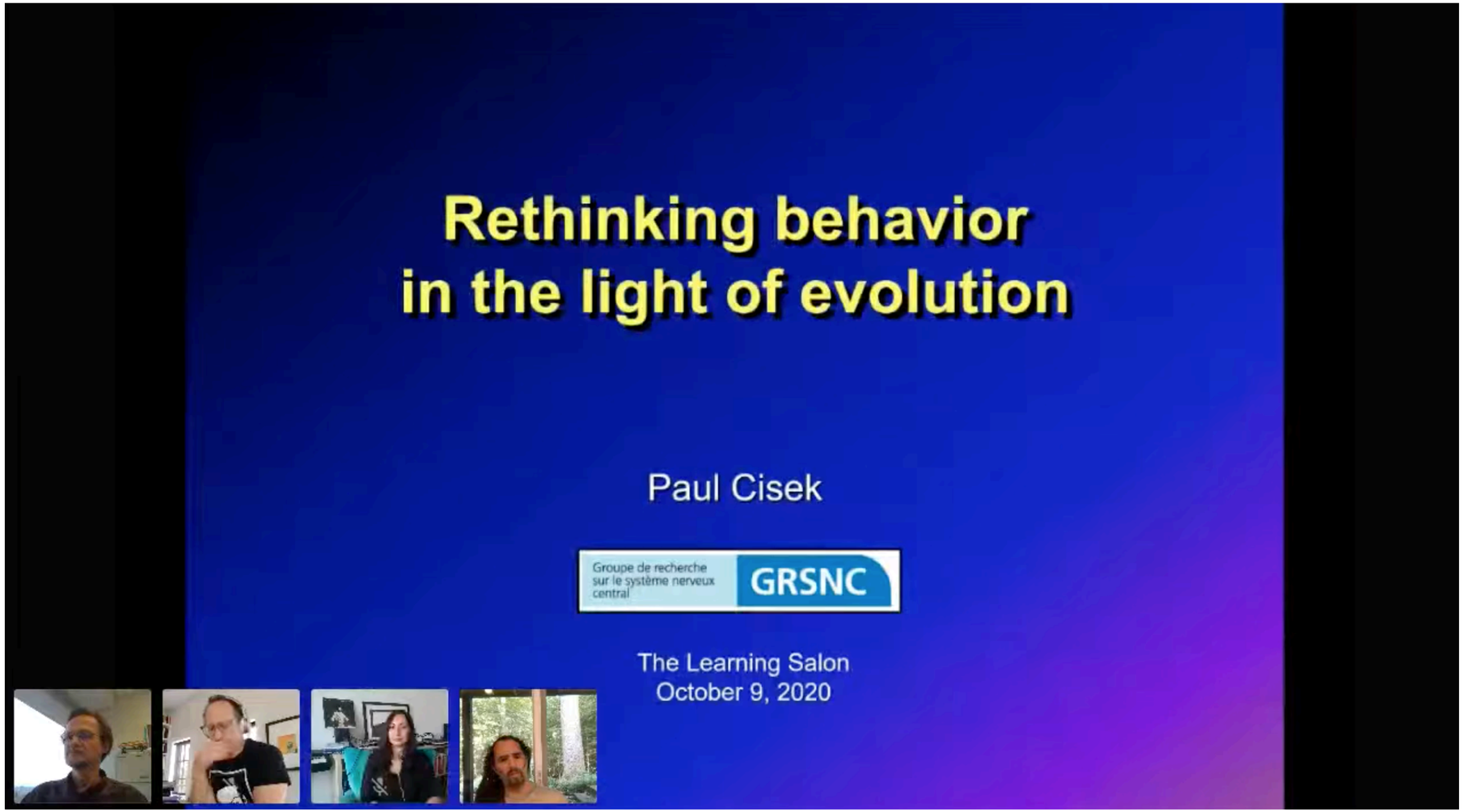
How does the brain evolve?

