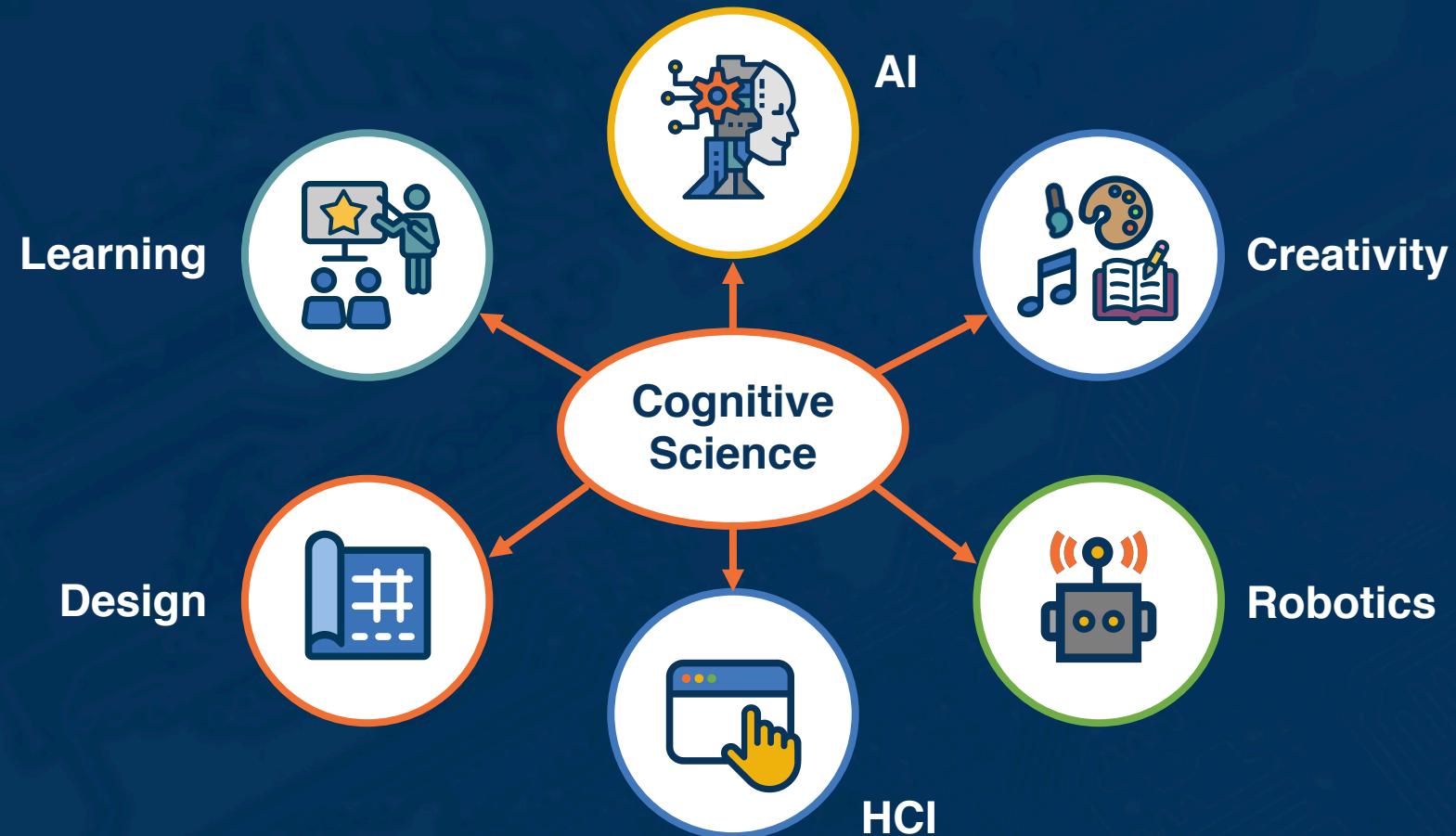


# Relationship to Design

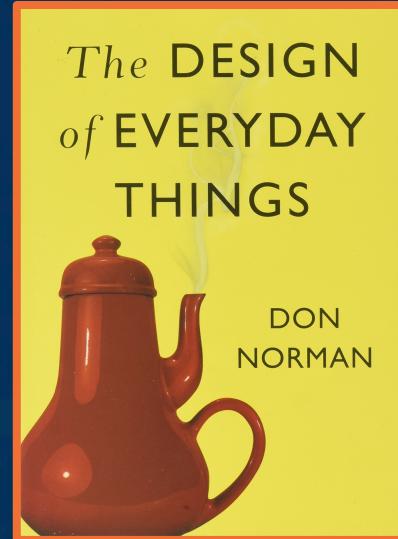


## Relationships to Cognitive Science

# Don Norman



Designer, Researcher

