

FUNDAMENTALS OF SITUATED INTERACTION - 16 SEPTEMBER 2016

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OF TOOLS AND INSTRUMENTS

INVENTION OF THE TOOL

- ▶ Humans are the only species that creates tools to shape their environment



2001, A Space Odyssey

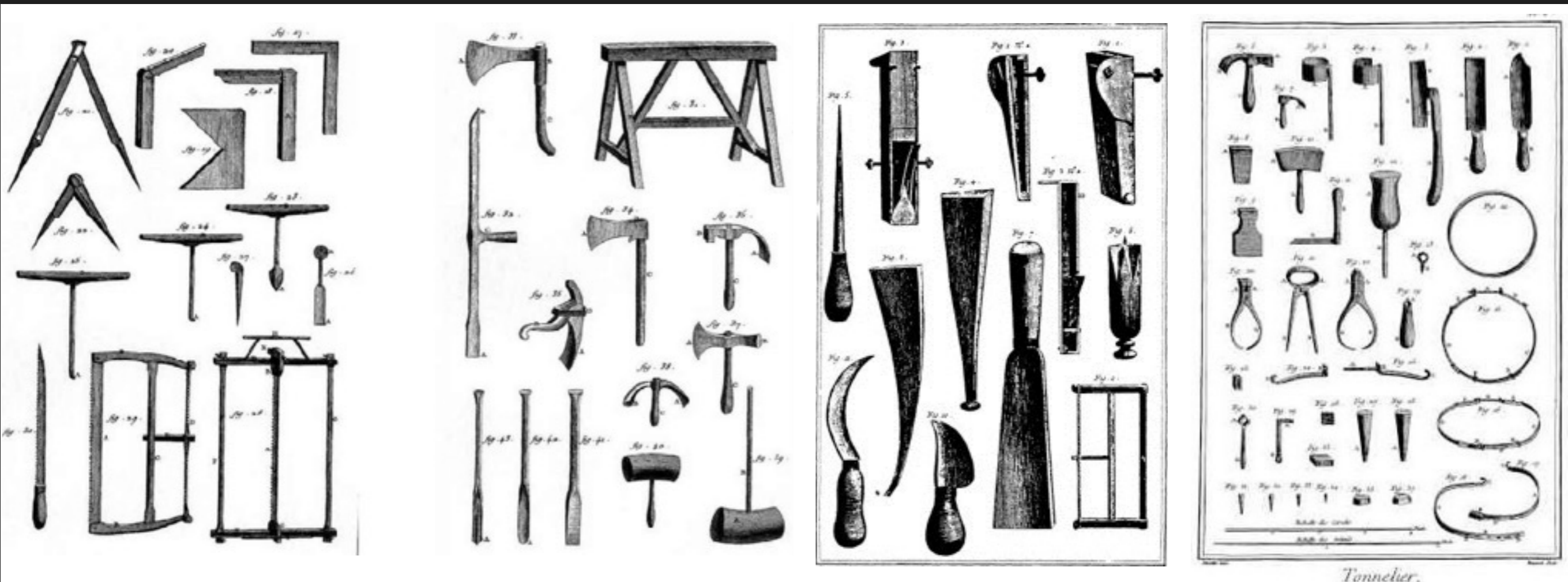
INVENTION OF TOOLS

- ▶ Traces of tools have been found as far back as 3.3 million years

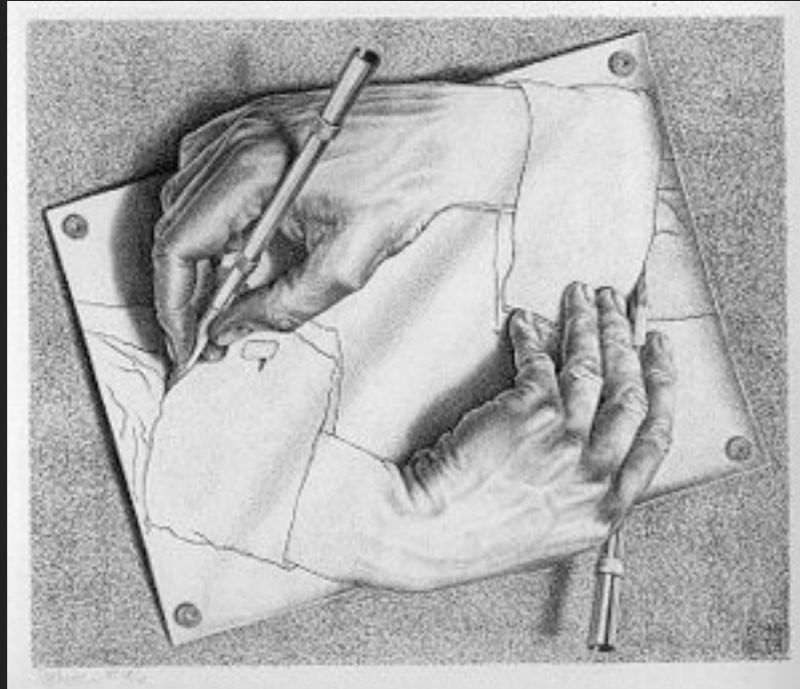


Sonia Harmand, anthropologist

MOST OF OUR INTERACTIONS WITH THE REAL WORLD ARE MEDIATED BY TOOLS AND INSTRUMENTS

