

CS181DT Class 5: Physical computing



Makey Makey



Robot carving by Davide Quayola

Class 5 agenda

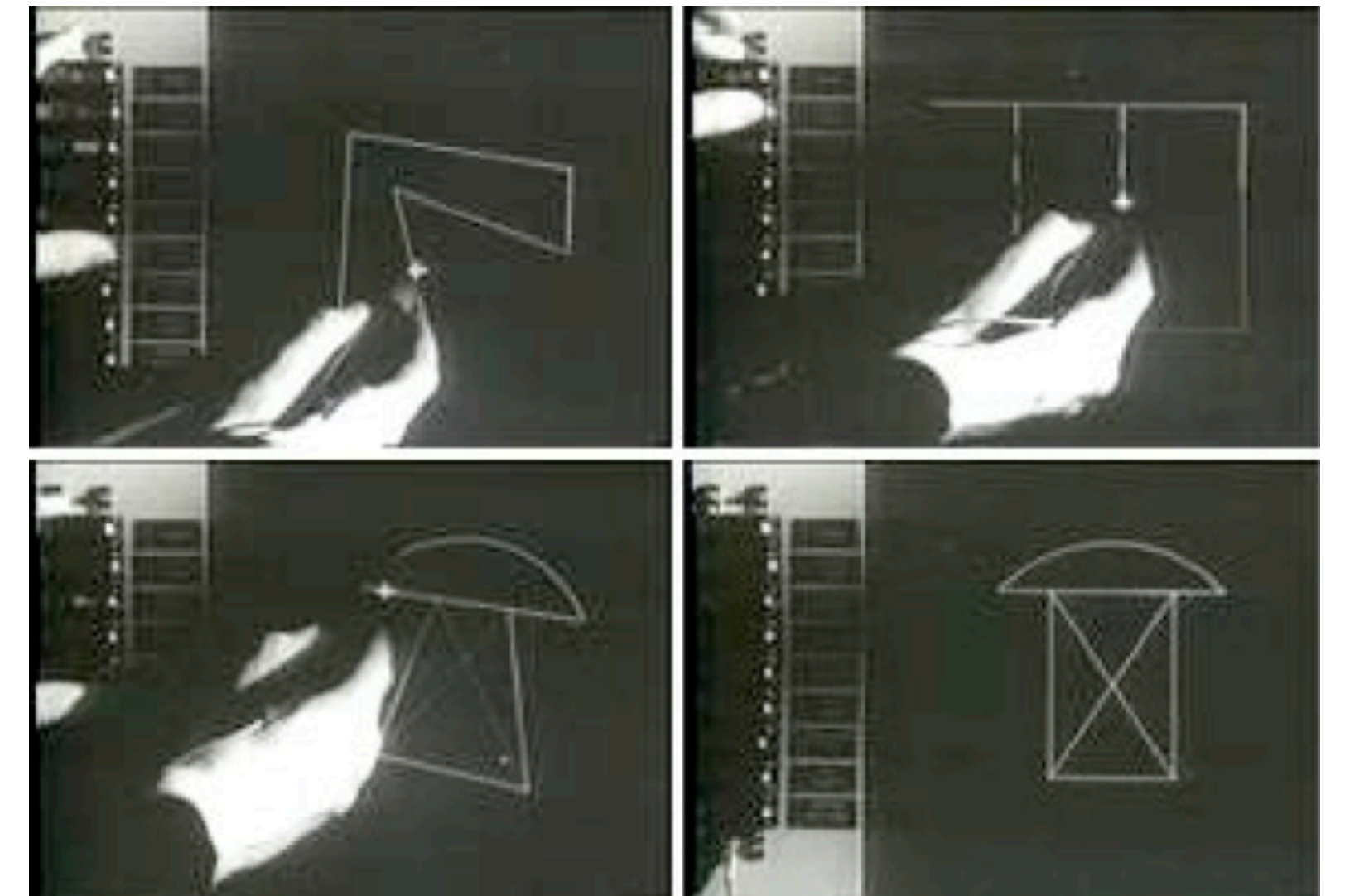
- ZC
- Mini lecture: The evolution of physical computing
- Break
- Seminar: Tangible Bits & How Bodies Matter
- Seminar: Being the Machine & Zooids

