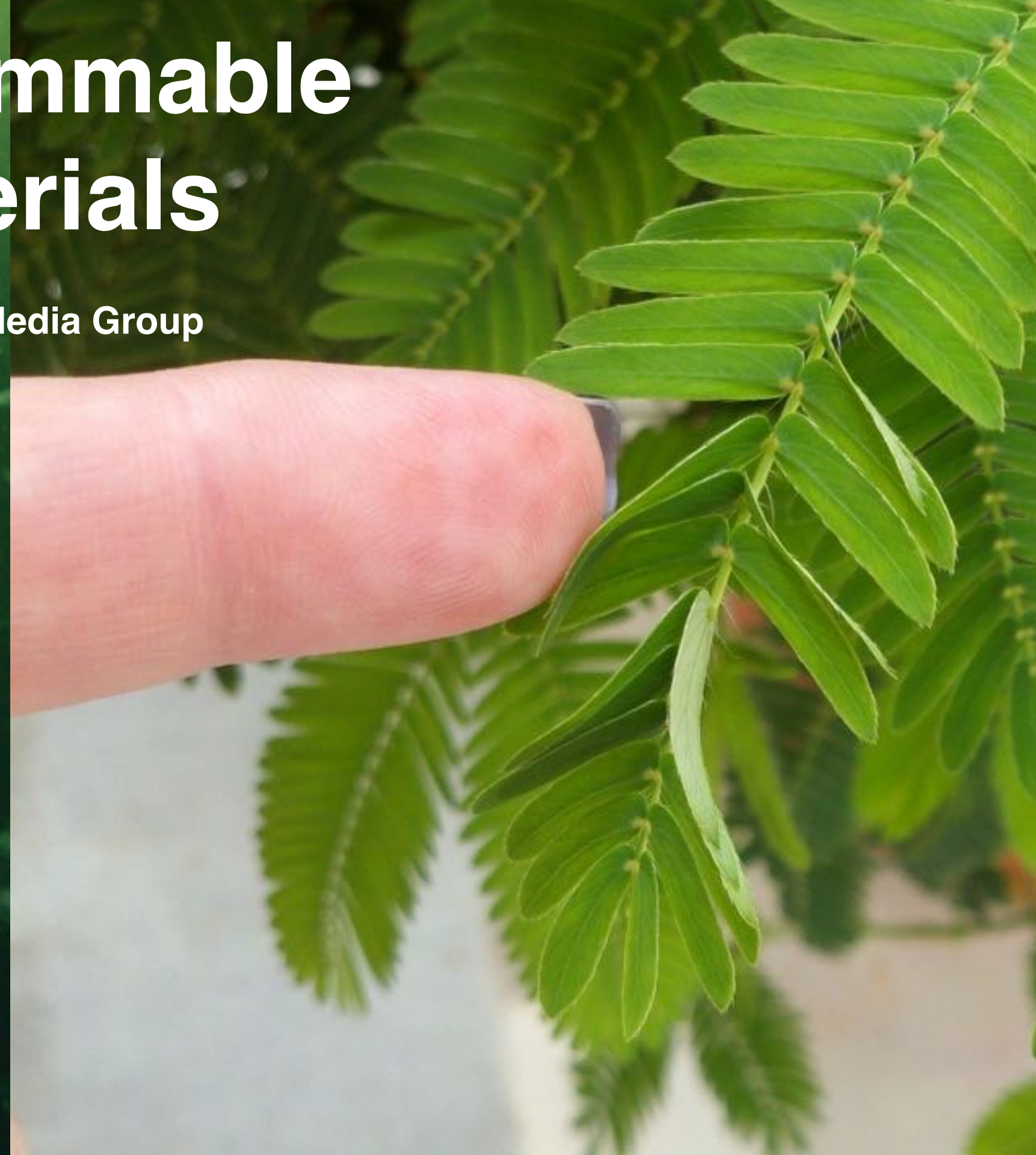
Radical Atoms: Dynamic Shape Displays & Programmable Materials

static / passive → kinetic / active




Programmable Materials

Tangible Media Group



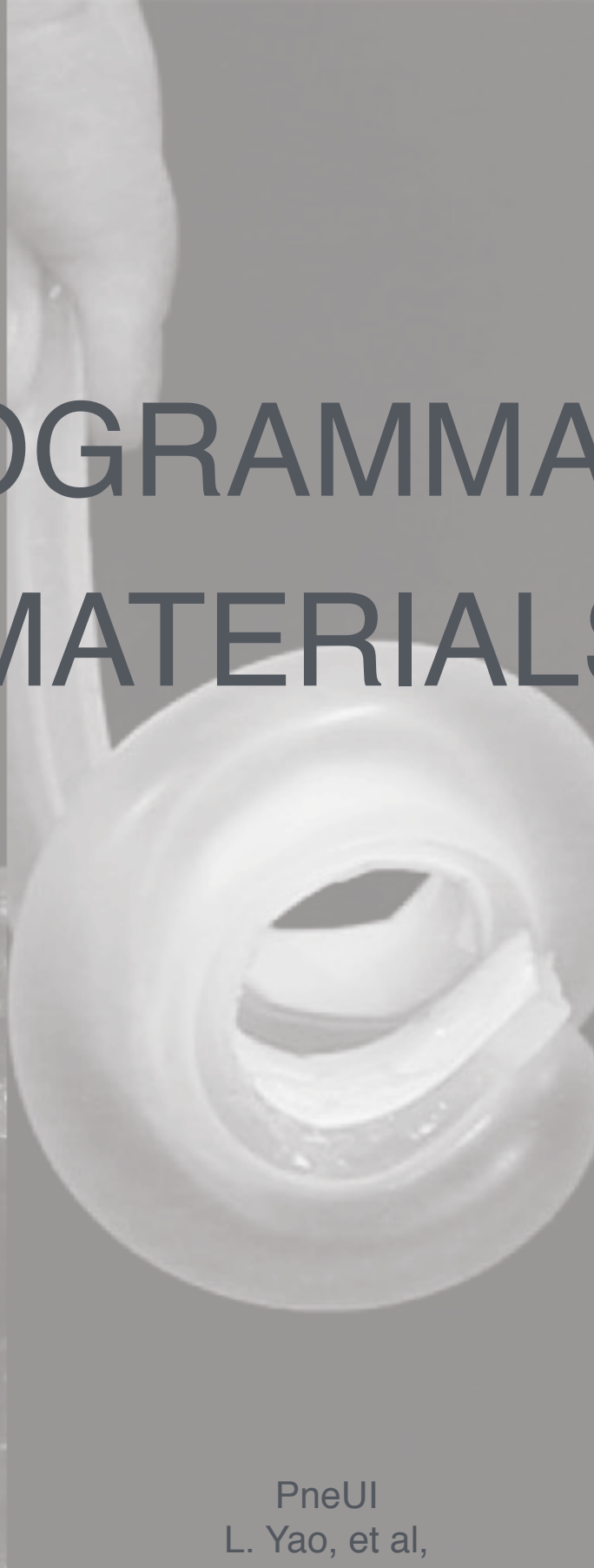
PROGRAMMABLE MATERIALS




jamSheets,
J. Ou, et al,
TEI (2014)




optiElastic
L. Yao, et al,
UIST(2014)



PneUI
L. Yao, et al,
UIST(2013)



bioLogic
L. Yao, et al,
CHI(2015)



Cillia,
J. Ou, et al,
CHI (2016)

PneUI (2013): Programmable Materials (1)



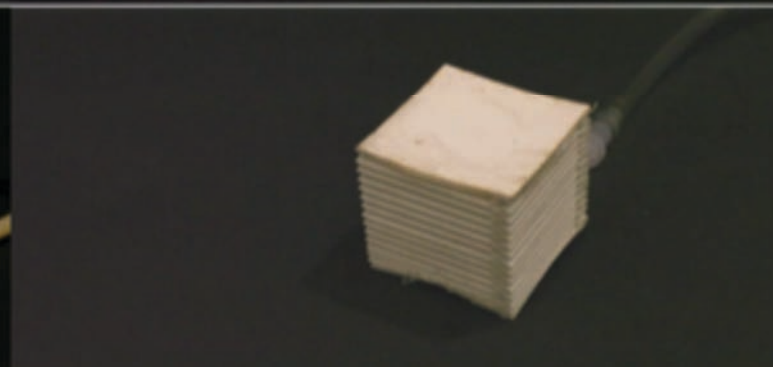
Curvature on Surfaces: Bending and Curling



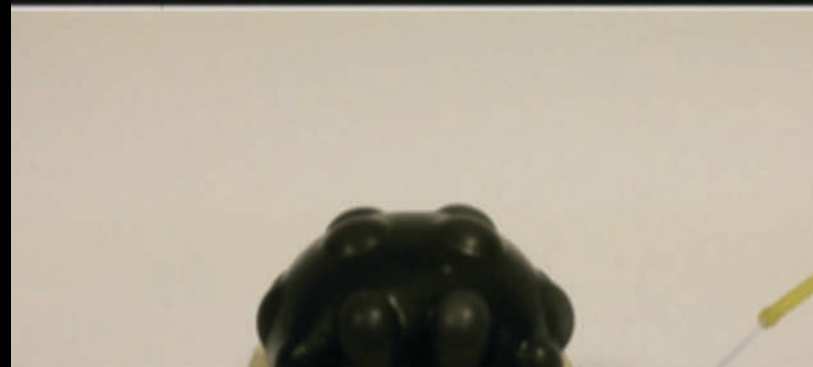
Composite Thin and Flexible Circuitry



Unidirectional Volume Change of Solid Geometries



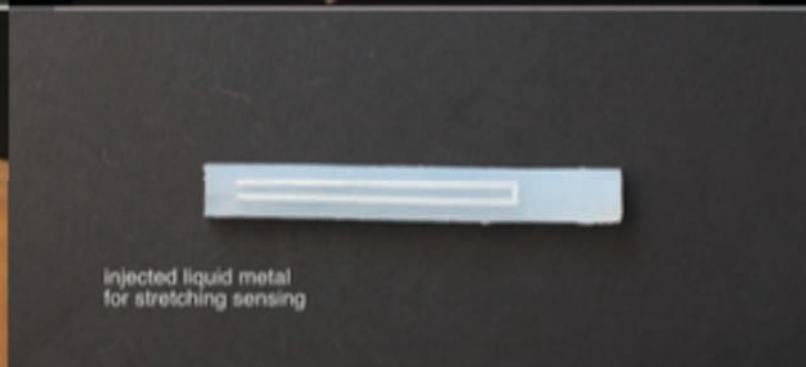
Composite Sensors on Folding Structures



Dynamic Texture Change



macro + micro airbags in elastomer



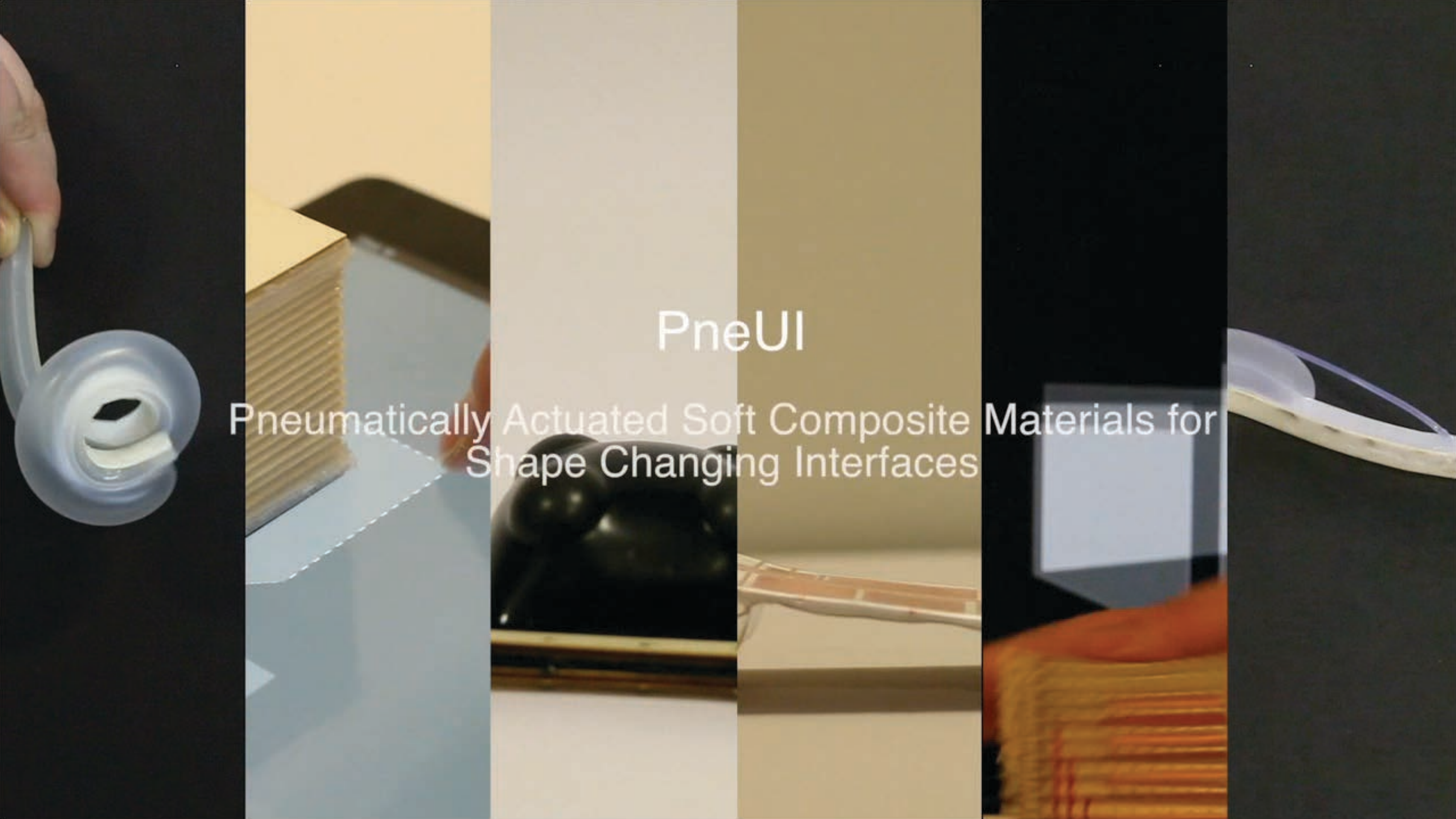
injected liquid metal for stretching sensing

