Putting Minsky and Brooks Together

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Perception: Irreconcilable Approaches?

Minsky

- "GOFAI"
- search
- cognition
- abstract symbols
- software
- top-down

vs.
vs.
vs.
vs.
vs.
vs.

Brooks

- "Nouvelle AI"
- behaviors
- perception / action
- physical grounding
- robots
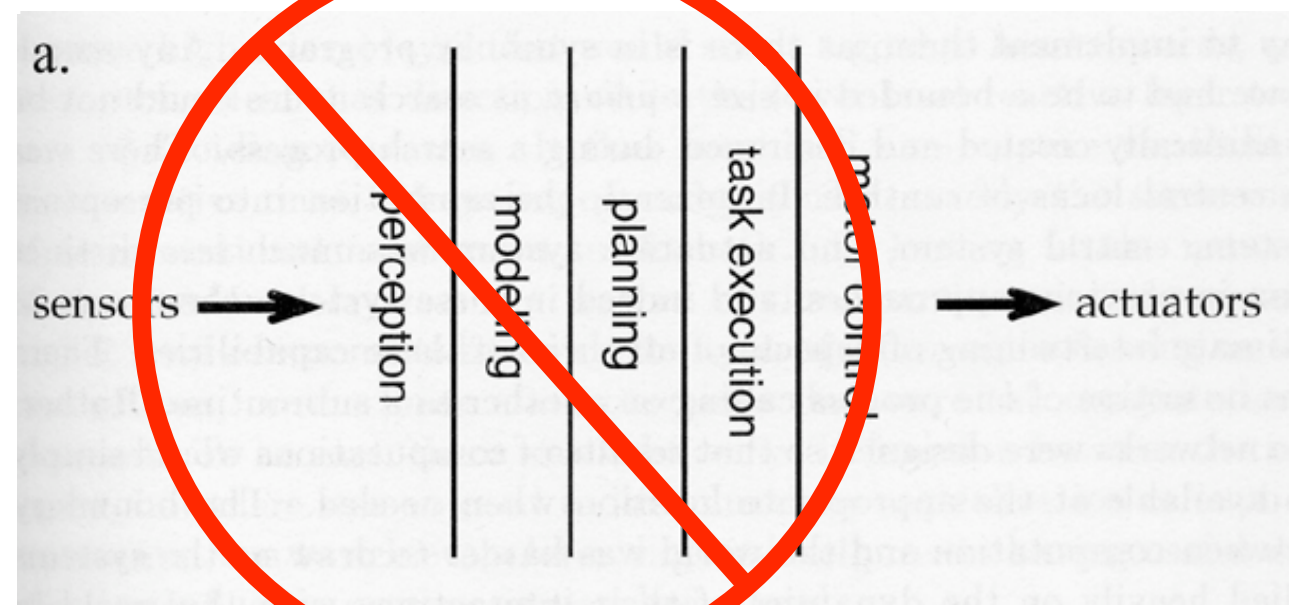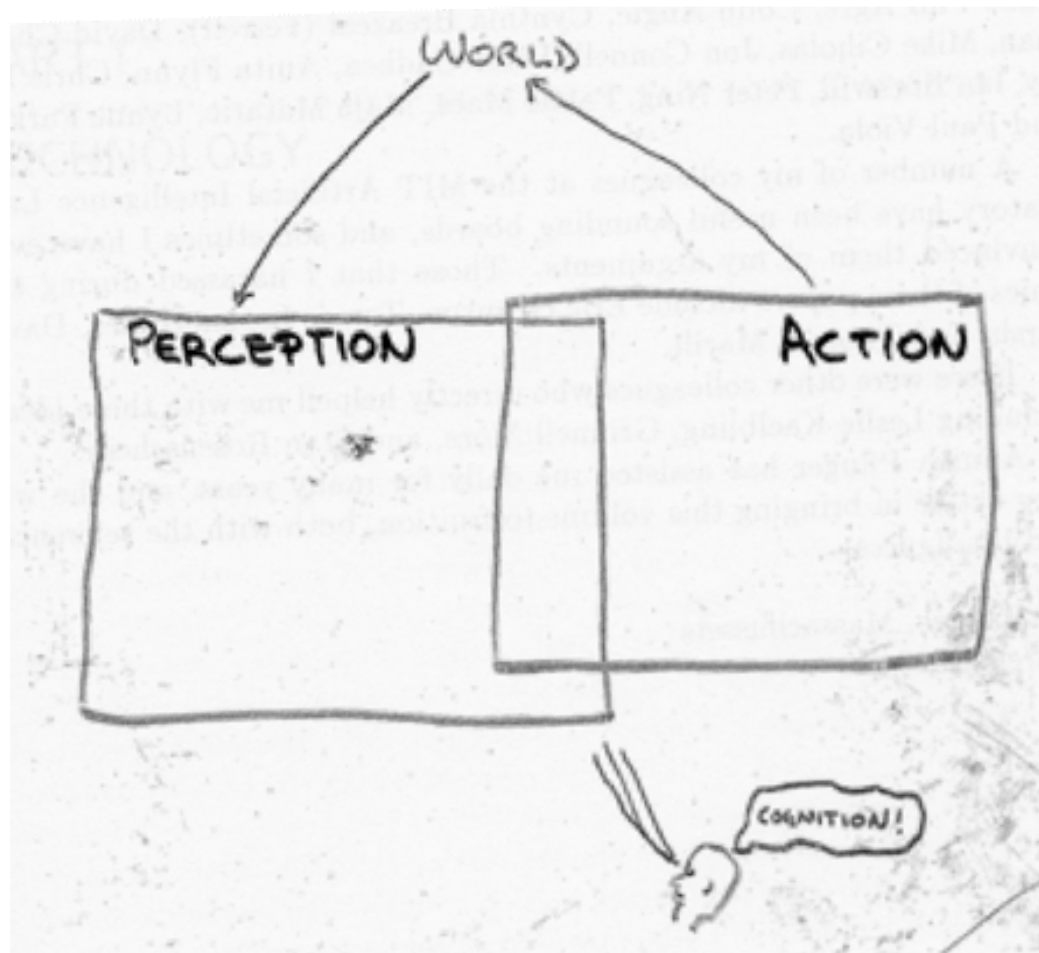- bottom-up

But...

