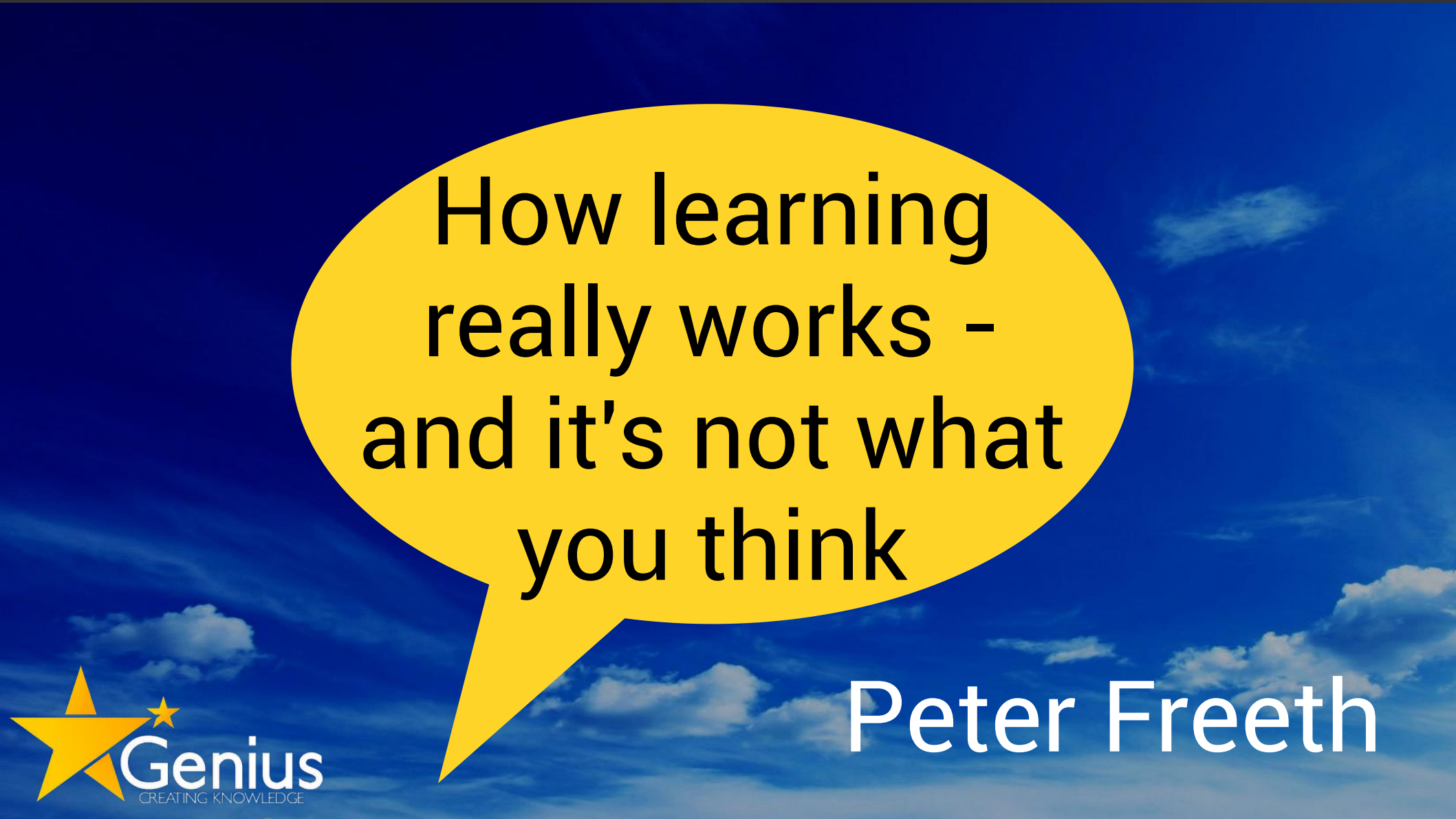
How learning really works - and it's not what you think
Peter Freeth
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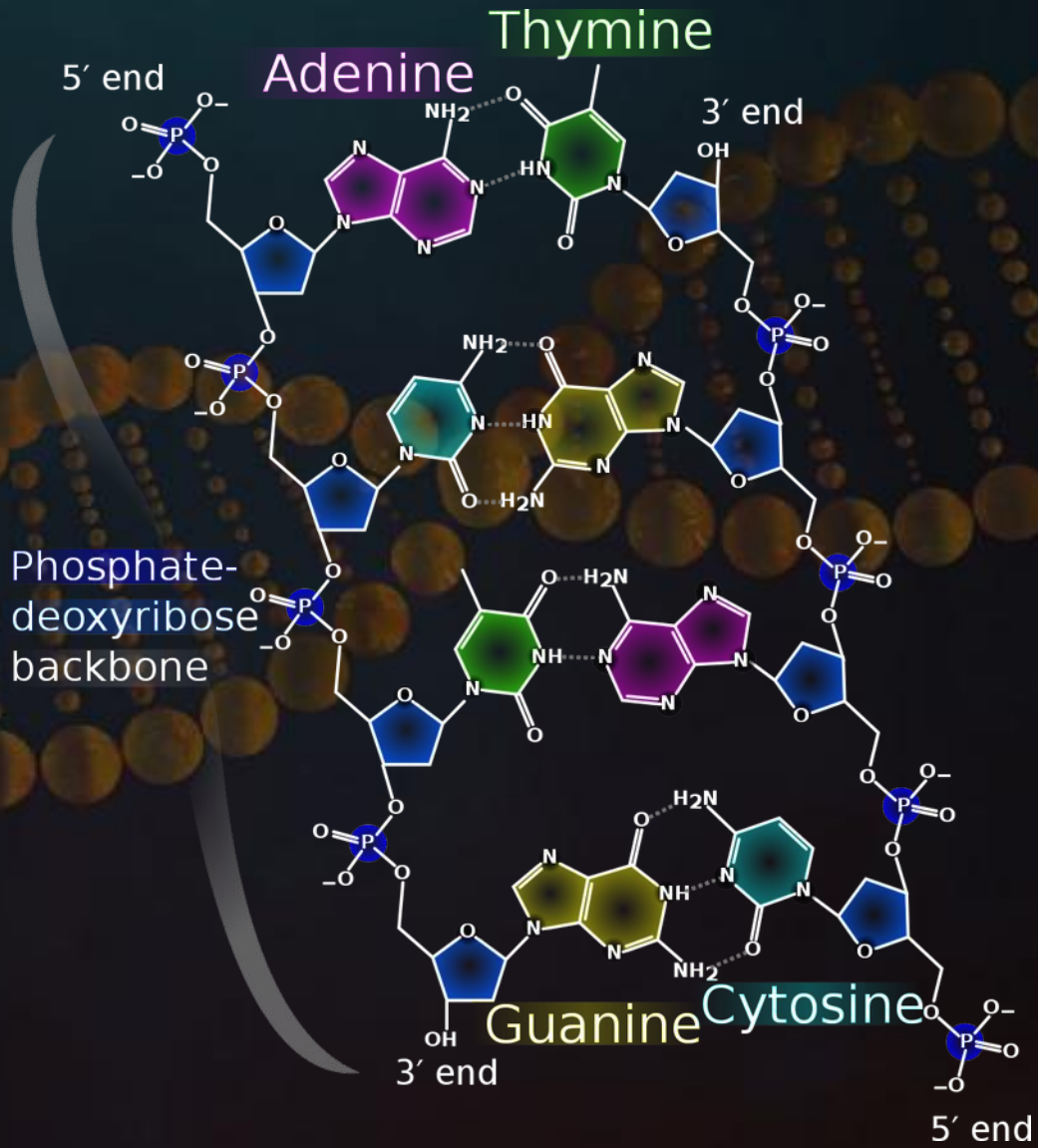
Genome