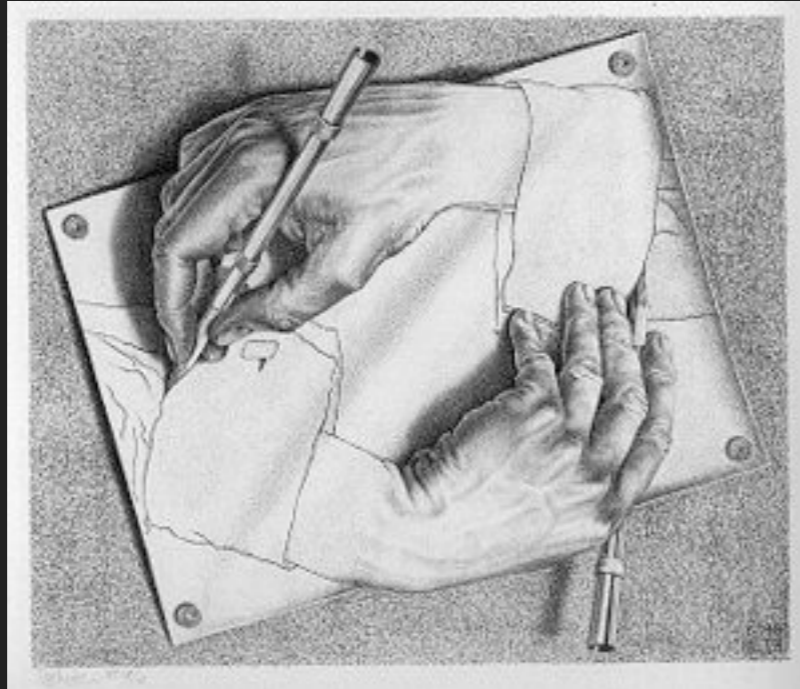


TOOLS TO SHAPE OUR ENVIRONMENT



INTRODUCTION

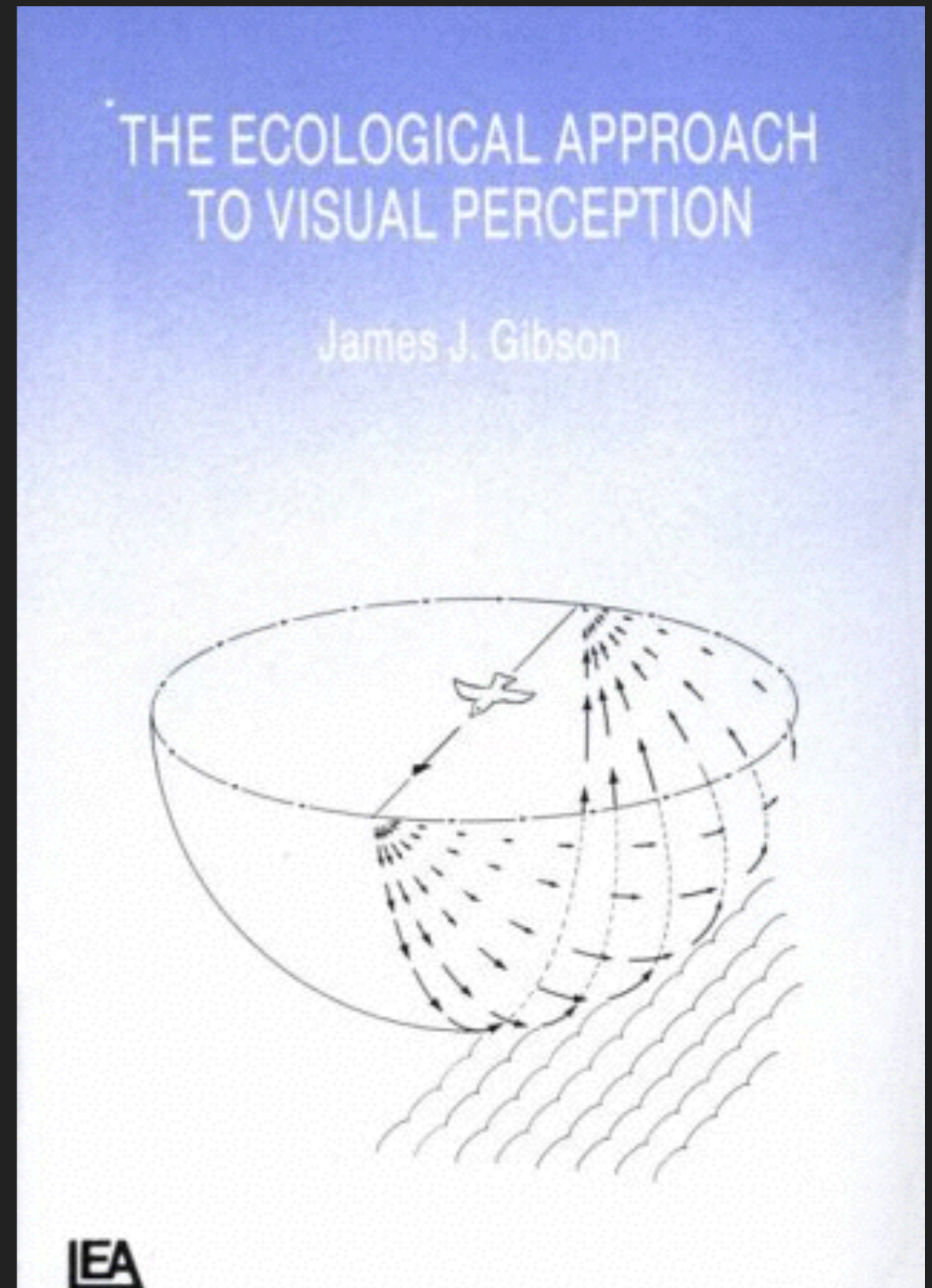
BUT NOT ALWAYS EASY TO LEARN



A BIT OF PSYCHOLOGY

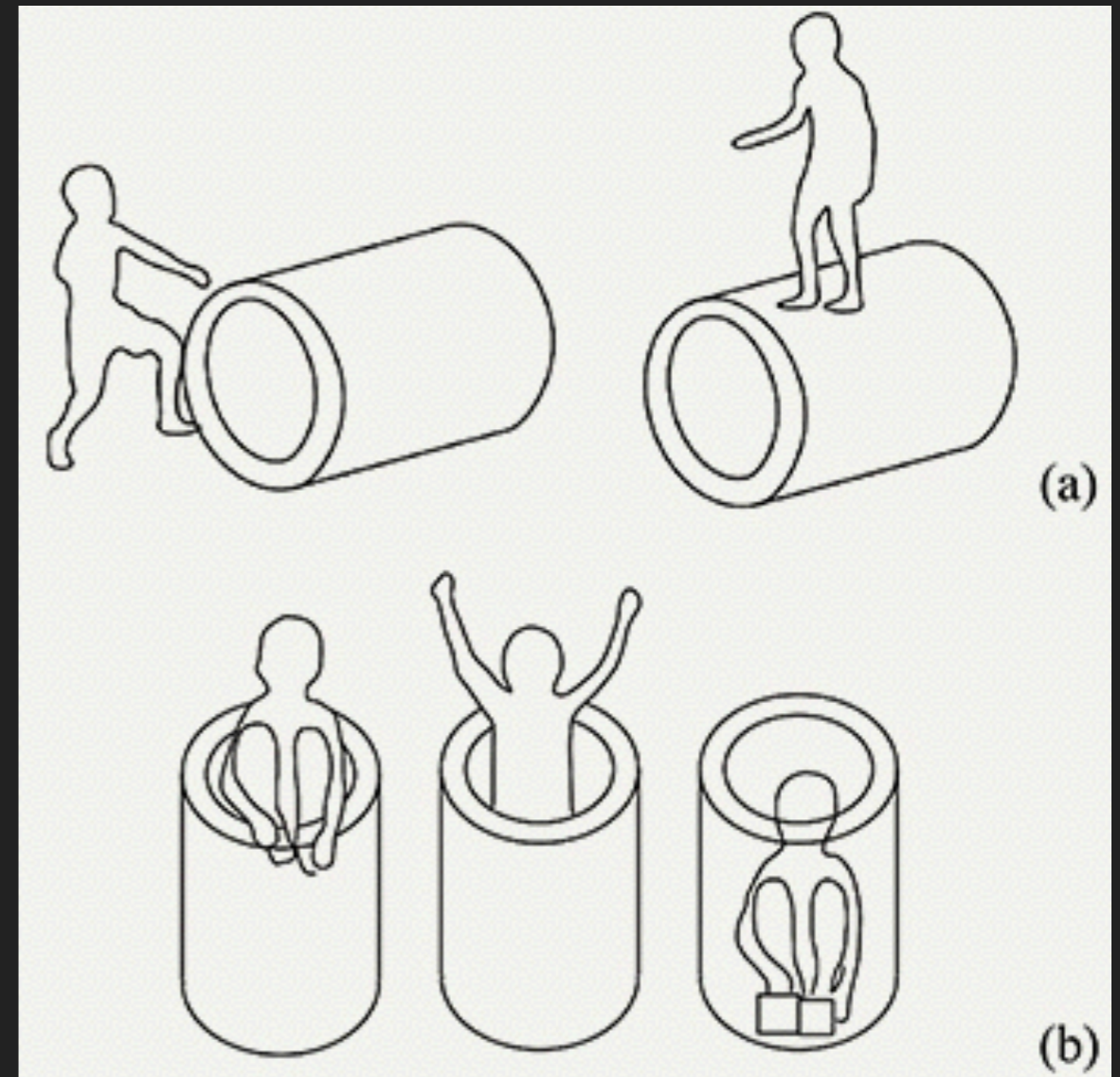
AFFORDANCES

- ▶ We directly perceive the capabilities for action of an object
- ▶ "... the affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill..."
James Gibson



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PERCEPTUAL LEARNING

- ▶ Learning to recognize affordances

- ▶ “We perceive to learn, as well as learn to perceive”