- Search went out long ago as the essence of AI
  - Frames: 1974
  - K-lines: 1980
  - Society of Mind: 1986
- "Symbol" doesn't even occur in the Society of Mind index
- We can make "behavior-based" entities without real robots
- The top-down / bottom-up interface is an interesting place
- Both Brooks and Minsky are after human-level AI
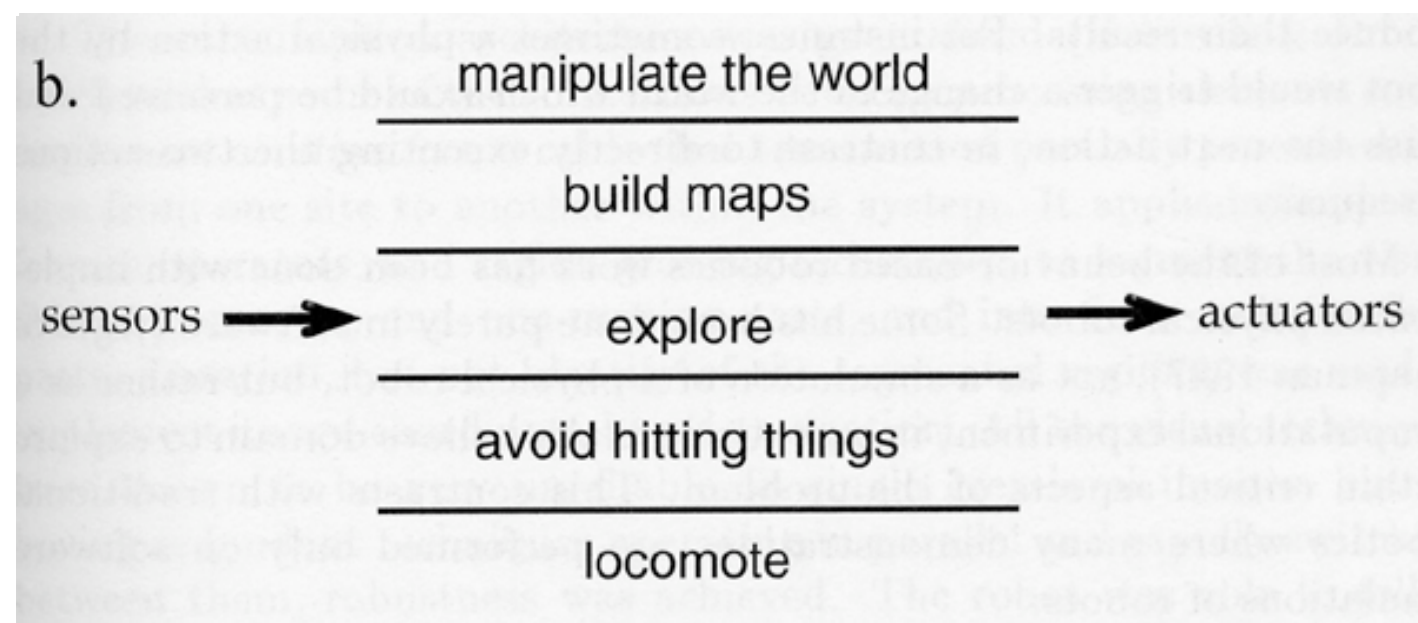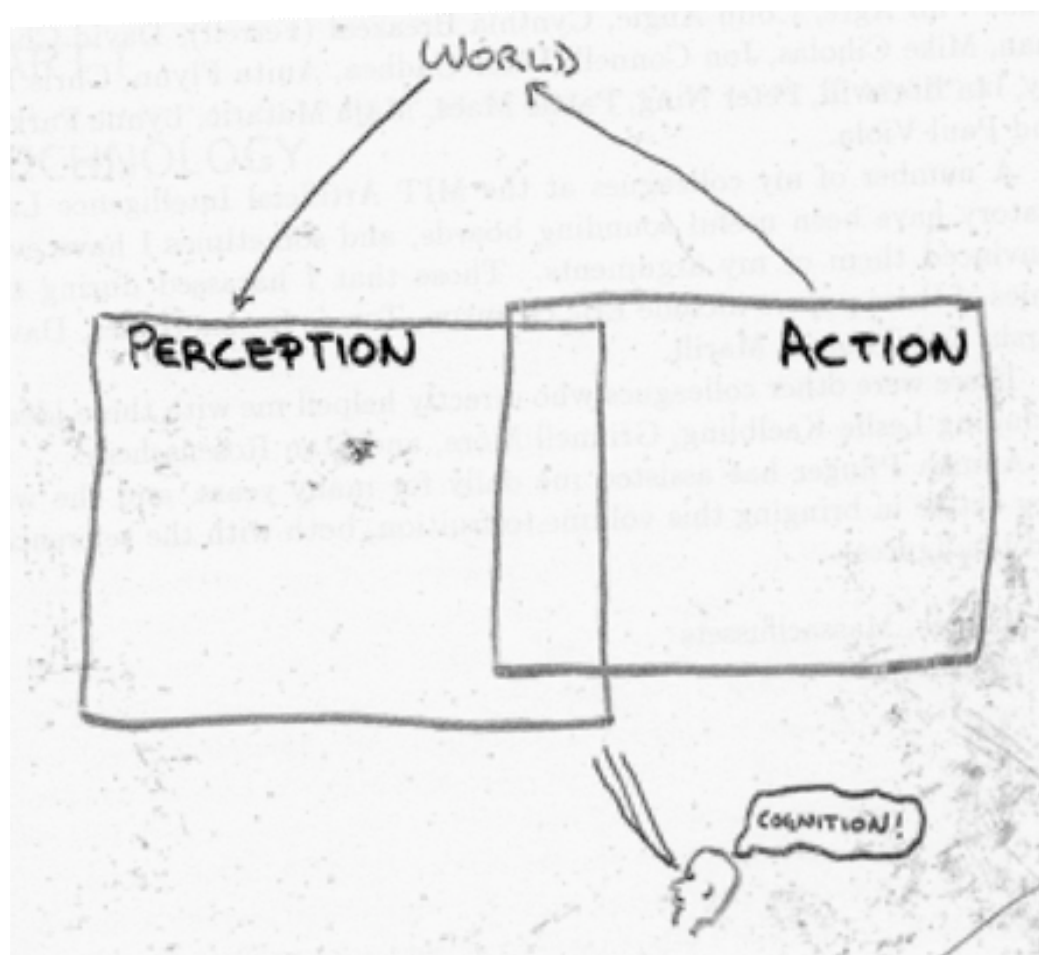
Structure of an intelligent entity
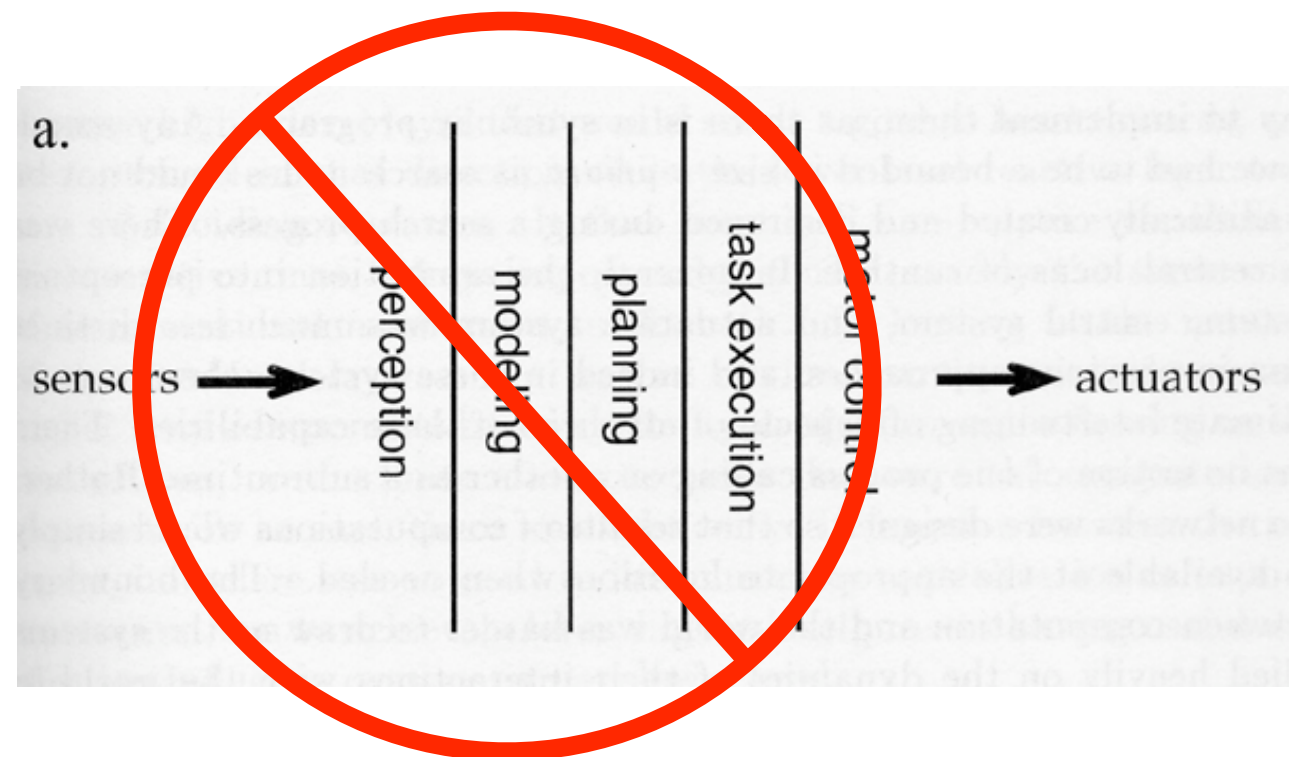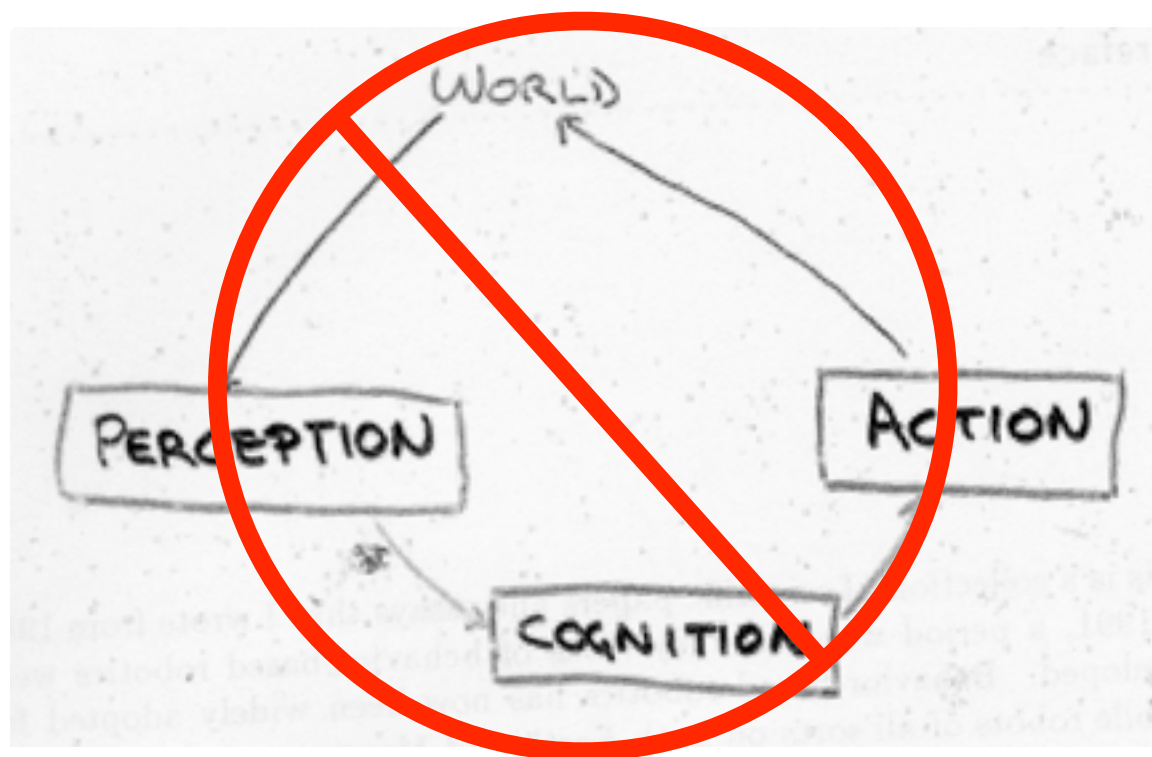
Brooks