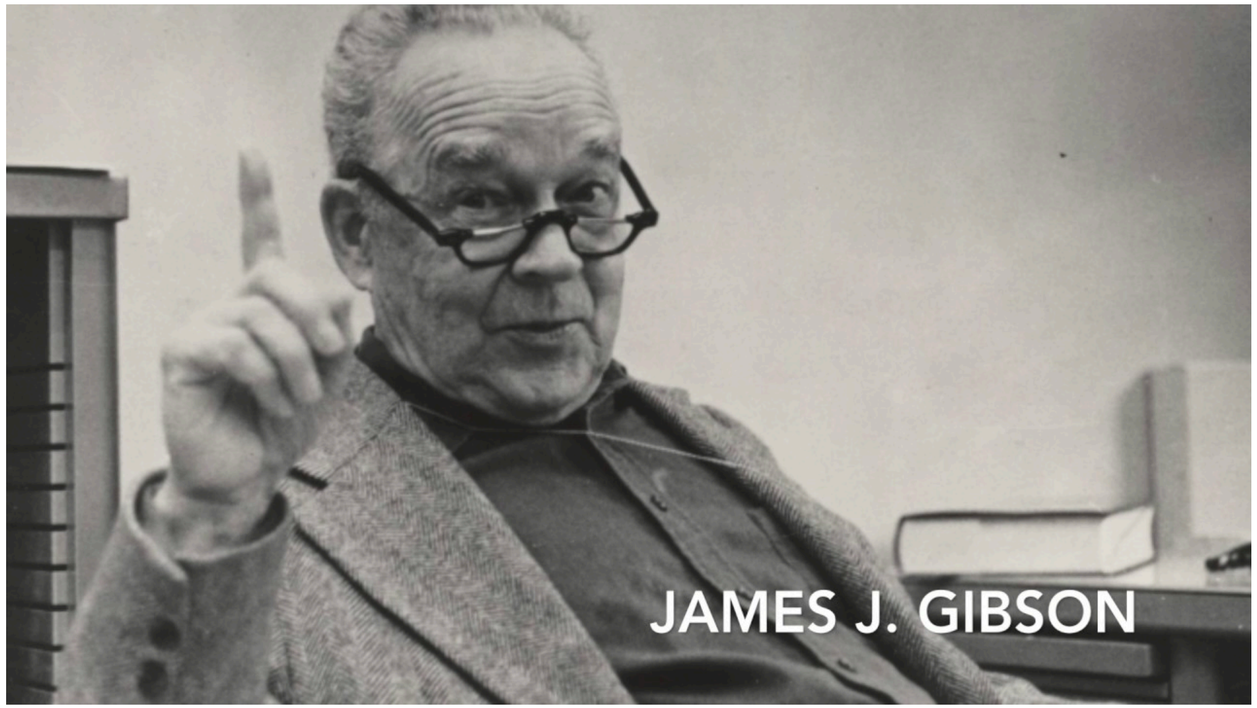
Readings for today

- Cisek, P. (2019). Resynthesizing behavior through phylo- genetic refinement. Attention, Perception, & Psychophysics, 81(7), 2265-2287.