The instructions to make a copy of you



Phenome

The physical expression of the instructions to make a copy of you

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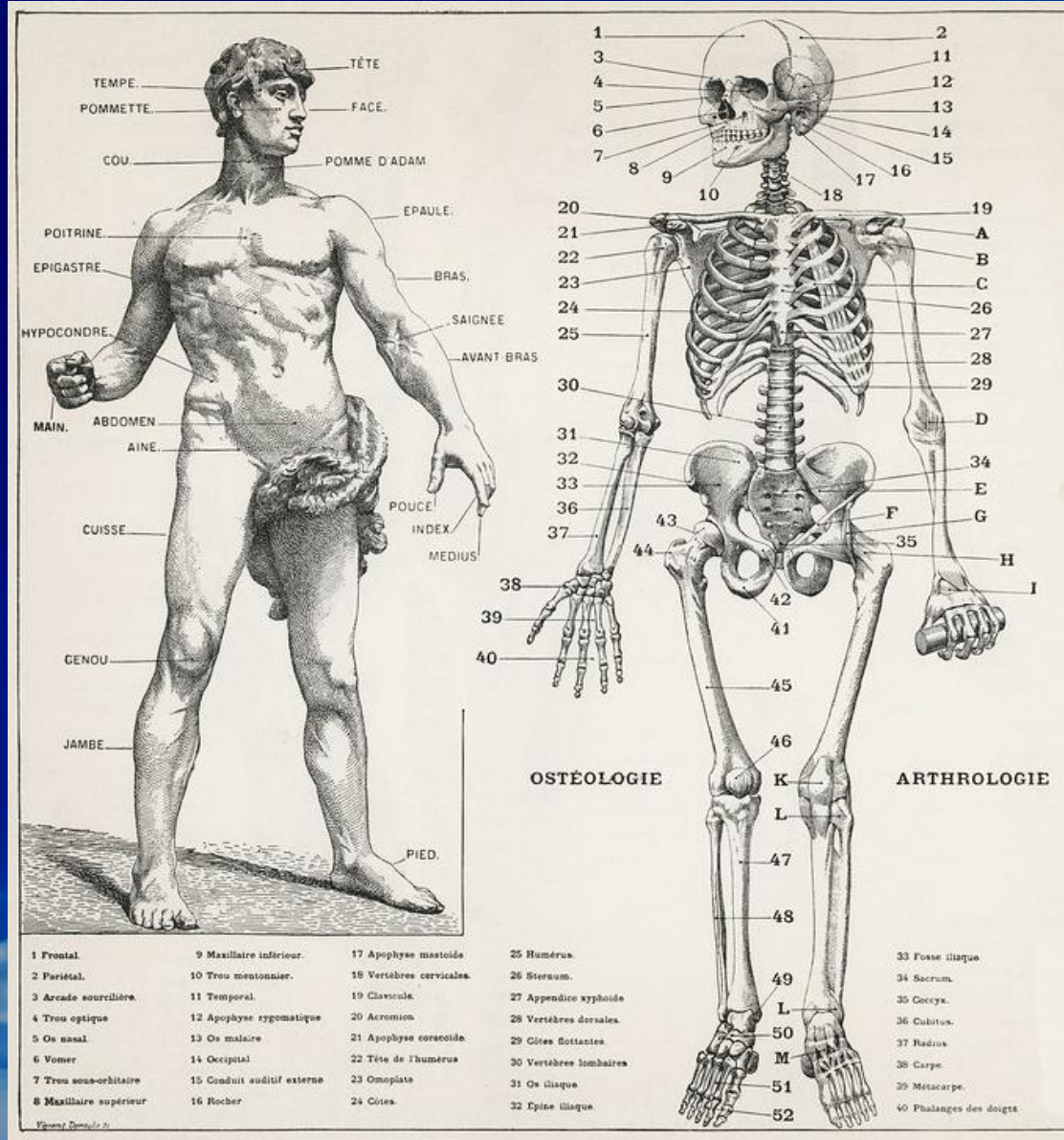

