

# Fundamentals of Human-Computer Interaction 1



Photos/collage by Jack L. Moffet in Dan R. Olsen, « Interacting in Chaos », Interactions, sept-oct 1999.

Michel Beaudouin-Lafon  
Université Paris-Saclay  
mbl@liscn.fr

# About me

Michel Beaudouin-Lafon

Professor of Computer Science

Université Paris-Saclay

[mb@lisn.fr](mailto:mb@lisn.fr)

<https://www.lri.fr/~mb>

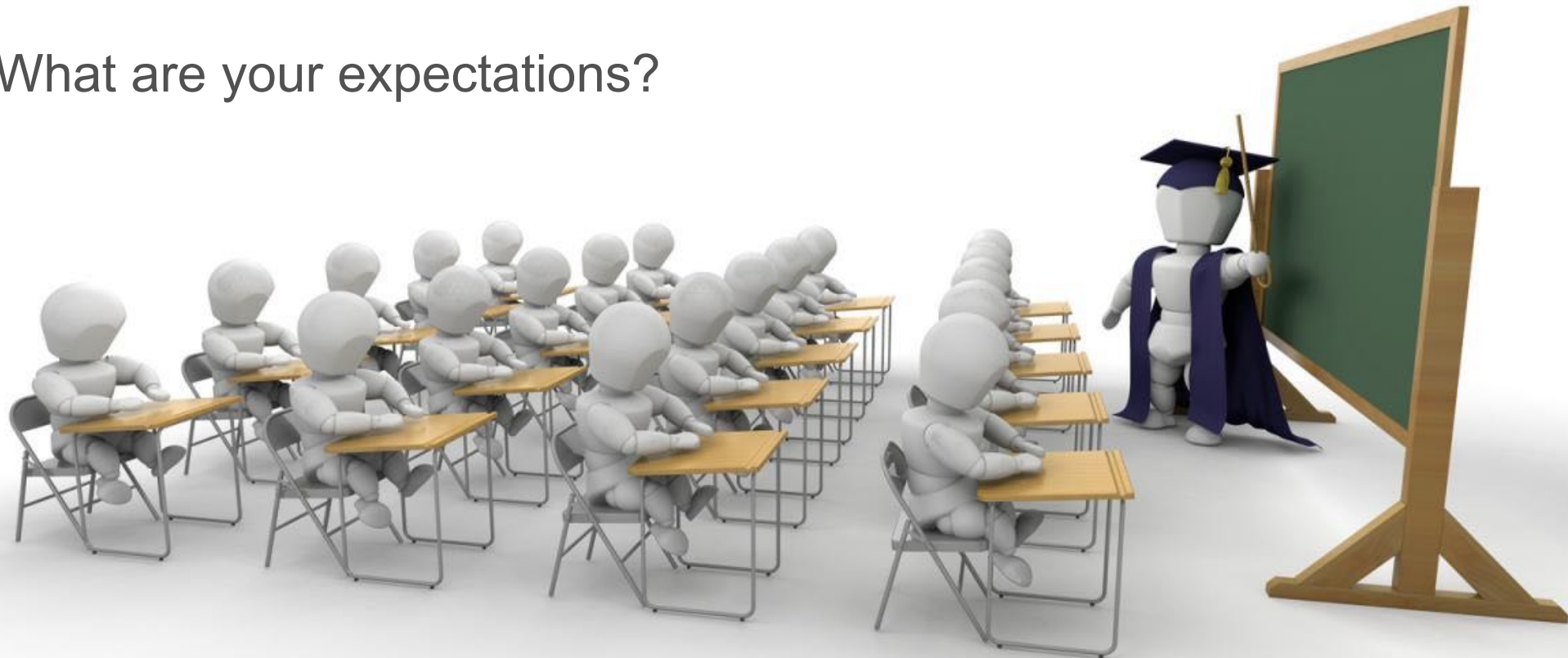


# About you

Why are you here?

What is your background?

What are your expectations?