Structure of an intelligent entity

Brooks

Structure of an intelligent entity

Brooks

Structure of an intelligent entity

Values, Censors, Ideals, and Taboos

| Self–Conscious Emotions |
| Self–Reflective Thinking |
| Reflective Thinking |
| Deliberative Thinking |
| Learned Reactions |
| Instinctive Reactions |

SENSORY

MOTOR

Innate, Instinctive Machinery

C-Brain: "reflective"

B-Brain: "deliberative"

A-Brain: "reactive"

External World
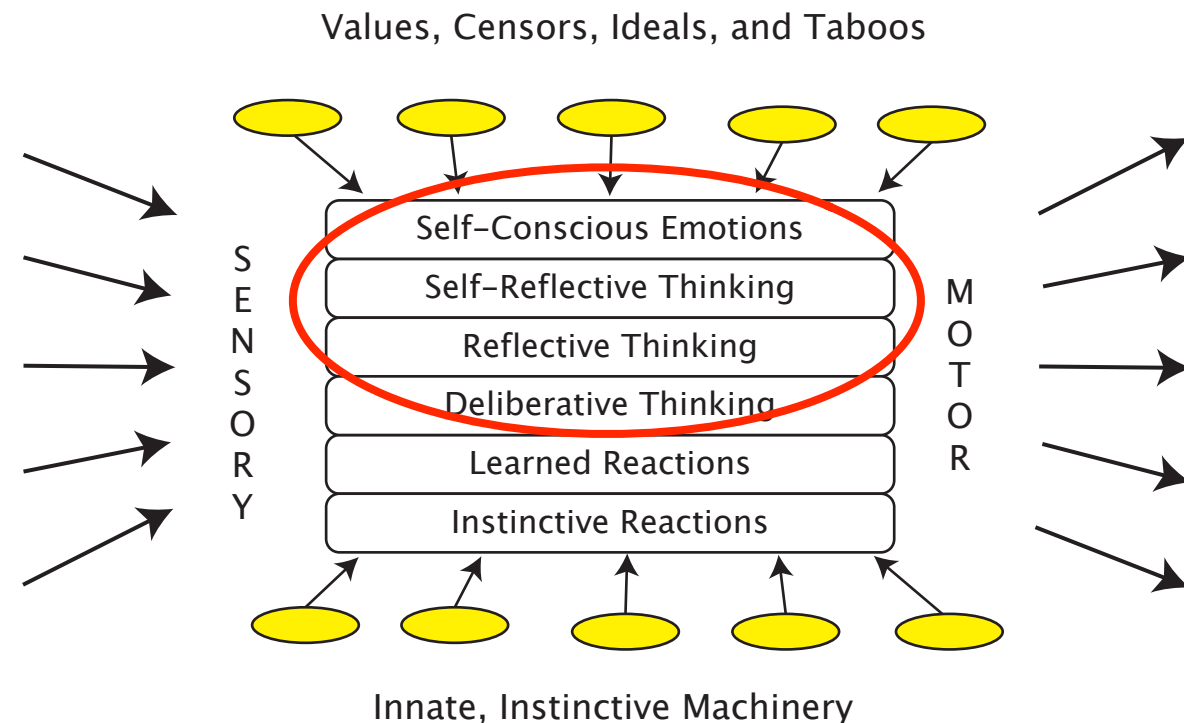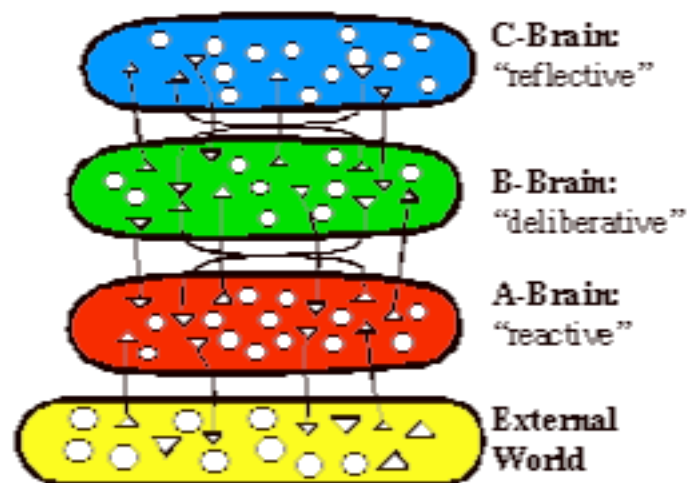
Minsky