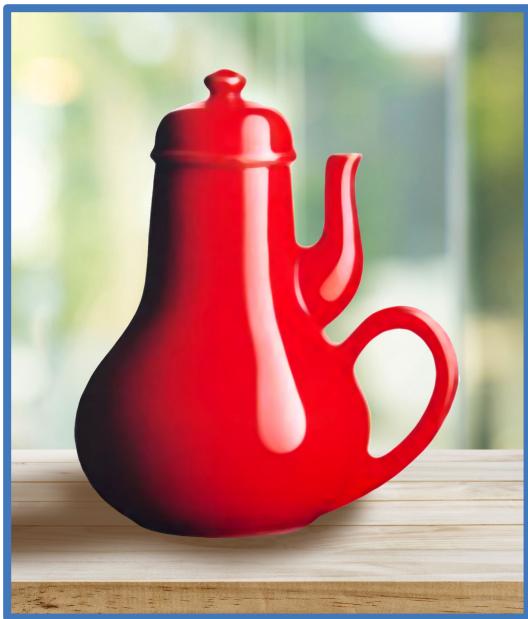


User centered design

*Image: wikipedia.org*



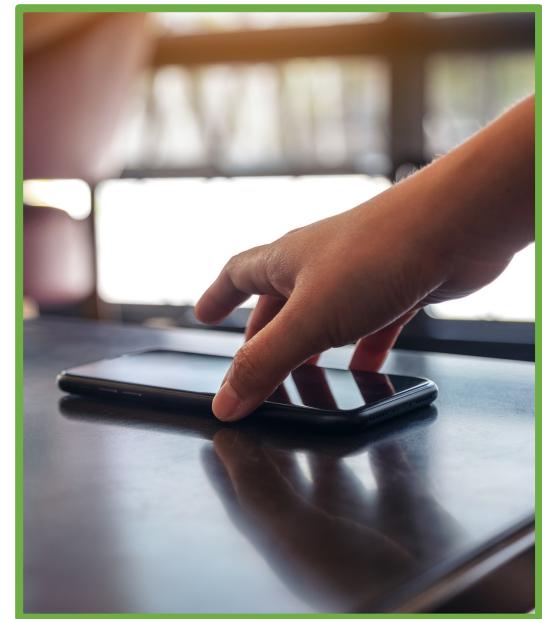
Aesthetics



Ergonomics

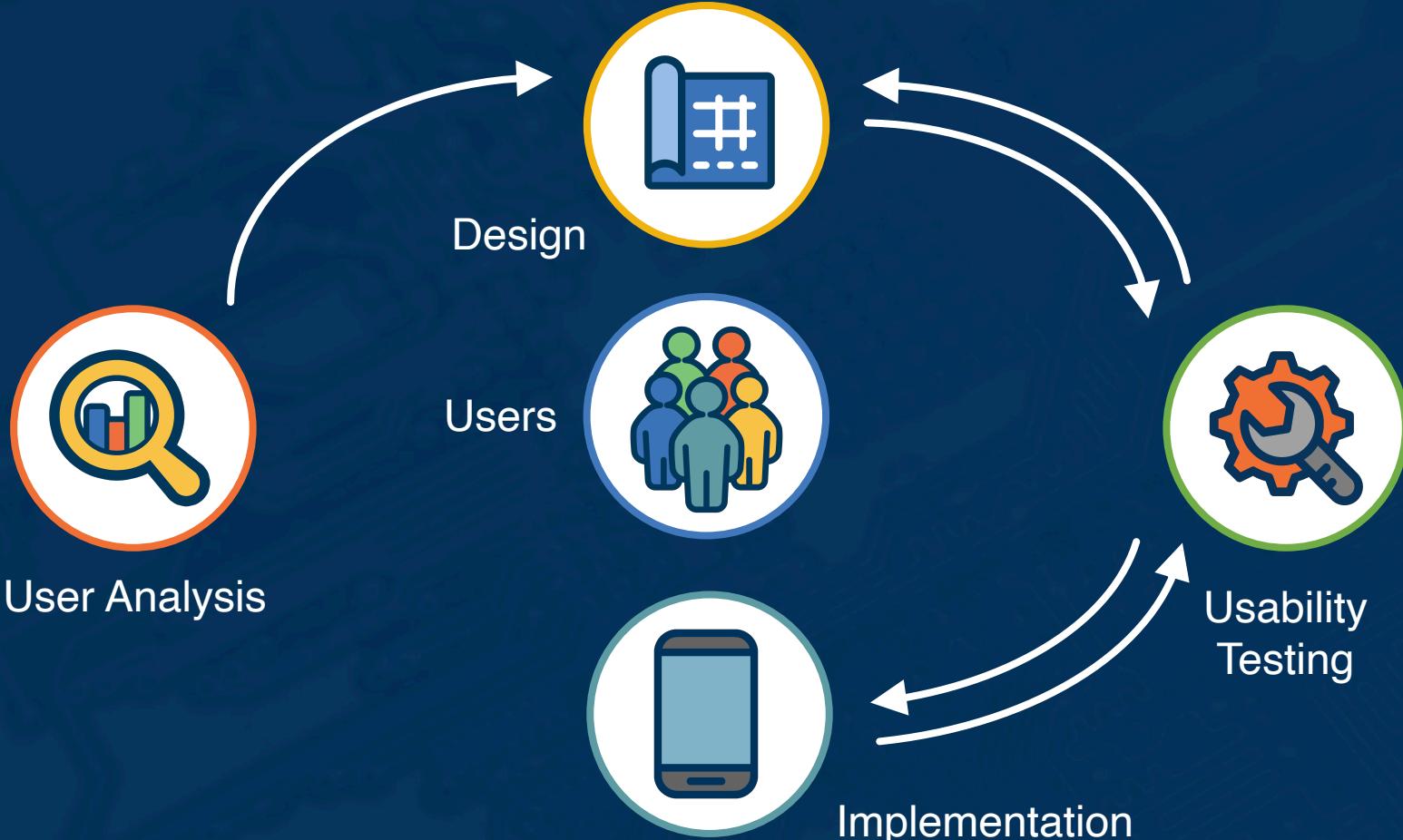