The evolution of an idea of physical computing

How an essay from the 1960s has influenced an entire generation of research

The Ultimate Display: 1965

- 2 years after his PhD thesis Sketchpad, Sutherland wrote an essay (The Ultimate Display) about a computer display that used as many senses as possible—specifically **kinesthetic** & different kinds of body movement
- Objects displayed by a computer do not have to follow rules of physical reality - pioneer of VR
- "The ultimate display would, of course, be a room within which the computer can control the existence of matter"



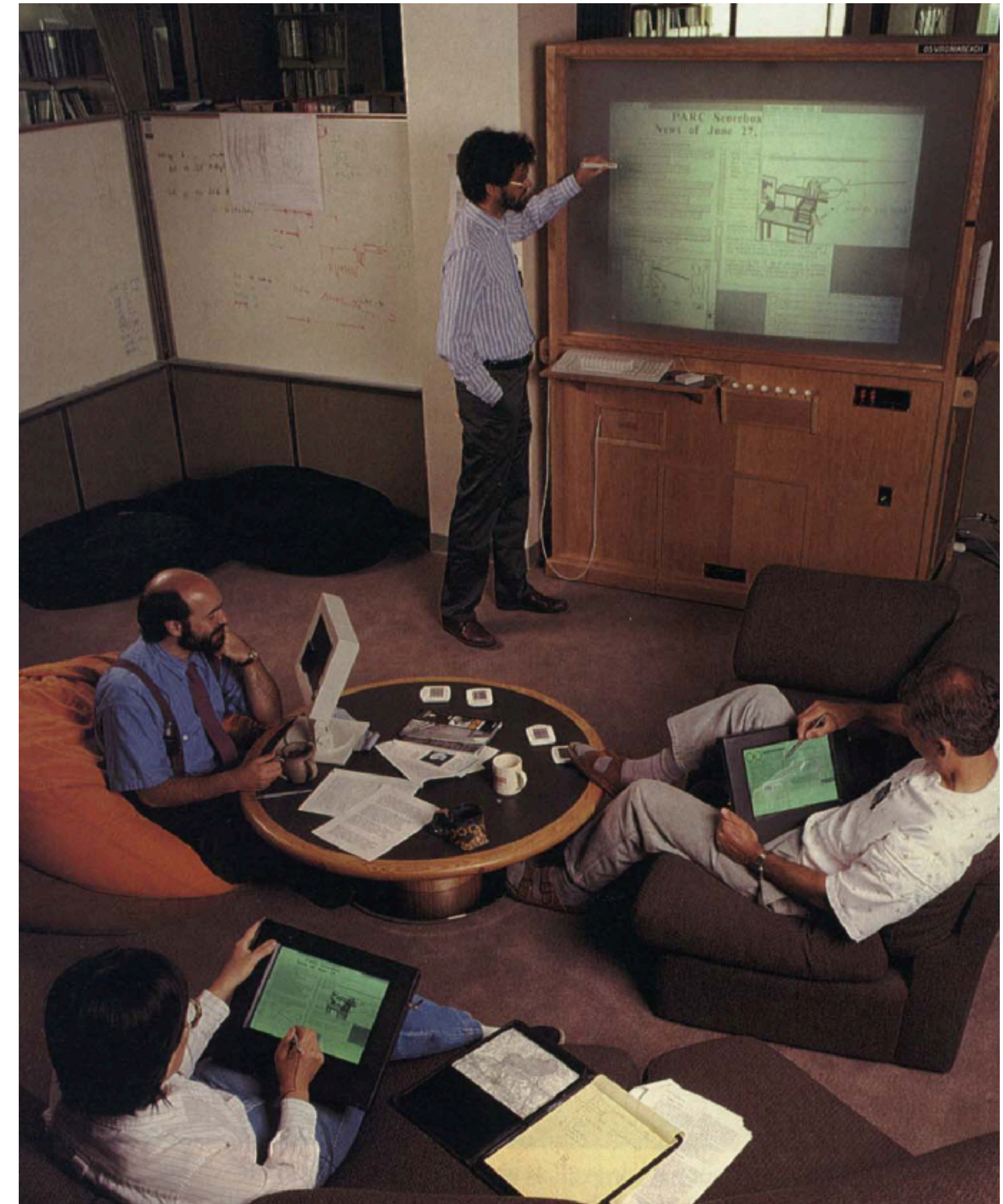
(Top) Recall: Sketchpad, 1963

(Bottom) Sutherland's head mounted display, 1968



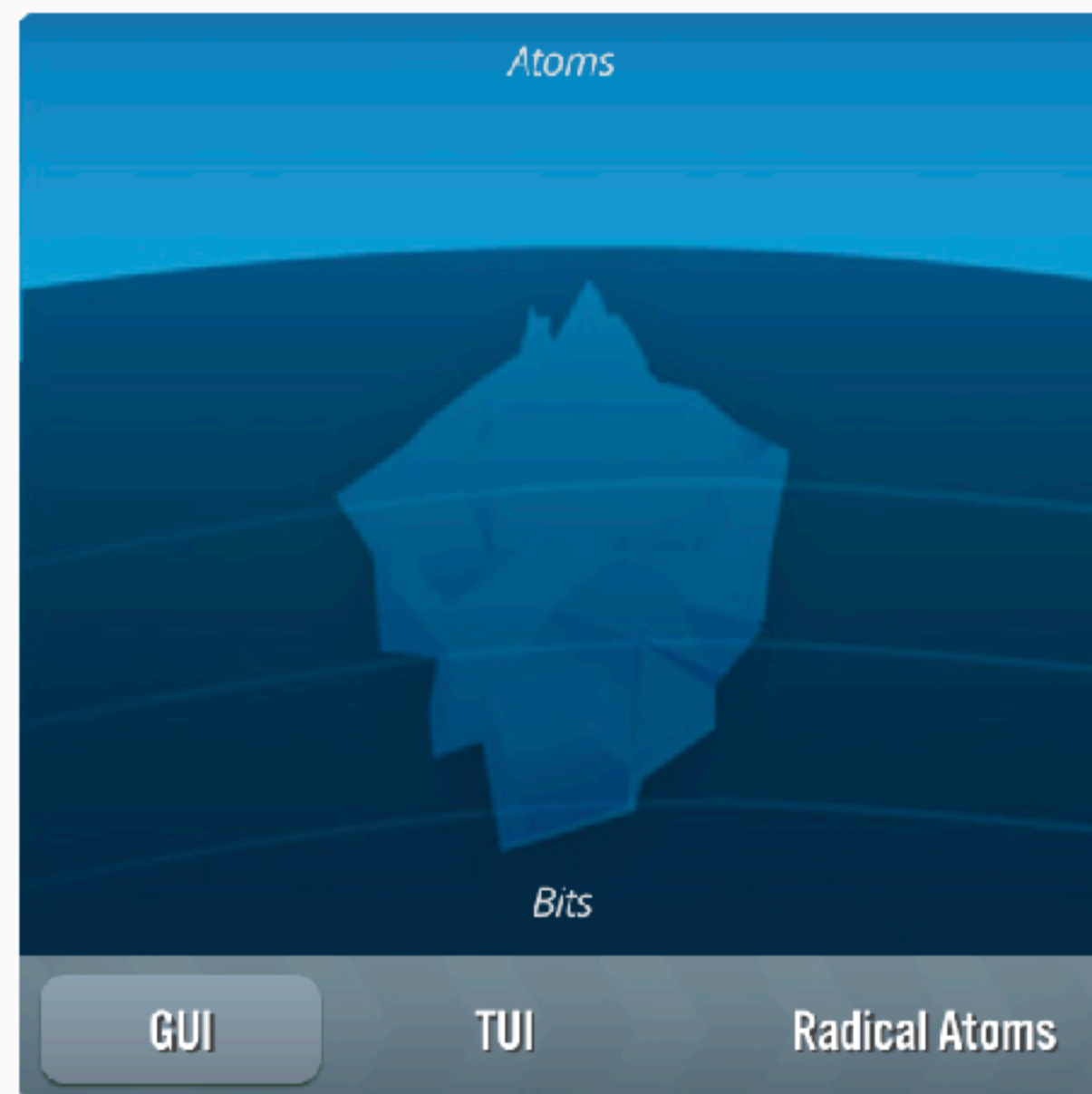
Computer for the 21st century: 1991

- Mark Weiser (at Xerox PARC) created the field of “ubiquitous computing” (or ubicomp), where he proposed rooms full of “pads, tabs, and boards”
- (This was before cell phones/iPads were a thing)
- Ubicomp was credited towards advancing the “Internet of things” (IoT), where all your devices are “smart” and connected to Wifi