Phenome

The physical expression of the instructions to make a copy of you

Including your brain

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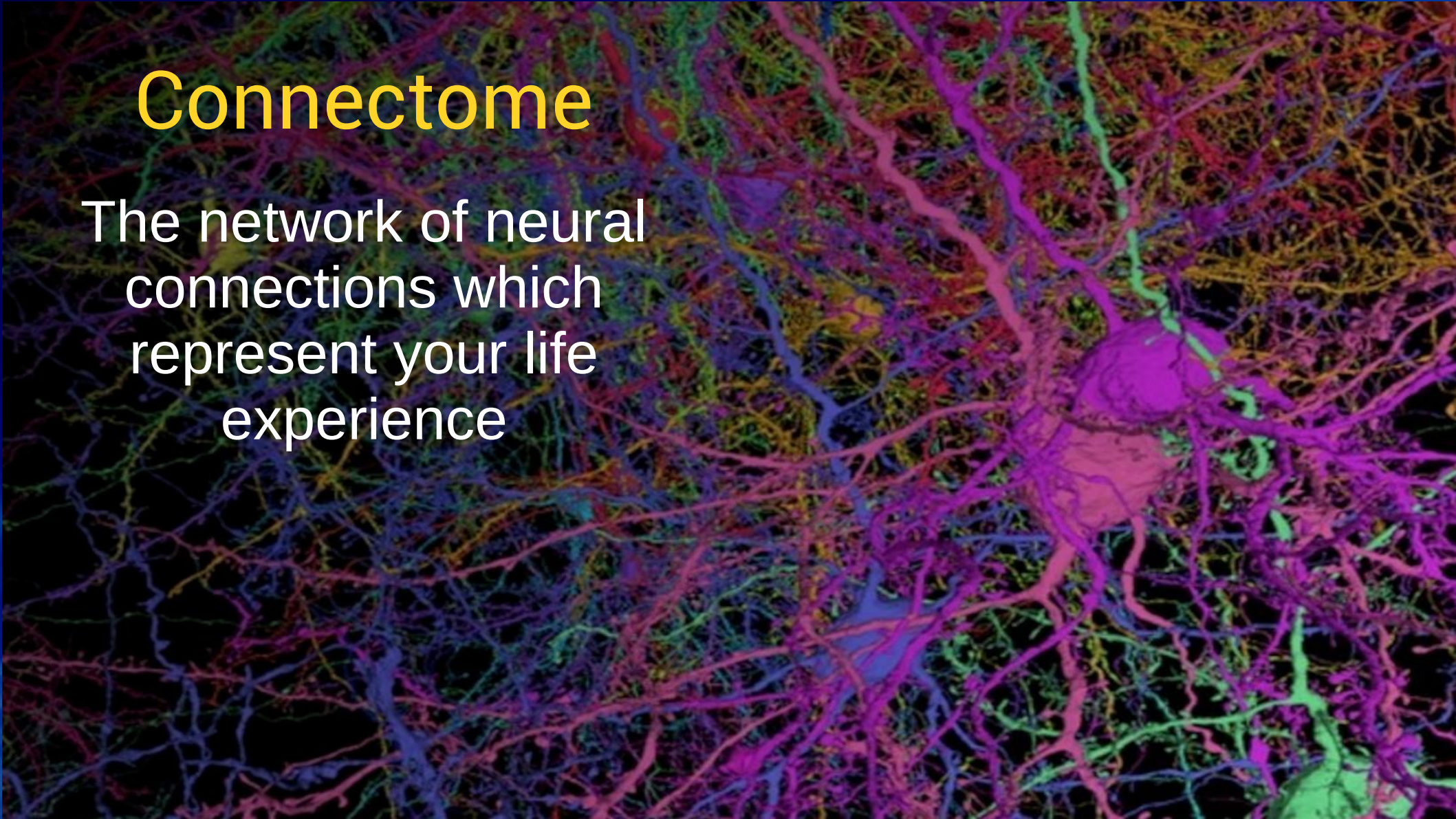
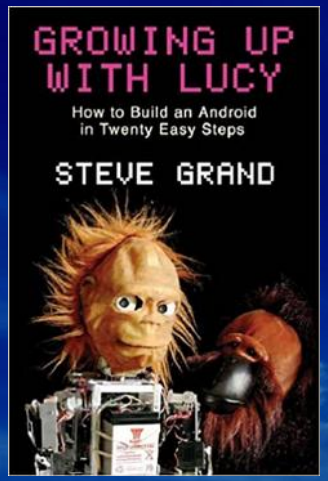

Connectome
The network of neural connections which represent your life experience