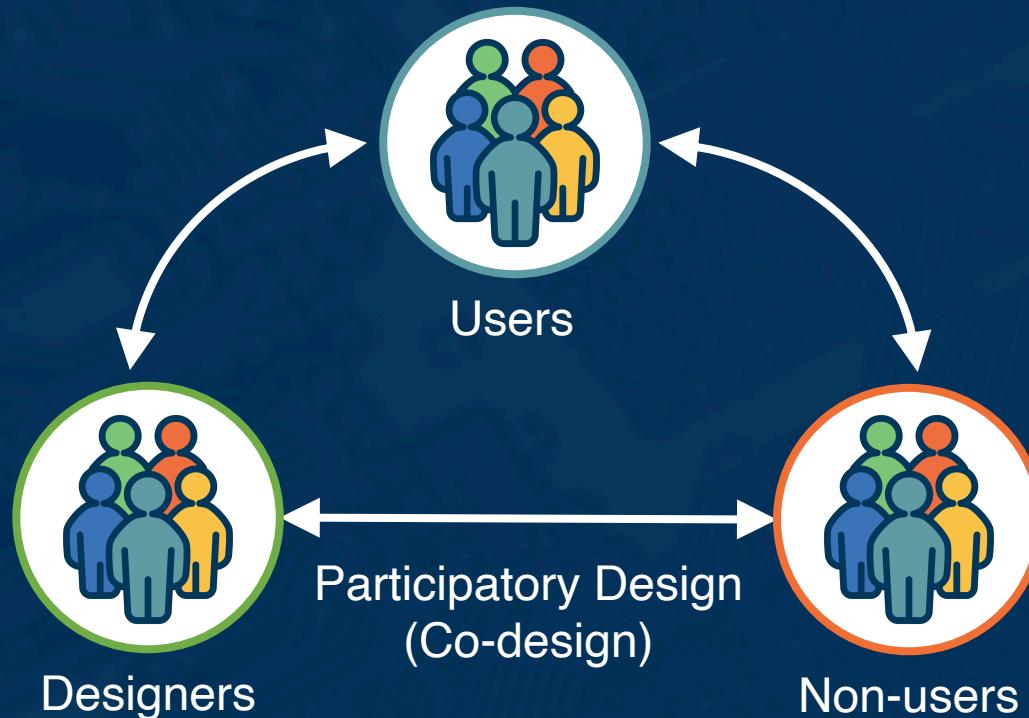
Cognition



What is a Good Design and a Poor Design?

# User Centered Design





# Human Centered Design

Ecology



Users



Designers