Composite Liquid Metal in Elastomeric Channels



Sensing inflation

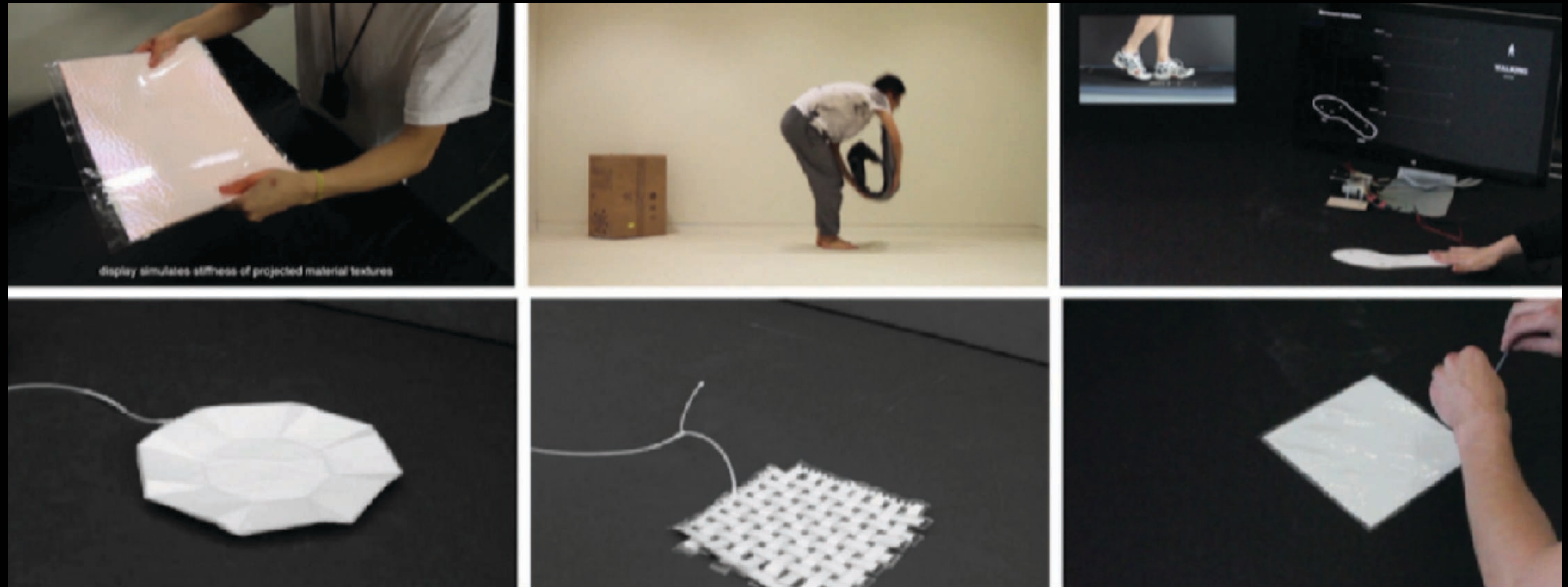




PneUI

Pneumatically Actuated Soft Composite Materials for Shape Changing Interfaces


jamSheets (TEI 2014)





Cillia - 3D Printed Functional Hair Structure

Jifei Ou, Gershon Dublon, Chin-Yi Cheng, Liang Zhou, Felix Heibeck and Hiroshi Ishii

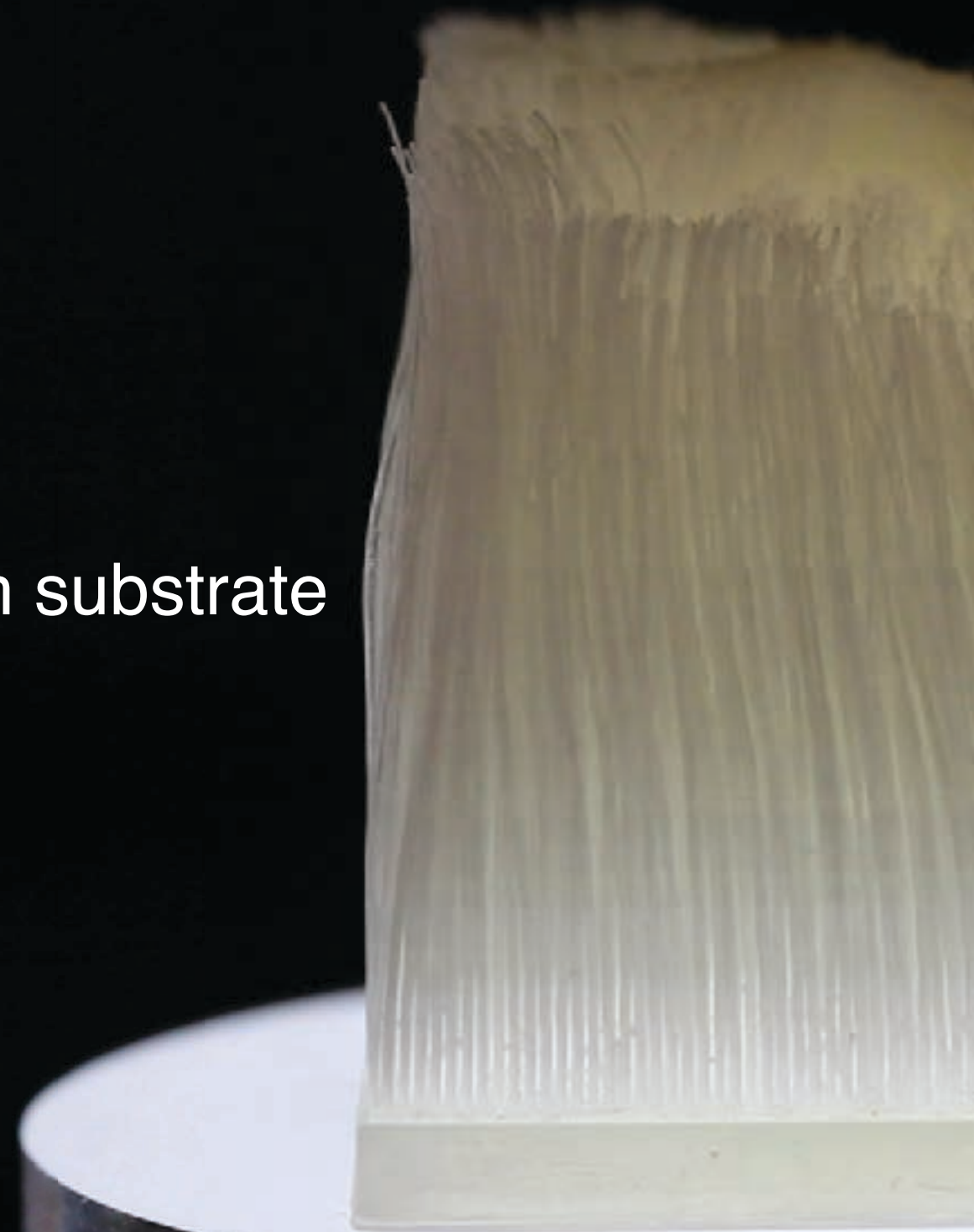


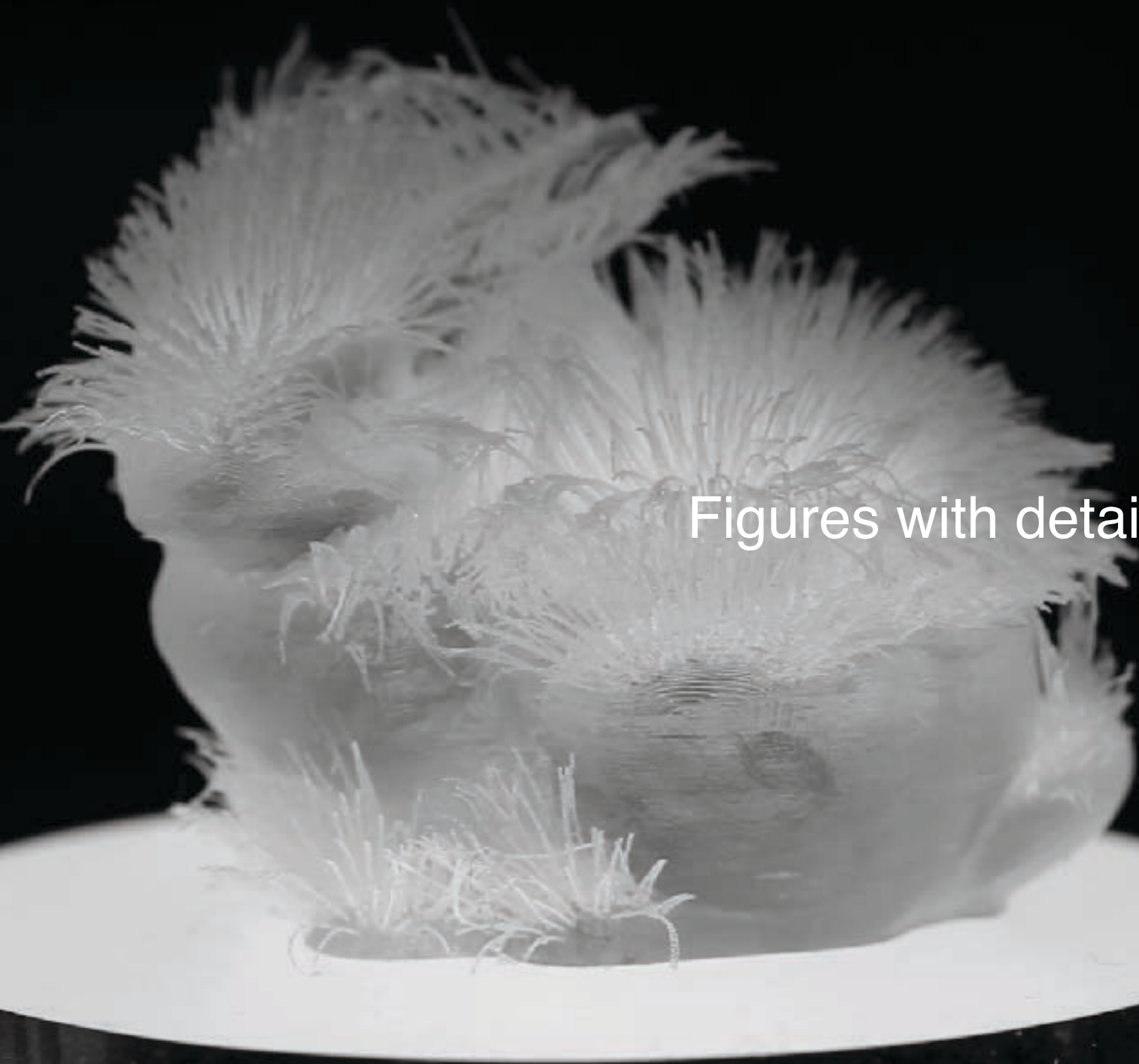
printing figures that have detailed surface texture

Cillia presents a computational method of 3D printing hair structures. It allows us to design and generate hair geometry at 50 micrometer resolution and assign various functionalities to the hair. The ability to fabricate customized hair structures enables us to create super fine surface texture; mechanical adhesion property; new passive actuators and touch sensors on a 3D printed artifact.