Some Behavior Networks
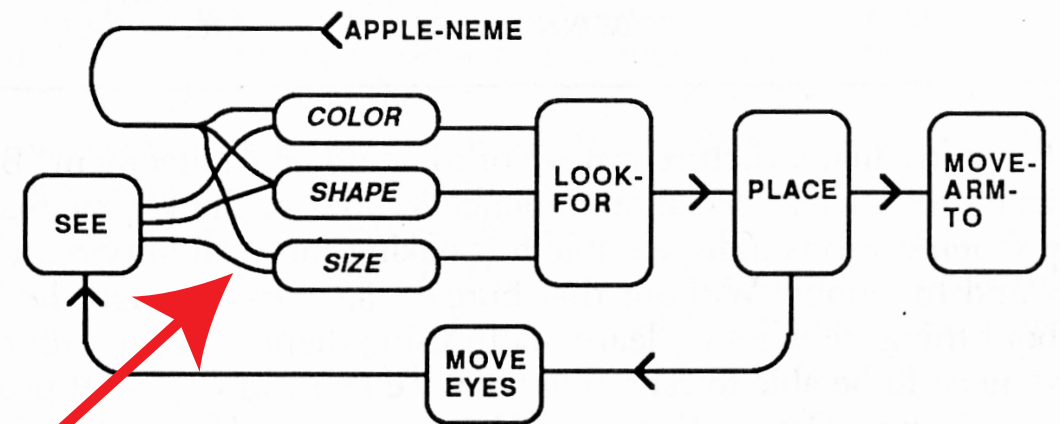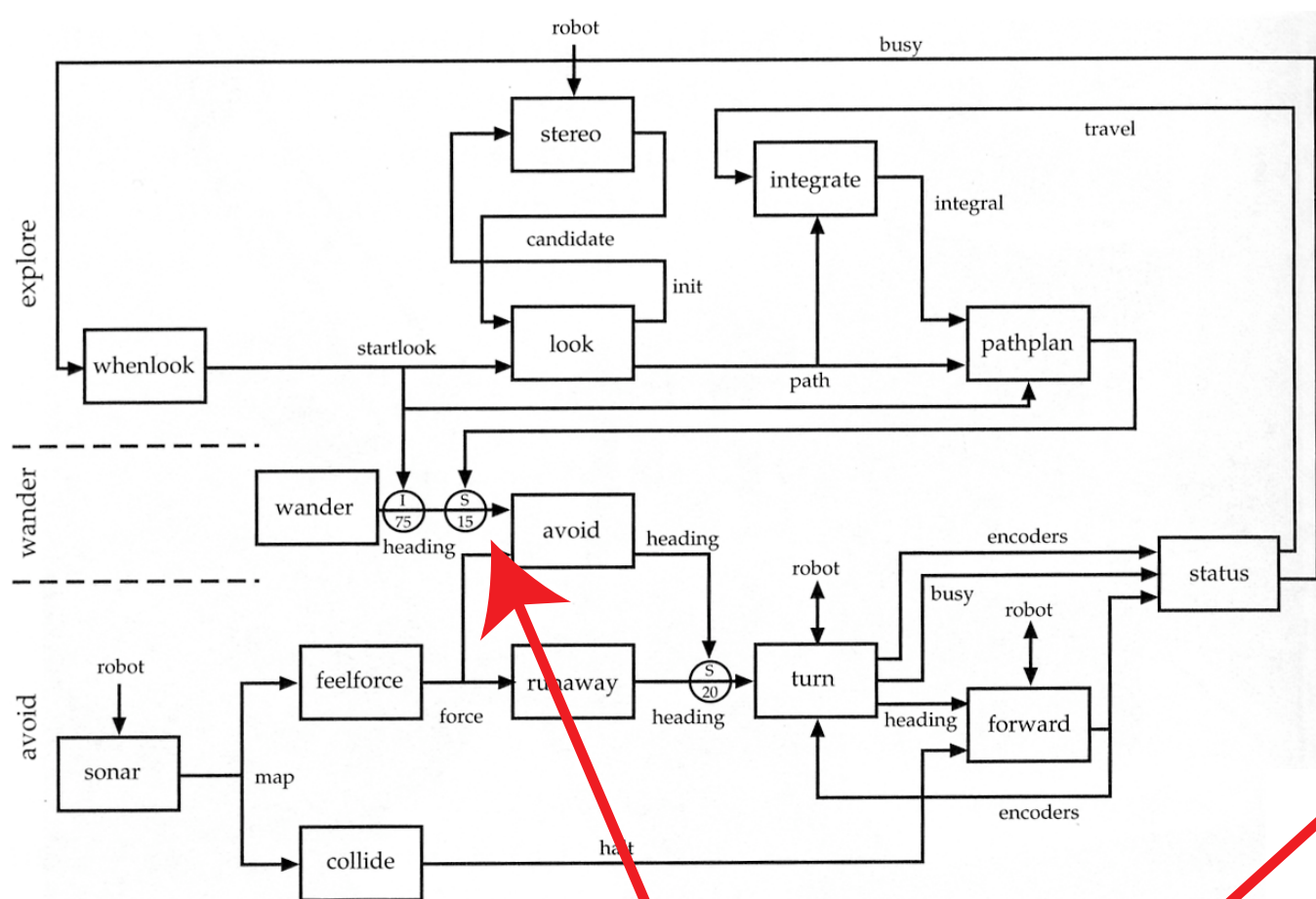
K-line activation: a "simulus"

What about "physical grounding"?

