Beyond Pixels
Toward Radical Atoms
SIGGRAPH 2015 NEXT

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Hiroshi Ishii
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1995 - 2015
Battle against Pixel Empire
Tangible Bits ➔ Radical Atoms
A Graphical User Interface 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.
TRANSFORM
Tangible Media Group led by Prof. Hiroshi Ishii from MIT Media Lab.
TRANSFORM

Tangible Media
MIT Media Lab
Design vs Technology
Tangible Bits
embody digital information to interact with directly with hands

MIT Media Lab
Orrery
Tangible Representation of Knowledge
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/wiki/A_Philosopher_Giving_a_Lecture_on_the_Orrery](http://en.wikipedia.org/wiki/A_Philosopher_Giving_a_Lecture_on_the_Orrery)
SandScape
Ars Electronic Center 2003

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

Tangible Media Group
MIT Media Laboratory
Radical Atoms
Dynamic Future Material that Transform, Conform & Inform
Relief: A 2.5D Shape Display
Daniel Leithinger & Hiroshi Ishii
TimeScape
based on Relief

Daniel Leithinger, Jinha Lee, Sean Follmer, Austin Lee, Matthew Chang & Hiroshi Ishii
Sean Follmer, Daniel Leithinger, Alex Olwal, Akimitsu Hogge, Hiroshi Ishii
Cooper Hewitt Design Museum
inFORM Exhibit

Daniel Leithinger,
Dr. Sean Follmer
Philipp Schoessler,
Jared Counts,
Ken Nakagaki,
David Doan, Basheer
Tome and
Prof. Hiroshi Ishii
inFORM ENGINES
Designed by Daniel Leithinger & Sean Follmer, and Rendered by Amit Zoran
inFORM ENGINES
Designed by Daniel Leithinger & Sean Follmer, and Rendered by Amit Zoran

MIT Media Lab
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."
April 8-13, 2014 in Milan
5000 visitors interacted
100 said “Amazing!” to me
TRANSFORM

AS ADAPTIVE AND DYNAMIC FURNITURE

LUKE VINK • VIIRJ KAN • KEN NAKAGAKI • DANIEL LEITHINGER
SEAN FOLLMER • PHILIPP SCHOESSLER • AMIT ZORAN • HIROSHI ISHII
Two Material Options Exist Today

1. **Frozen Atoms:**
   inert, rigid, passive physical materials (incl. metal, wood, glass and plastic)

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
Radical Atoms: Dynamic Shape Displays & Programmable Materials

Vision-Driven: Beyond Tangible Bits, Towards Radical Atoms

Hiroshi Ishii
PneUI (2013): Programmable Materials (1)
jamSheets (2014): Programmable Materials (2)
BioLogic (2015)

Natto 納豆

Programmable Materials (3)

Bacillus subtilis natto

The bacteria Bacillus subtilis taken with a Tecnai T-12 TEM. Taken by Hiroshi Ishii, Tangible Media Group, MIT Media Lab.
**BioLogic (2015)**

*Bacillus subtilis* natto cells as natural nano-actuators and nano-sensors

**Programmable Materials (3)**

The bacterium *Bacillus subtilis* taken with a Tecnai T-20 TEM. Taken by Allon Weiner, The Weizmann Institute of Science, Rehovot, Israel, 2006.
ZeroN

Jinha Lee, MIT Media Lab
Rehmi Post, MIT Center for Bits and Atoms
Hiroshi Ishii, MIT Media Lab
1. How to embody & interact with the information?
   ▶︎ Beyond Pixels ▶︎ Tangible Bits
   ▶︎ Embodied Interactions

2. Material is the Future
   ▶︎ Radical Atoms (Material User Interfaces)

3. Nature-Derived Design (Biological Material)
   Build ▶︎ Grow
TRANS-Disciplinary

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

“auf-heben”
Beyond Pixels
Toward Radical Atoms

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