# Organization of the course

Fundamentals of HCI 1 vs. Fundamentals of HCI 2

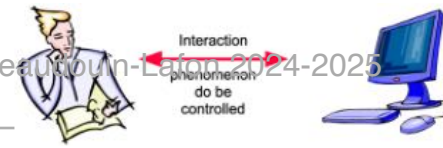
TA sessions

Web site for the course:

<https://www.lri.fr/~mbi/FundHCI>

Grading





# Outline

## FundHCI 1

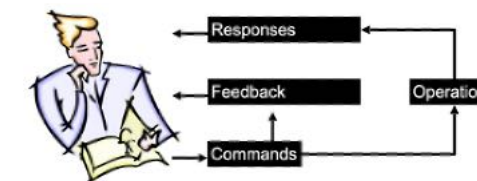
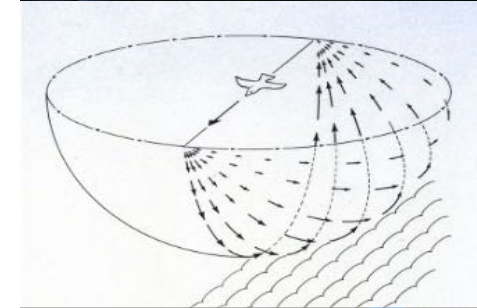
### Introduction

### Interaction styles

### Psychology of interaction

### Graphical interaction

### Conceptual design





# Outline

## FundHCI 1

Introduction

Interaction styles

Psychology for HCI

Graphical interaction

Conceptual design

## FundHCI 2

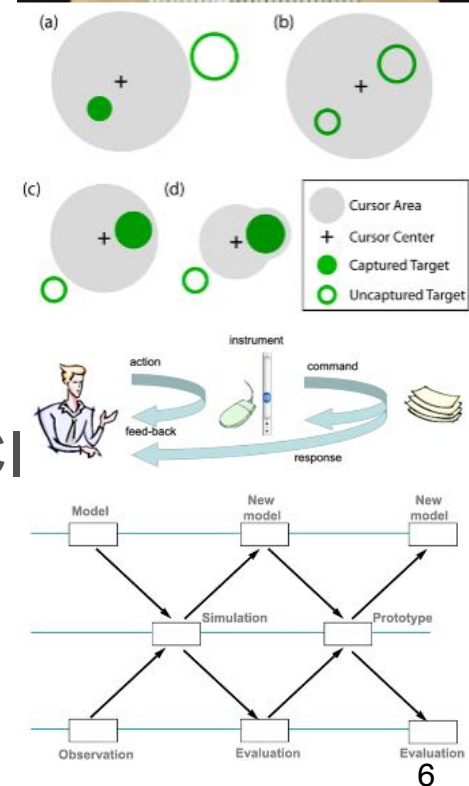
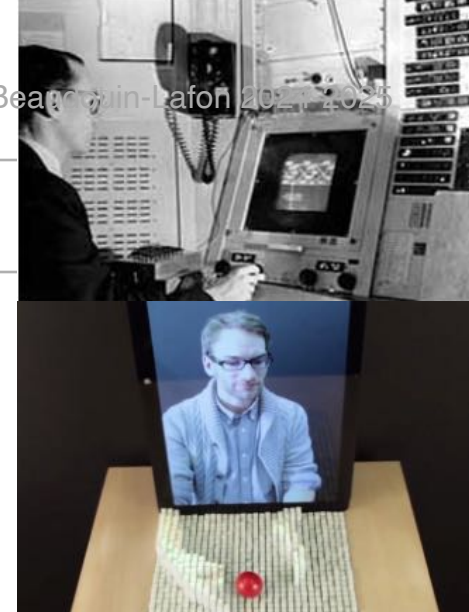
History