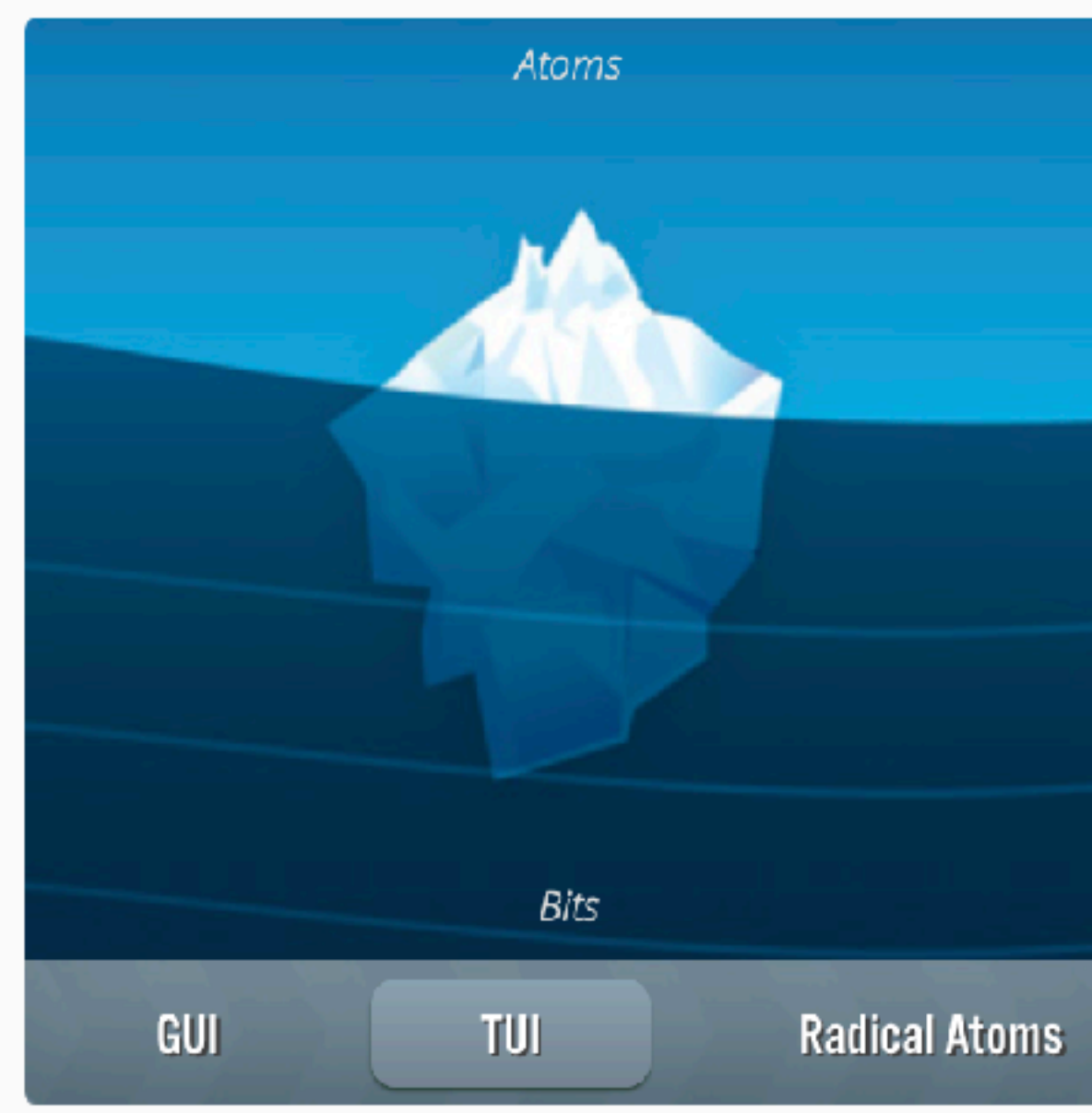


Tangible Bits: 1997

- Hiroshi Ishii (MIT Media Lab) was inspired by Mark Weiser's vision of ubicomp and wrote the paper you read



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.



