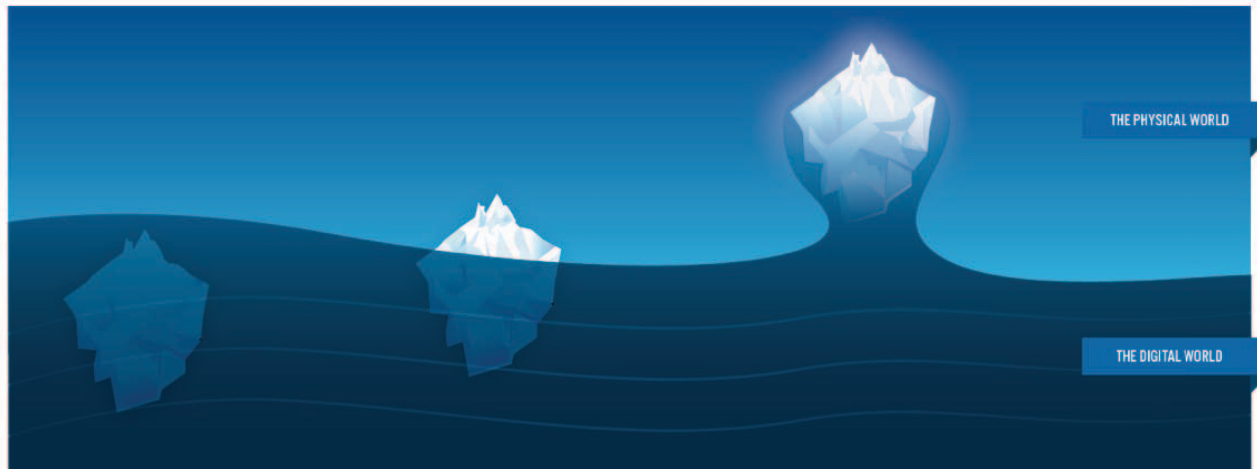


GUI PAINTED BITS

TUI TANGIBLE BITS

RADICAL ATOMS



A **graphical user interface** only lets us see information and interact with it indirectly, as if we were looking through the surface of the water to interact with the forms below.

A **tangible user interface** is more like an iceberg: there is a portion of the digital that emerges beyond the surface of the water - into the physical realm - so that we may interact directly with it.

Radical Atoms describes our vision for the future of interaction, 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.

"Radical Atoms" is our vision of human interactions with the future dynamic physical materials that are conformable, transformable, and informable.

Tangible Media Group



VOLUME XIX.1 | JANUARY + FEBRUARY 2012

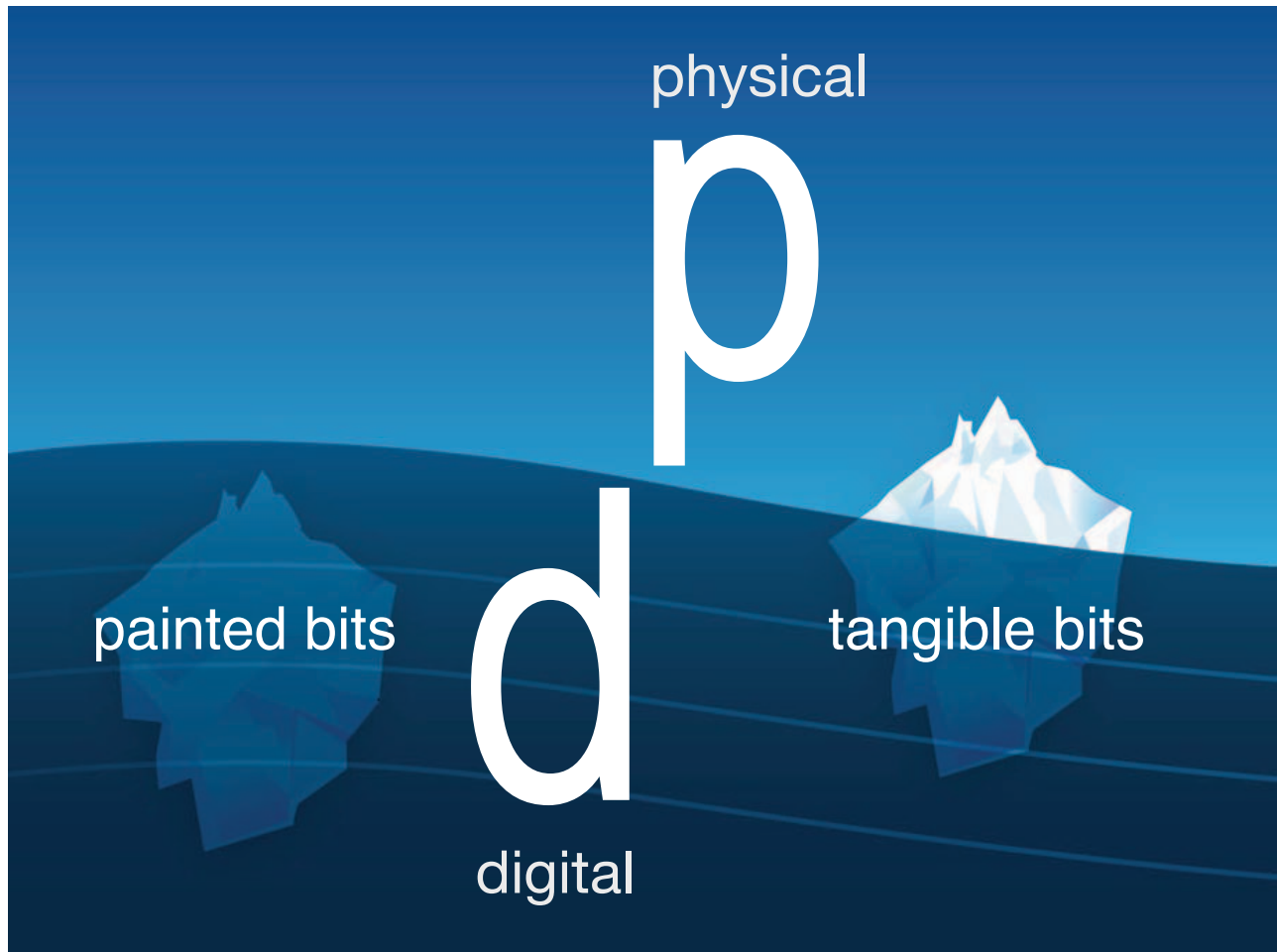
interactions

EXPERIENCES | PEOPLE | TECHNOLOGY



Radical Atoms: Beyond Tangible Bits, Toward Transformable Materials

Cover Story by Hiroshi Ishii, Dávid Lakatos,
Leonardo Bonanni, and Jean-Baptiste Labrune





digital augmentation viewer & glasses



<http://petit invention.wordpress.com/2008/02/10/future-of-internet-search-mobile-version/>
(c) Mac Funamizu "Looking Glass"

