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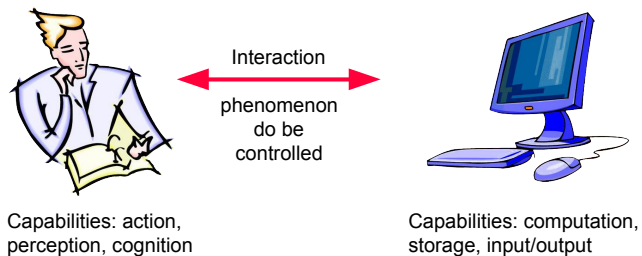
Photos/collage by Jack L. Moffet in Dan R. Olsen, « Interacting in Chaos », Interactions, sept-oct 1999.

Michel Beaudouin-Lafon
Université Paris-Sud
mbl@lri.fr

Master Informatique - Université Paris-Sud

Outline

Introduction

History

Psychology 101

Graphical interaction

Post-WIMP interaction

Engineering of interactive systems

Conceptual design

Theories and models of interaction

Human-Computer Interaction

Interaction

phenomenon
do be
controlled

Capabilities: action,
perception, cognition

Capabilities: computation,
storage, input/output

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

In the real world: *Situated Interaction*

Environment

Users   Artifacts   Computers
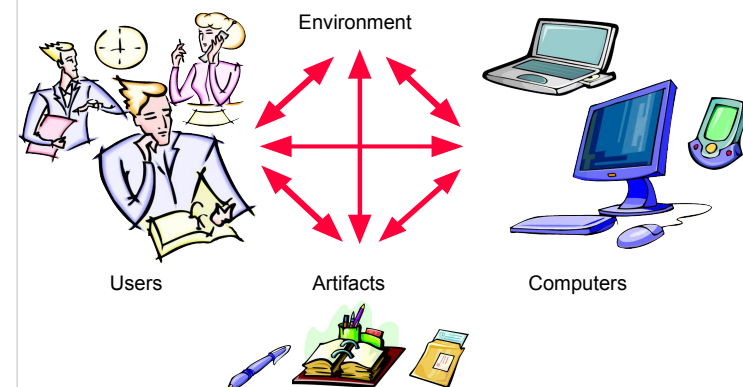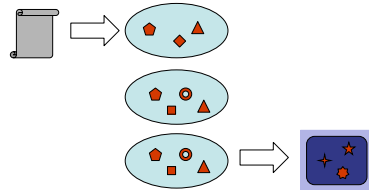
An interactive system is **not** ...

An algorithmic system that:

- Reads input
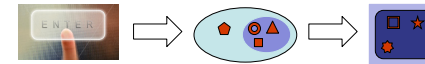
- Processes it

- 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

Two 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

Asymmetry:
    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

« 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
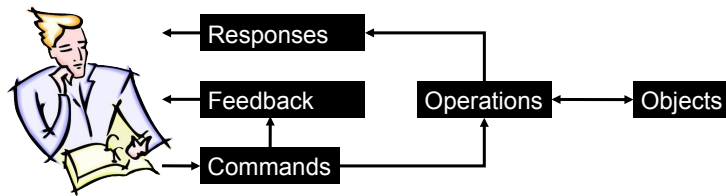
Ideally, matches the user's *mental model*

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):
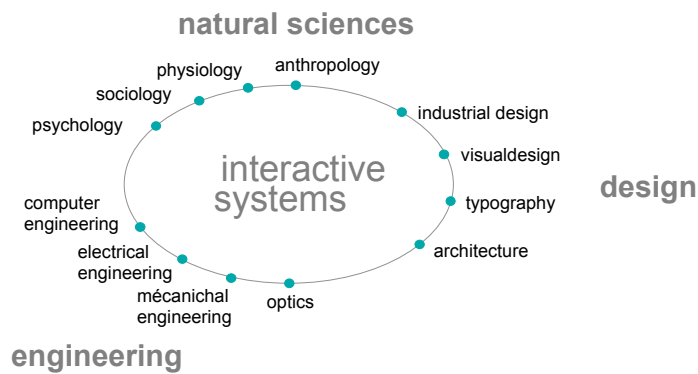Measure of success = invisibility, transparency
Making things simple is difficult (and difficult to understand)

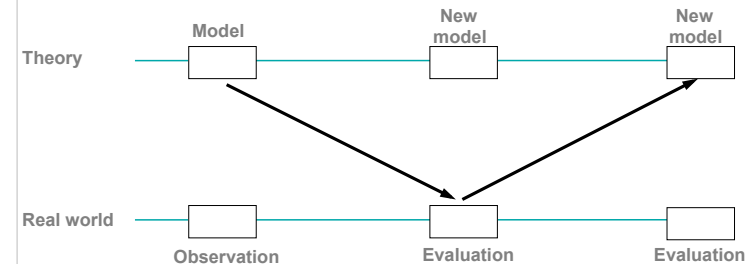Adaptability of humans is a strength ... and a weakness

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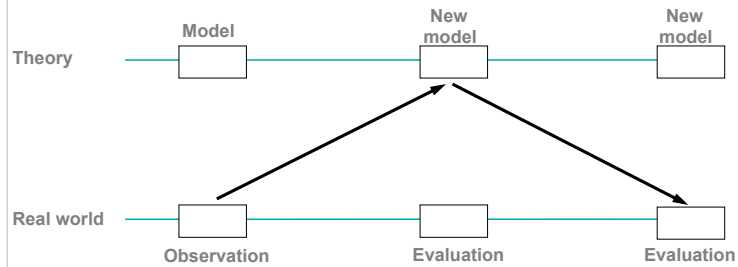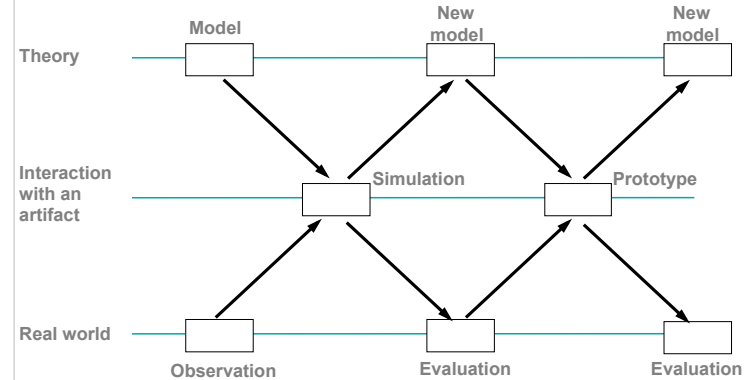⇒ Design and HCI research require unique skills

Multidisciplinary approach

Research strategies: Psychology

Research strategies: Anthropology

Theory — Model, New model, New model

Real world — Observation, Evaluation, Evaluation

Research strategies: HCI

Theory — Model, New model, New model

Interaction with an artifact — Simulation, Prototype

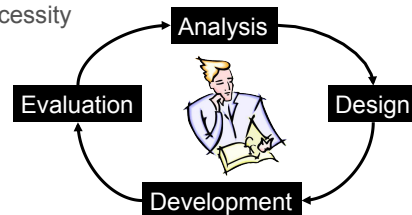**Real world** — Observation, Evaluation, Evaluation

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

Analysis · Design · Development · Evaluation

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