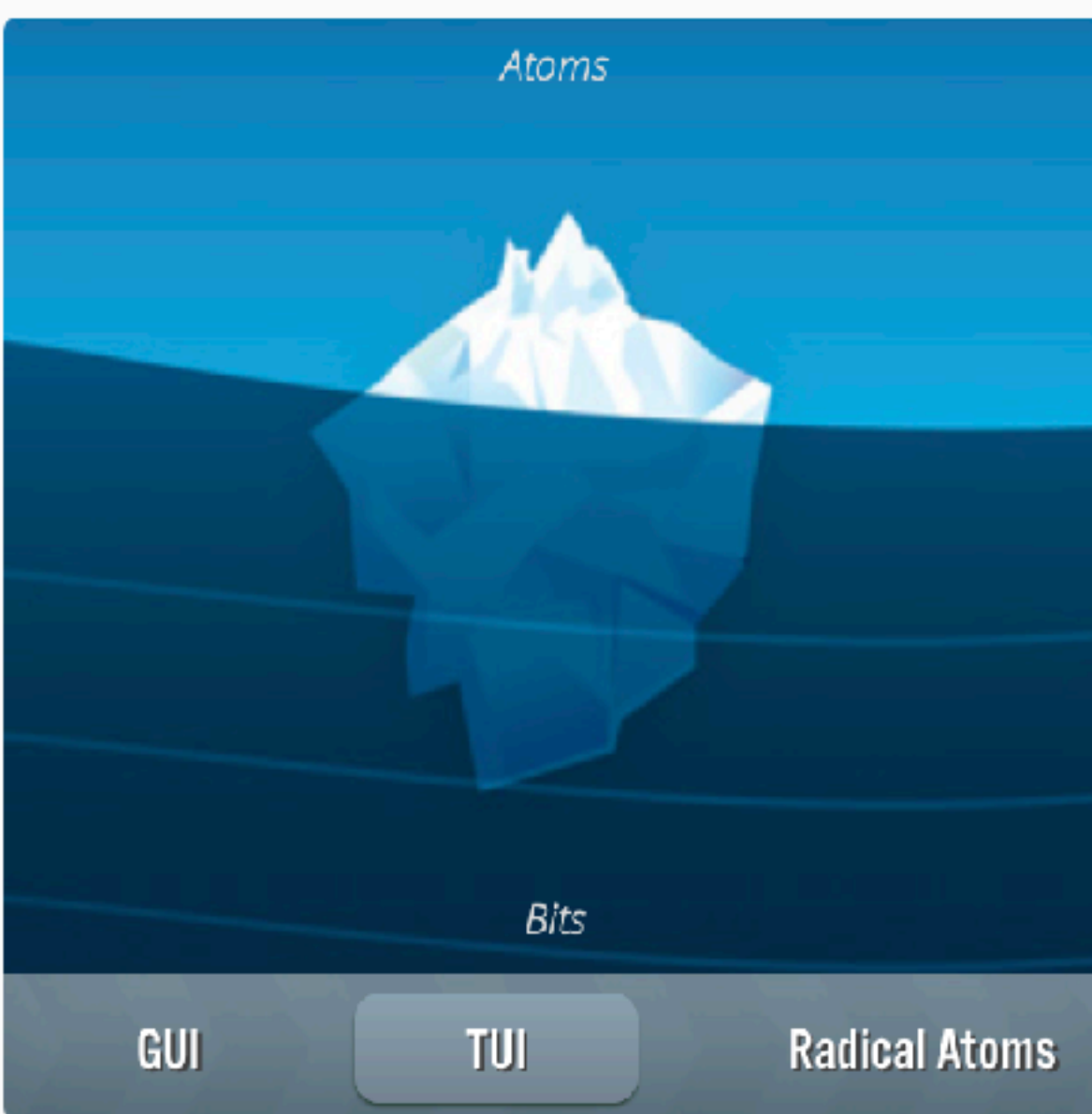
A **Tangible User Interface** is like an iceberg: there is a portion of the digital that emerges beyond the surface of the water - into the physical realm - so that we may interact directly with it.