Materialize

digital information to
interact with directly

1990s

GUI

1997

TUI

2000s

2010s

2020s

2030s

2040s

2050s

2060s

2070s

2080s

2090s

2100s

2110s

2120s

2130s

2140s

2150s

2160s

2170s

2180s

2190s

2200s

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2220s

2230s

2240s

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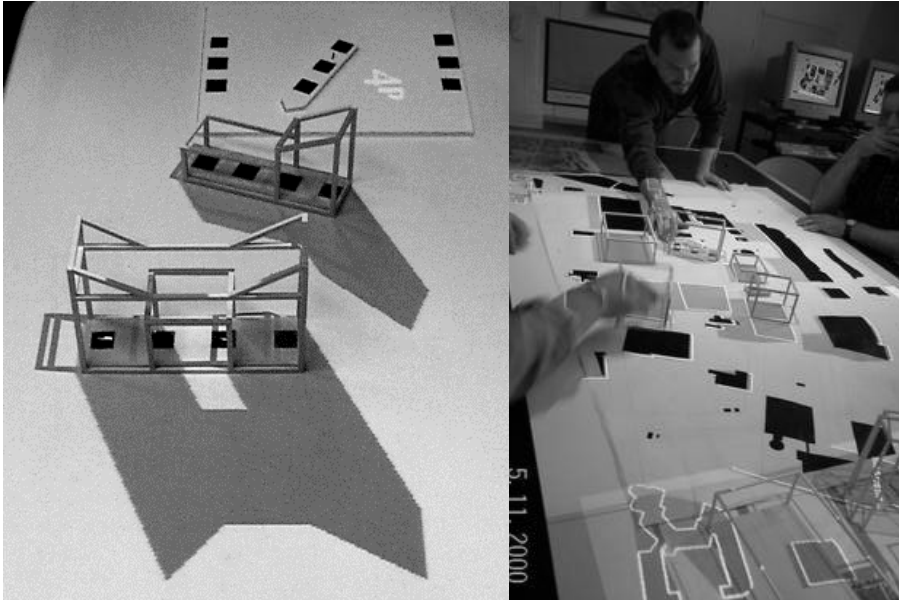
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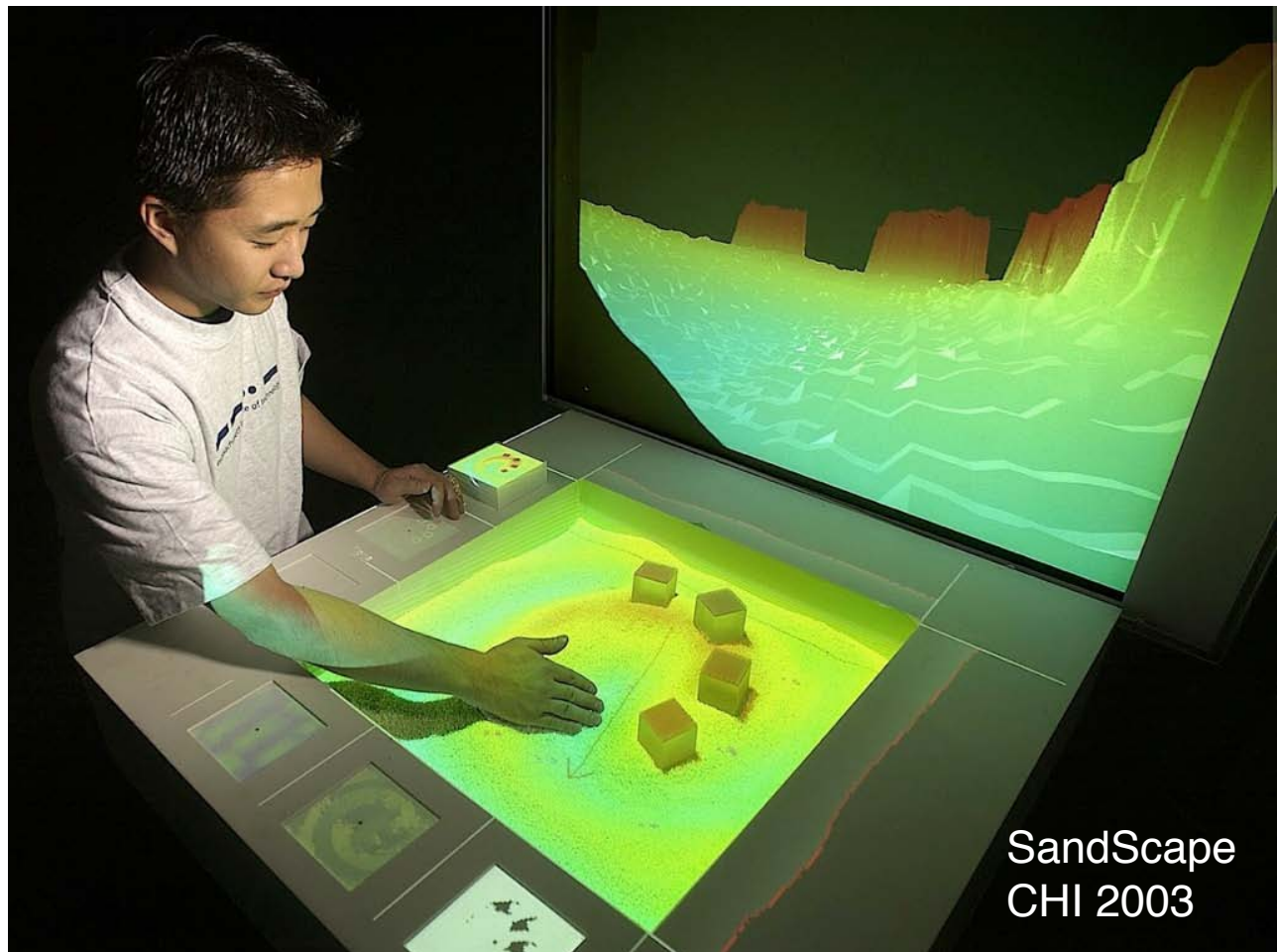
13540s