Eleanor Gibson

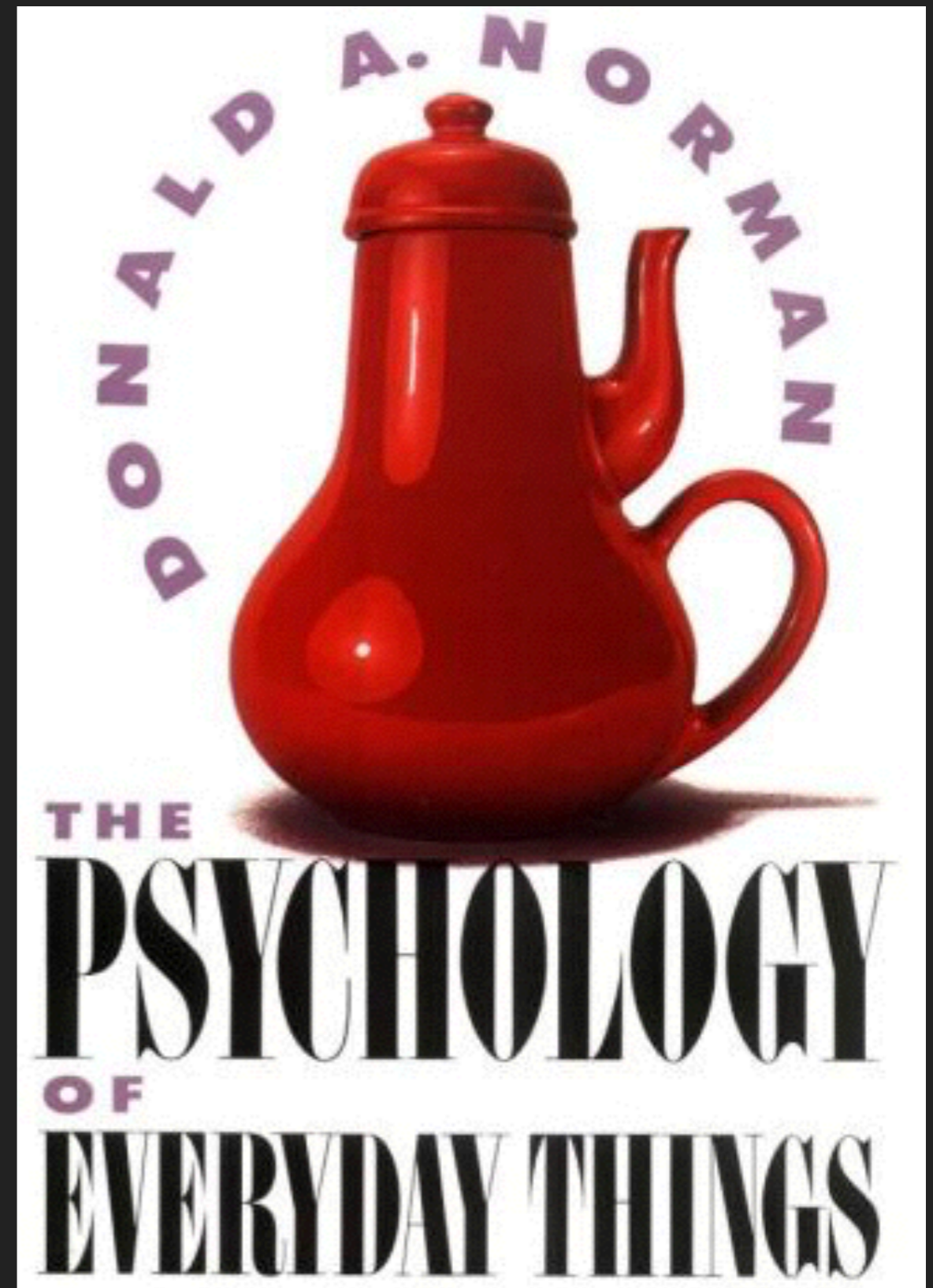




JAMES & ELEANOR GIBSON

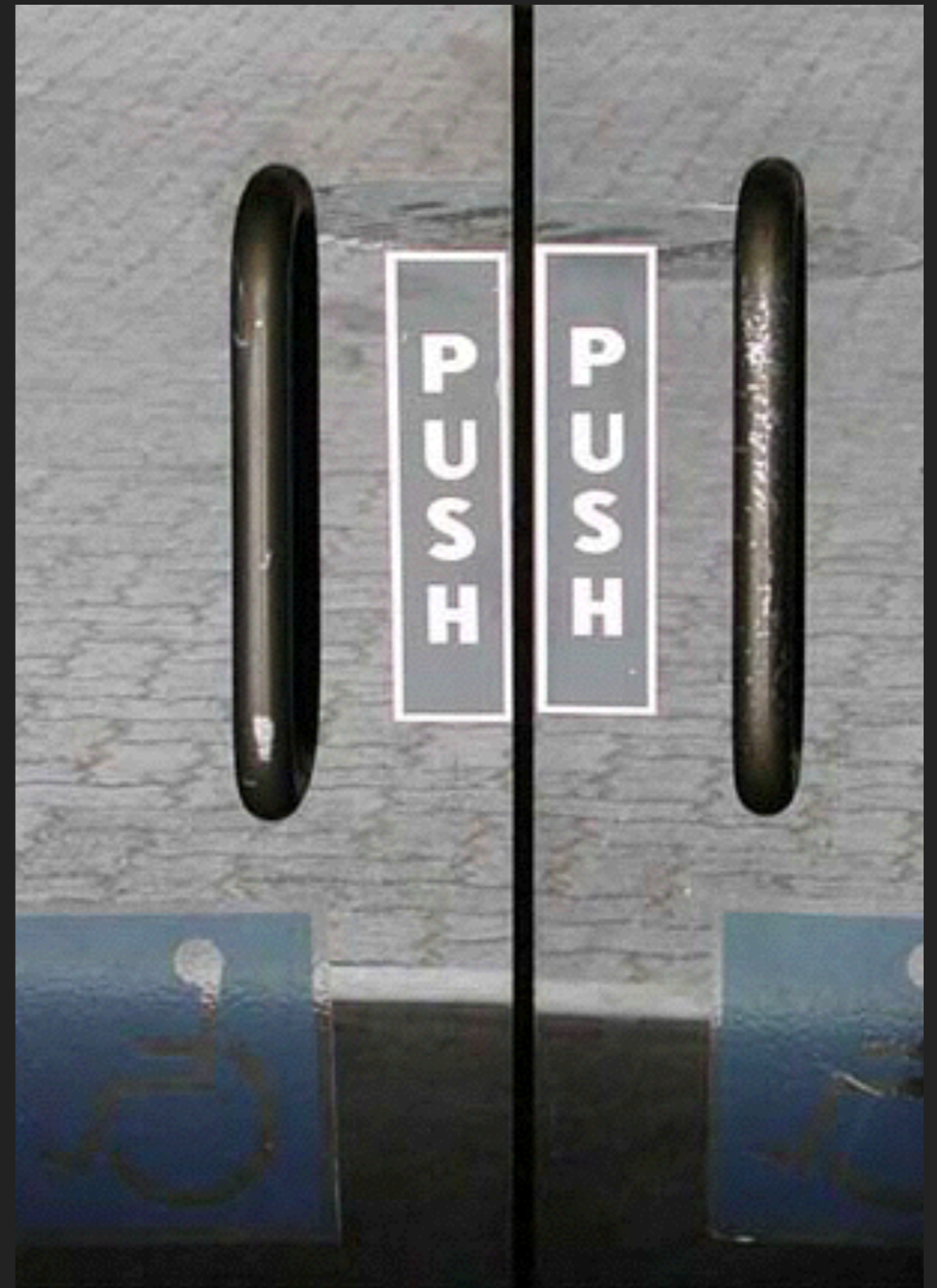
SIGNIFIERS

- ▶ Affordances as redefined by Don Norman
- ▶ To be perceived, an affordance must be visible



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THE POWER OF TOOLS

- ▶ We internalize the tool as a physical extension of our body



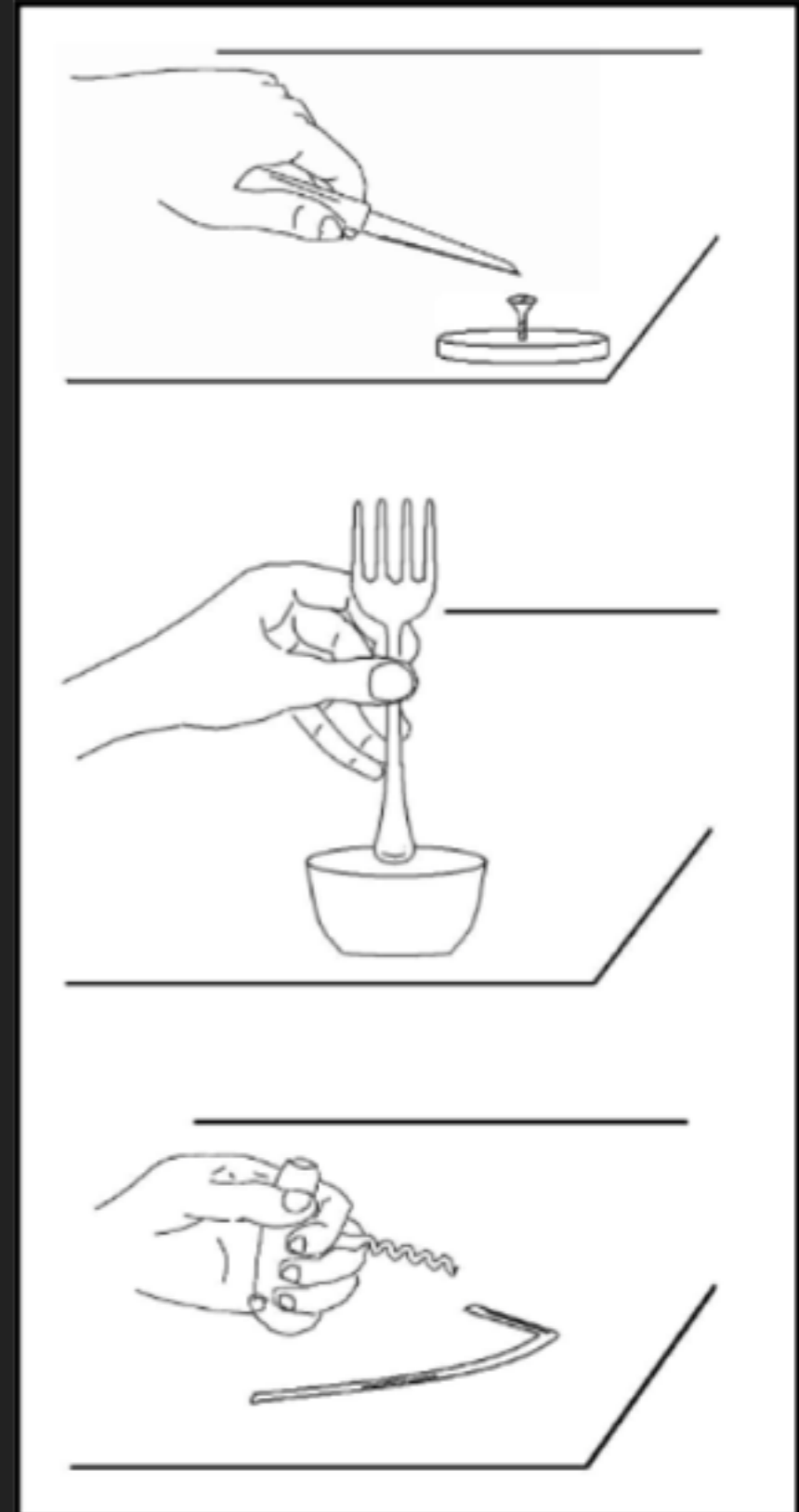
THE POWER OF TOOLS

- ▶ We internalize the tool as a physical extension of our body



TECHNICAL REASONING

- ▶ We simulate in our head the physical mechanism to solve a problem
- ▶ We appropriate the objects at hands



APPROPRIATION

- ▶ A pen or a ruler?
- ▶ A mug or a compass?