Transferring knowledge



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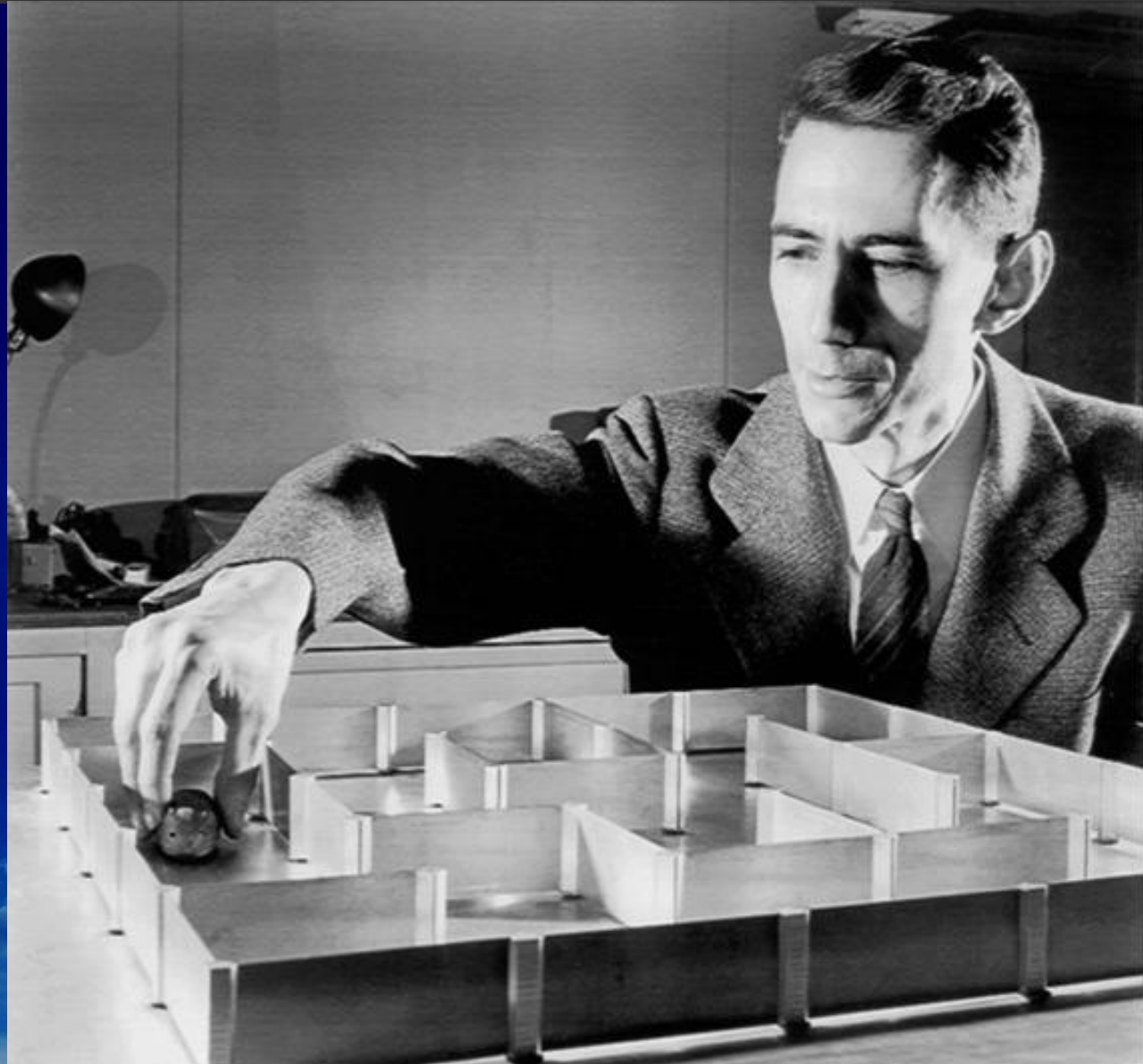
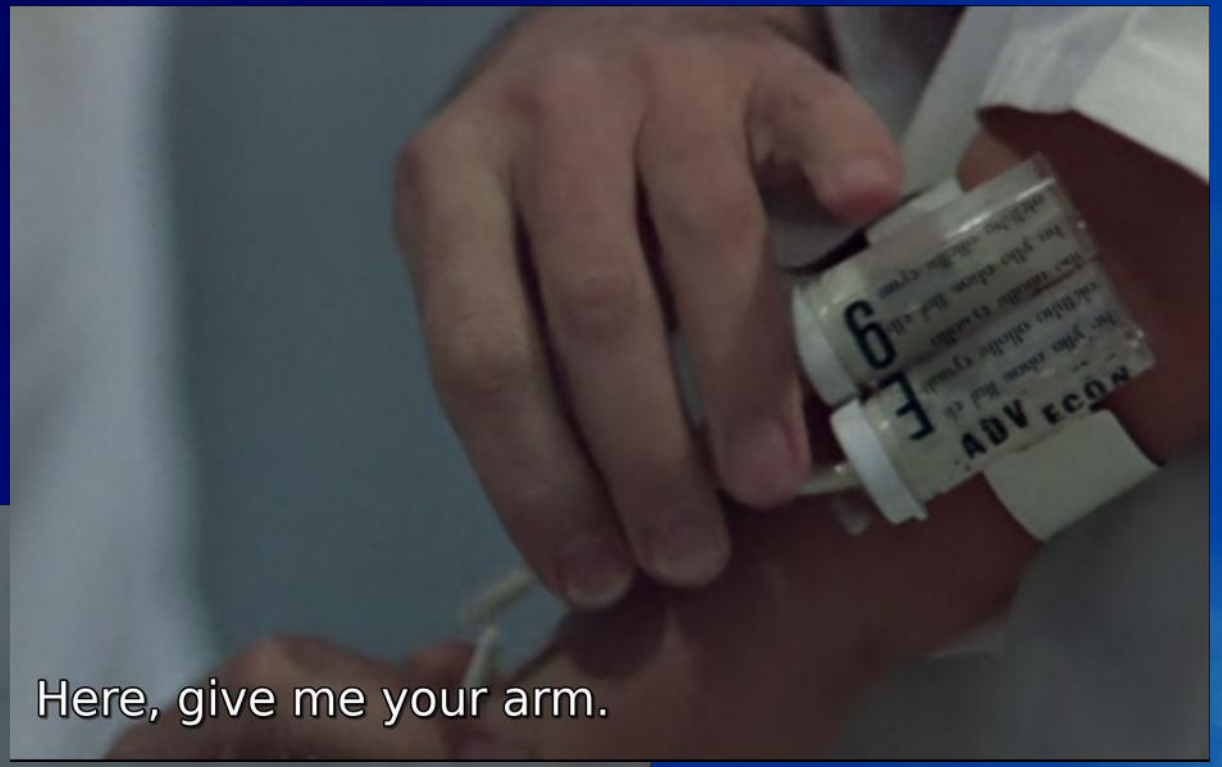
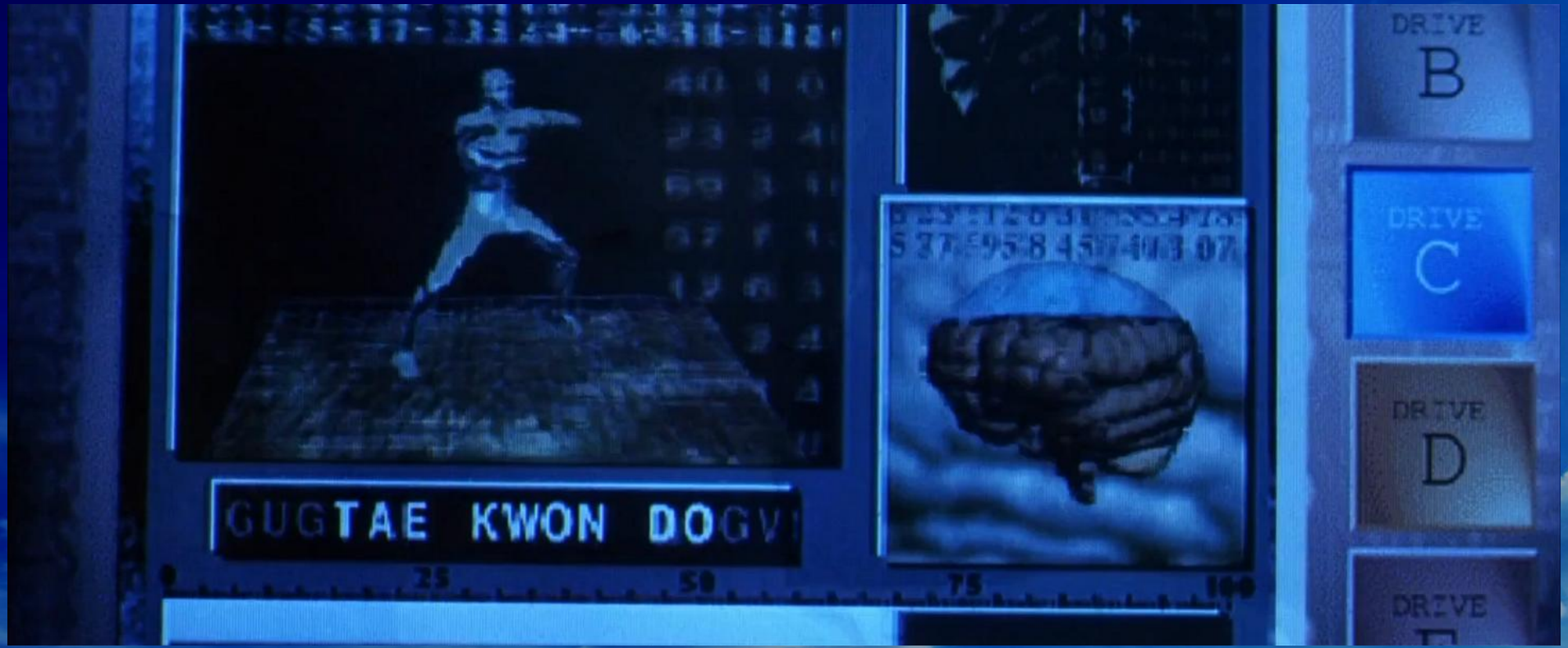