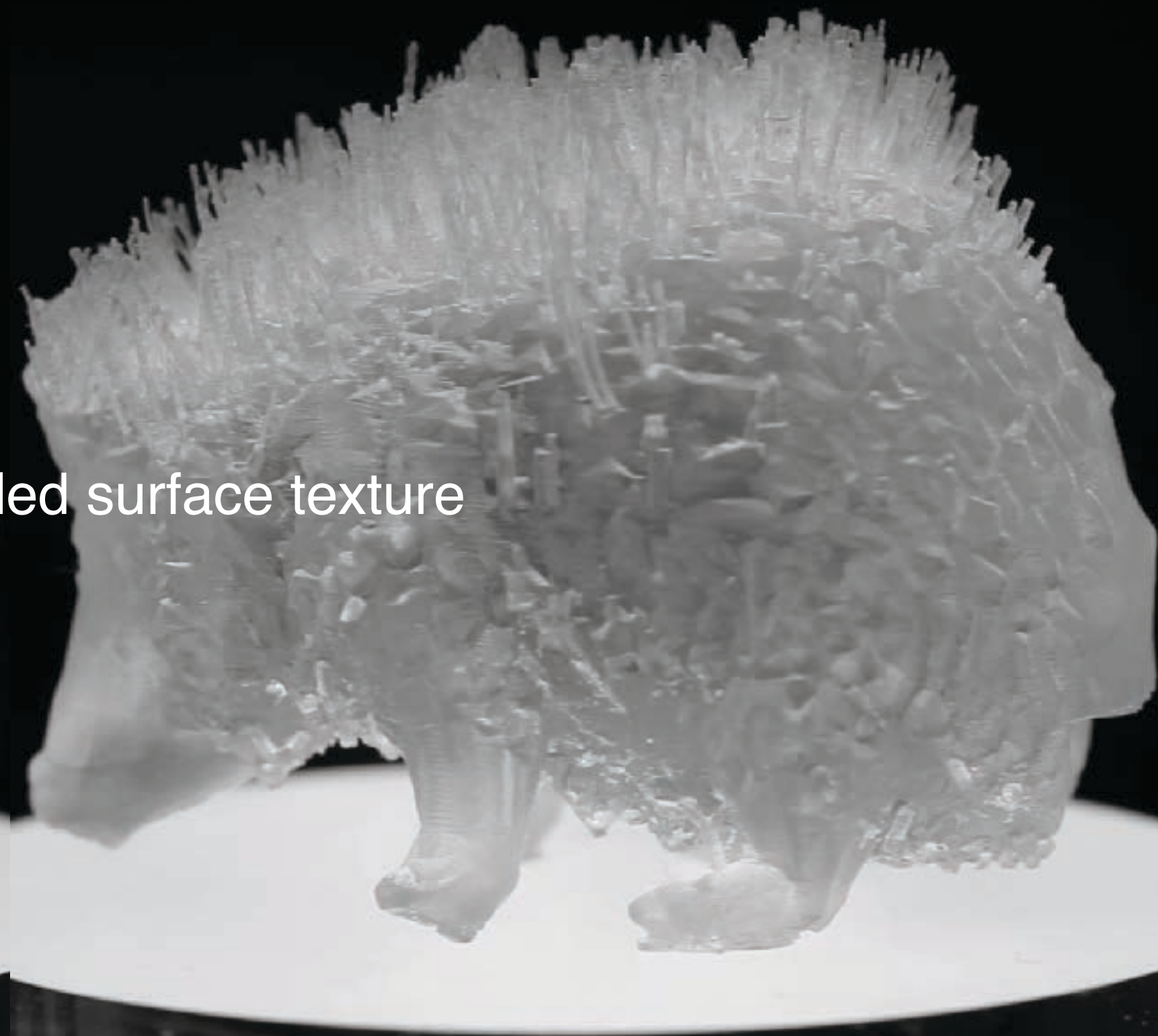


14,400 strands of hair on a 4cm by 4cm substrate





Figures with detailed surface texture



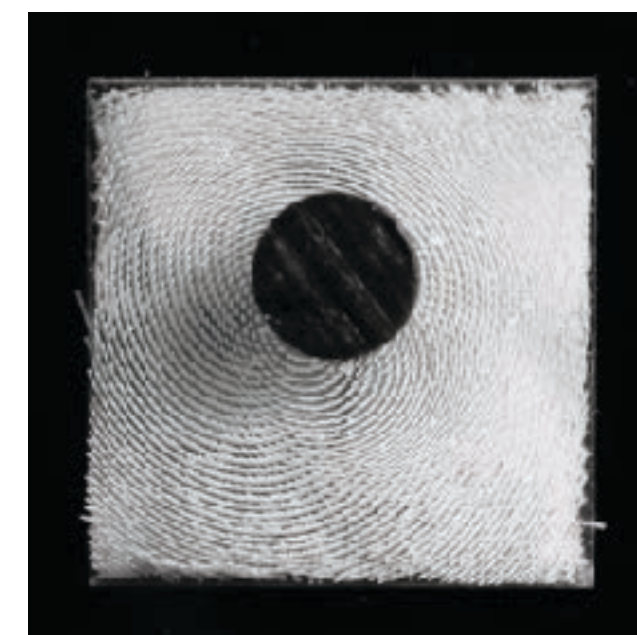
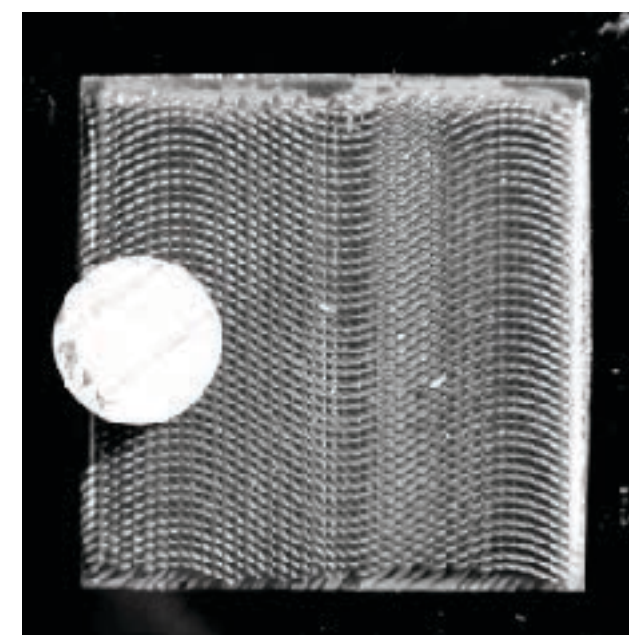
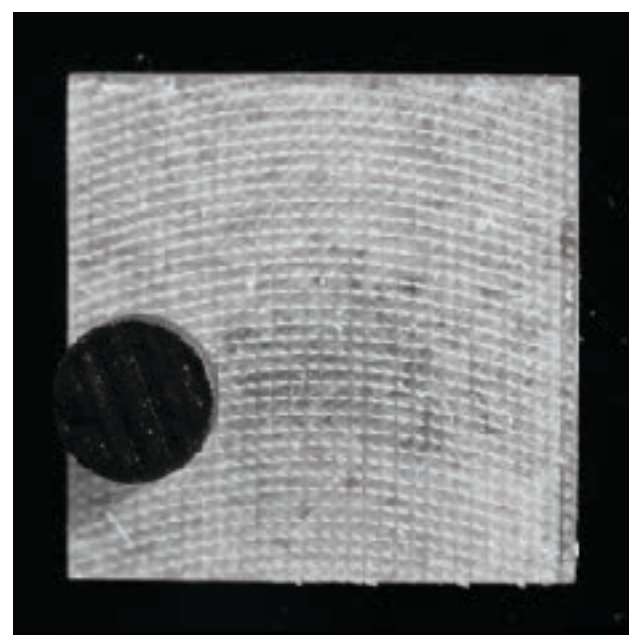
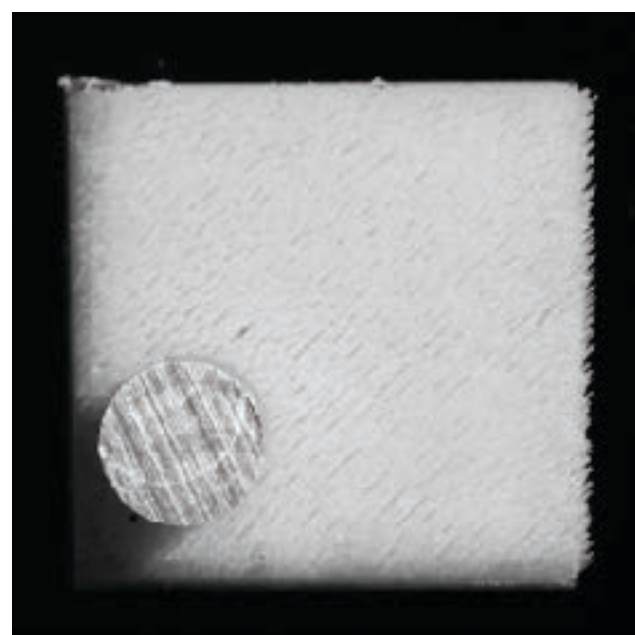
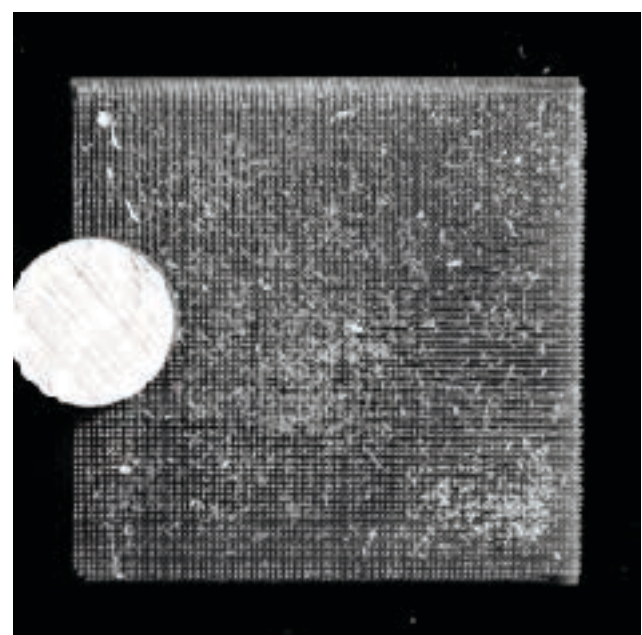
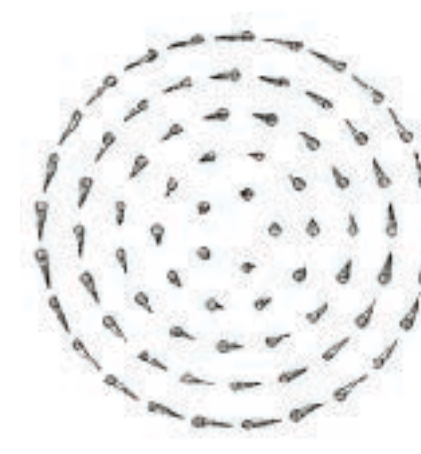
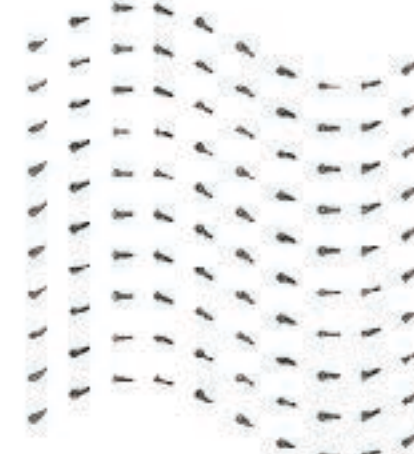
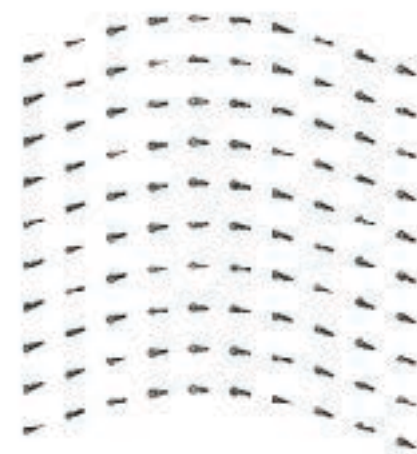
surface with mechanical adhesion



Moving Direction Control

Linear

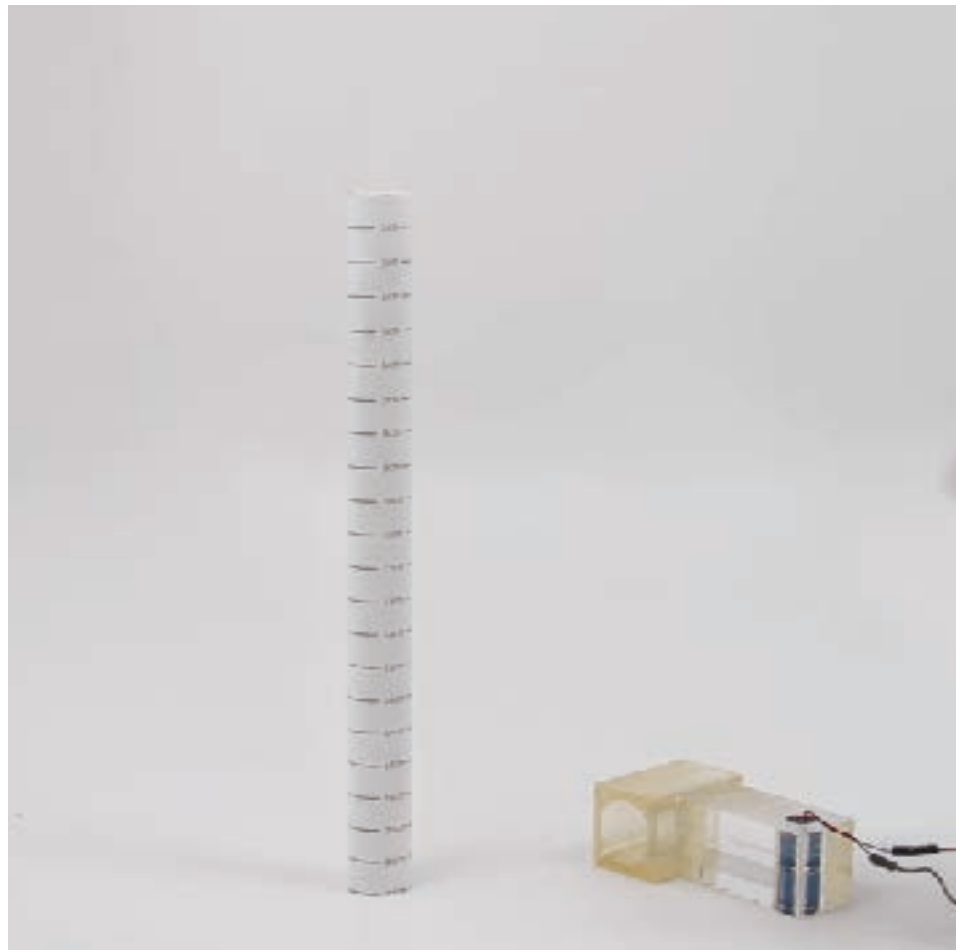
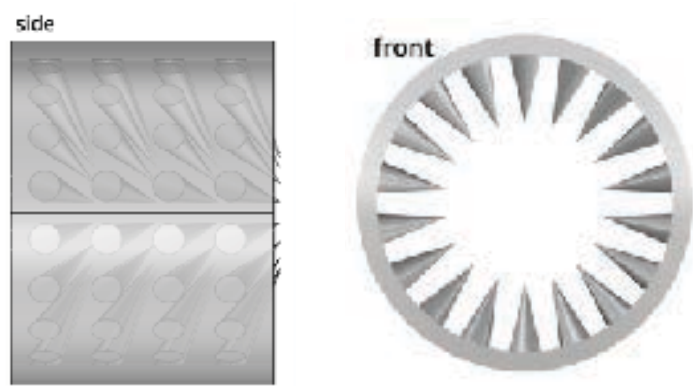
Curved