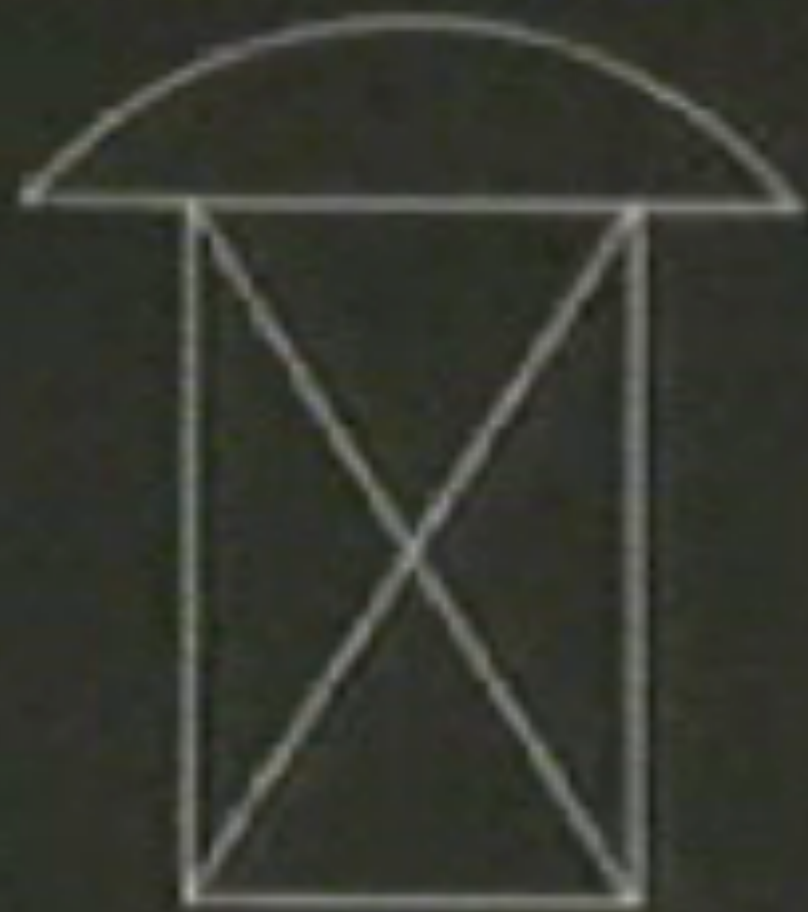
**WHAT ABOUT
DIGITAL TOOLS?**



SKETCHPAD

IVAN SUTHERLAND, 1963

**GRAPHICAL
INTERACTION**



COMPUTER AS TOOL

- ▶ “Computers are like a bicycle for our minds”
Steve Jobs

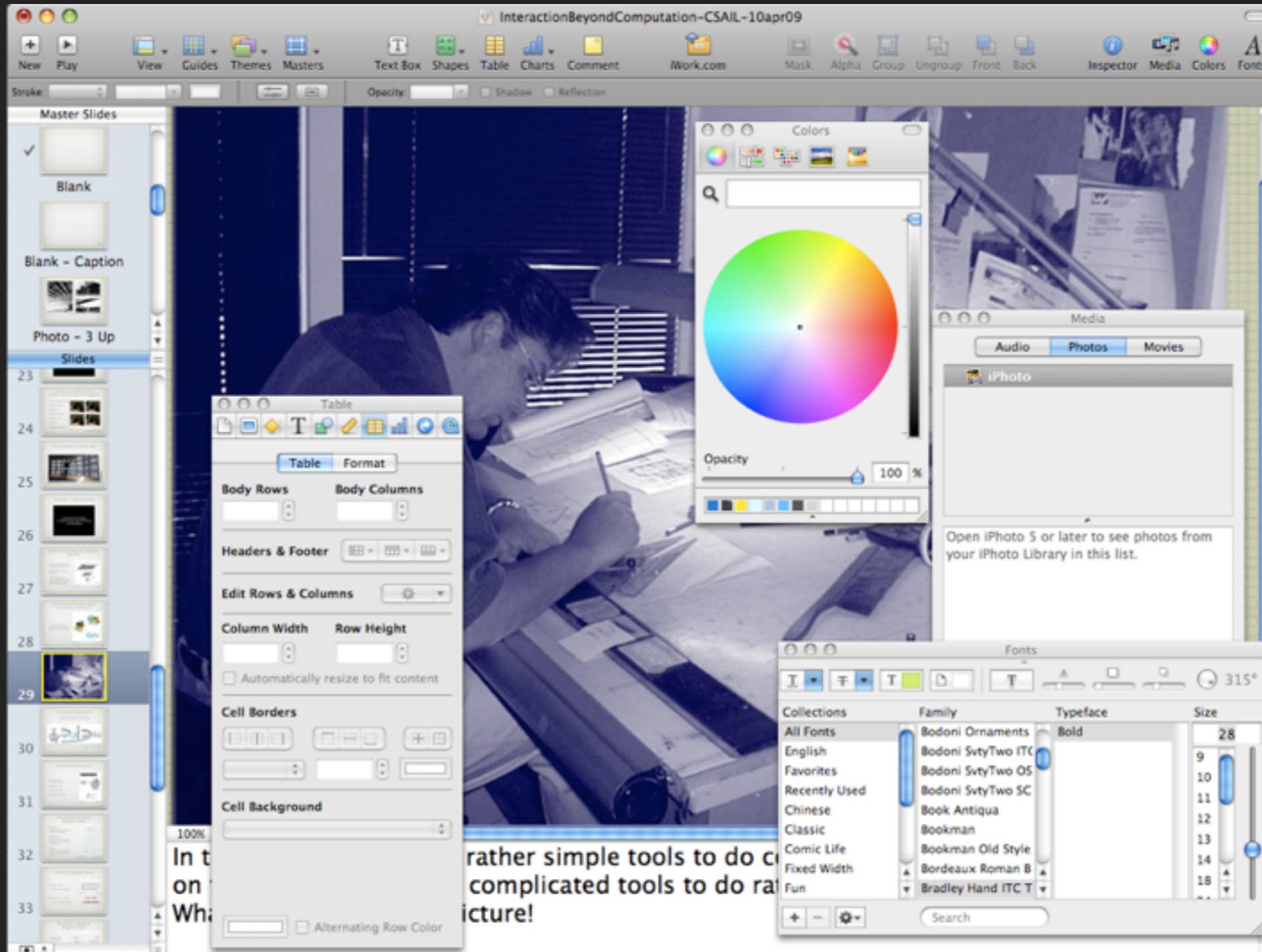


DIGITAL TOOLS

FROM PHYSICAL TOOLS ...