Intravenous learning THX 1138



The Matrix



How did it all get in there?

The magic of timing

Stimuli presented to your sensory systems

Coincident events became connected

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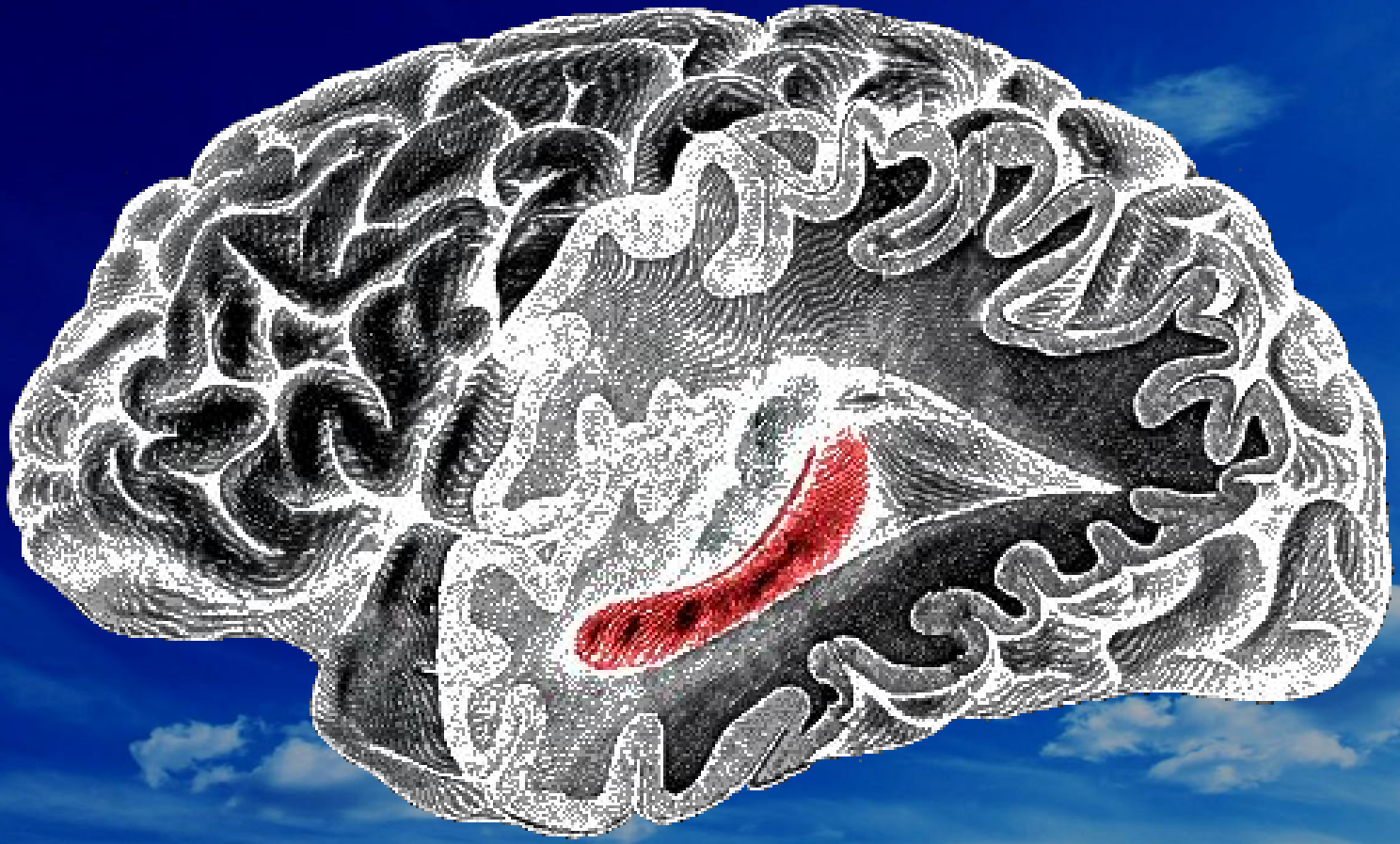
Making connections

- Hebbian theory (1949)
- Spike Timing Dependent Plasticity (1973)
- Neurons spontaneously interconnect based on the timing of incoming signals
- The hippocampus creates an ‘action replay’ to integrate unfamiliar signals