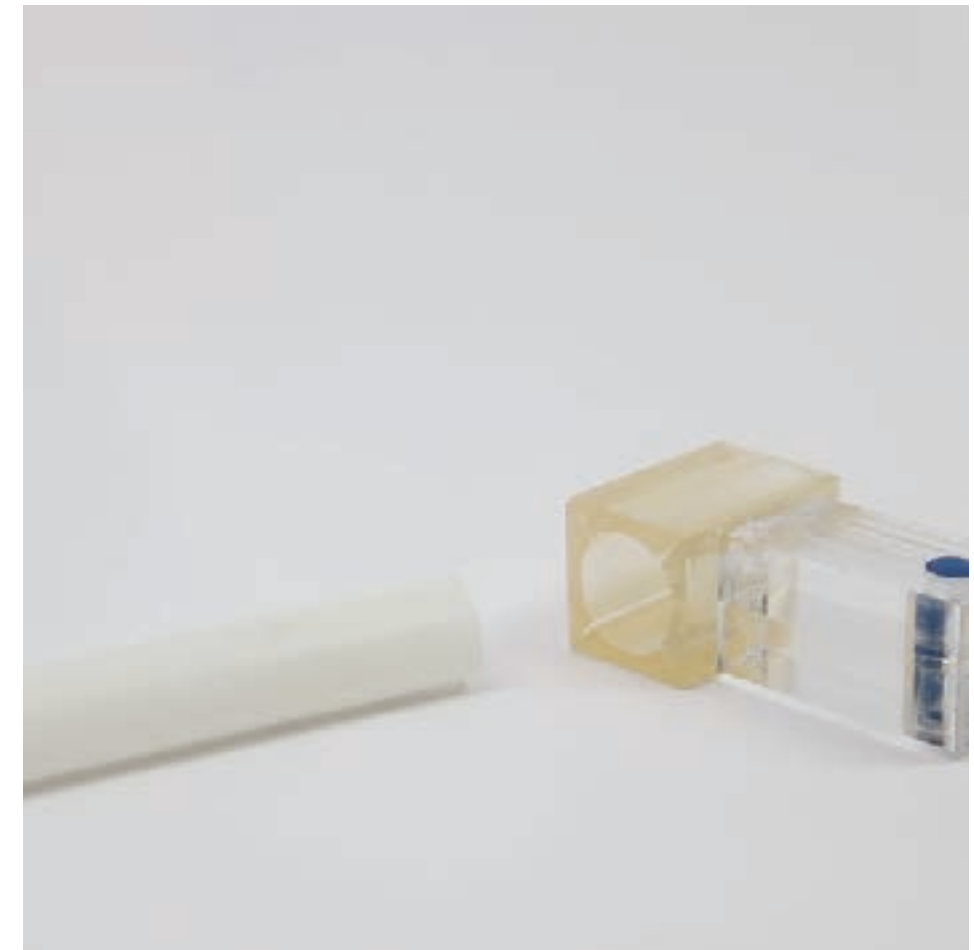
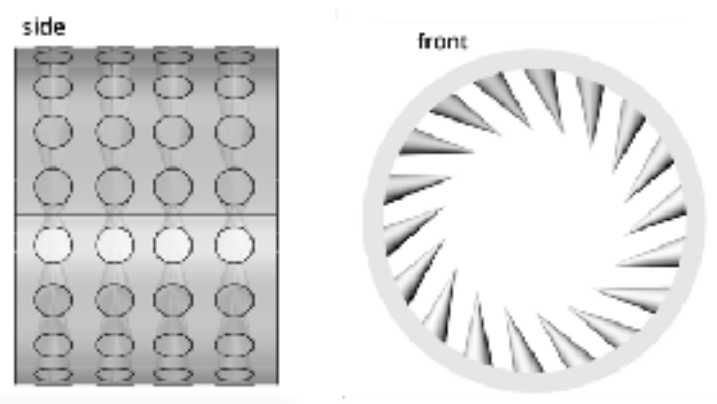


Printed figures with encoded movement

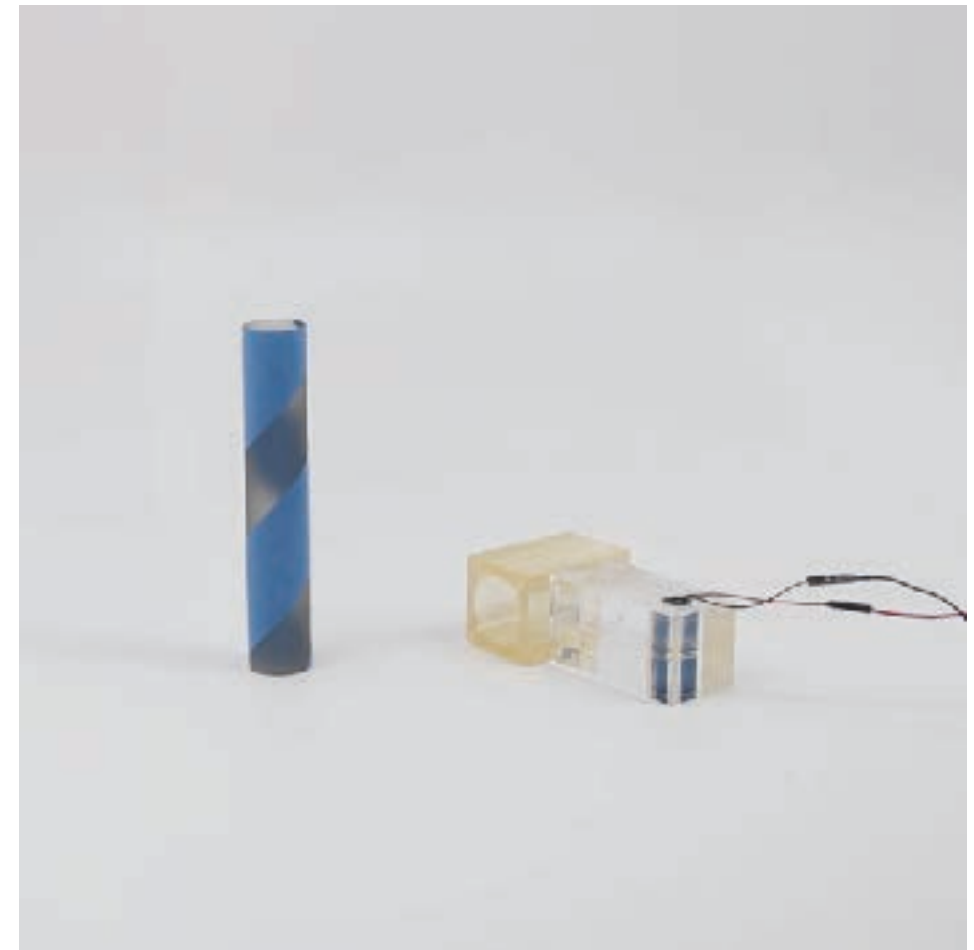
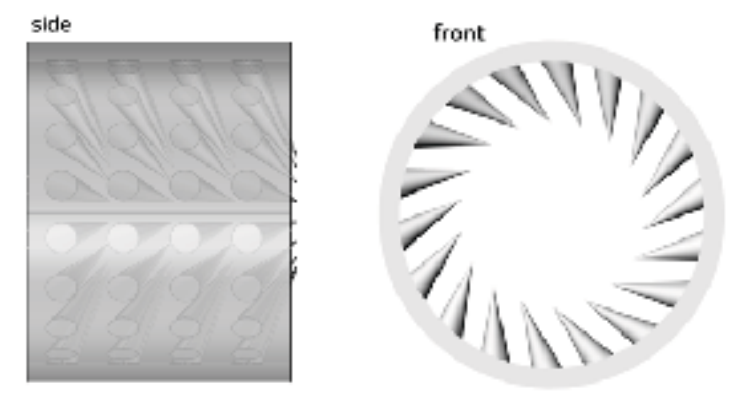
Linear