Cisek in his own words



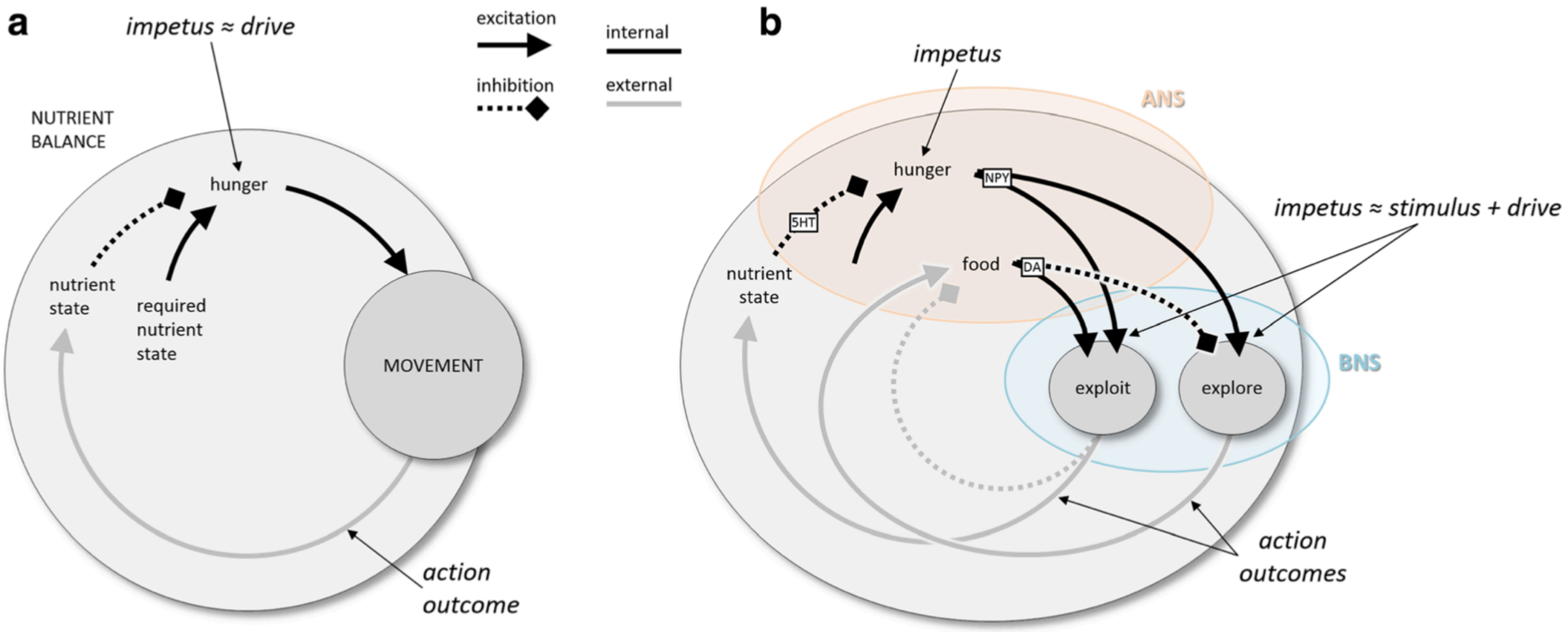
Gibson’s affordances



The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill. The verb to afford is found in the dictionary, the noun affordance is not. I have made it up. I mean by it something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarity of the animal and the environment.