Hippocampus



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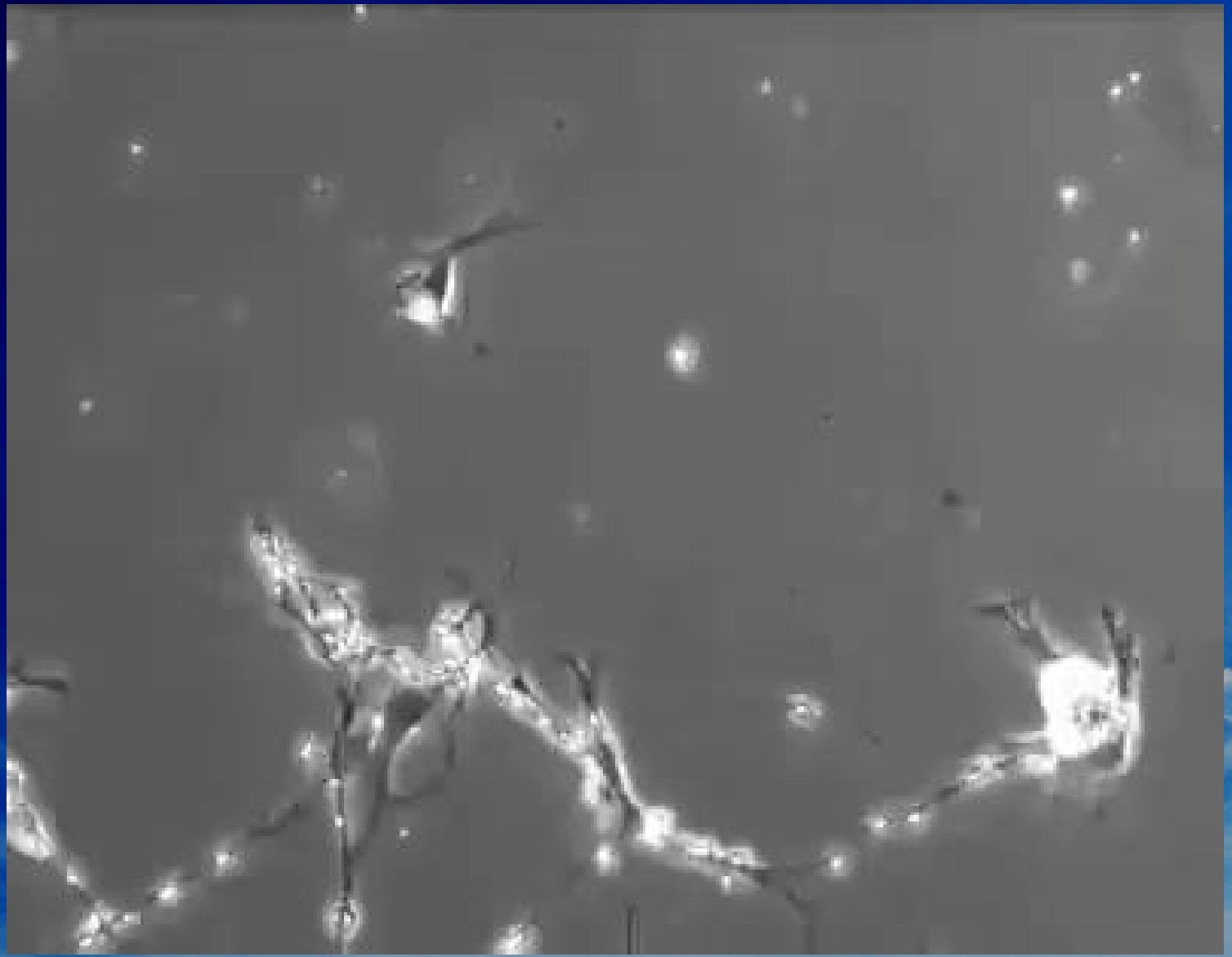
Neurons forming connections



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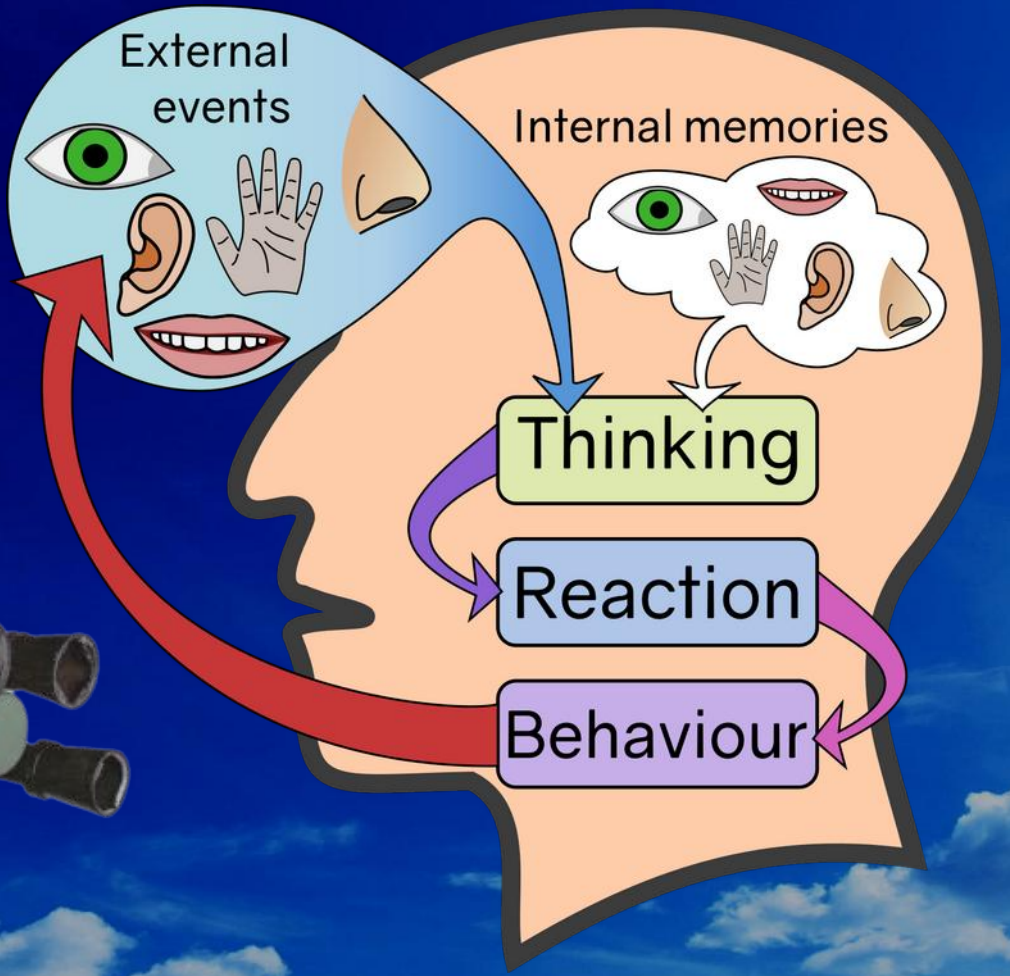
The decision making system