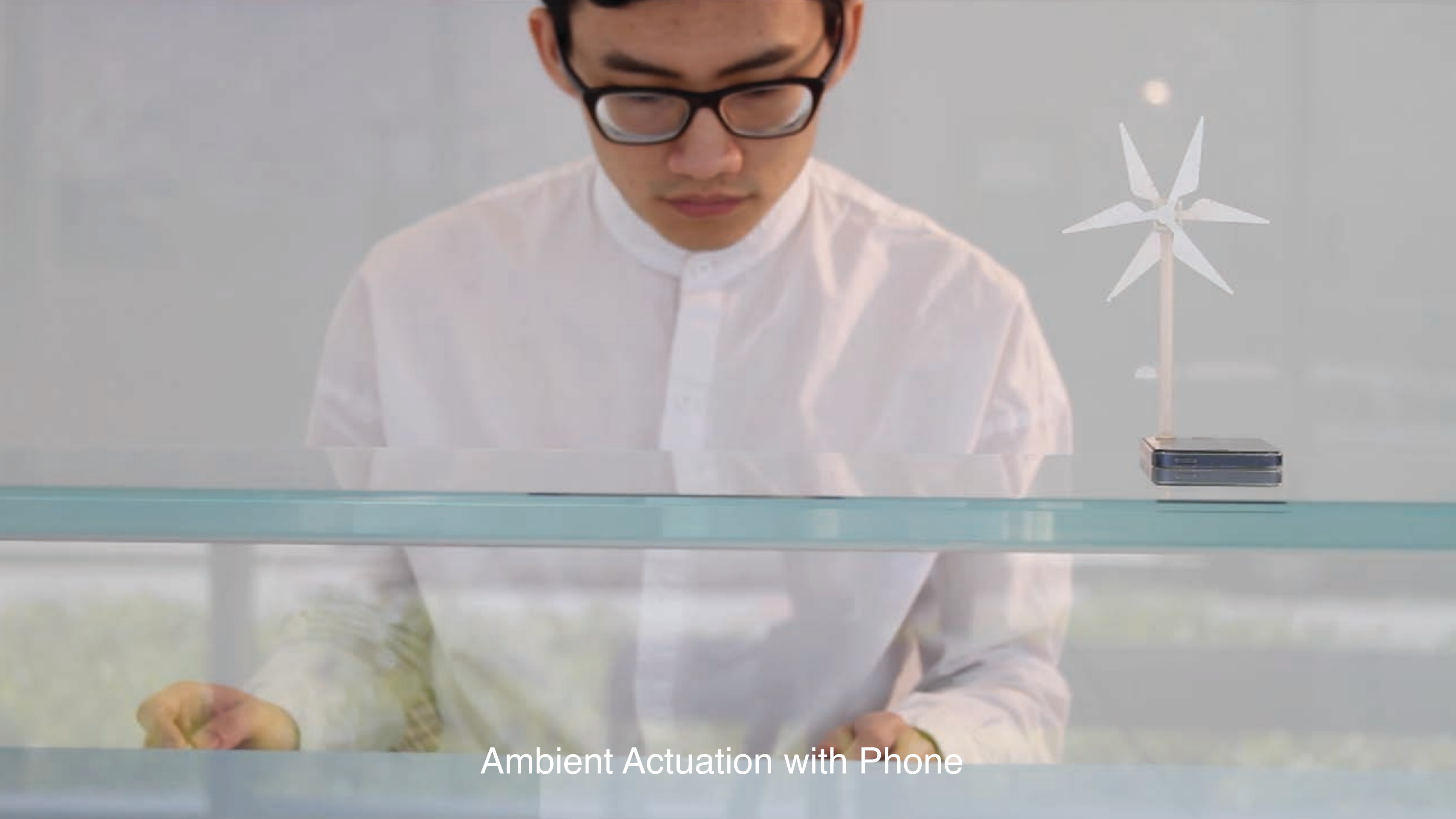


Rotary

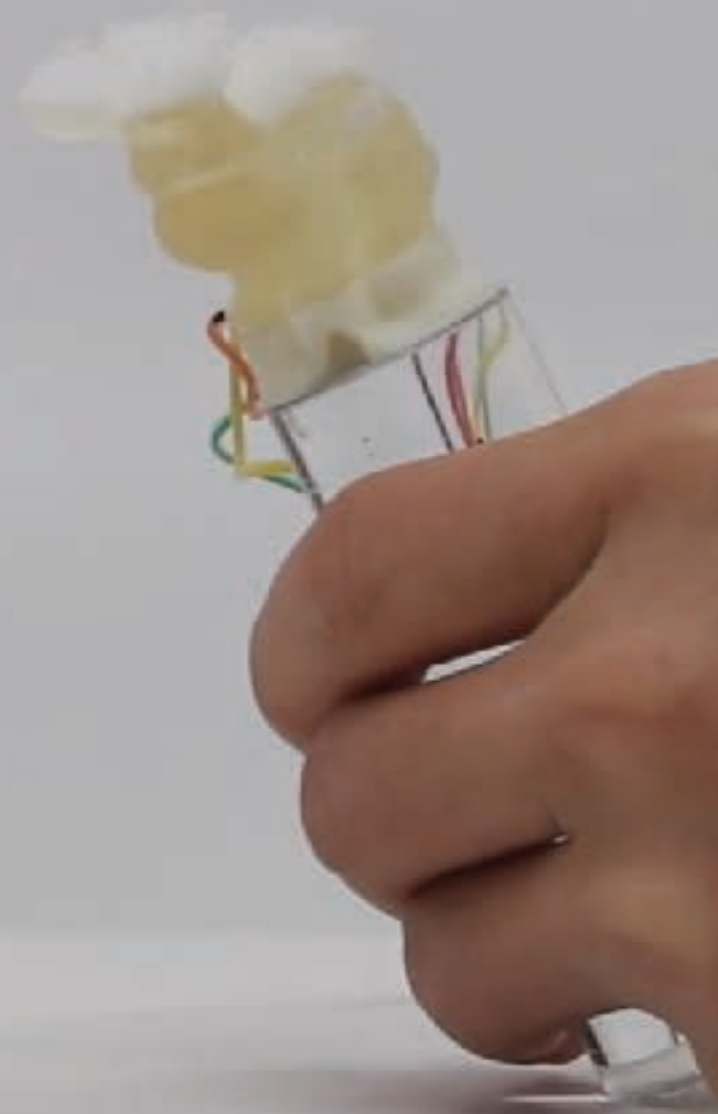


Combined





Ambient Actuation with Phone





Mimosa
Active Transformation



Wheat Awns
Stimuli: Humidity
Passive transformation






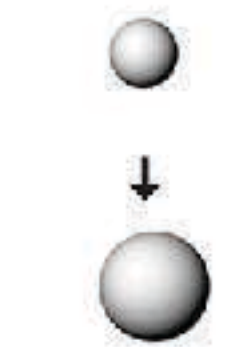



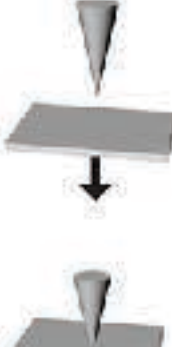



















Venus flytrap leaf
Stimuli: active transformation



Sunflowers
Stimuli: Light
Active transformation





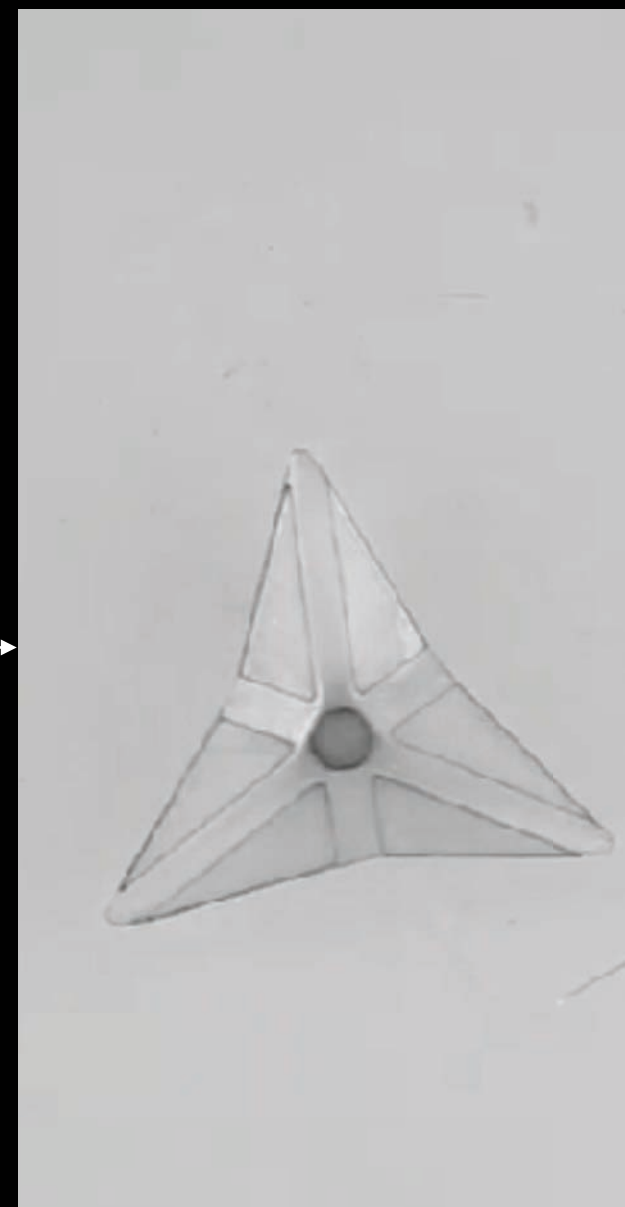
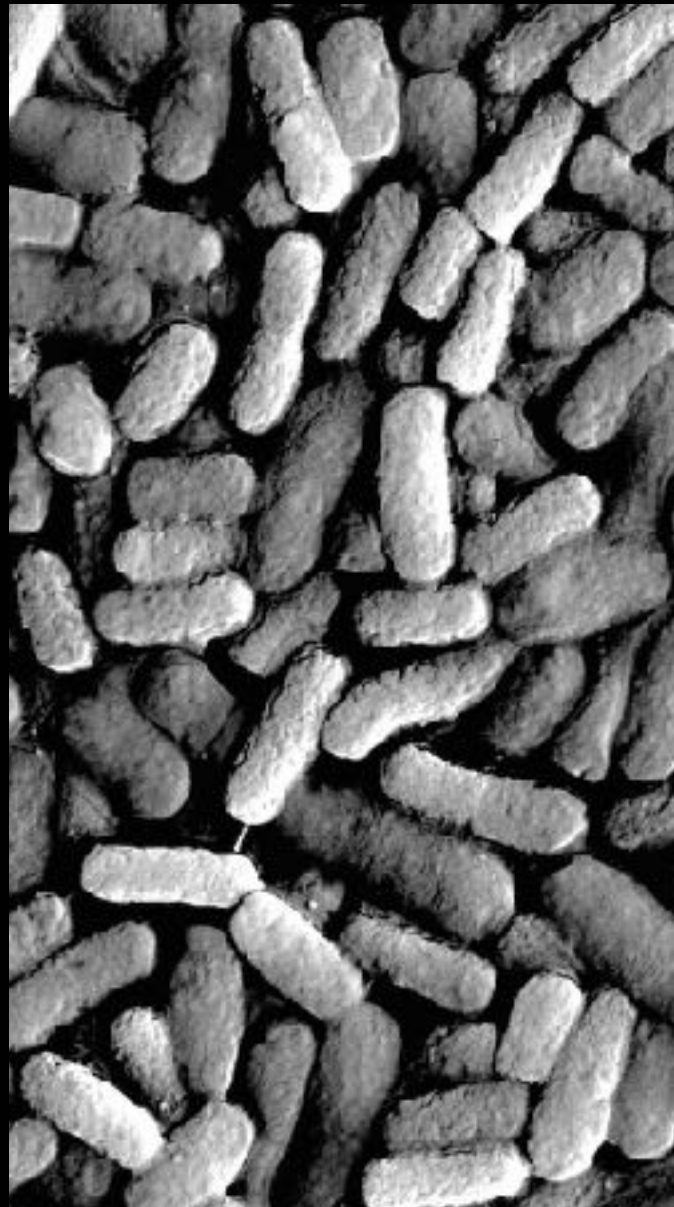
	Orientation		Volume	Spatiality	Permeability	Snap-buckling	Drilling	Growth
2D Bending	2D Coiling (Spiral)	3D Coiling (Helix)						
								
								
								
Pine Cones	<i>Selaginella lepidophylla</i>	Chiral seed pod	Natto Cells	Euglena cells	Lotus pod	Flytrap	Erodium awns	Slim Mold

“Bio is the new Digital”

Nicholas Negroponte 2015

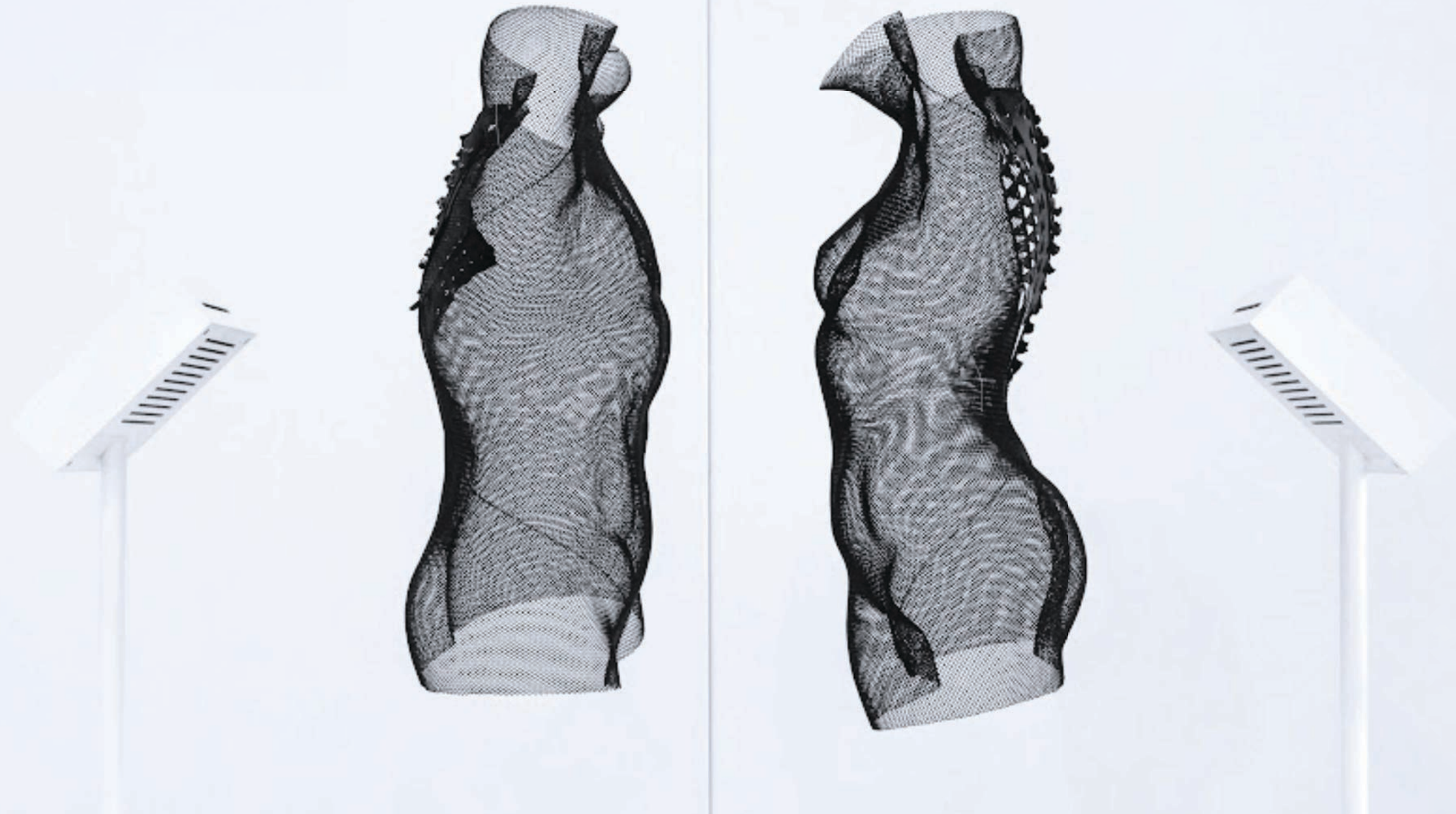


BioLogic



Lining Yao, Jifei Ou, Chin-Yi Cheng, Helene Steiner, Wen Wang, Guanyun Wang, Hiroshi Ishii.
bioLogic: Natto Cells as Nanoactuators for Shape Changing Interfaces. In Proc. of CHI 2015. ACM