... TO DIGITAL TOOLS

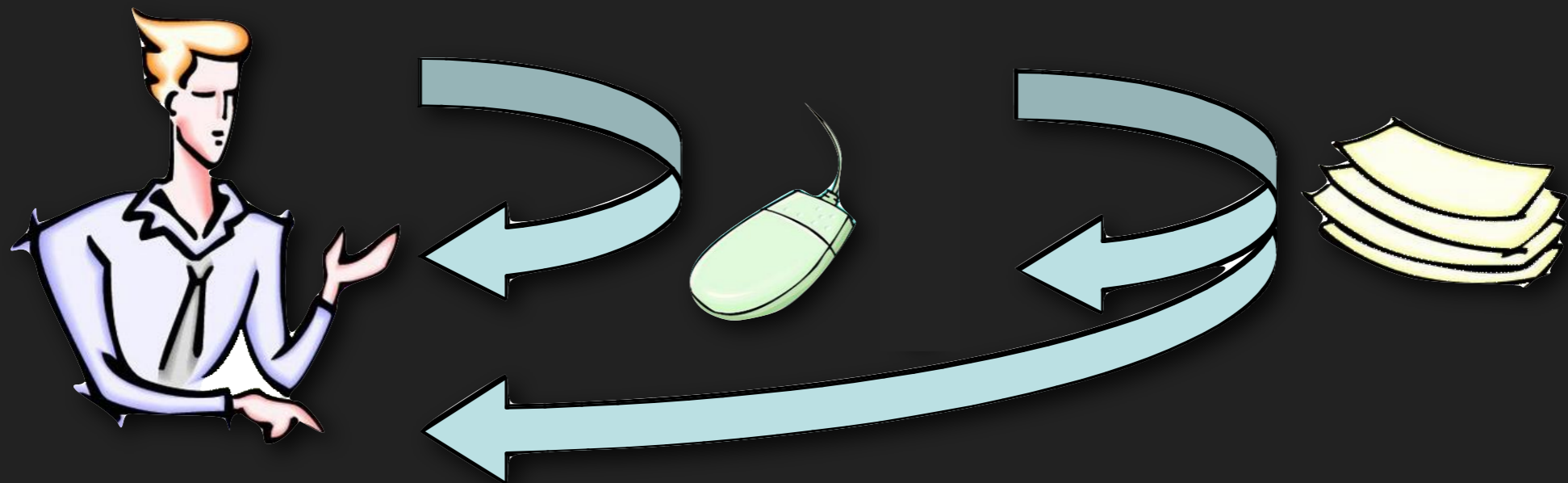


INSTRUMENTAL INTERACTION

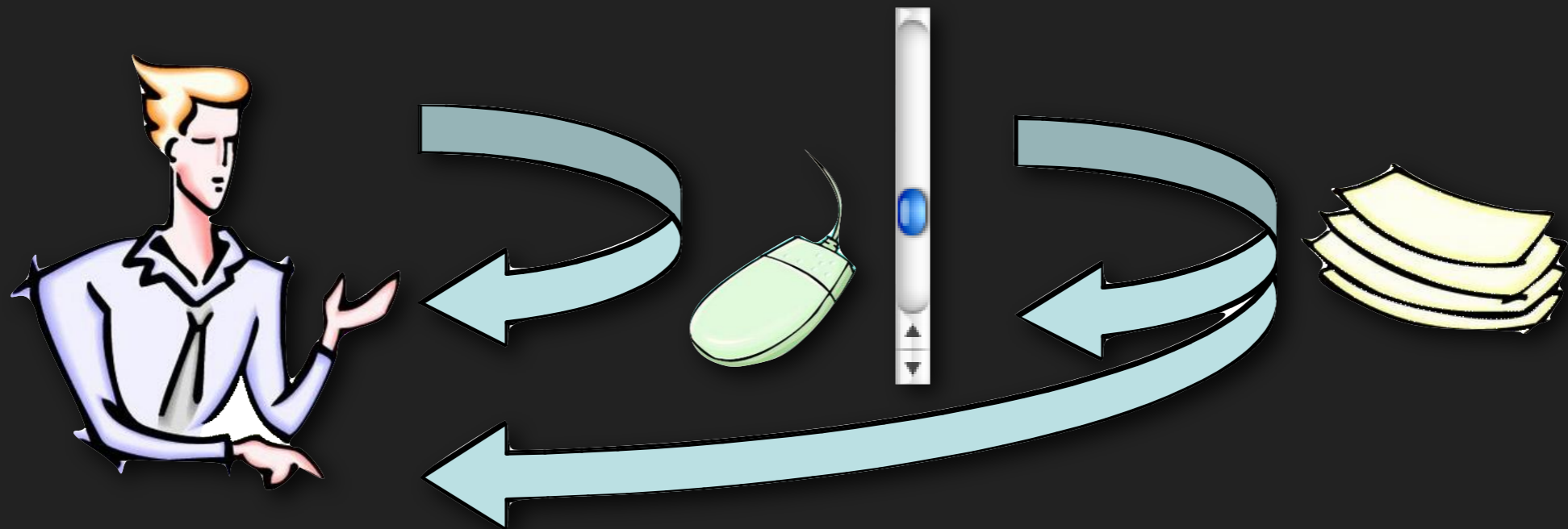
INTERACTION IS MEDIATED BY A TOOL



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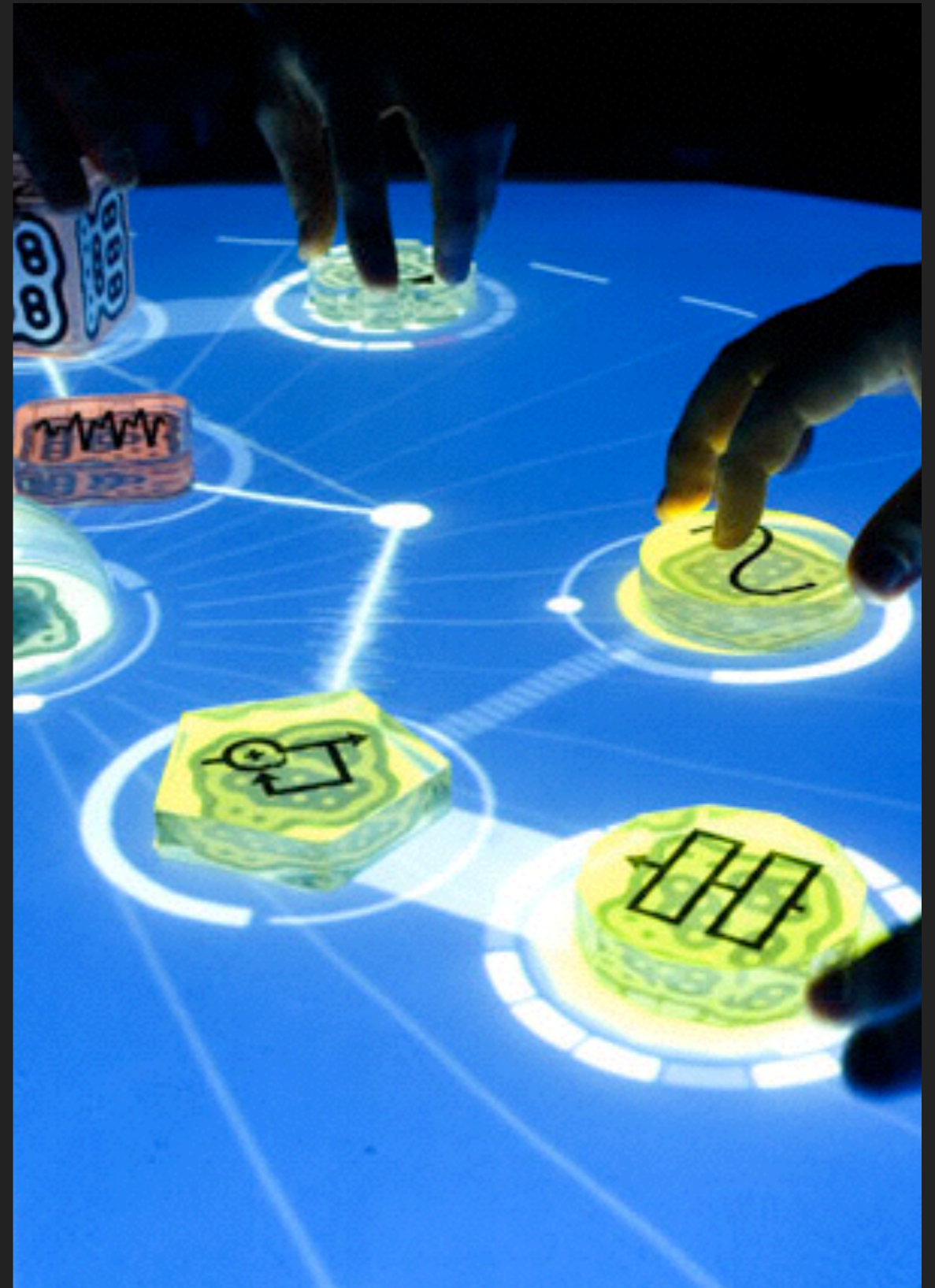
INTERACTION IS MEDIATED BY A TOOL



A DESCRIPTIVE MODEL

- ▶ From direct manipulation
- ▶ To tangible interaction

- ▶ But not universal:
- ▶ Voice-based interaction?
- ▶ Gesture-based interaction?



INSTRUMENTAL INTERACTION

CPN2000

CPN Editor

Toolbox
 Style Tools
 Editing Tools
 Simulation Tools
 Page Tools

CPN
 Top
 Receiver(1)
 Receiver(2)
 Network
 Sender

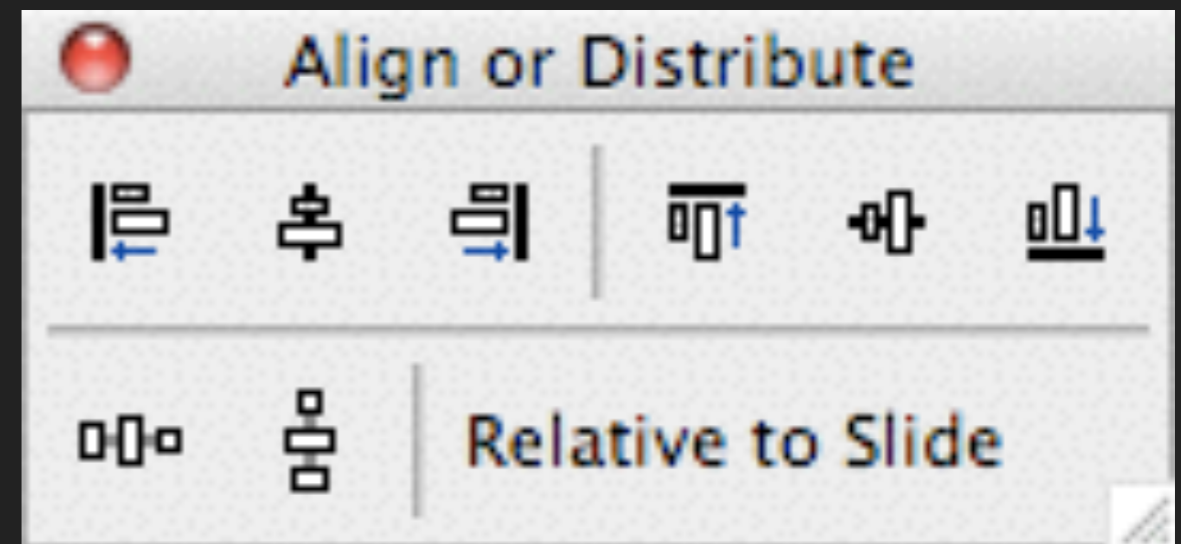
Receiver(1) Receiver(2)