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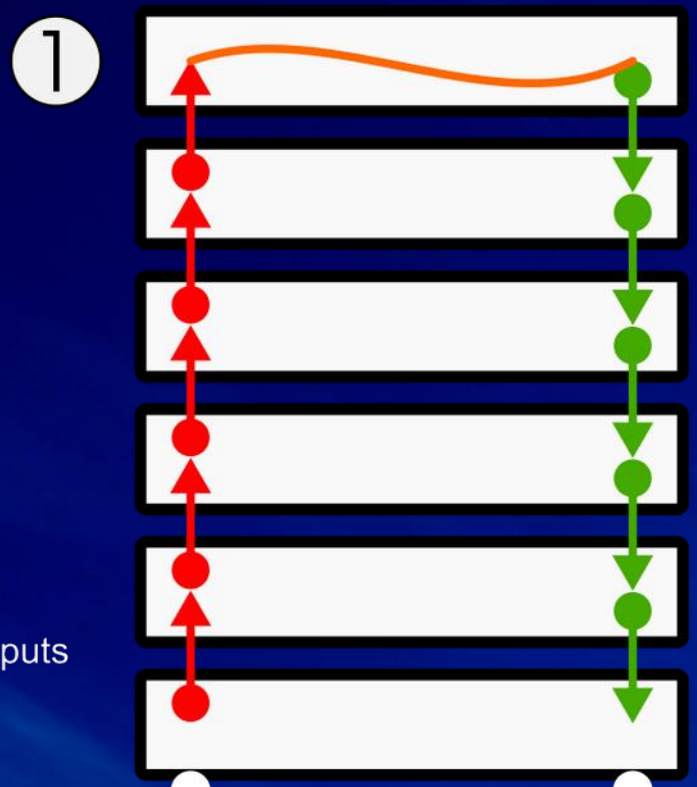
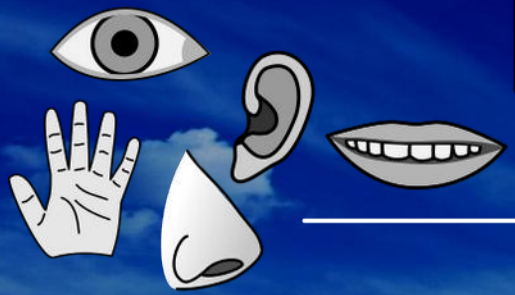


Sensory inputs



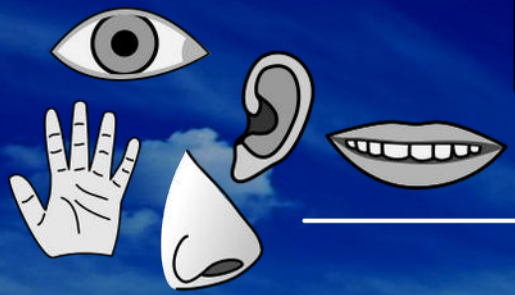
Motor outputs, for example:
Skeletal muscles: Arms & legs
Glands: Release of hormones
Diaphragm and larynx: Speech
Eyes: Focus of attention

2

Neocortex

Brain stem

Sensory inputs



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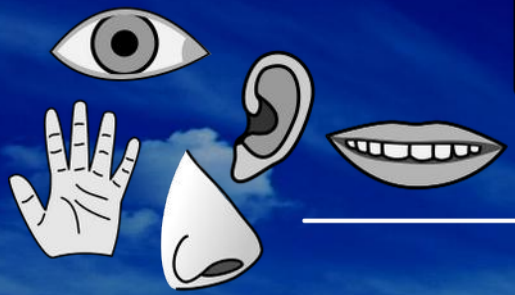
3

Neocortex

Brain stem

Sensory inputs



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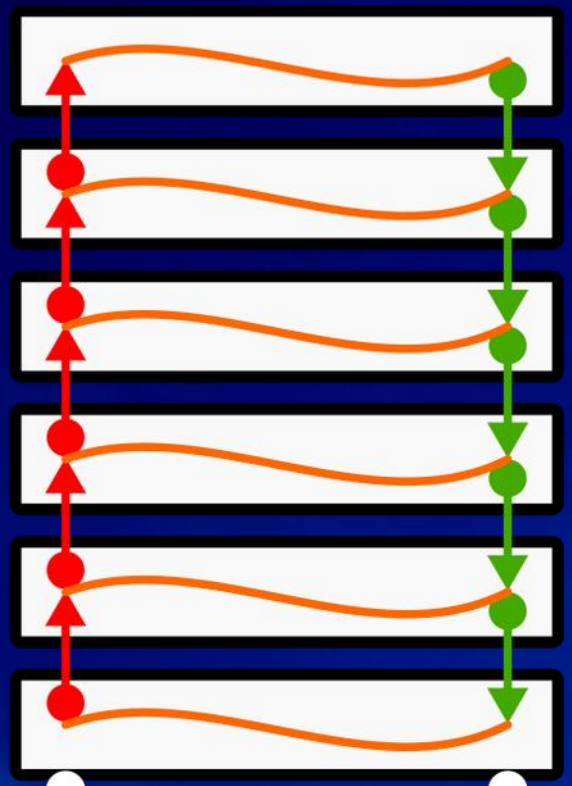
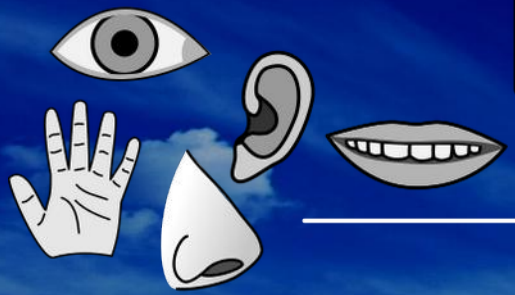