I/O Bulb & Luminous Room

John Underkoffler & Hiroshi Ishii CHI 99



© 2009 MIT Media Laboratory, Hiroshi Ishii

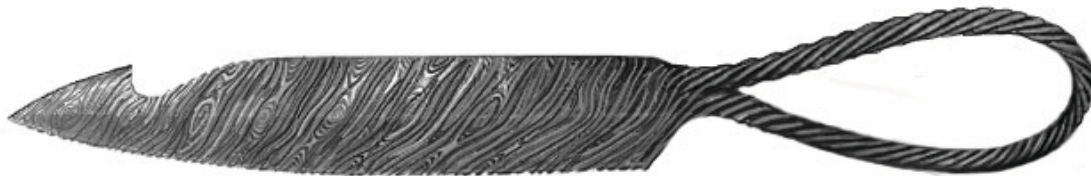


SandScape
CHI 2003



Radical Atoms

Forging Atoms to Conform,
Transform, and Inform



Damascus Steel Knife http://en.wikipedia.org/wiki/Damascus_steel

**Our Vision of Interactions with
Dynamic Physical Material**

Radical Atoms



- Vision-Driven Design Research on Interactions with Dynamic Physical Material that can
 - Conform to structural constraints,
 - Transform structure & behavior, and
 - Inform new abilities.

Dynamic Materials Conform / Transform

- **Material**
Shape Memory Alloy
NiTiNoI
- **Robotics**



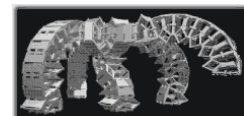
BOSU
Amanda Parkes



Surflex
Marcelo Coelho



topobo
Raffle & Parkes



Polypod
Mark Yim

Dynamic Materials

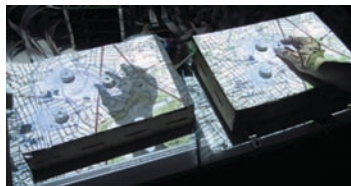
Programmable Matters

- Nanotech
- Computer Science
- Robotics
- Biology
- Material Sciences

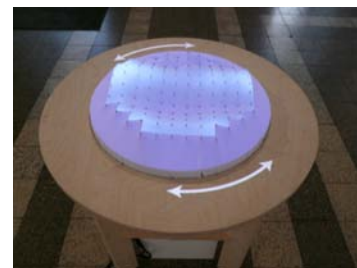
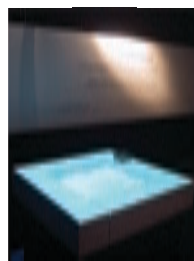
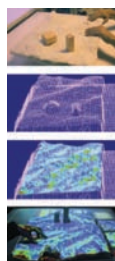
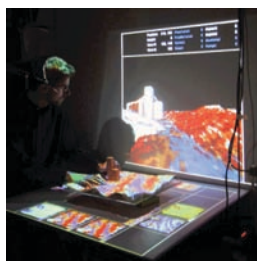
Tabletop Tangibles

Tangible Media Group

- Sensetable – Actuated Workbench – PICO

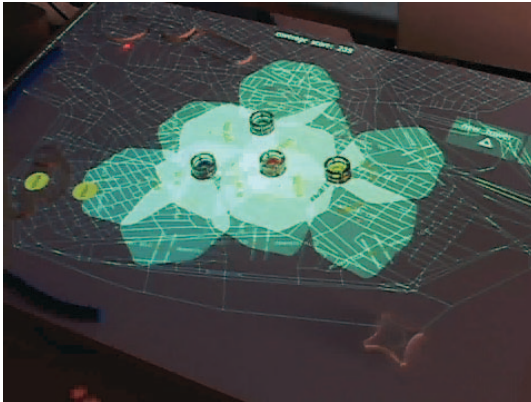


- Illuminating Clay / SandScape => Relief (dynamic clay)



PICO: Tabletop Tangibles

James Patten and Hiroshi ISHII CHI 2007



- Mechanical constraints, coupled with computer-controlled actuation, provide a novel and effective way to interact with computers.