Non-users



Humanity Centered Design



The link between how things look and how they're used



Chair → Sit (enable)

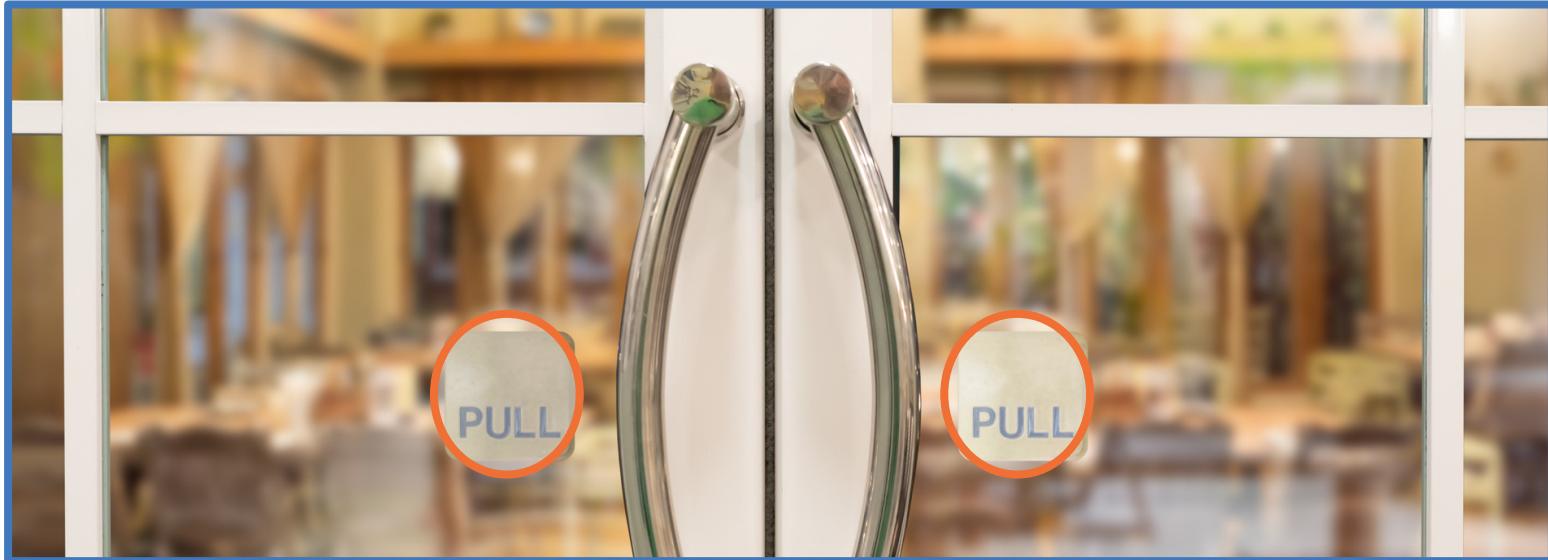


Gate → Don't proceed (disenable)