Advanced interaction styles

Pointing and navigation

Instrumental interaction

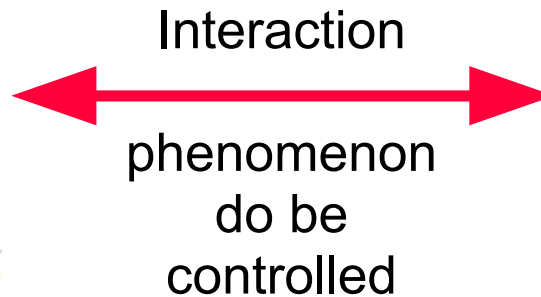
Theories and models for HCI



# Human-Computer Interaction



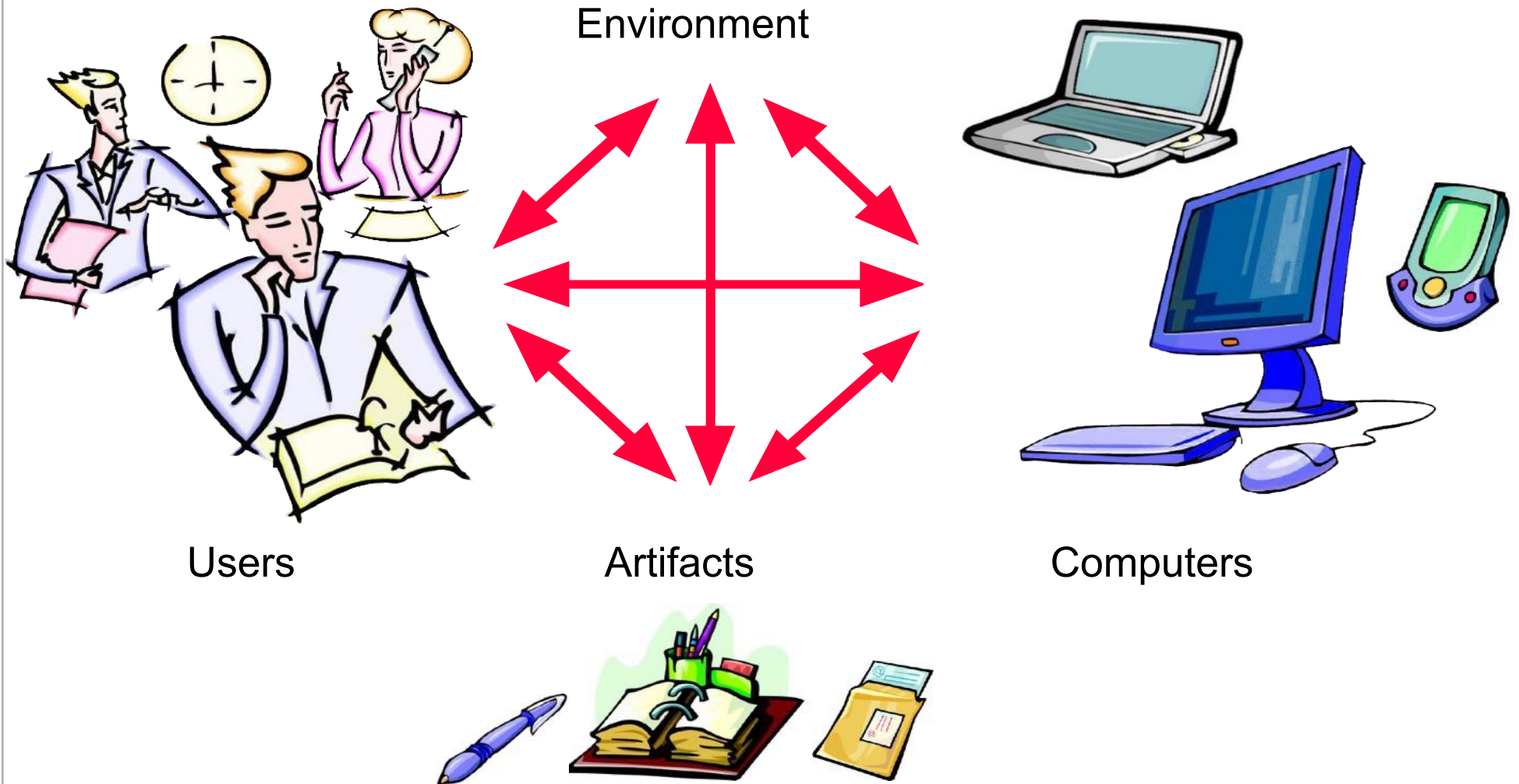
Capabilities: action,  
perception, cognition



Capabilities: computation,  
storage, input/output

Environment: physical, social,  
organisational, cultural, etc.