Kinetic Tangibles

Tangible Media Group

- inTouch – Curlybot – Topobo

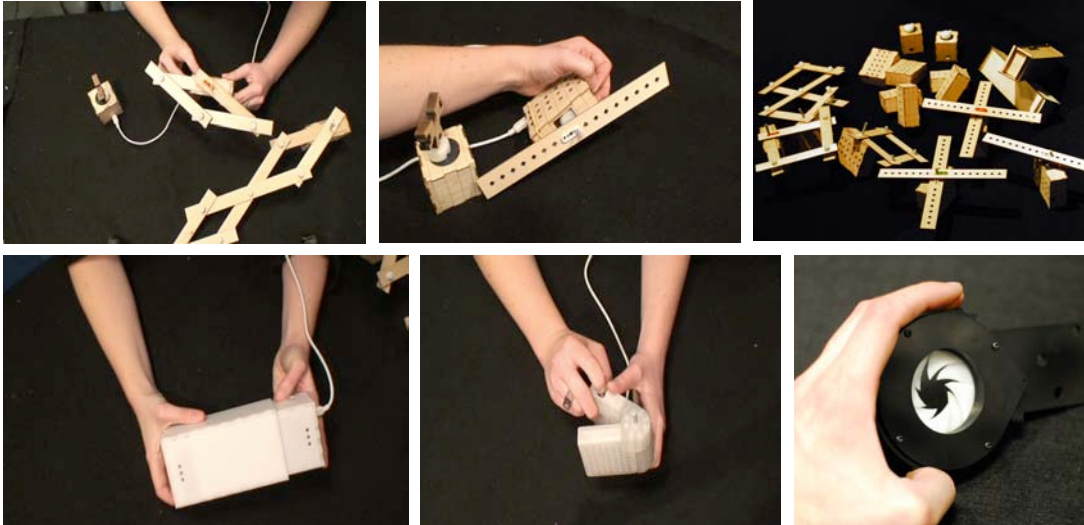


- Kinetic Sketchup – BOSU



Kinetic Sketchup

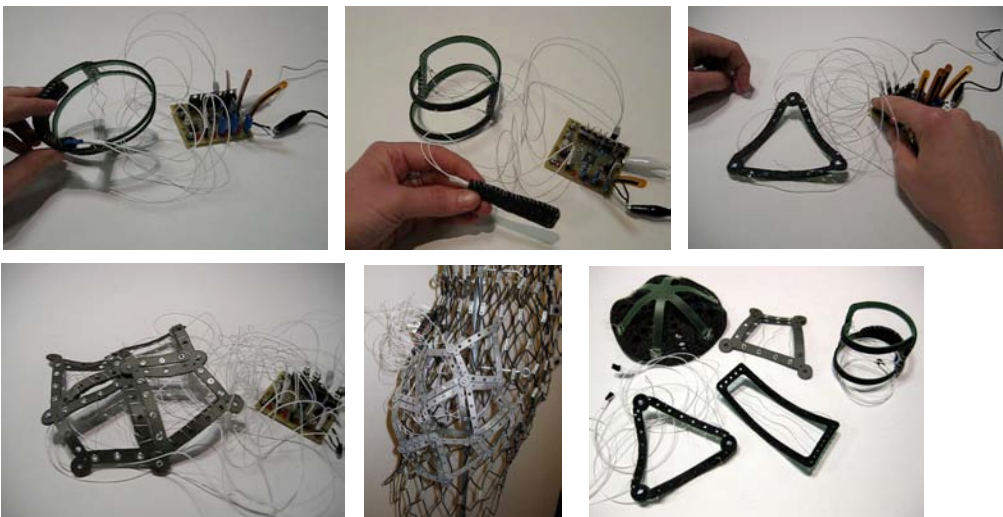
Amanda Parkes and Hiroshi ISHII 2009



- Gestural recording functionality with varying mechanical and behavioral controls