Receiver(1)

Top Network Sender

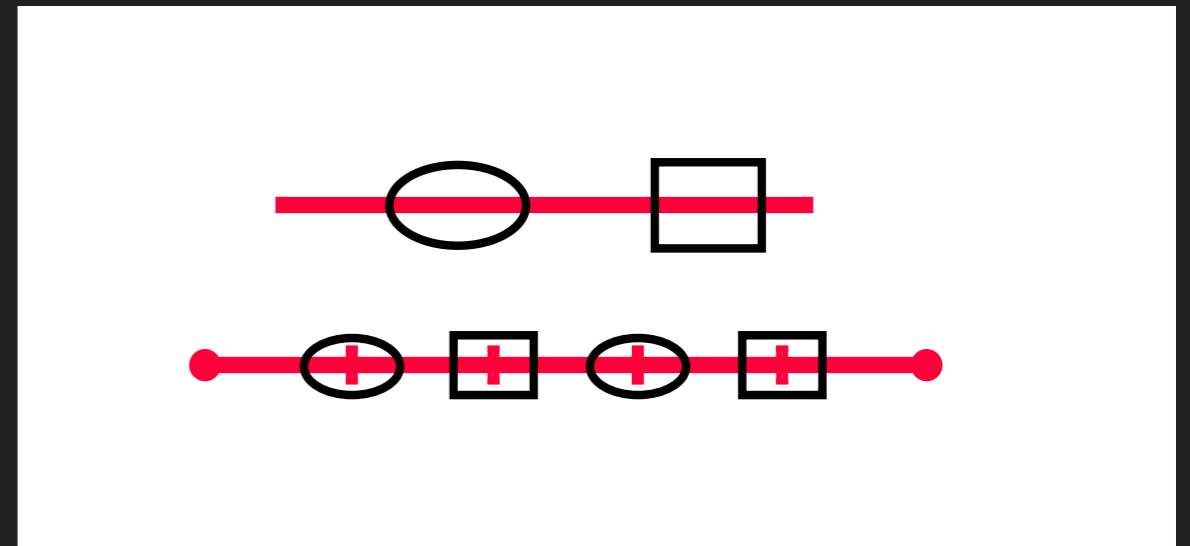
REIFICATION

- ▶ Transform a command into an object that can be directly manipulated
- ▶ Example : alignment



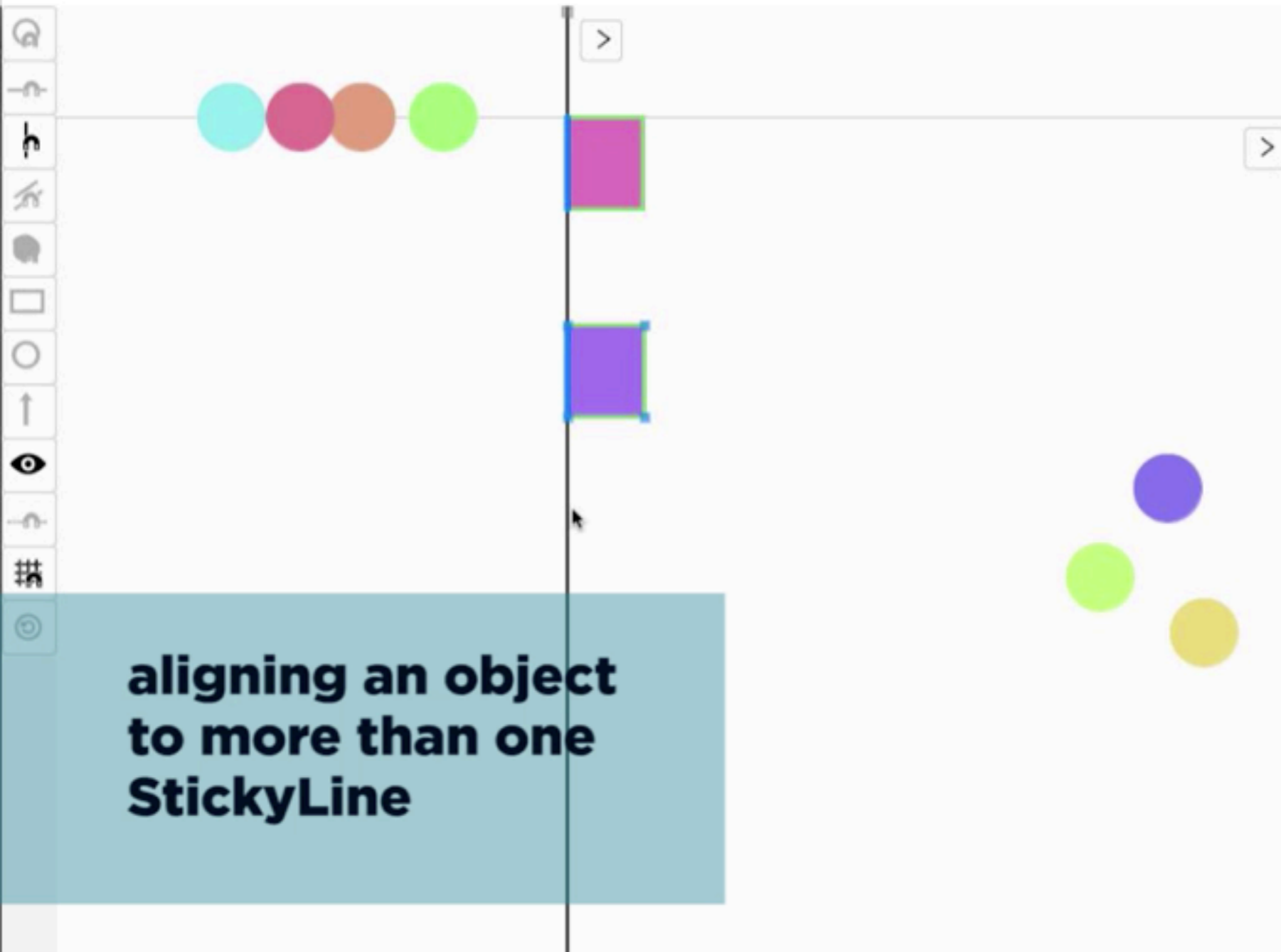
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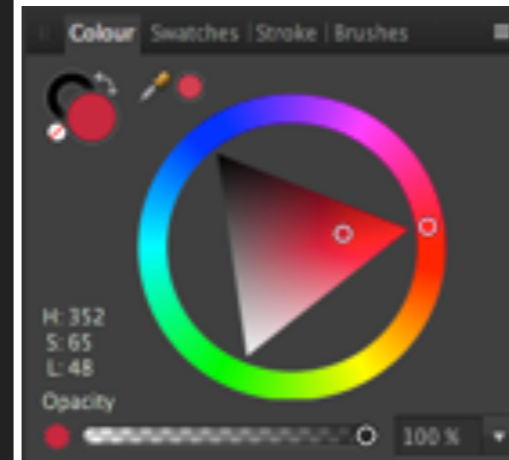
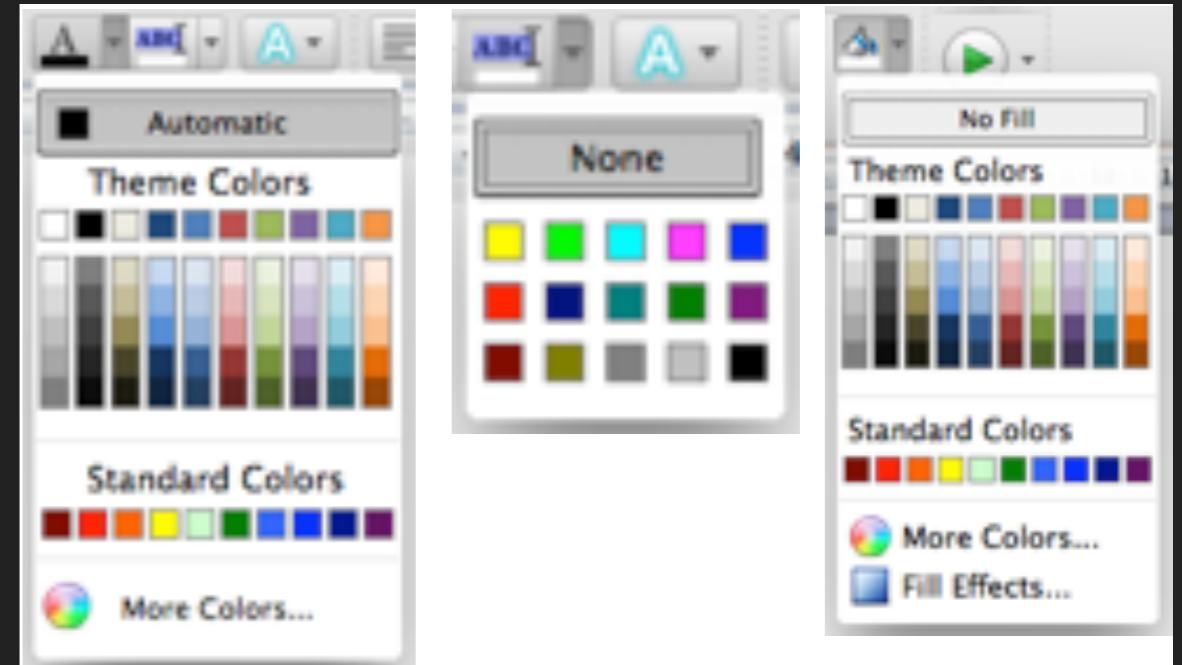
STICKYLINES