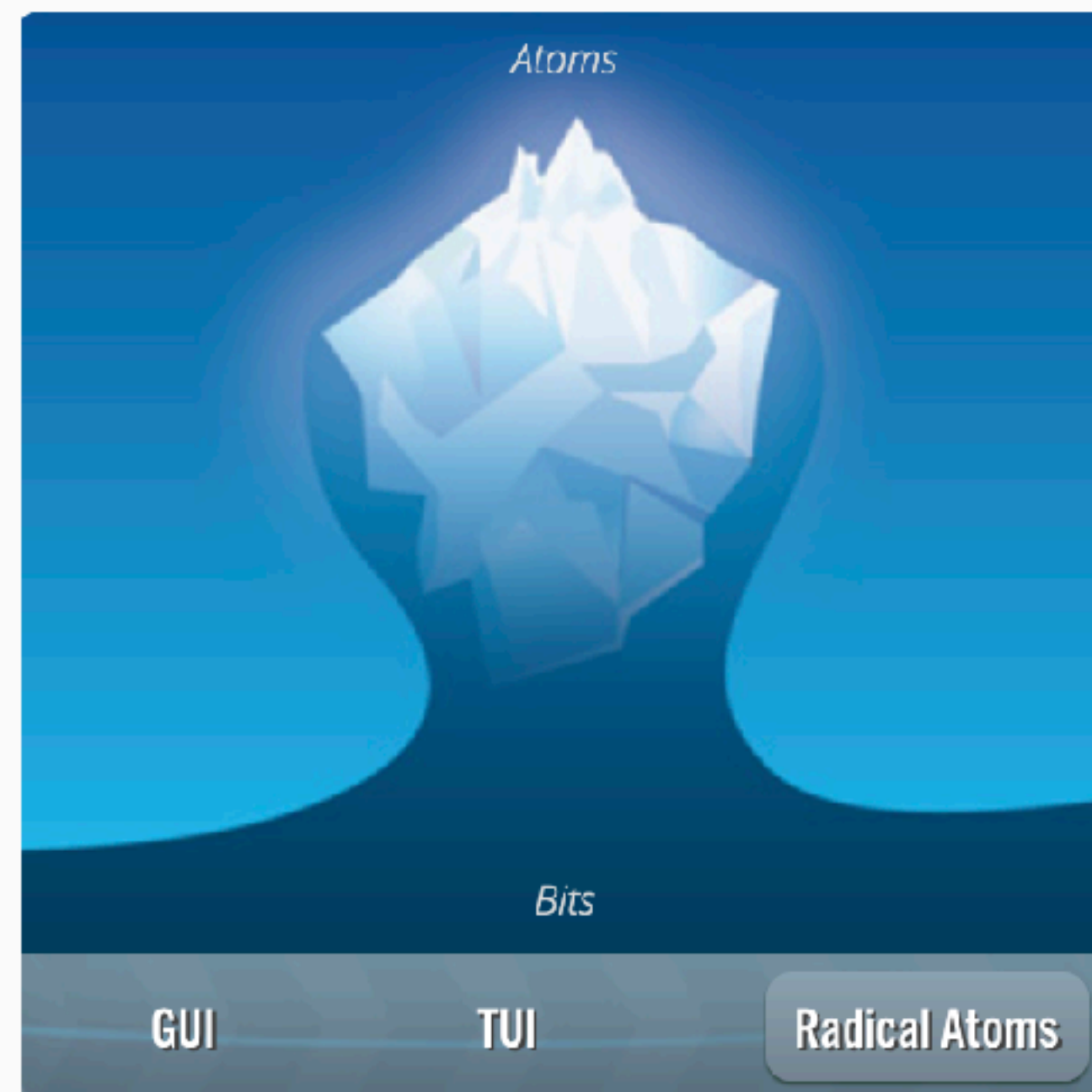
<https://digitalartarchive.siggraph.org/artwork/natalie-jeremijenko-live-wire/>