My own unbiased, objective (yeah right) opinion:

- Modeling AIs on humans from the ground up is useful:
  - Humans are our only example of intelligence
  - We want to be able to relate to the AIs we build
- But ultimately, the agent / world boundary is fuzzy...
- ... so there's nothing special about the "real" world.
- But maybe there is about the *kinds* of inter-level interactions needed!

In their own words

"What makes us such excellent animals? We do not have the strength of an ox, an antelope's speed, or the grace of a cat. However, we humans are unsurpassed in our flair for developing new forms of art.   We fabricate weapons, garments and dwellings; we're matchless at all sorts of social inventions; we make codes of behavior, with laws to enforce them—and then invent clever new ways to evade them. And surely our most outstanding trait is our knack for inventing new Ways to Think."

- Minsky, The Emotion Machine

"At first blush, my decision to leave out a cognition box seemed to indicate that I was giving up on chess, calculus, and problem-solving as a part of intelligence that I wanted to tackle. In fact, this was not my intent. To me it seemed that these sorts of intelligence capabilities are all based on a substrate of the ability to see, walk, navigate, and judge. My belief at the time, and still today, is that they arise from the interaction of perception and action, and that getting these right was the key to more general intelligence."
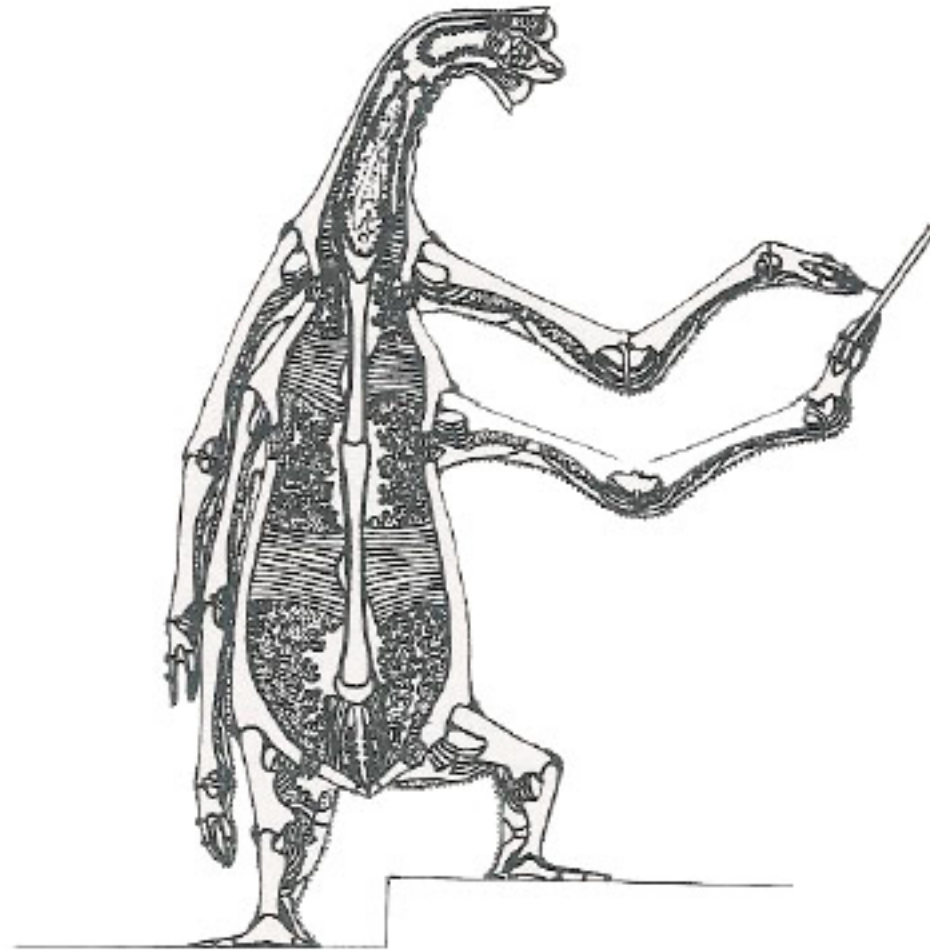
- Brooks, Flesh and Machines