BOSU: Kinetic Tangibles

Amanda Parkes and Hiroshi ISHII 2009



- Dynamic modeling tools offering kinetic memory in soft materials

TimeScape

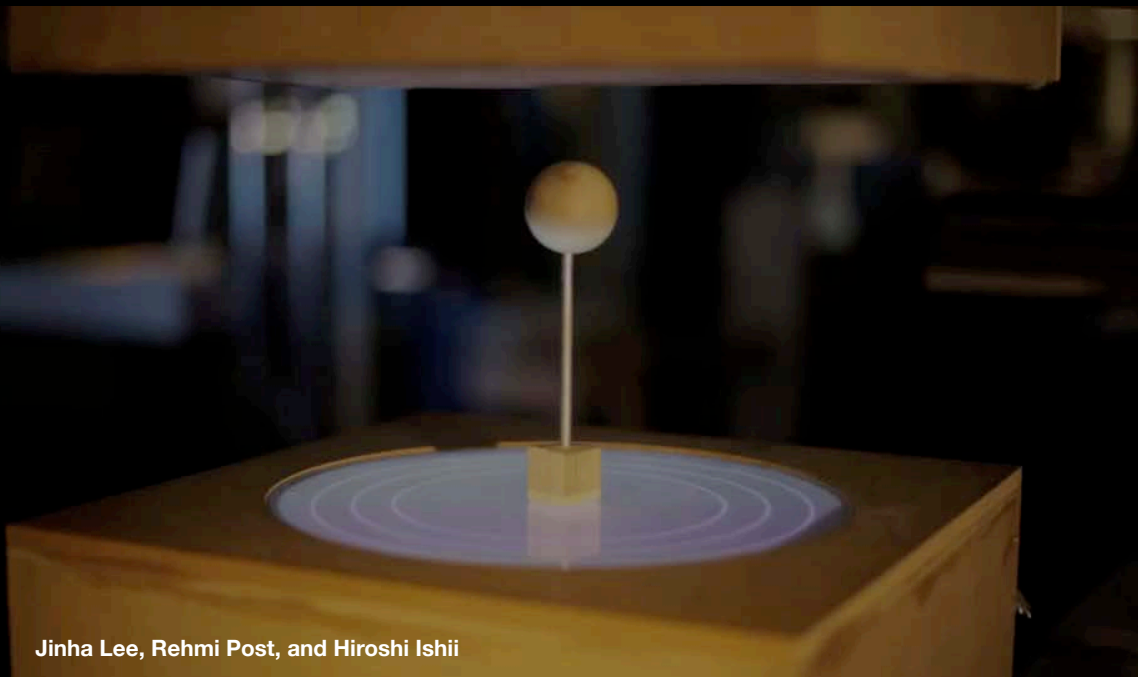
based on Relief



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

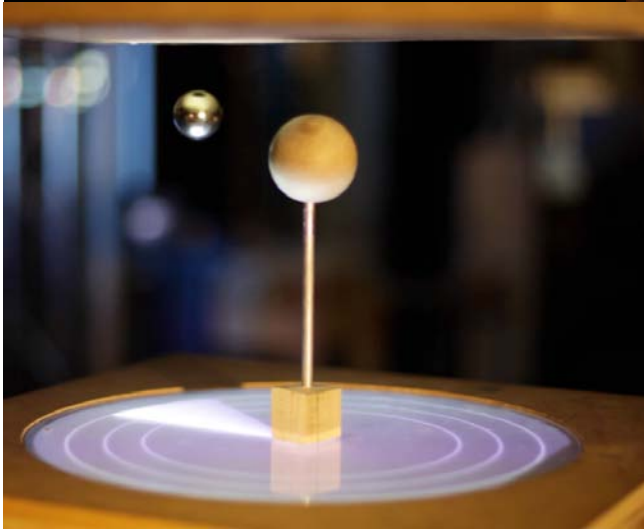
ZeroN

UIST 2011

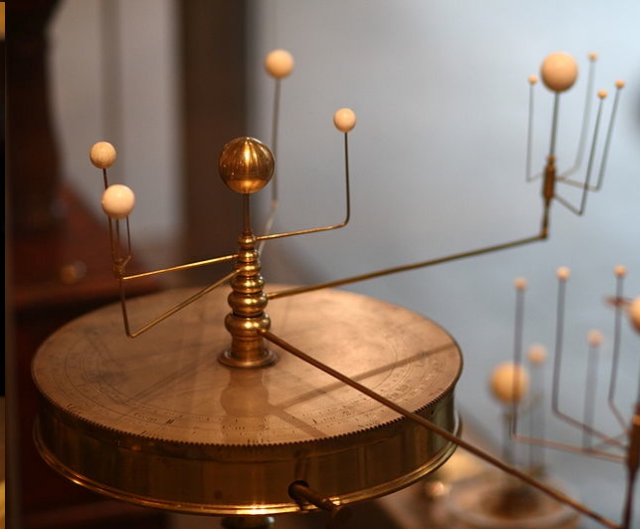


Jinha Lee, Rehmi Post, and Hiroshi Ishii

ZeroN



Orrery



Q: affordance / legibility



Amphorm

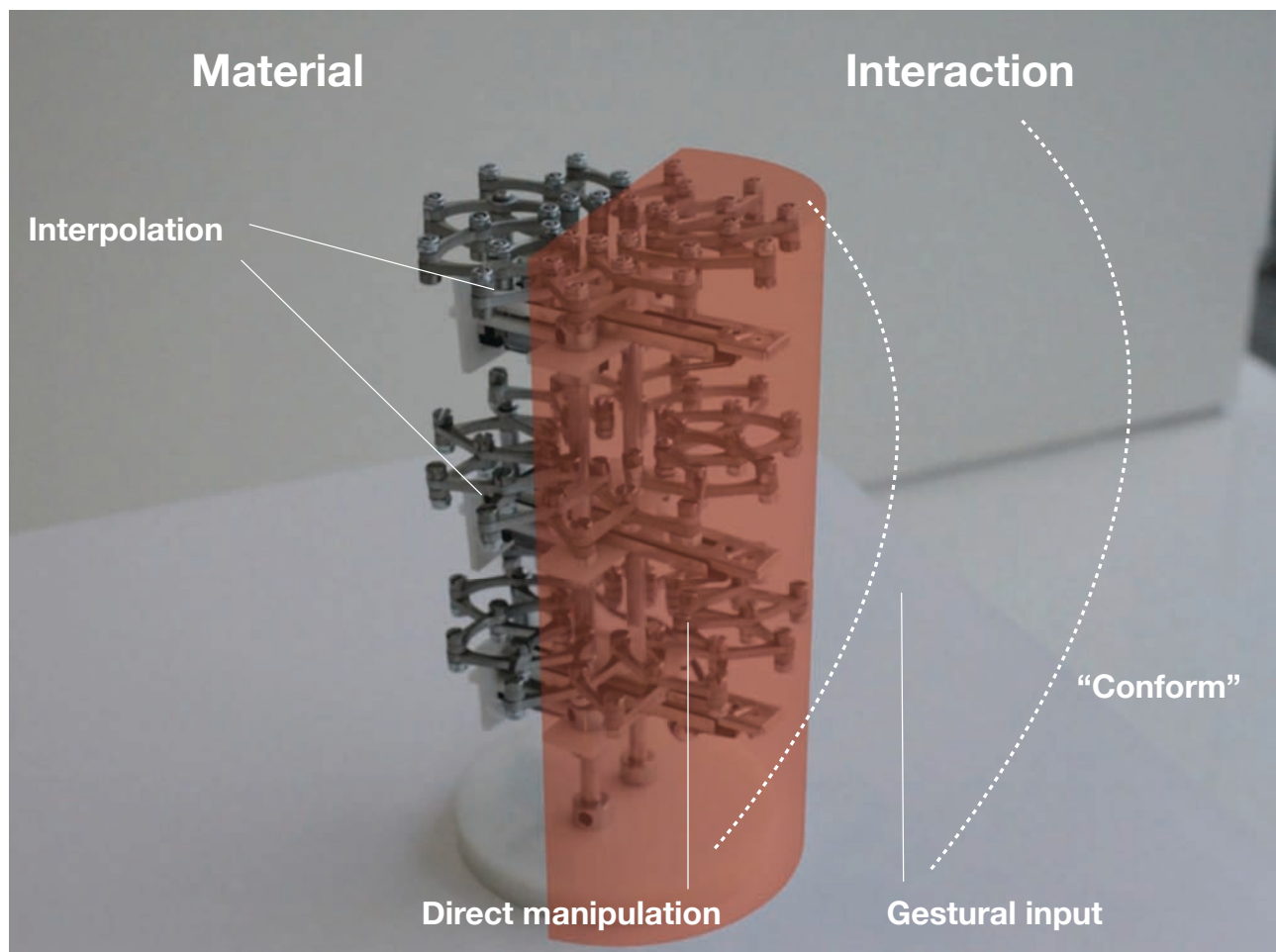
Dávid Lakatos &
Hiroshi Ishii

(Amphora + Form)
Vase that uses kinetic elements to
transform its shape in sync with
a digital model