“Bio is the new Interface”

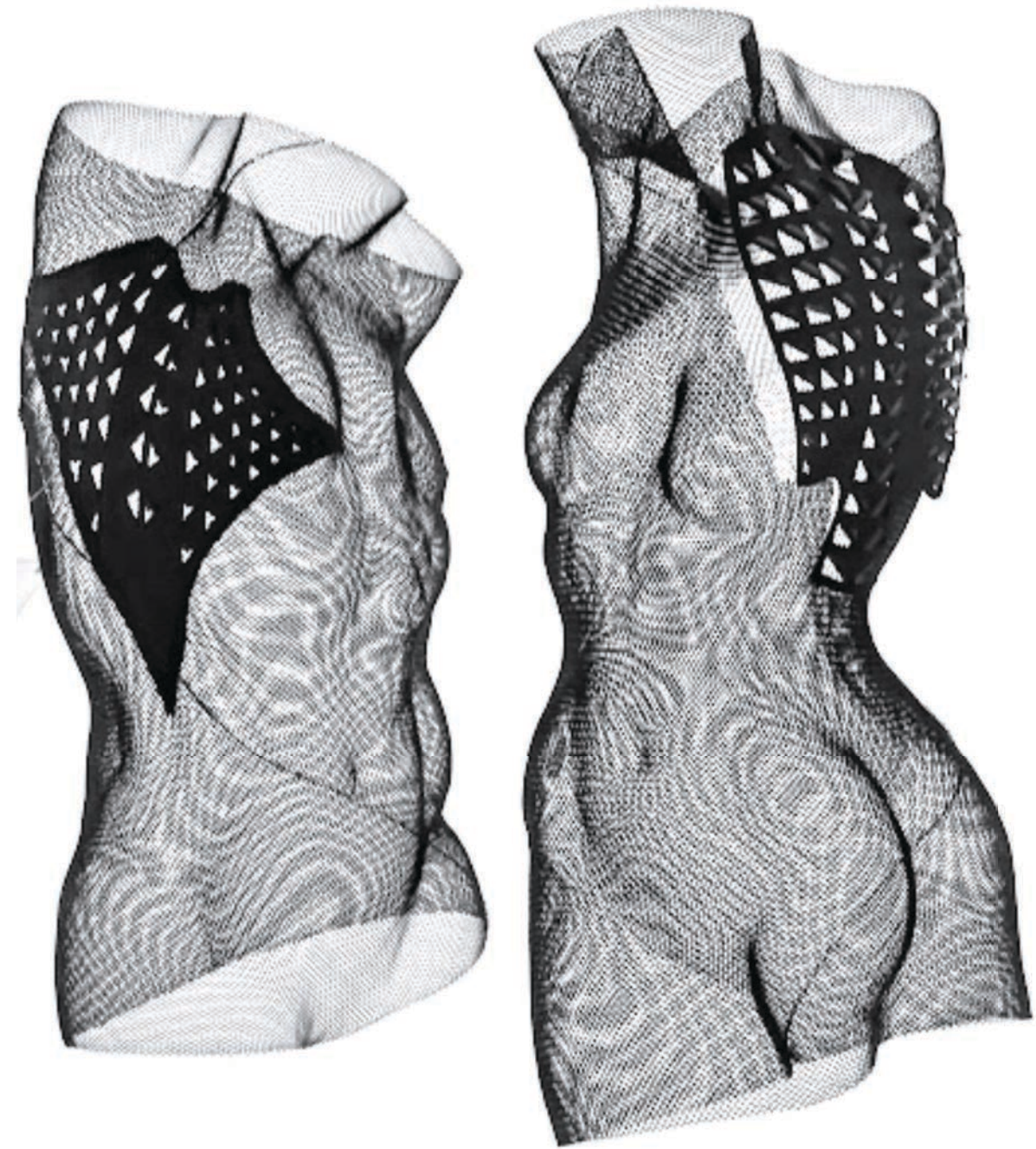


BIOLOGIC

TANGIBLE MEDIA GROUP, MIT MEDIA LAB

“Bio is the new Interface”

Tangible Media Group



bioLogic Exhibit at
MIT Media Lab E14 lobby



BIOLOGIC EXHIBITION

to Celebrate the MIT Media Lab's 30th Anniversary

Tangible Media Group, MIT Media Lab

bioLogic Team



Lining Yao, concept creation, interaction design and fabrication, MIT Media Lab



Wen Wang, biotechnology and material science, MIT Dept. of Chemical Engineering



Guanyun Wang, industrial design and fabrication, MIT Media Lab/Zhejiang University



Helene Steiner, interaction design, MIT Media Lab/Royal College of Art



Chin-Yi Cheng, computational design and simulation, MIT Architecture



Jifei Ou, concept design and fabrication, MIT Media Lab



Oksana Anilionyte, fashion design, MIT Media Lab/Royal College of Art



Prof. Hiroshi Ishii, advising and directing, Tangible Media Group, MIT Media Lab

3 A'DESIGN AWARDS 2016



Textile
Platinum



Wearable
Gold



Fashion
Silver



from build

Man-Made

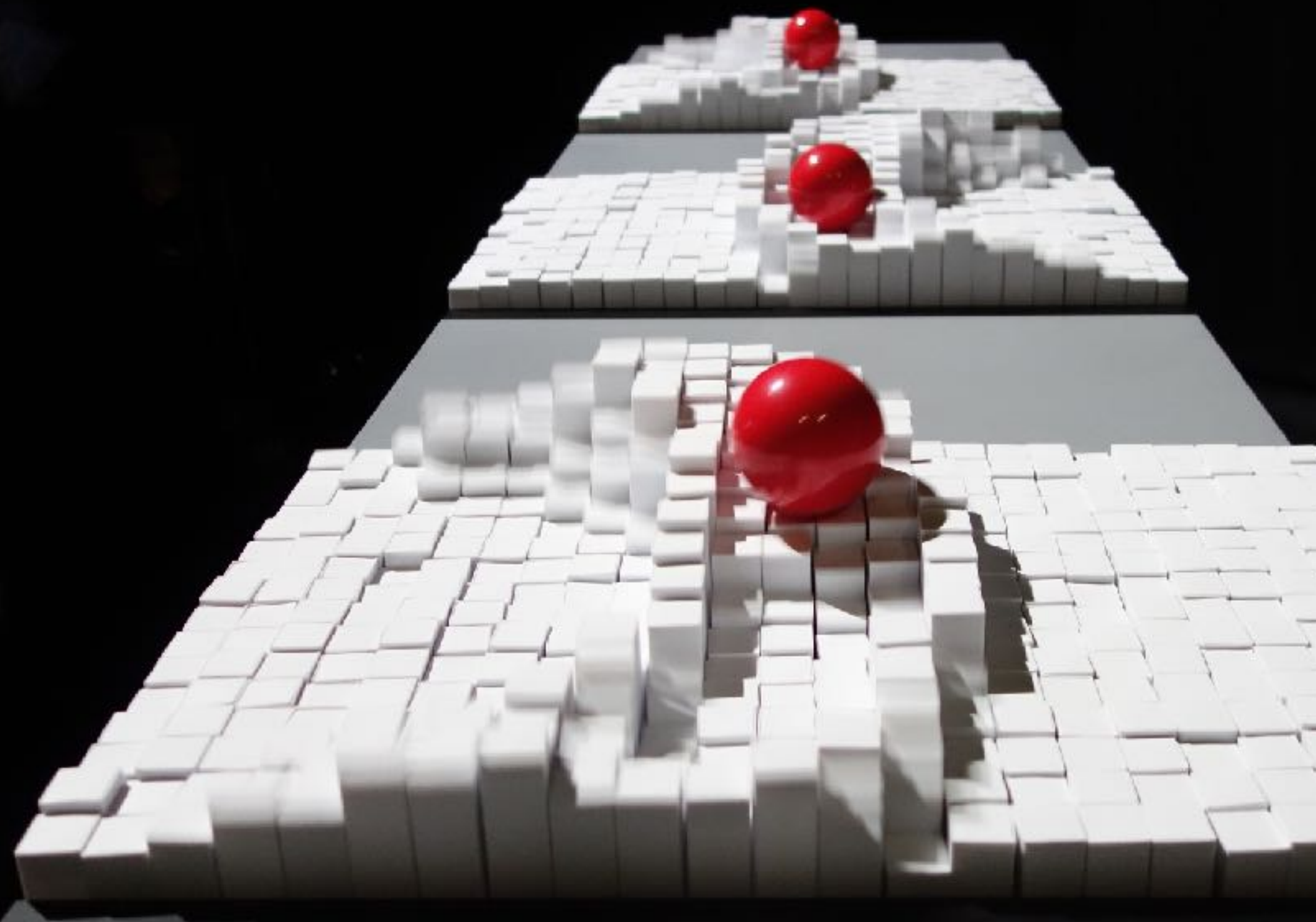


to grow

Nature-Derived



Dance



A futuristic scene with a blue gradient background. In the center, a glowing white sphere is mounted on a thin, dark, vertical stand that sits on a circular, glowing white platform. To the right, another glowing white sphere floats in the air. The word "Levitate" is written in large, white, sans-serif font on the right side of the image. The overall aesthetic is clean and high-tech.