Neocortex

Brain stem

Sensory inputs



Motor outputs, for example:
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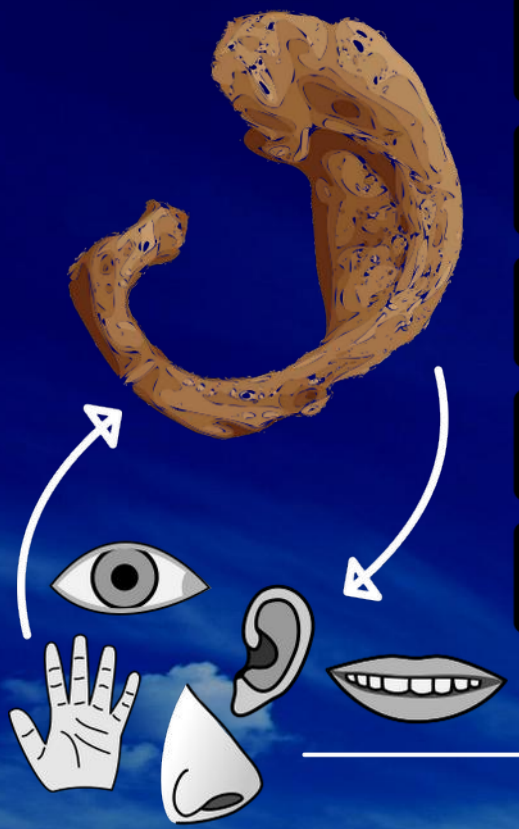
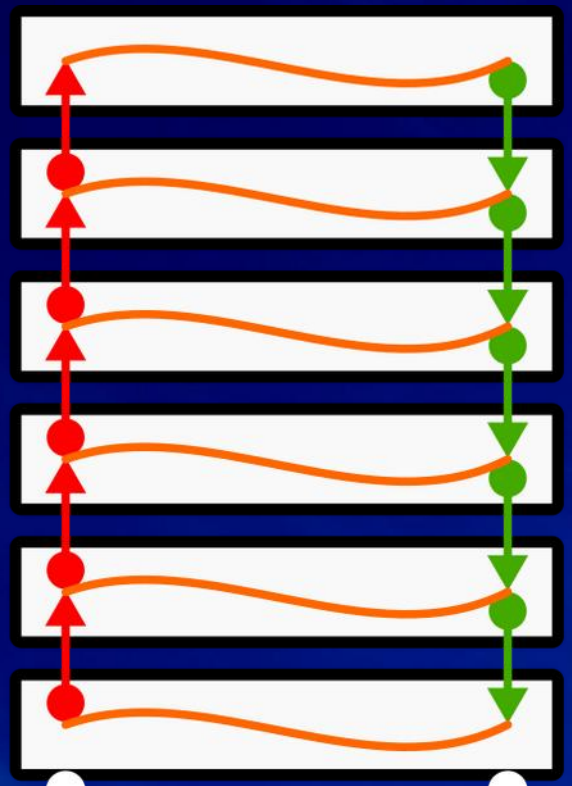
5





Neocortex

Brain stem

Motor outputs, for example:
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The best choice

?

Kolb 1984

- Not a model of explicit, intentional learning
- A commentary on the ongoing cycle of integrating new experience into the existing connectome or 'map'

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Kolb 1984

- ★Concrete Experience
  - Whether you like it or not
- ★Reflective Observation
  - Hippocampus replays
- ★Abstract Concept
  - I should have…
- ★Active Experiment
  - Next time...

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Proving

- The reference point for new experiences is the existing ‘map’
- The ‘map’ creates the filter for interpreting new experiences
- You will tend to focus on information which proves what you already know

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- Learning is continual and automatic
- You cannot prevent learning
- The question is…
- **Learning *what*?**

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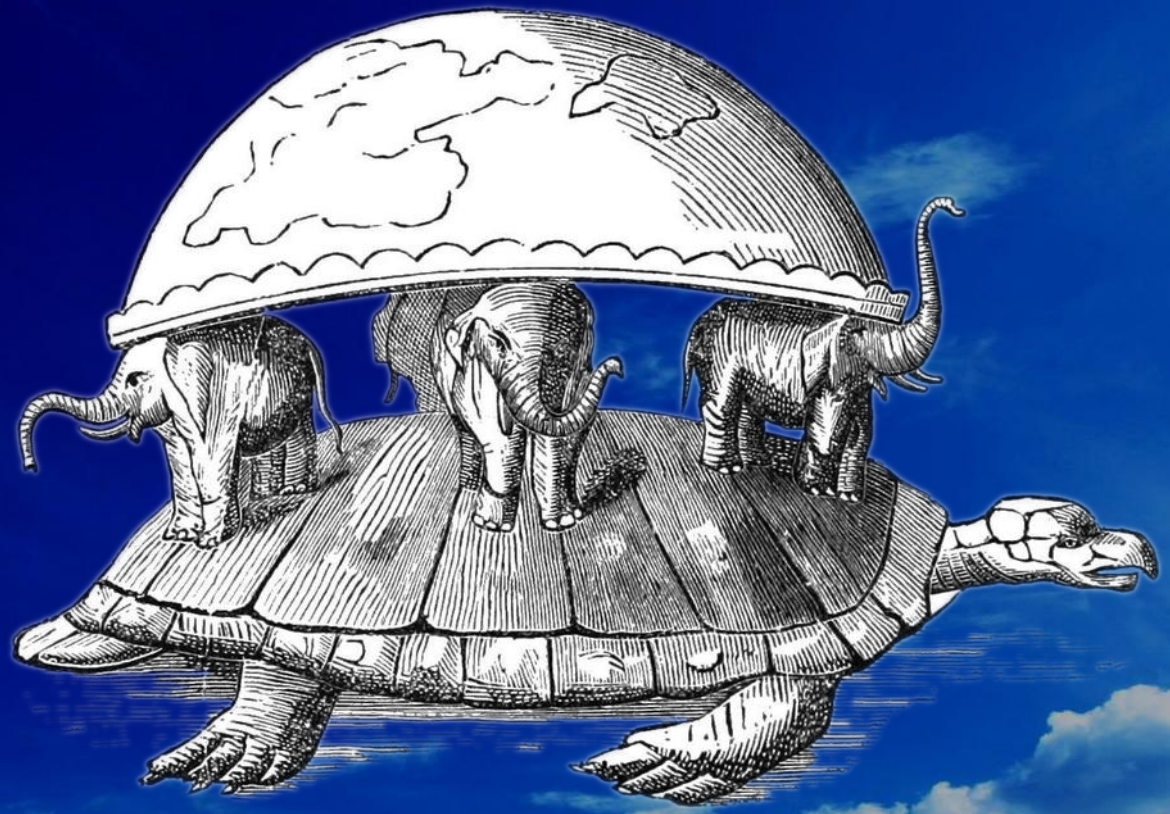
Learning about learning about learning about learning about learning



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- The physical environment
- The meaning of learning
- Emotional state
- Purpose
- Past experience
- Judgements
  - Right/Wrong/Success/Failure

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How learning really works - and it's not what you think

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It's **when**
you think
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That's all Folks!
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