# In the real world: *Situated Interaction*

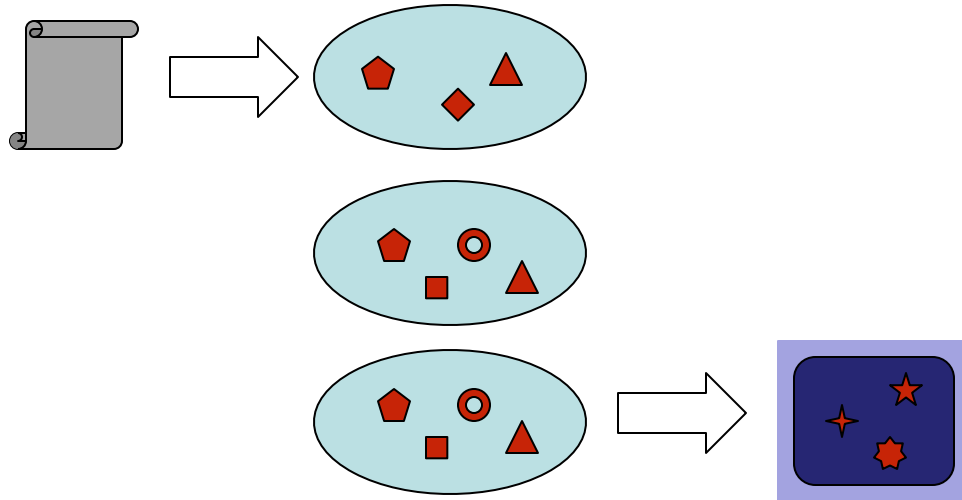




# An interactive system is **not** ...

An algorithmic system that:

- Reads input
- Processes it
- Writes results

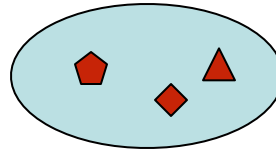


See Wegner, *Interaction is more powerful than algorithm*

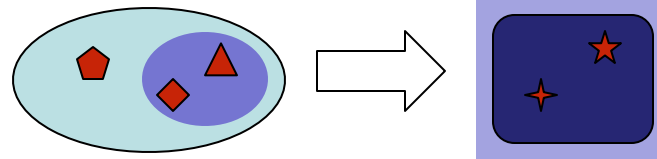
# An interactive system is ...

A computer system that:

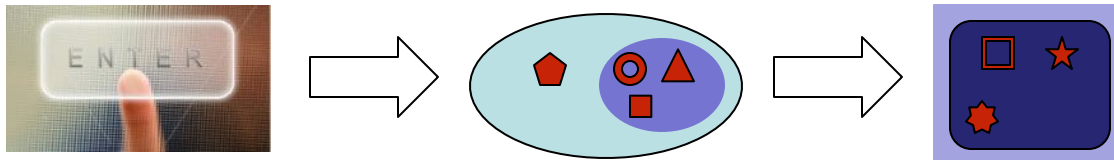
- Holds an internal state



- Creates perceivable representations of part of this state



- Reacts to input as soon as it arrives



# Three properties of interactive systems

## **Reactive:**

U provides input to S,  
S must process it immediately and generate output to U

## **Open:**

dependencies between S's output  
and U's future input are unknown to S

## **Asymmetric:**

U does not have to react immediately to S  
U likes to know the dependencies between S's input and output

# Two conceptions of human-computer systems

## « human-in-the-loop »

System-centric view where the user must conform to the system's rules, e.g. provide input in a specific order or format

Addresses operational tasks where the user performs actions that the computer cannot (yet) do



# Two conceptions of human-computer systems

## « **computer-in-the-loop** »

Human-centric view where the computer must be adapted to the capabilities of the user

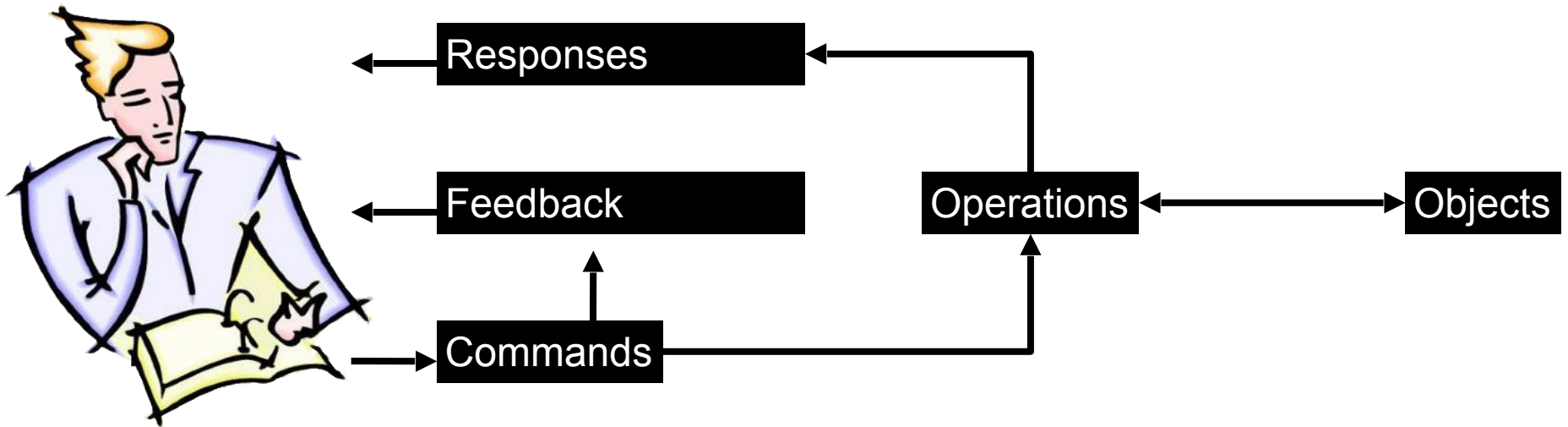
Addresses creative tasks where the computer extends or augments the capabilities of the user