Levitate

ZeroN



Jinha Lee, MIT Media Lab

Rehmi Post, MIT Center for Bits and Atoms

Hiroshi Ishii, MIT Media Lab



ZeroN: Tangible Media Group



Infinite Cube

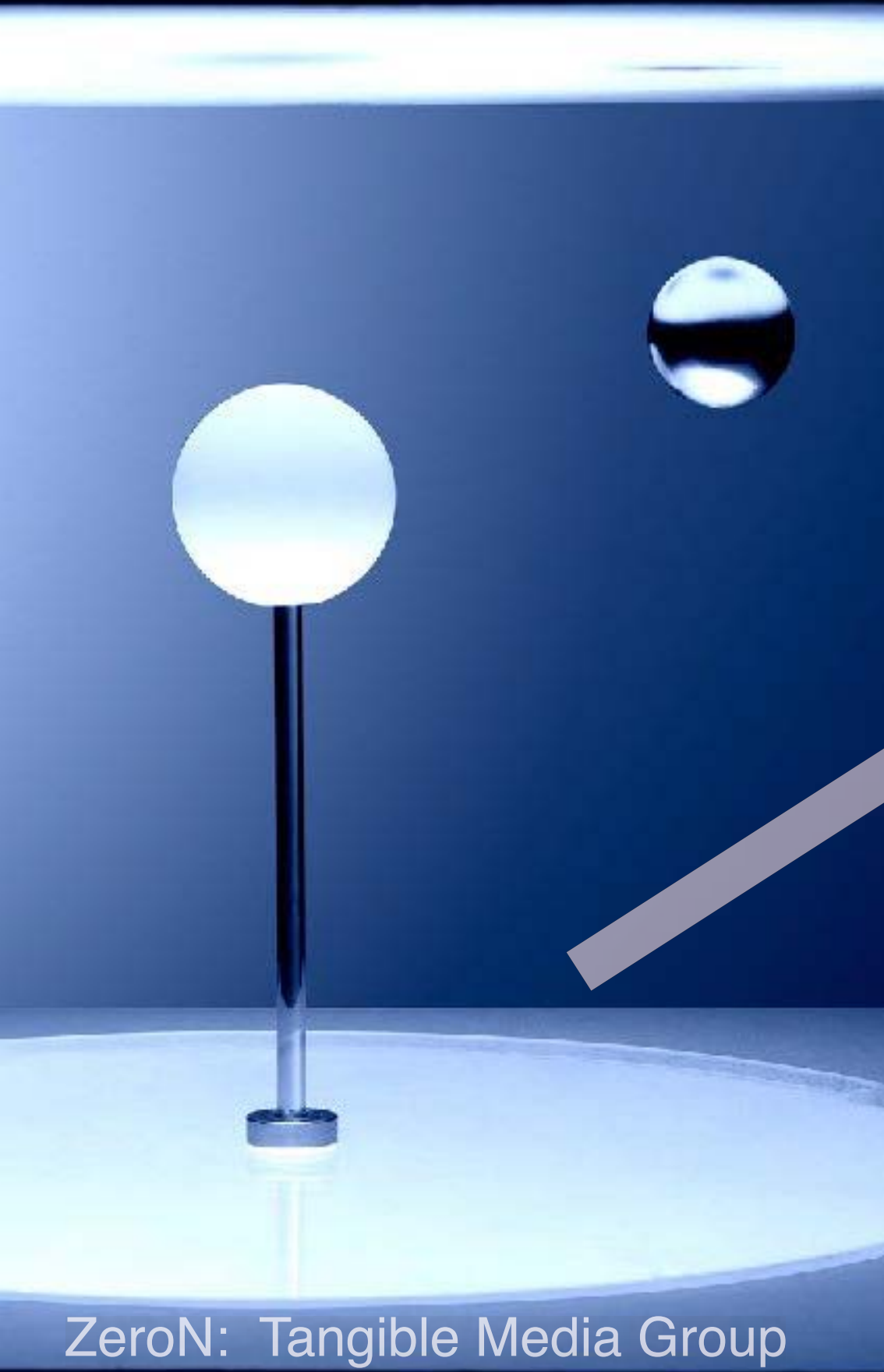
ART+COM

Radical Atoms Exhibition @ Ars Electronica Center

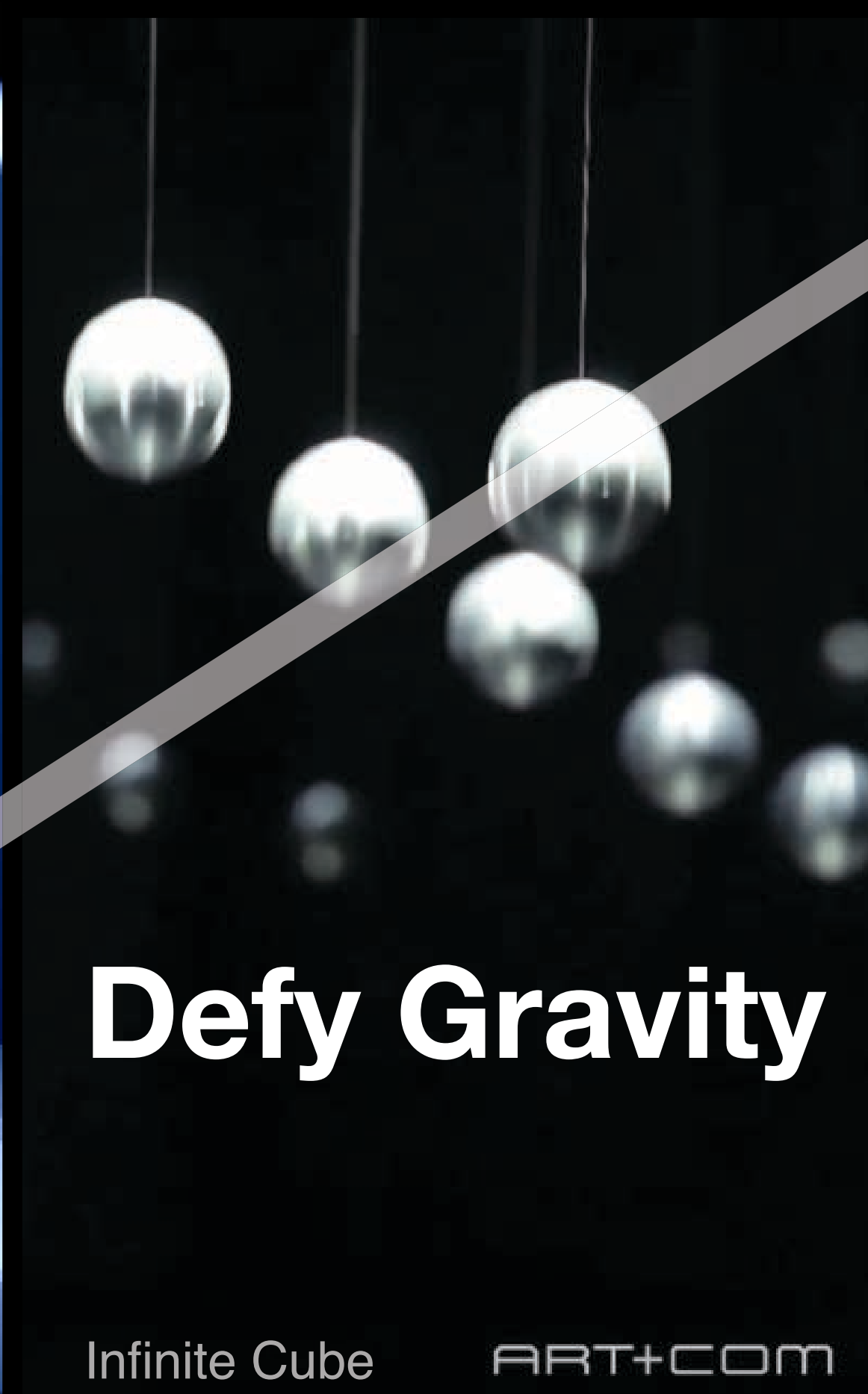


100 Drones

Ars Electronica Futurelab



ZeroN: Tangible Media Group



Defy Gravity

Infinite Cube

ART+COM



100 Drones

Ars Electronica Futurelab

The Future

is not to predict,
but to invent

Alan Kay 1971

This is the century in which you can be proactive about the future; you don't have to be reactive. The whole idea of having scientists and technology is that those things you can envision and describe can actually be built.

Envision

Photo courtesy of Nobukazu Kuriki

Envision

**Art &
Philosophy**

Embody

**Design &
Technology**

Inspire

**Art &
Aesthetics**



PERSPECTIVE





Earthbound Observers



Hawaii - Mauna Kea - Milky Way Overhead

Earthbound Observers

<http://www.nwicon.com/hawaii-mauna-kea-milkyway-over-observatories.htm>

NASA Deployed the Hubble Space Telescope in 1990

Unconstrained Perspective



Perspective of Hubble Space Telescope

<http://hubblesite.org/gallery/album/star/pr2010013a/>



Pillar and Jets HH 901/902
Hubble Space Telescope • WFC3/UVIS

NASA, ESA, and M. Livio and the Hubble 20th Anniversary Team (STScI)

STScI-PRC10-13a

<http://hubblesite.org/gallery/album/star/pr2005037a/>



Crab Nebula • M1
Hubble Space Telescope • WFPC2

NASA, ESA, and J. Hester (Arizona State University)

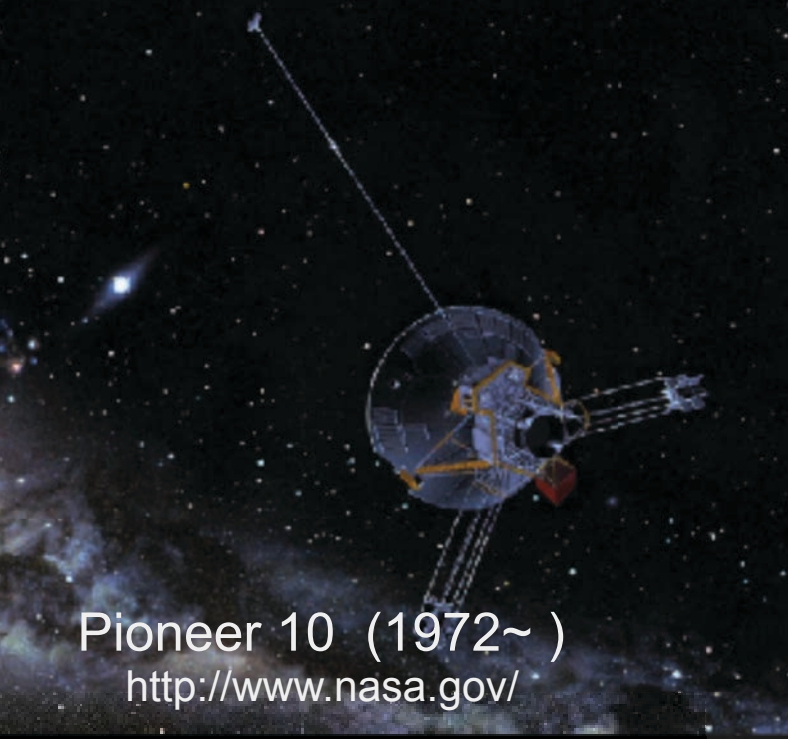
STScI-PRC05-37



Voyager 1 Deployed in 1977

Unconstrained Perspective





Pioneer 10 (1972~)
<http://www.nasa.gov/>



Pioneer 11 (1973~)
<http://www.nasa.gov/>



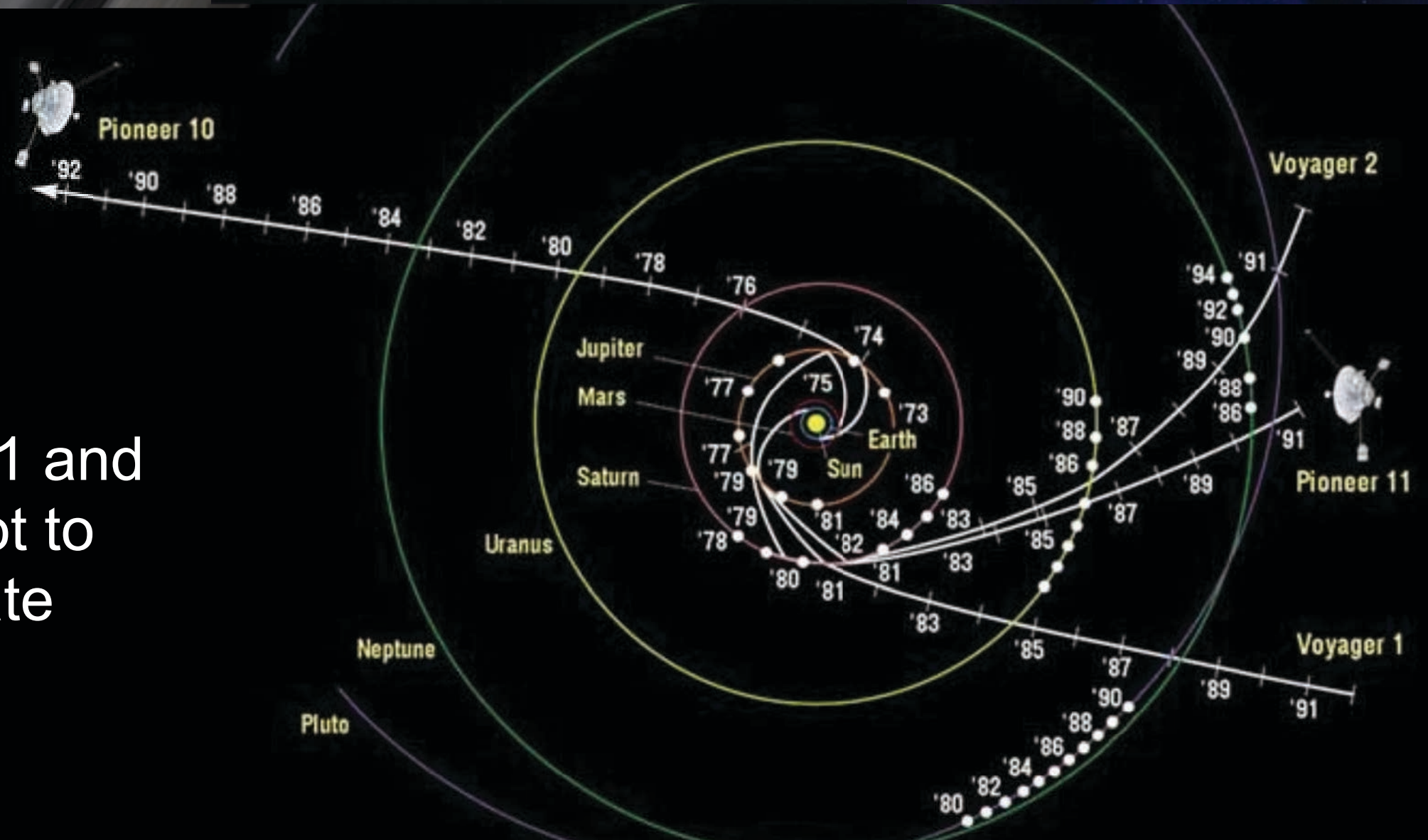
Voyager 1 (1977~)
<http://voyager.jpl.nasa.gov/>



Voyager 2 (1977~)
<http://voyager.jpl.nasa.gov/>

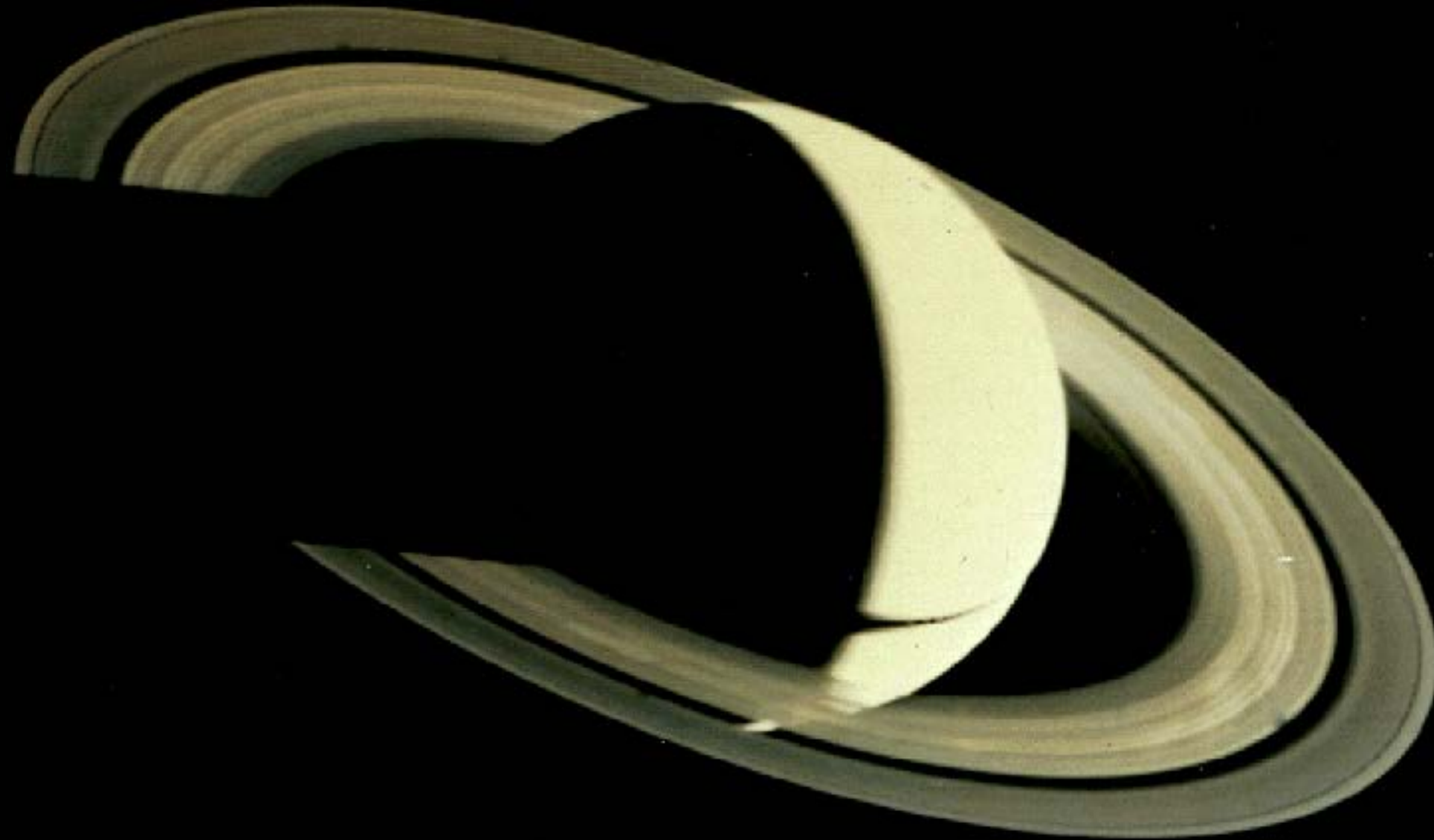
Gravitational Slingshot

Pioneer 10 and 11 and Voyager 1 and 2 used the power of this slingshot to shift their trajectory and accelerate from planet to planet