From Tangible Bits to Radical Atoms

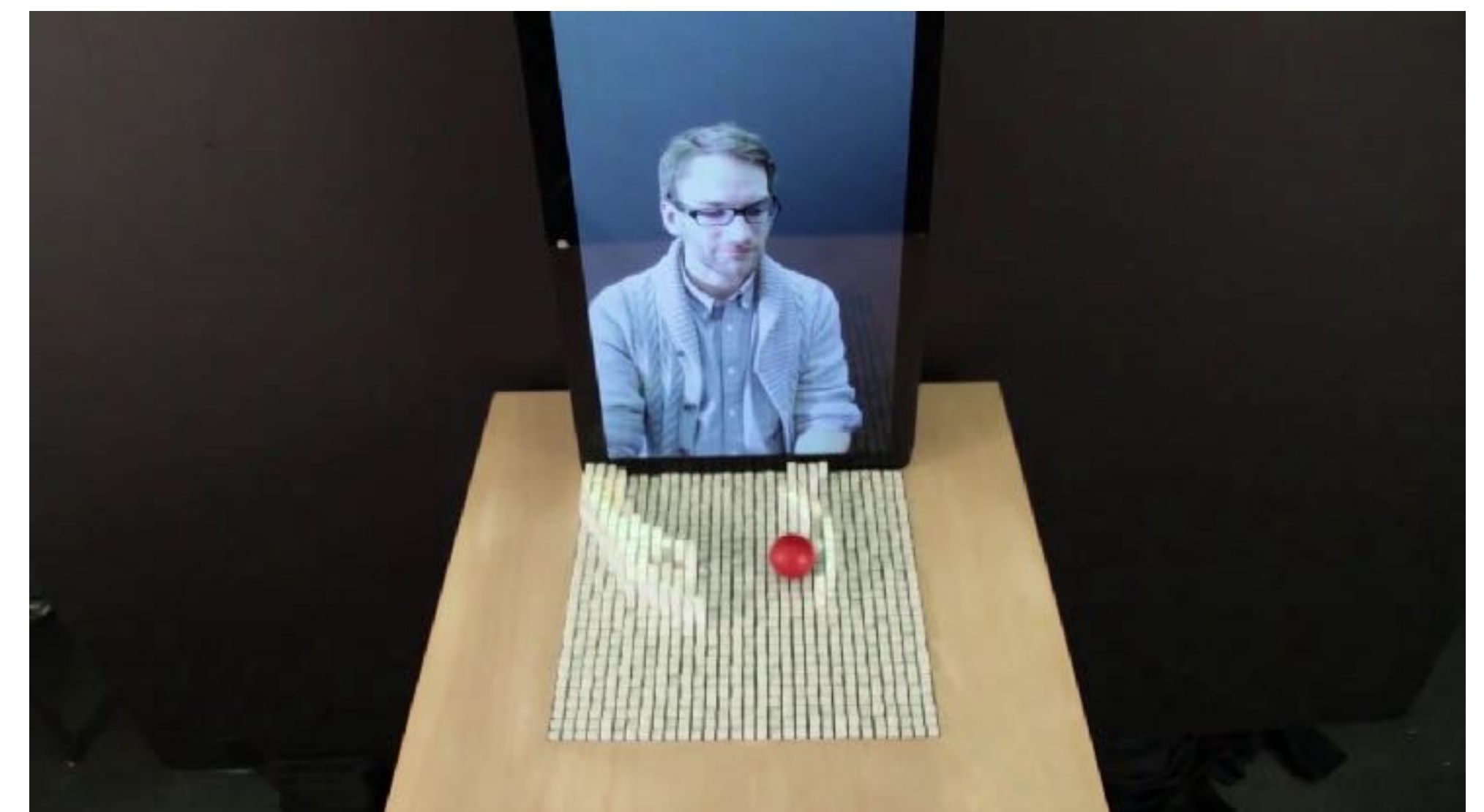
- Radical atoms -“all digital information has physical manifestation”



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 - 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.



Dynamic Land

- Bret Victor's (author of the brief rant on interaction design)'s new non-profit research lab
- Recall Sutherland's vision: "The ultimate display would, of course, be a room within which the computer can control the existence of matter"

<https://dynamicland.org/2024/Intro/>



So, have we done it? Have we made "the ultimate display?"

If so, what advantages does having physicalized computer programs bring?

If not, why not? What needs still to be done?

Break

Seminars!

Class 5 recap

- TODOs:
 - By **Monday's** class:
 - PM2: Sensory cardboard (bring to class!)
 - By next Weds:
 - HMC makerspace safety trainings (general, laser cutter, 3D printer)