# Conceptual model

Model of how this system operates



Ideally, matches the user's *mental model*

# BEWARE!

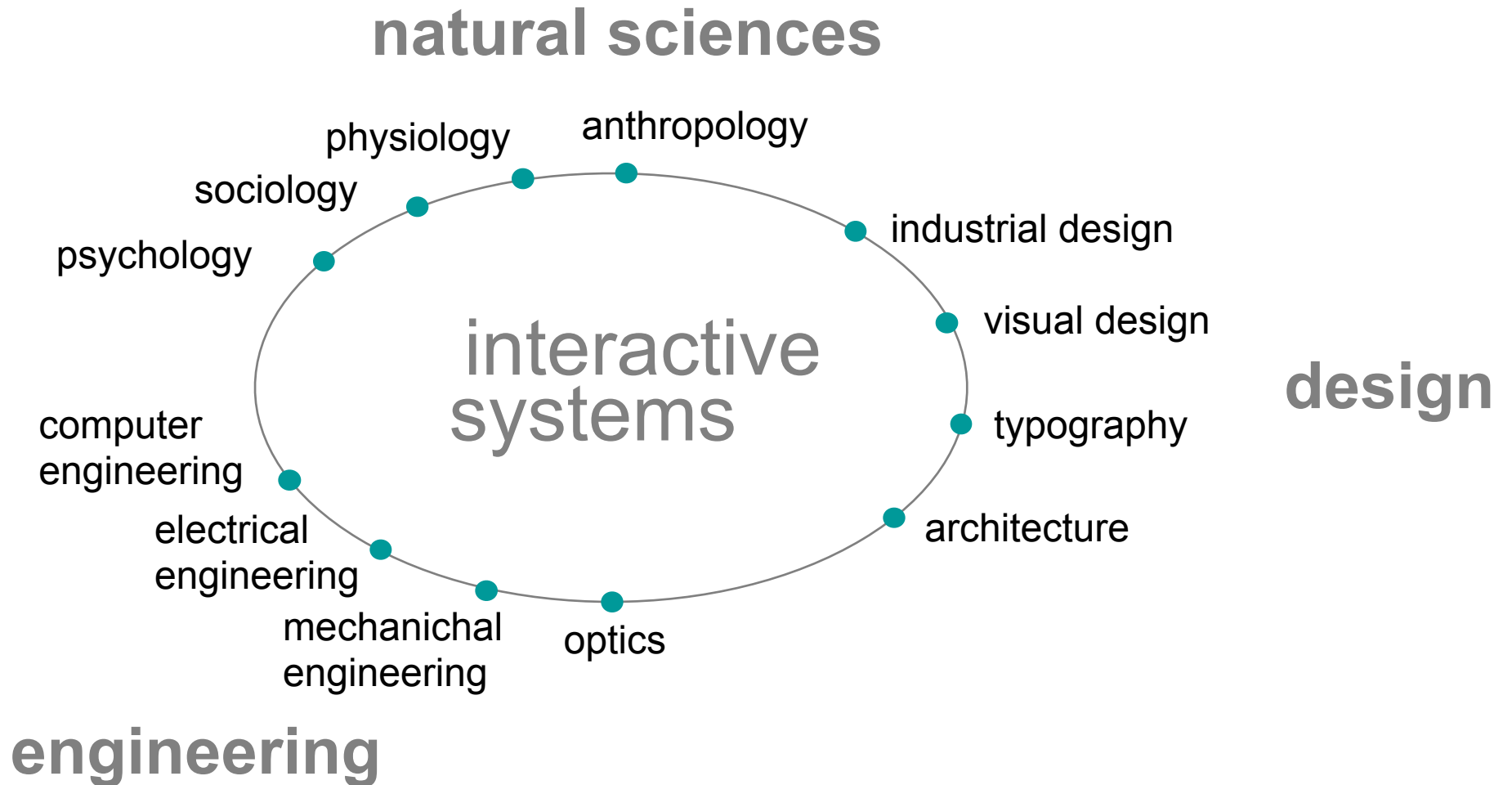
We all use interactive systems  
We all have ideas of how to improve them  
... But few are designers or HCI researchers