Saturn from the Voyager 1's Perspective

Unconstrained Perspective

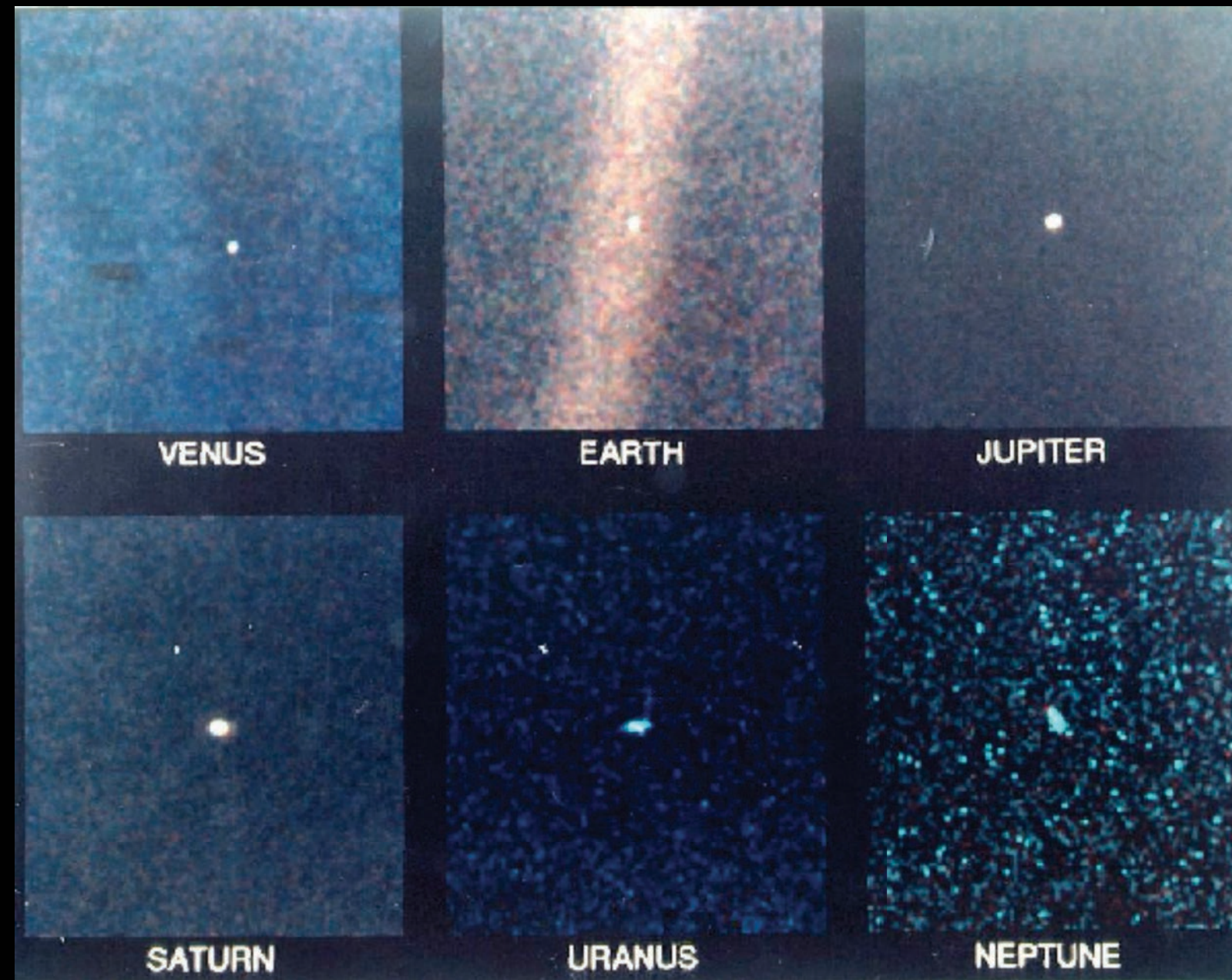


https://en.wikipedia.org/wiki/Voyager_1#/media/File:Crescent_Saturn_as_seen_from_Voyager_1.jpg



Planets from the Voyager 1's Perspective

Unconstrained Perspective





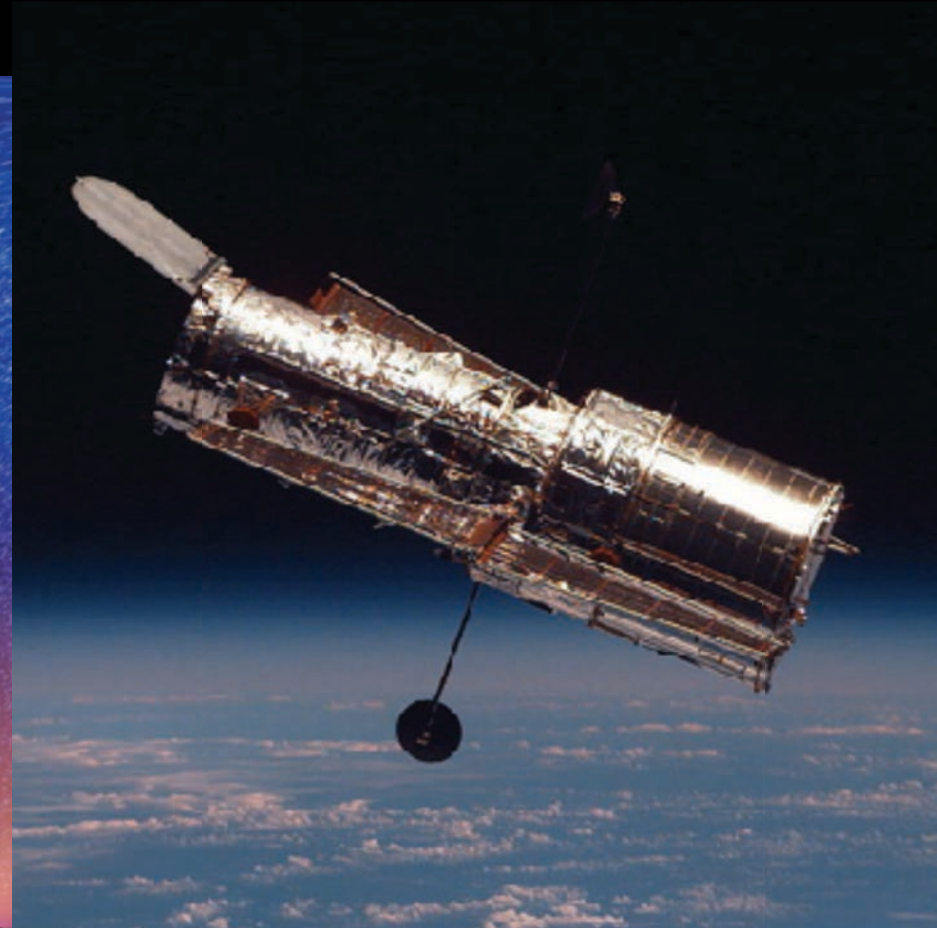
People could only see the world from their own perspective

Towards Holistic Worldview

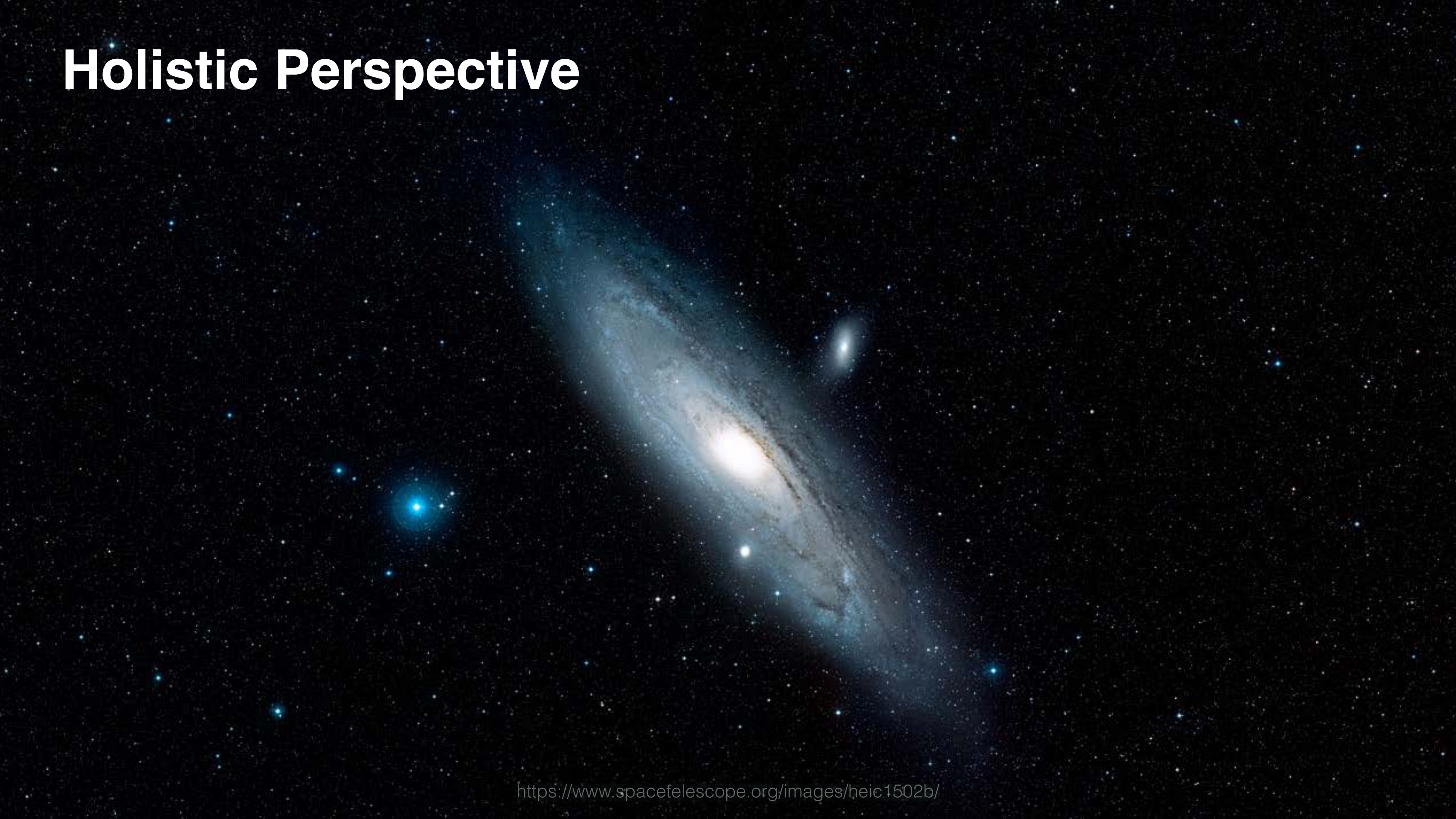
Enhance

Expand

Escape



Holistic Perspective



Holistic Perspective & Heuristic Focus



<https://www.spacetelescope.org/images/heic1502b/>

<http://uncyclopedia.wikia.com/wiki/File:Earth.jpg>

TRANS-Disciplinary

Finding opportunity in conflict between disciplines
Breaking down old paradigms to create new archetypes

“auf-heben”

Art

Art provides new perspective that
turns our gaze to a new horizon

**October 2015
MIT Media Lab 30th Anniversary
Tangible Media Group 20th Anniversary**



Thanks!

Hiroshi Ishii
MIT Media Lab



@ishii_mit



ishii.mit

MIT
Media
Lab