Affordances



Make affordances clearer

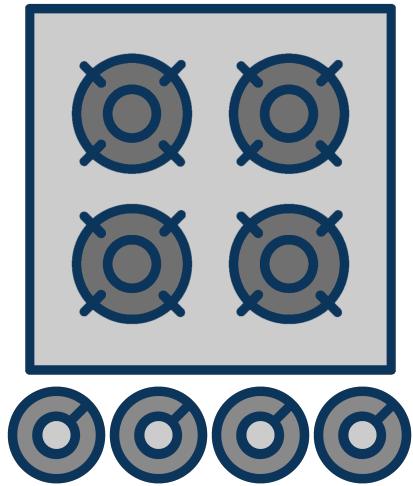


Signifiers

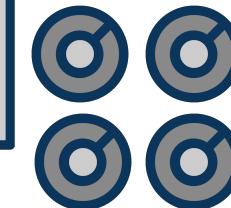
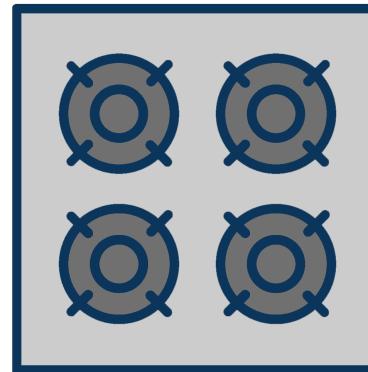


The relationship between two sets of things  
(control and effect)

Bad  
mapping



Good  
mapping



Knobs (Control) & Burners (Effect)

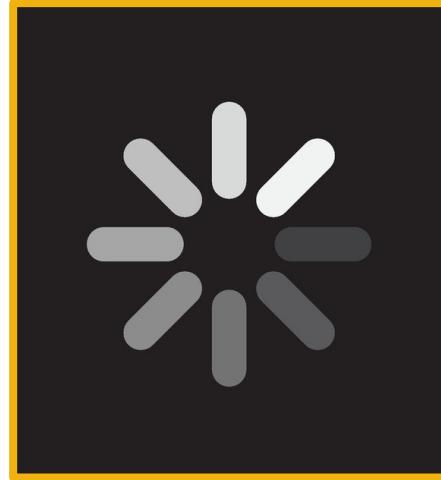
Mapping



Communicates the results of an action



Elevator Button



Spinner

Feedback

## **Reflection:**

Think about how affordances, signifiers, mapping, and feedback relate to theories of human cognition.