Paradox of Human-Computer Interaction (HCI):  
Measure of success = invisibility, transparency  
**Making things simple is difficult** (and difficult to understand)

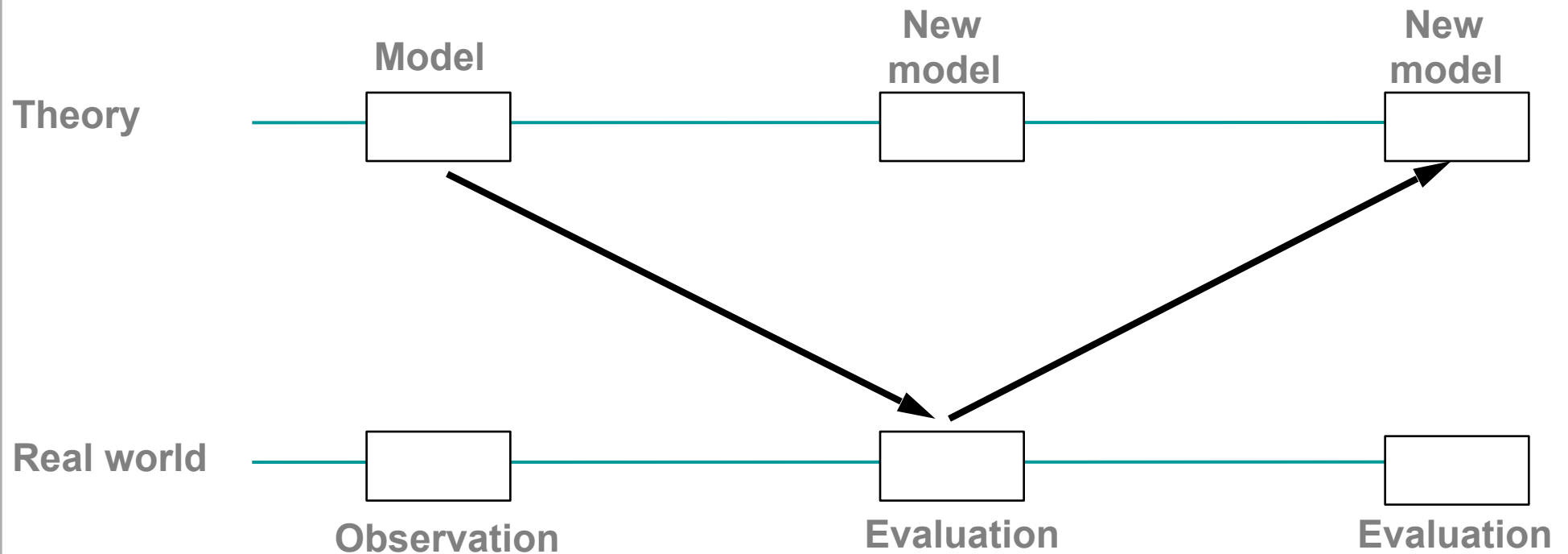
Adaptability of humans is a strength ... and a weakness

- ⇒ HCI is a complex multidisciplinary domain
- ⇒ Design and HCI research require unique skills