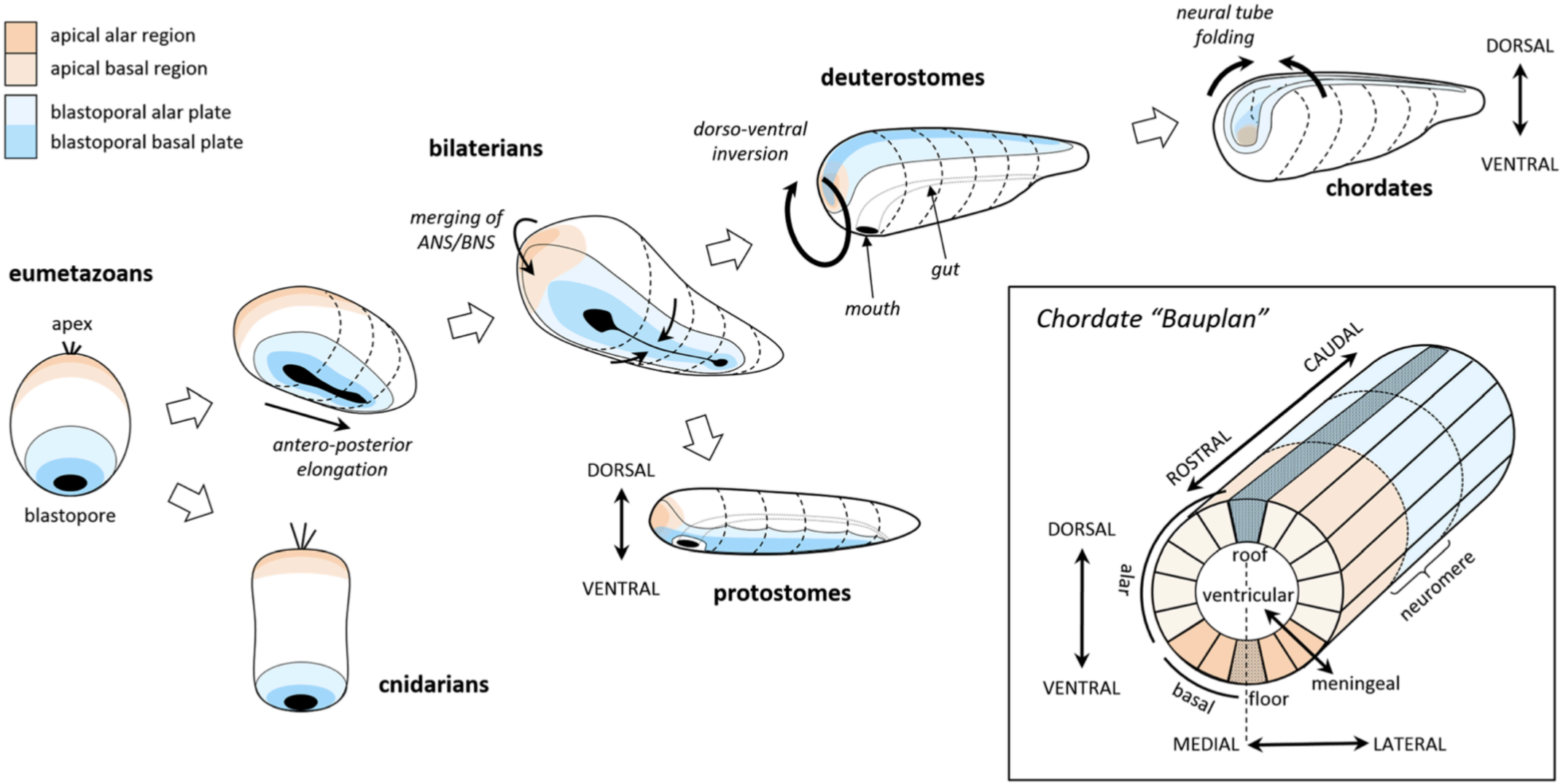
— Gibson (1979, p. 127)

Start simple…



(Cisek 2019)

… increase complexity to maximize fitness.



(Cisek 2019)