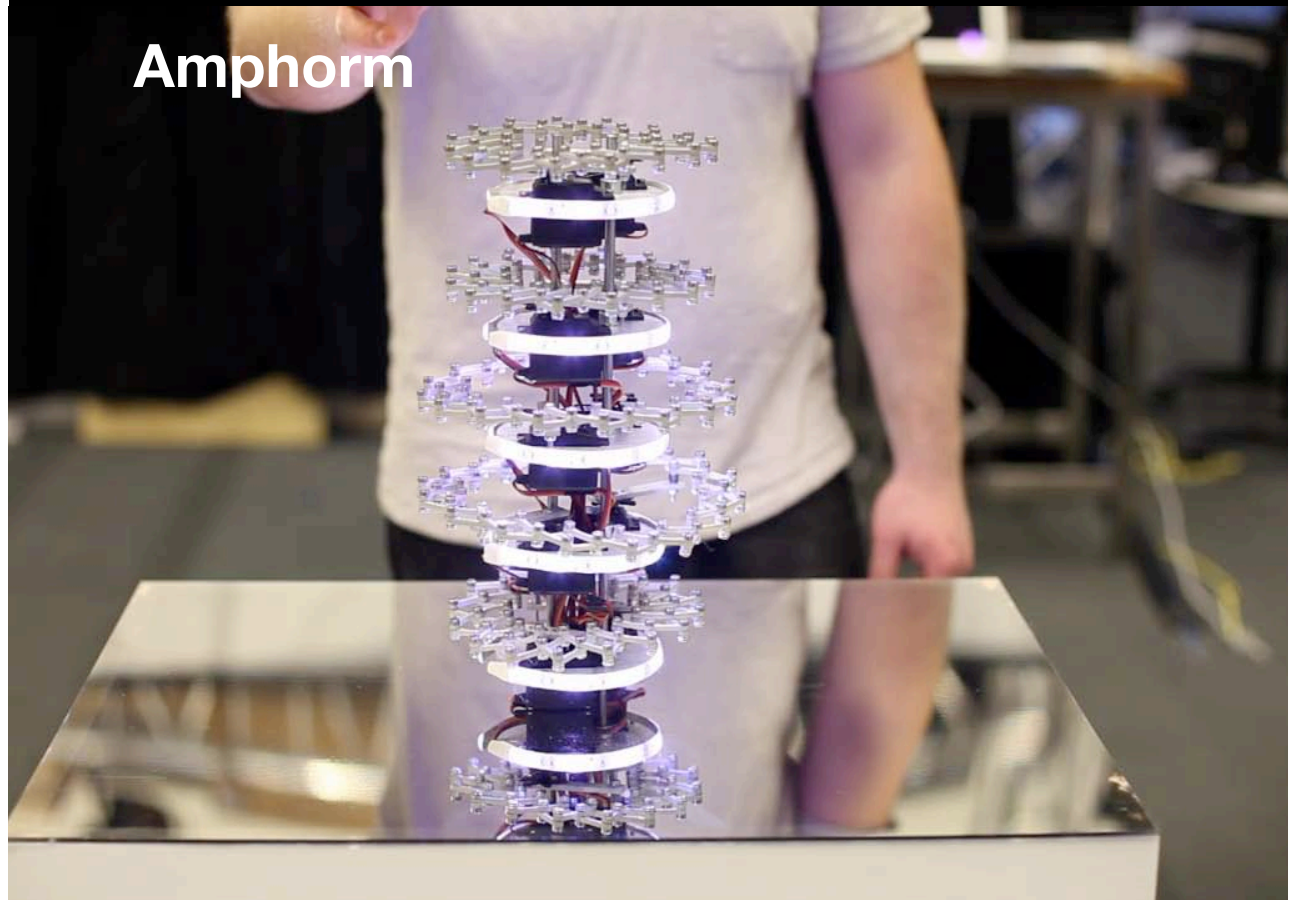


How will we interact with future dynamic materials in our environment?

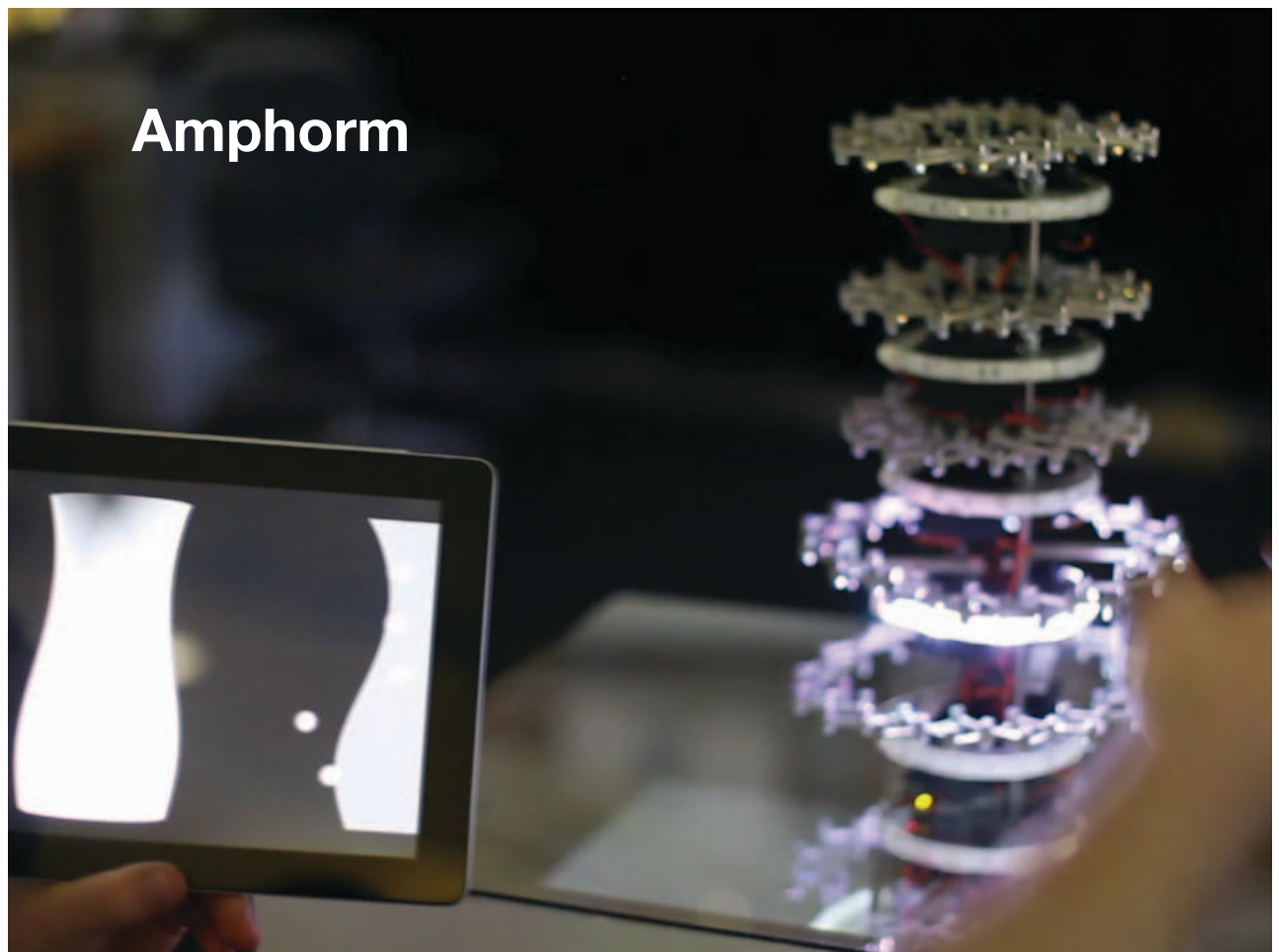
How can we experiment without these materials?



Amphorm



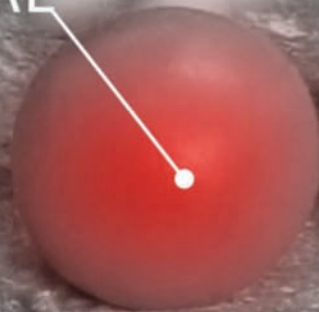
Amphorm



Amphorm



ROLLING **PERFECT RED**
MAKES A PERFECT SPHERE



PERFECT RED

towards *Radical Atoms*: exploring form-giving with shape memory clay

Radical Challenges

- Designing with **dynamically controllable material**
- Challenging static **affordances** with dynamic **abilities**
 - Identify dynamic material
 - Understand material abilities
 - Predict range of abilities
- Redefining human **cognitive invariants**

Dynamic Abilities

- Shape-shifting
- Color-changing
- Rapid solidification
- Rapid liquefaction (melting/
freezing)
- Rapid sublimation/deposition
- Anti-gravitational