Proposal:
Build the Planiverse
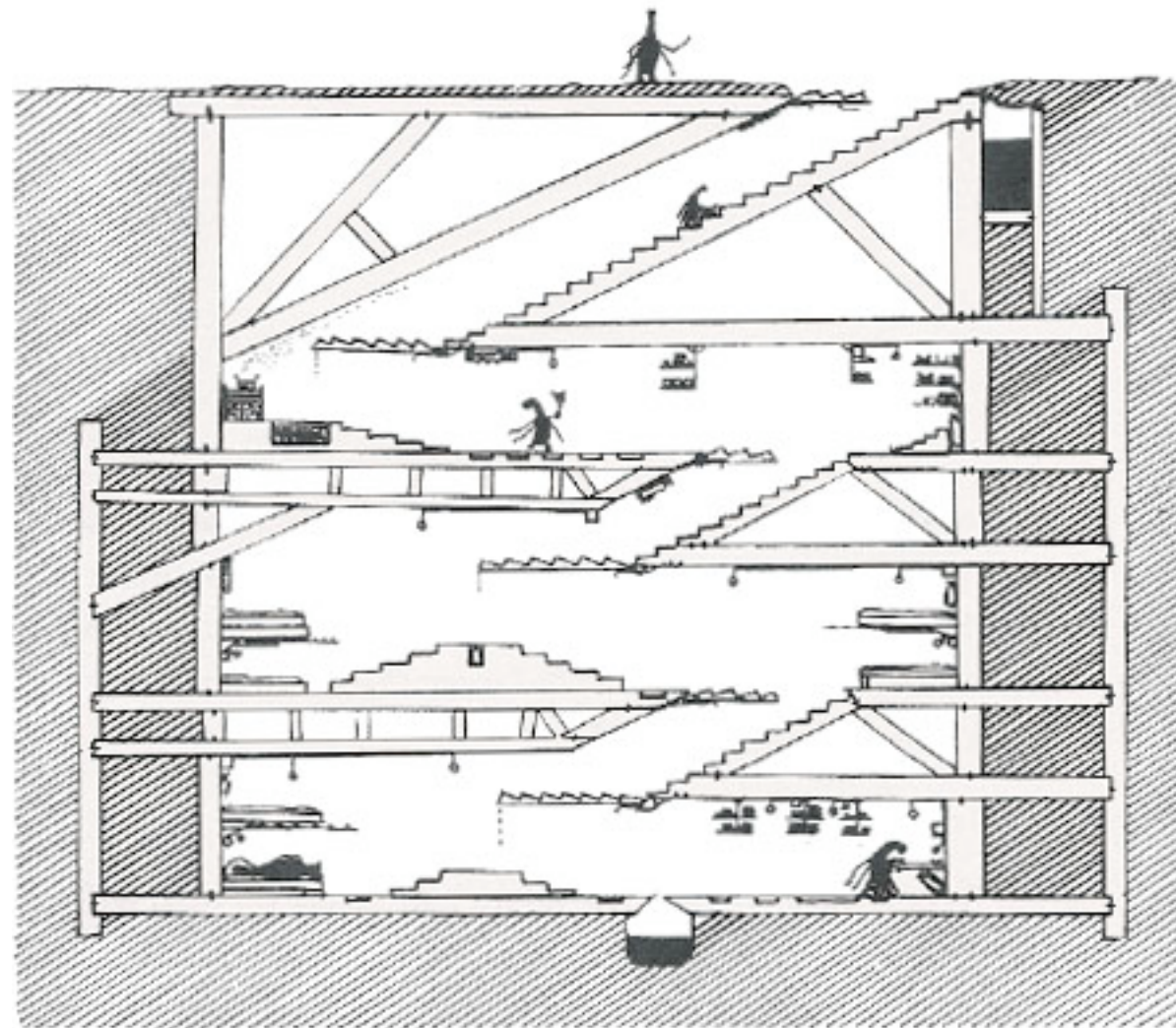
Proposal:
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Build the Planiverse

- It has enough elements of the "real" world, but is more suitable for software development

- Creature behaviors can be built up in increasingly sophisticated layers, with something like physical grounding

- It's easier to make these foundational layers in a 2D world

- Behaviors can include physical manipulation, problem-solving, social interactions, language