M. Ciolfi, N. Maudet, W. Mackay, M. Beaudouin-Lafon



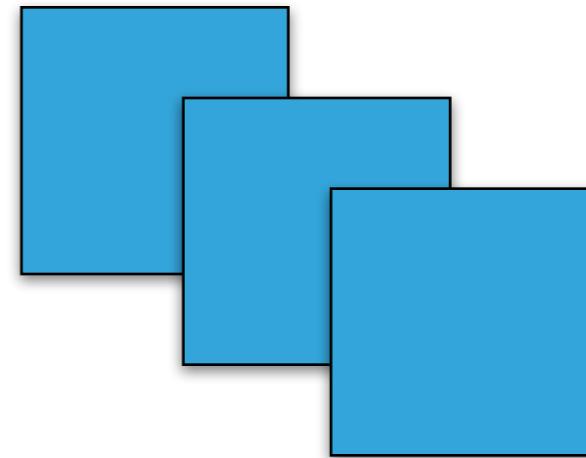
POLYMORPHISM

- ▶ The same tool can be used in different contexts
- ▶ Example : color selector
- ▶ Free the tools from the applications where they are trapped!



REUSE

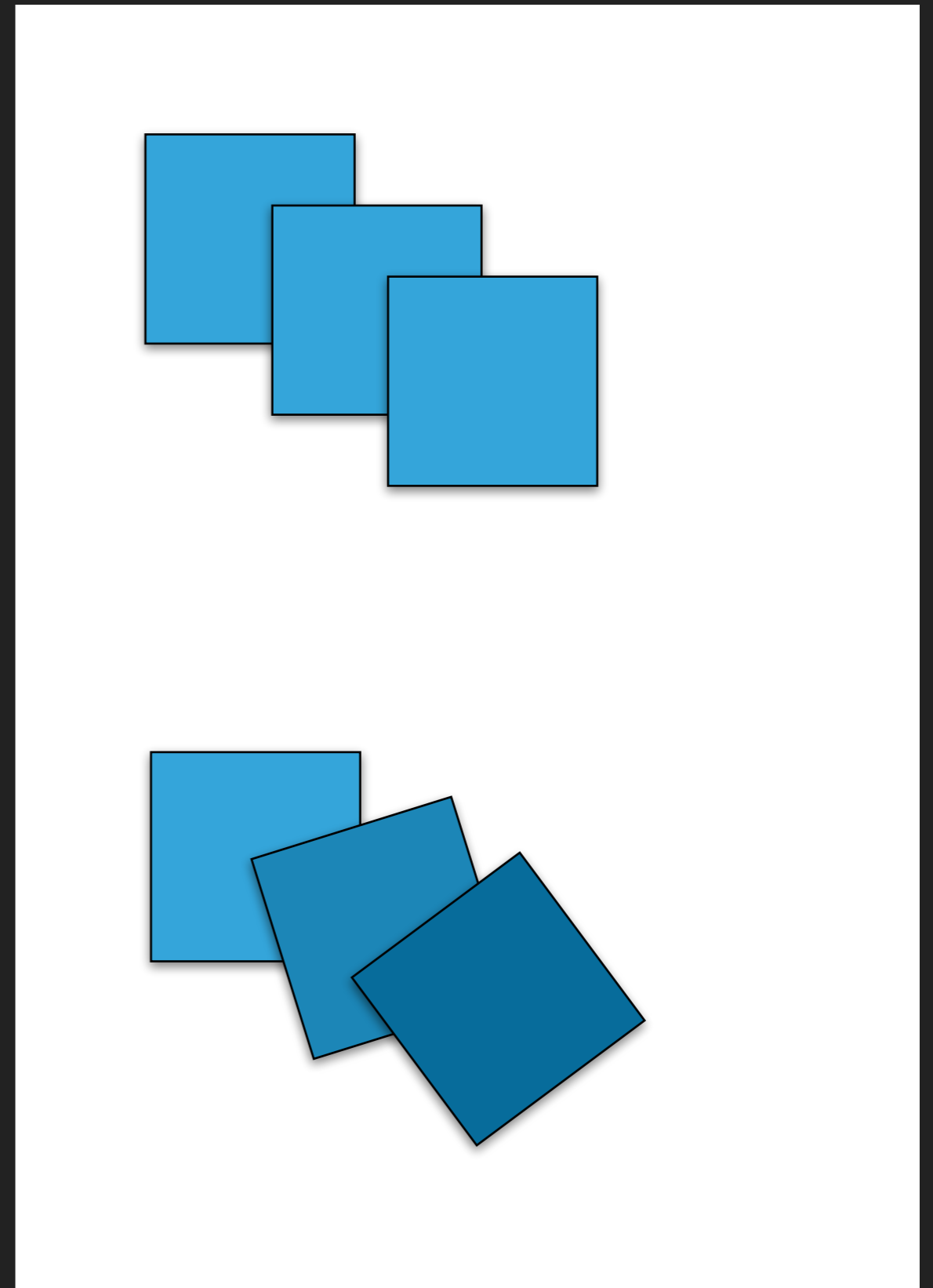
- ▶ Output reuse (objects)
- ▶ Example : copy-paste