## Situated Cognition

All designs enables situated cognition or actions



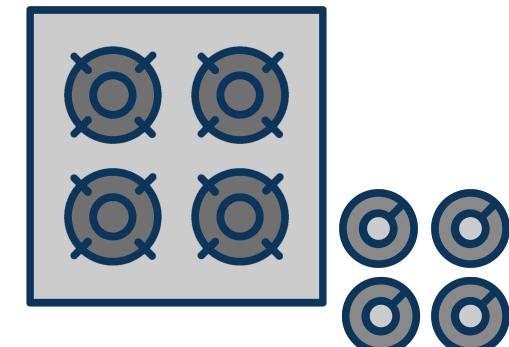
## Distributed Cognition

Information processing is distributed across designs

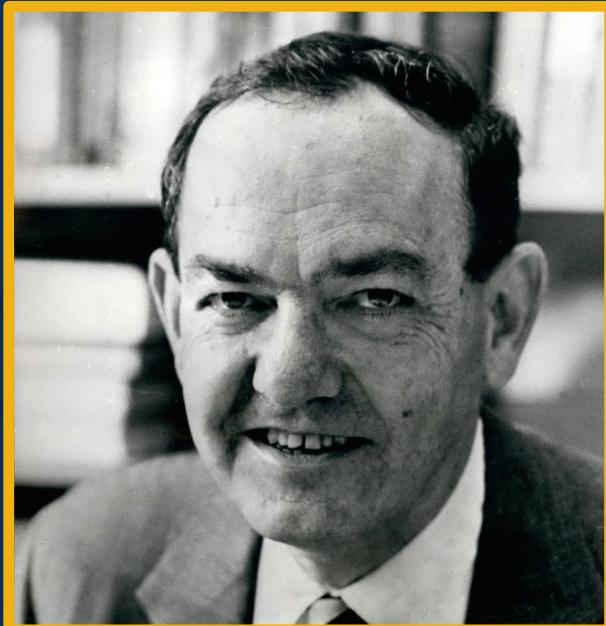


## Analogies

Attributes and relations between design objects



# Herbert A. Simon



Economist, political scientist  
and cognitive psychologist



Best known for the  
theories of "bounded  
rationality" and  
"satisficing"



Architecture



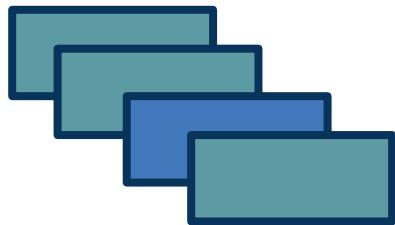
Software Engineering



City Planning



Science of Design



Design  
Alternatives

“Select”



“Satisfice”



Goals &  
Constraints

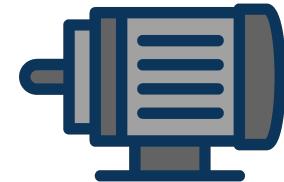
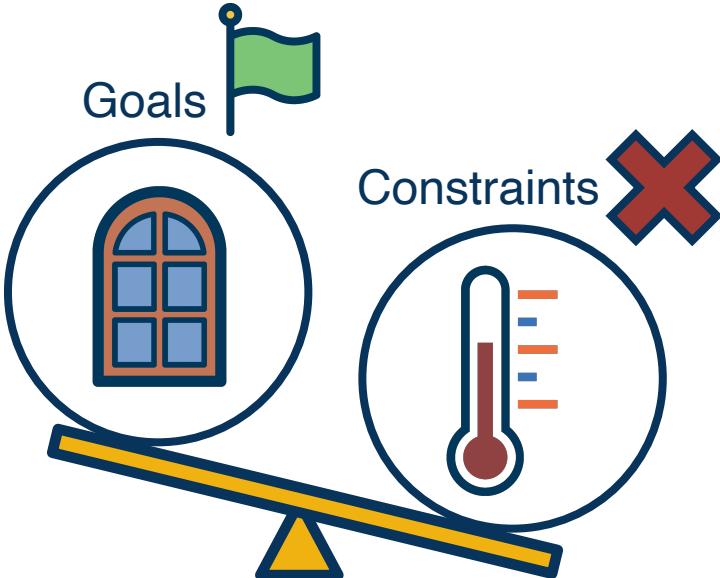


General Purpose and Domain Specific Design



**House**

- ◆ Temperature
- ◆ Shape of rooms/doors
- ◆ View from window
- ◆ Fenestration
- ◆ Room arrangements
- ◆ ....



**Motor**

- ◆ Voltage
- ◆ Current
- ◆ Material
- ◆ Cost
- ◆ ....