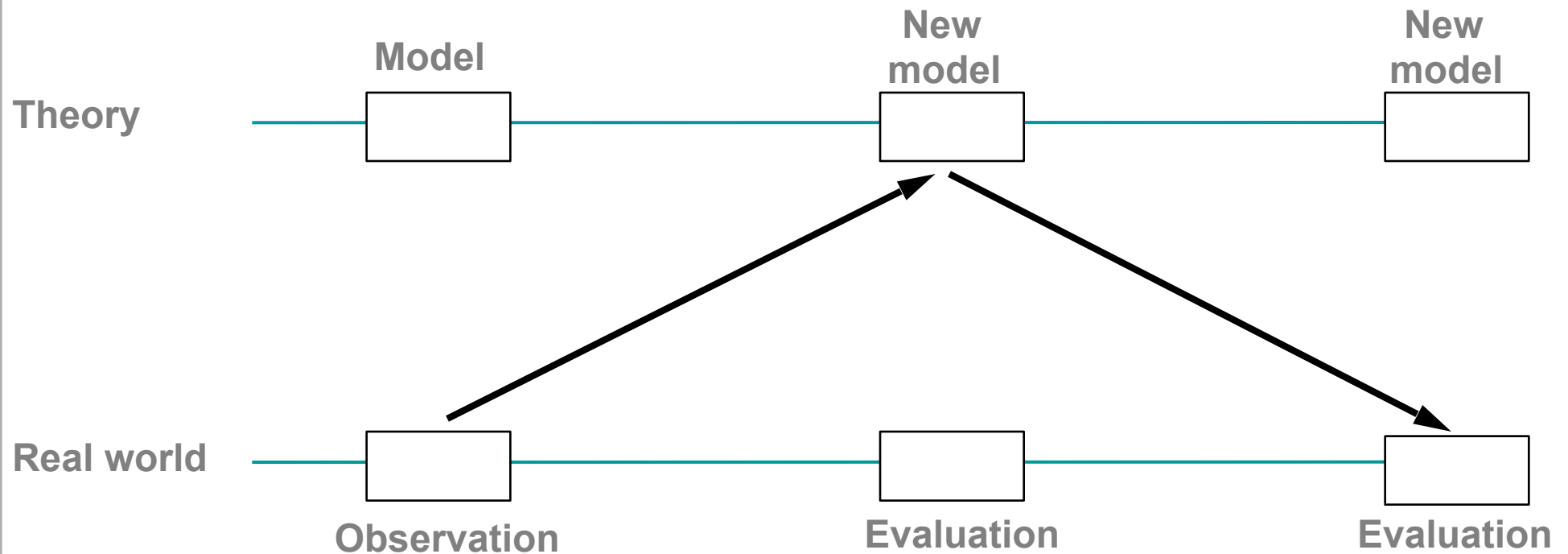
# Multidisciplinary approach



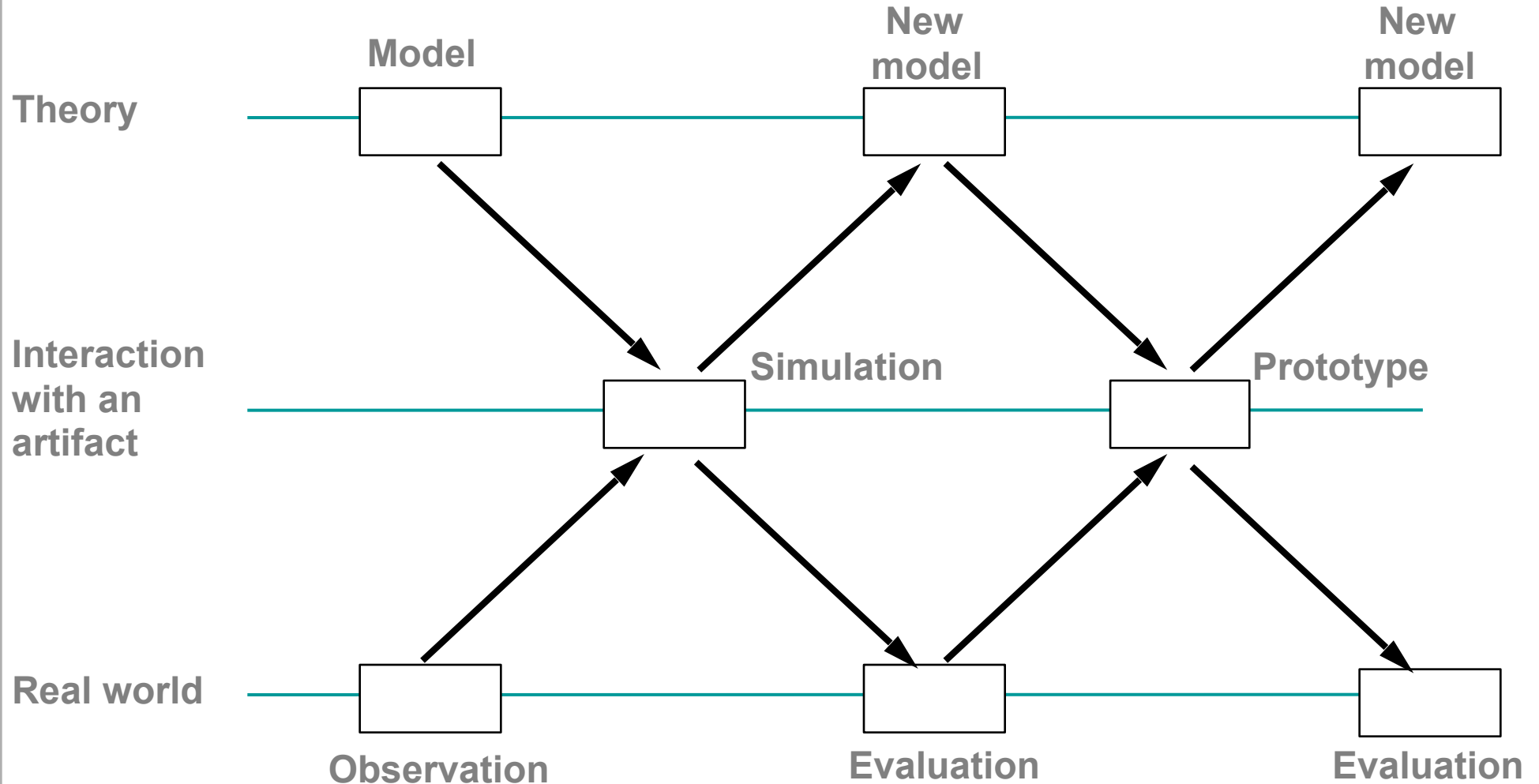
# Research strategies: Psychology



# Research strategies: Anthropology



# Research strategies: HCI





# The design of interactive systems

## Importance of human factors

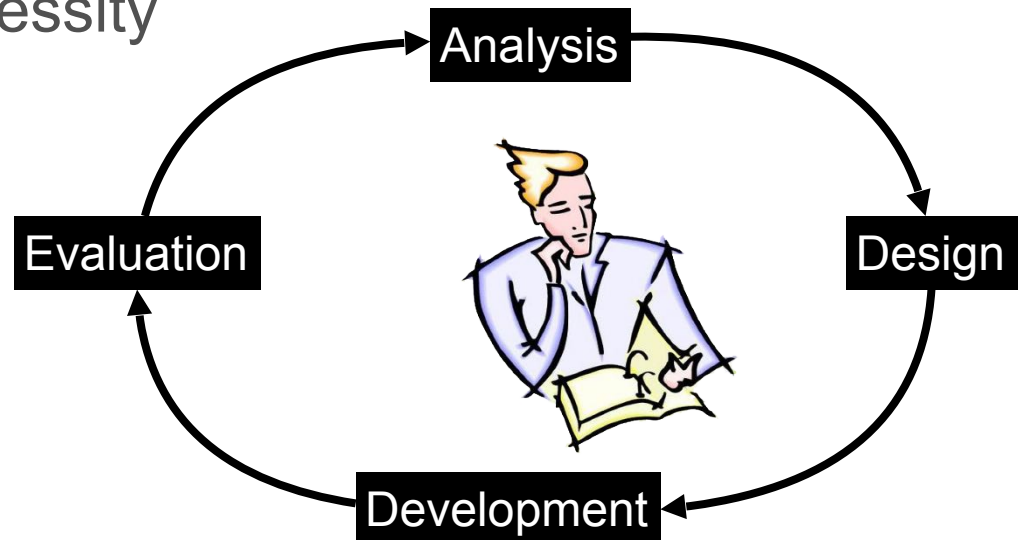
Few quantitative and/or generative theories

## Chaotic aspect of design

Small causes, large effects

## Iterative approach is a necessity

User-centered design



# Interaction paradigms

## Computer-as-tool

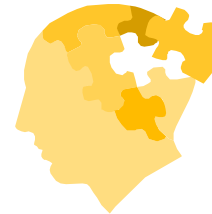
First person interfaces  
Augment the user



Focus of  
the course

## Computer-as-partner

Second person interfaces  
Delegate tasks



## Computer-as-media

Third person interfaces  
Human-human communication