REUSE

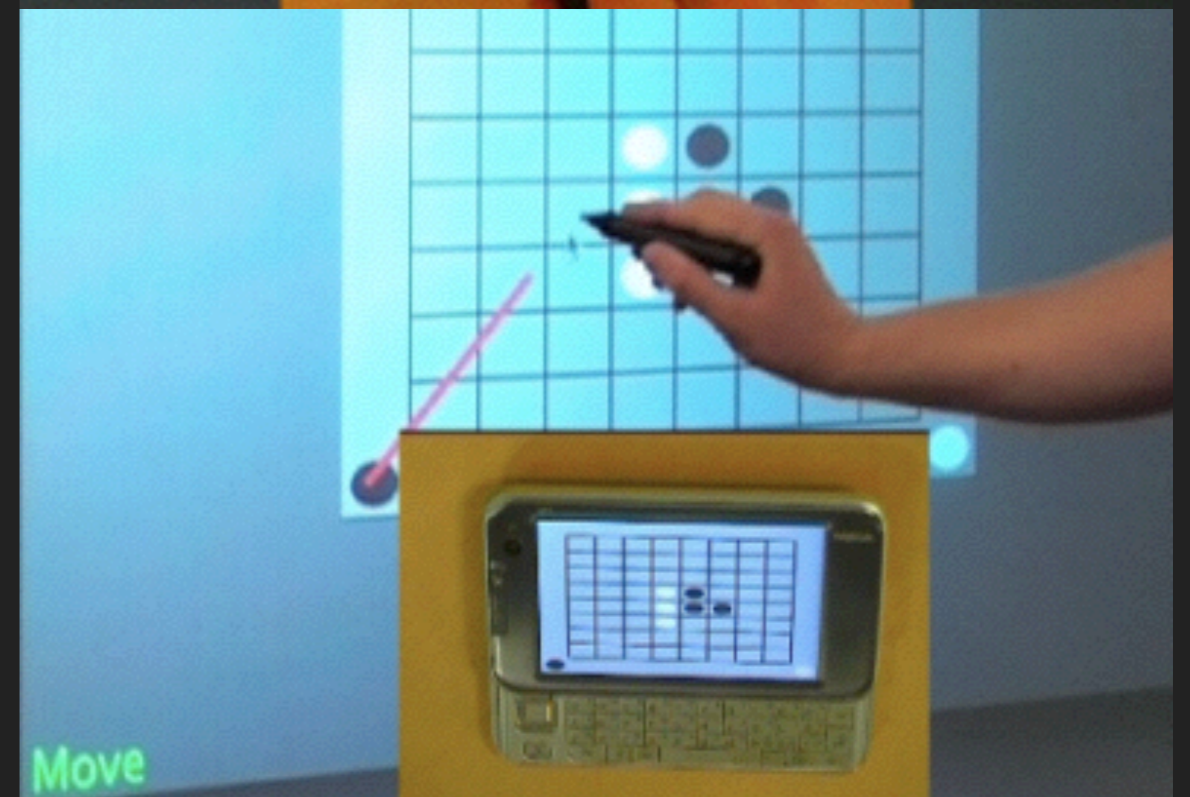
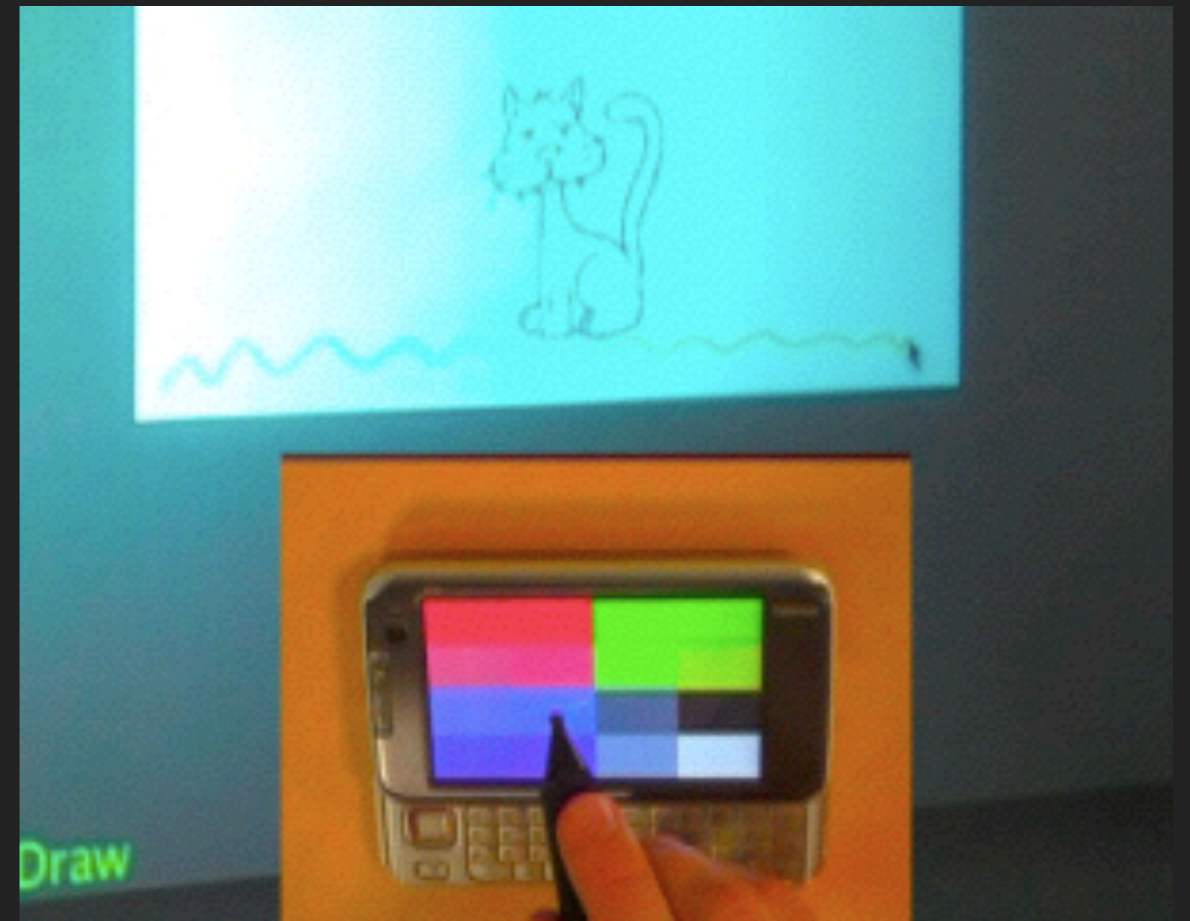
- ▶ Output reuse (objects)
- ▶ Example : copy-paste

- ▶ Input reuse (commands)
- ▶ Example : redo, macros



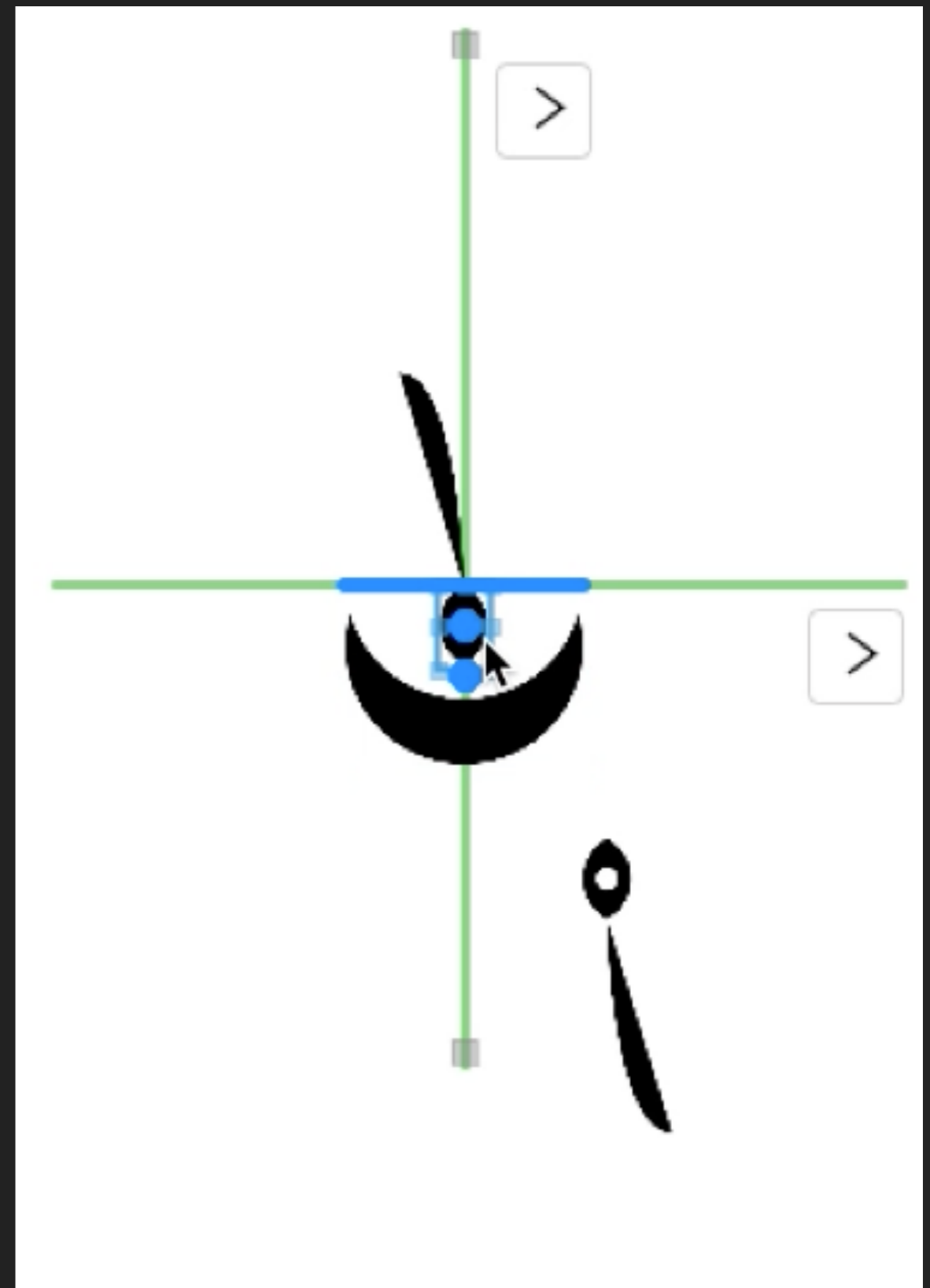
UBICOMP INSTRUMENTS

- ▶ Instruments spanning multiple interaction surfaces
- ▶ Multi surface interaction
- ▶ VIGO (CHI'09)



ANALYZING STICKYLINES

- ▶ Reification of alignment
- ▶ Polymorphic
 - ▶ Align objects of different types
 - ▶ Move command adds/removes object to/from StickyLines
- ▶ Reusable
 - ▶ Copy StickyLine (with objects)
 - ▶ Copy tweaks



INTEGRATING THE PRINCIPLES

- ▶ Reification and polymorphism:
 - ▶ More objects and fewer commands
- ▶ Reification facilitates output reuse:
 - ▶ More first-class objects can be reused
- ▶ Polymorphism facilitates input reuse:
 - ▶ Increases the scope of commands