Radical Atoms: Challenges Materials, Tools, and Applications

- **How to Inform Atoms?**
 - Direct Manipulation (with touch & gesture)
 - Special Tools (“RA oven”)
 - Context Aware (semi-automatic)
 - Programming
 - » Tangible Programming
 - » 3D CAD (GUI) & download
 - » Programming by Examples
- **Killer Applications**

Radical Atoms

Forging Atoms to Conform,
Transform, and Inform



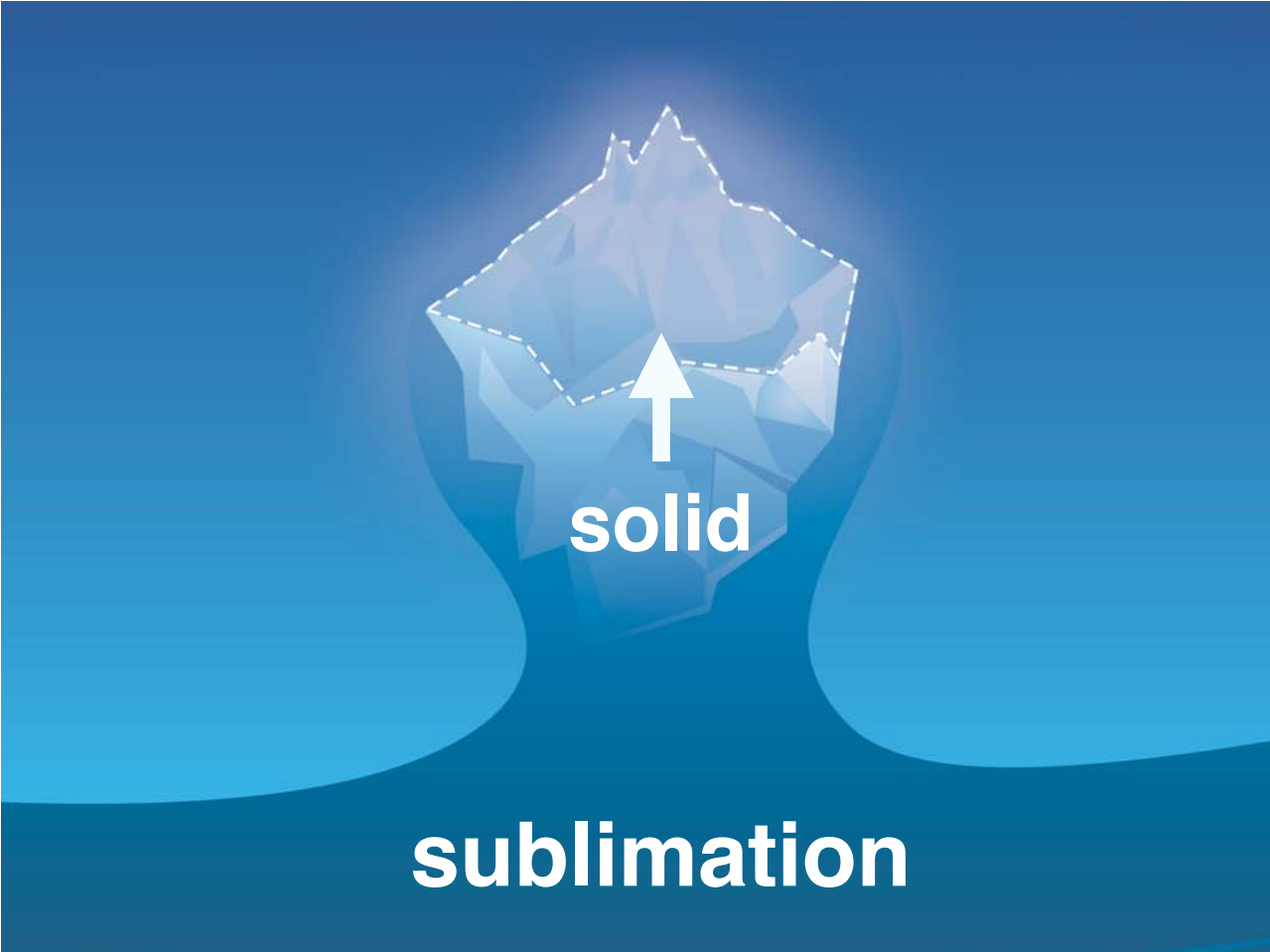
Damascus Steel Knife http://en.wikipedia.org/wiki/Damascus_steel