K-Line-Based Programming Language
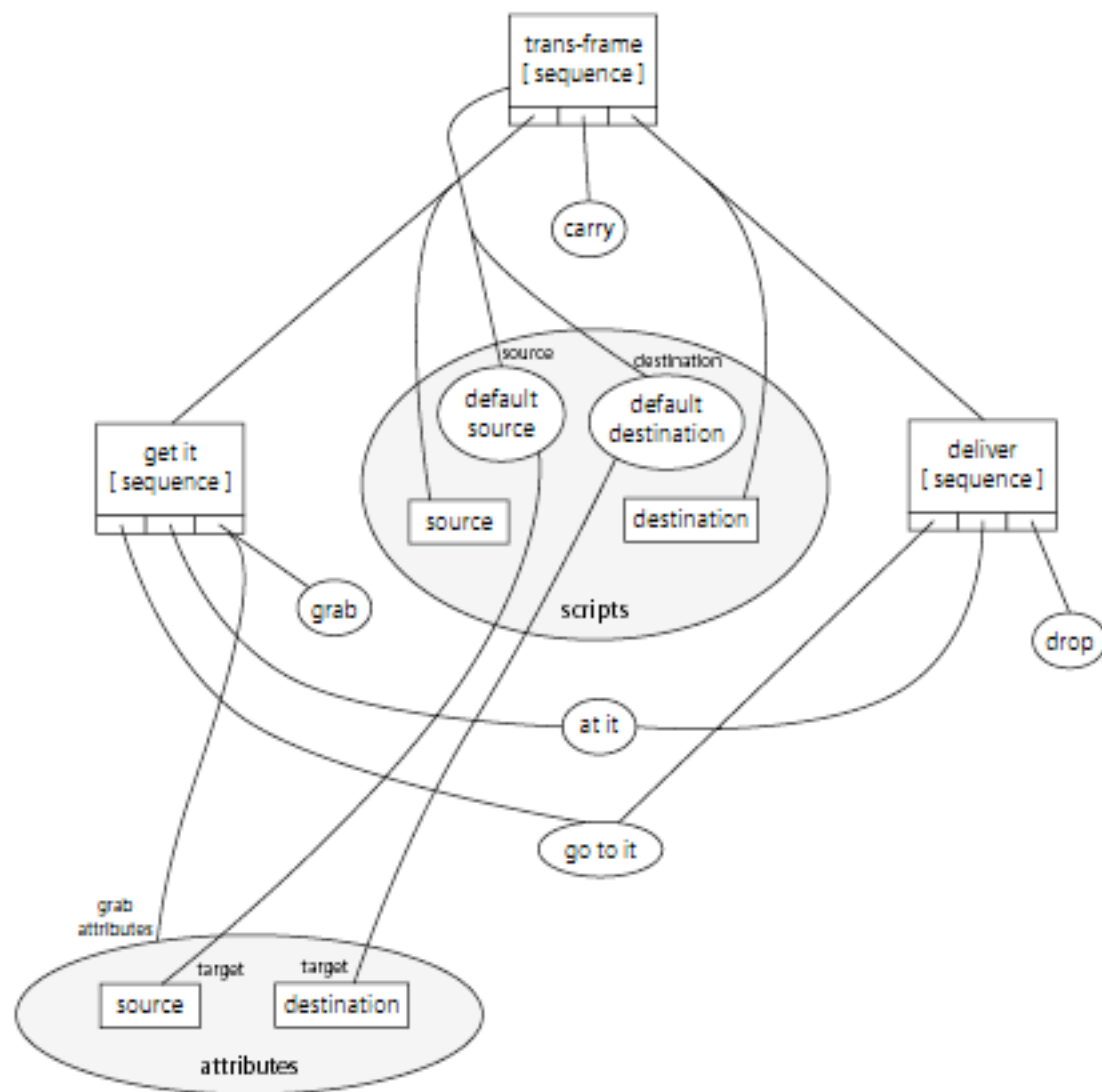

```
scripts<source, destination>:
{
    find_matching_box   = attributes: target: [ box; color: grab_attributes ];

    default_source       = attributes: target: source;
    default_destination  = attributes: target: destination: target;
};

get_it = sequence(go_to_it, at_it?, < attributes: grab_attributes: ^*, grab >);

deliver = sequence(go_to_it, at_it?, drop);

trans_frame =
[
    0.5 * (scripts: [ source: default_source; destination: default_destination ]);

    sequence(
        [ scripts: source; get_it; ];
        carry;
        [ scripts: destination; deliver ];
    );
]
```
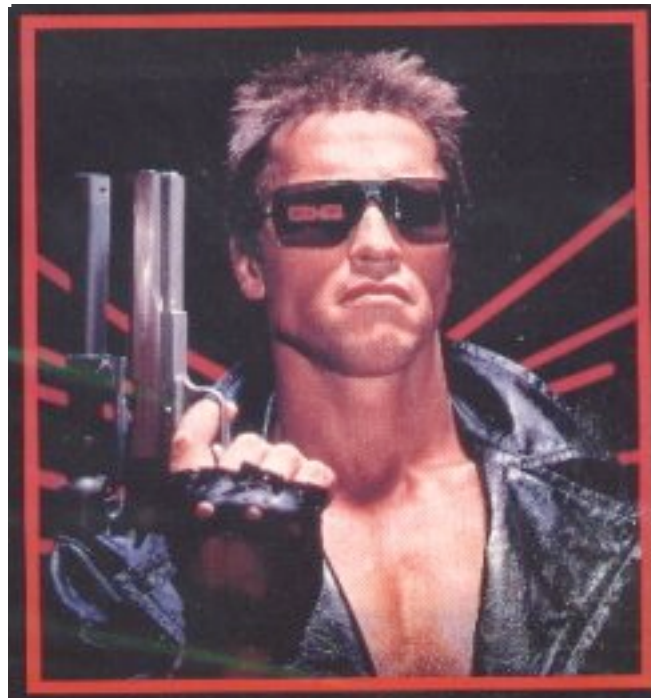
The Five Questions

1. Why should I **fear** your research?

The Five Questions

1. Why should I **fear** your research?
2. Why should I **rejoice** that it's being done?

Society of Mind ideas are **begging**
to be implemented and tested.

A behavior-based approach
can help accomplish this.
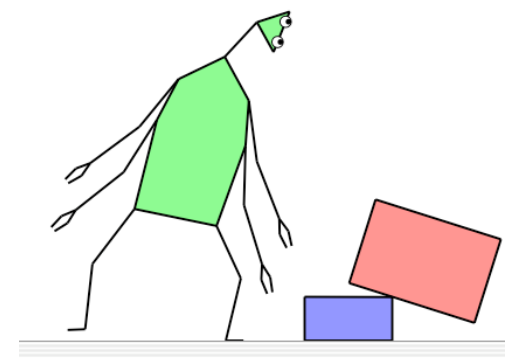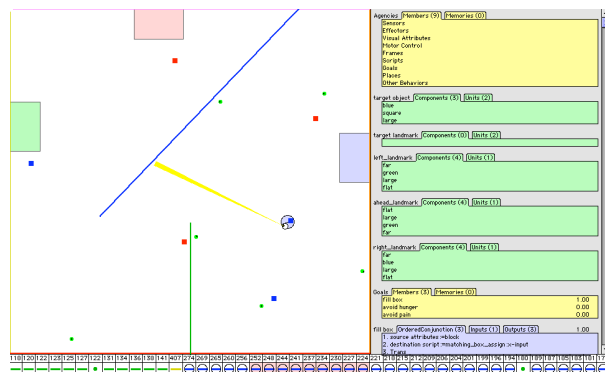
The Five Questions

1. Why should I **fear** your research?
2. Why should I **rejoice** that it's being done?
3. What should I tell my **mom** about it?

You're right, Ma, we should
learn to play nice.

The Five Questions

1. Why should I **fear** your research?
2. Why should I **rejoice** that it's being done?
3. What should I tell my **mom** about it?
4. What is your most **interesting** discovery?

We can build systems that combine
Society of Mind and behavior-based principles.

The Five Questions

1. Why should I **fear** your research?
2. Why should I **rejoice** that it's being done?
3. What should I tell my **mom** about it?
4. What is your most **interesting** discovery?
5. What is your most **recent** discovery?

Brooks's subsumption architecture
has K-lines (sort of)!

The End

Now, let's argue!