Designing a House vs. Electric Motor



Rationality



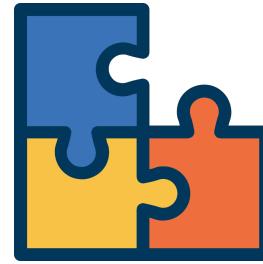
Incomplete Information



Limited Cognitive  
Computation



Time Constraint



Bounded  
Rationality



Satisficing

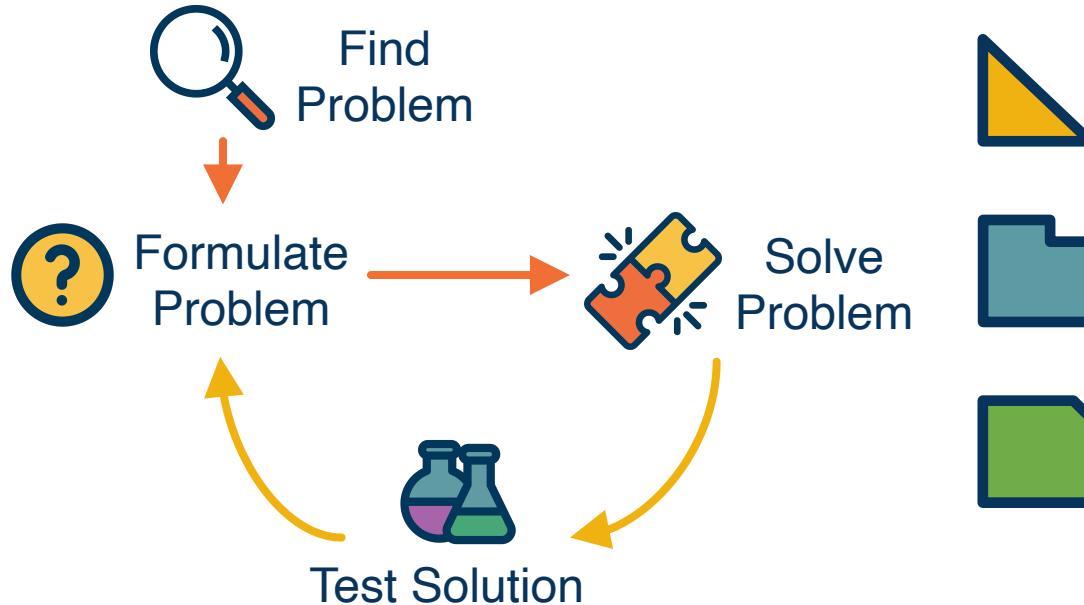


Good Enough  
Decision

**Bounded Rationality**



Design process is shaped by bounded rationality



**1st iteration:**

Incomplete Model: Poor understanding of the problem



**2nd iteration:**

...



**nth iteration:**

Satisficing Model: Better understanding of the problem

## **Reflection:**

Think about how you use design thinking  
in your research or projects.

# How Do Goals Emerge?

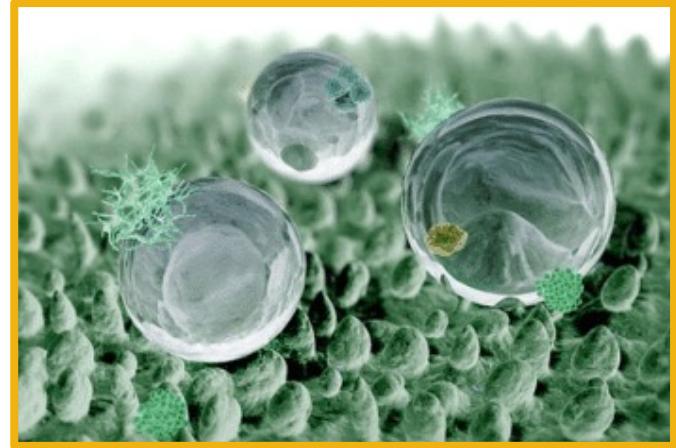




**Biologically  
Inspired Design**



**Solution-Based  
Design**



**Solution:**  
Lotus Effect



**Problem:**  
Dirt on the surface  
of the building

*Close-Up Image: Nagel, Jacquelyn & Stone, Robert. (2011). Teaching Biomimicry in the Context of Engineering Design.*

**Biologically Inspired Design Example**