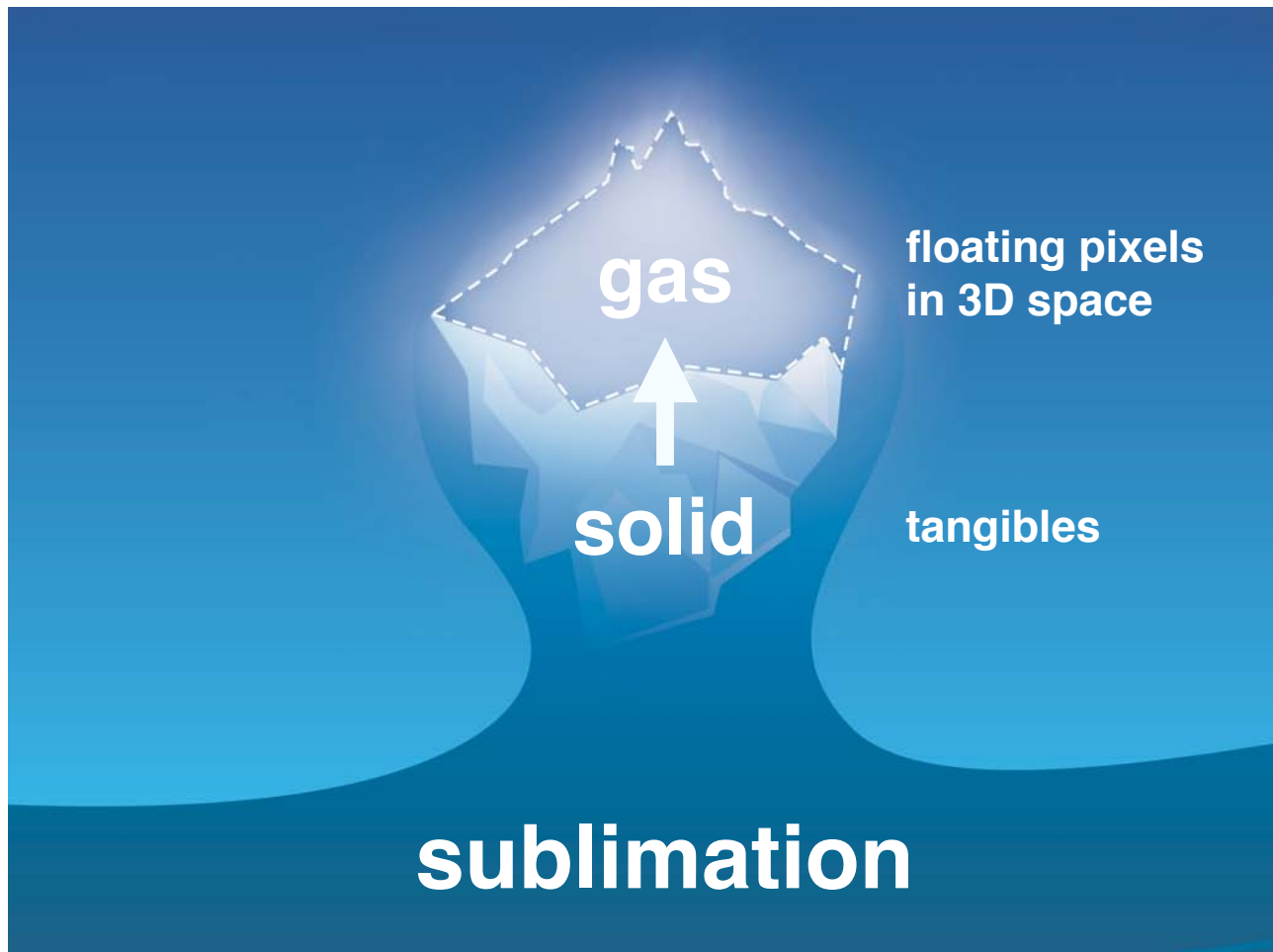
tangible bits
1997

radical
atoms
2012

Radical Atoms

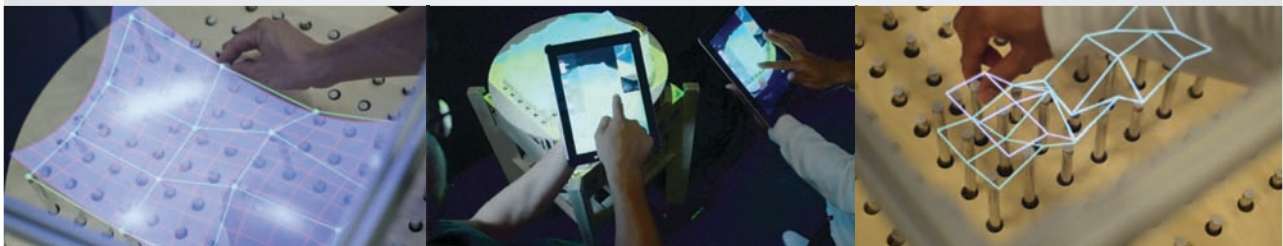
is Dynamic Future Material that
Conform, Transform & Inform





SUBLIMATE:

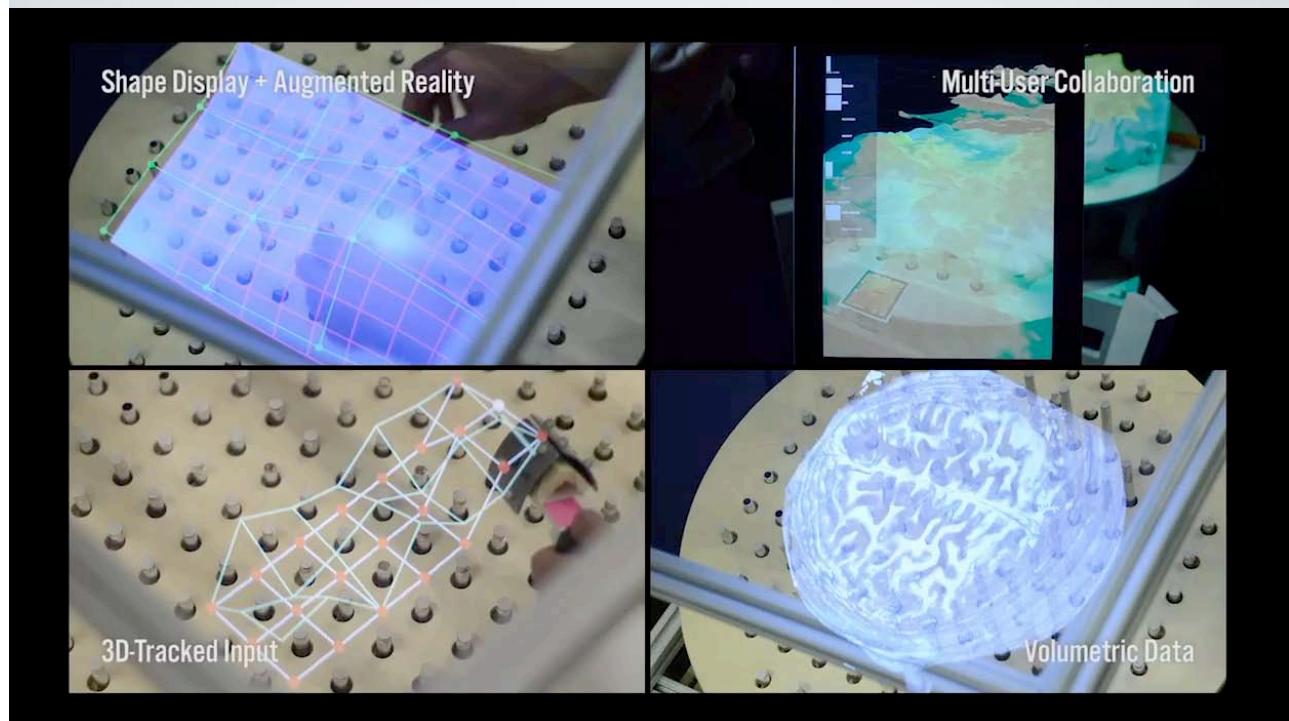
STATE-CHANGING VIRTUAL AND PHYSICAL RENDERING
TO AUGMENT INTERACTION WITH SHAPE DISPLAYS



Daniel Leithinger, Sean Follmer, Alex Olwal,
Samuel Luescher, Akimitsu Hogge, Jinha Lee, Hiroshi Ishii

Tangible Media Group, MIT Media Lab
<http://tangible.media.mit.edu>

SUBLIMATE



VOLUMETRIC