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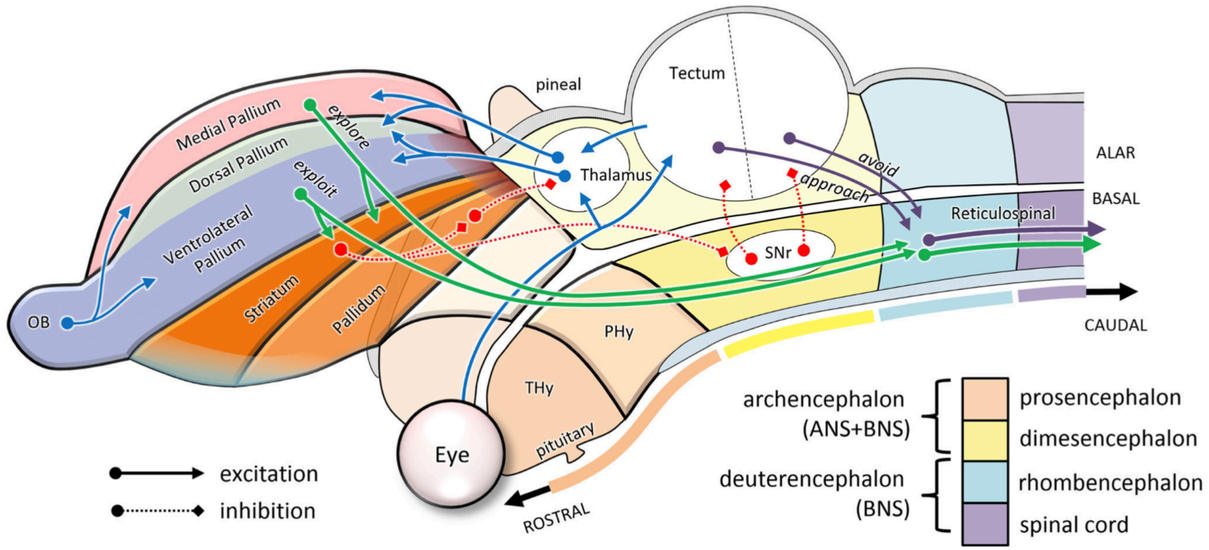
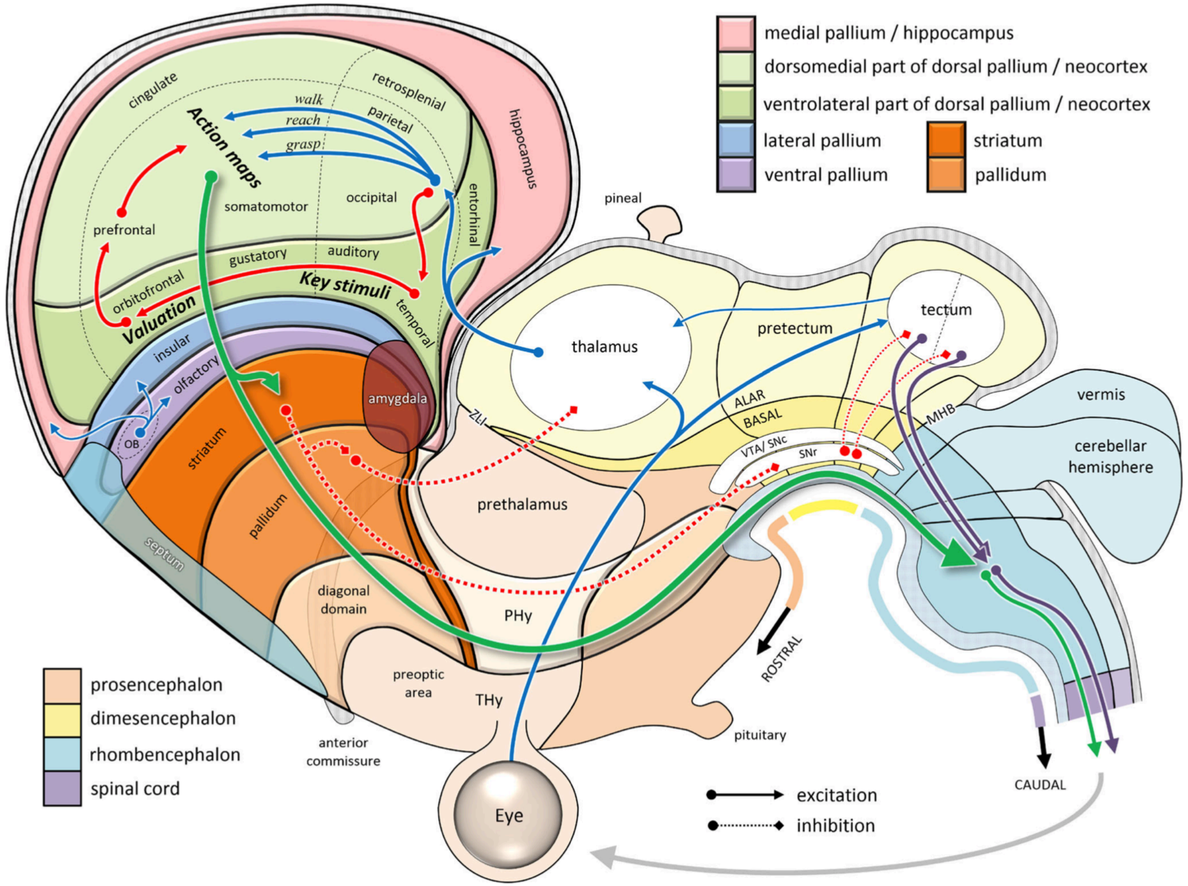
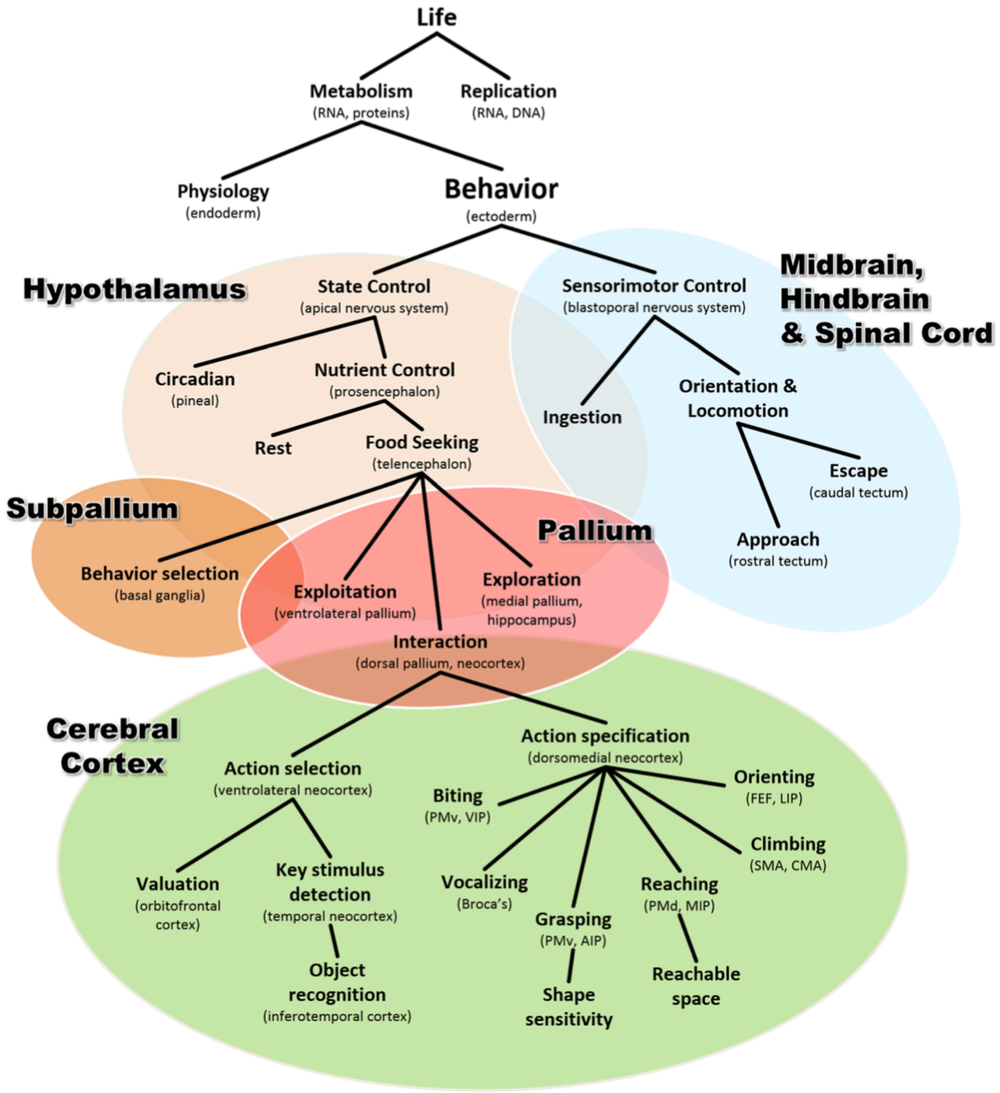




(Cisek 2019)

Revised taxonomy via phylogenetic refinement



Here, the hierarchy of functional categories is constructed by progressive differentiation that follows, along each branch, the putative sequence of specializations that occurred over evolutionary time. Thus, behavior is a specialization of metabolism, object recognition is a specialization of action selection, and so forth. I would argue that these are not simply semantic exercises, but useful constraints that can reveal similarities of the underlying mechanisms.

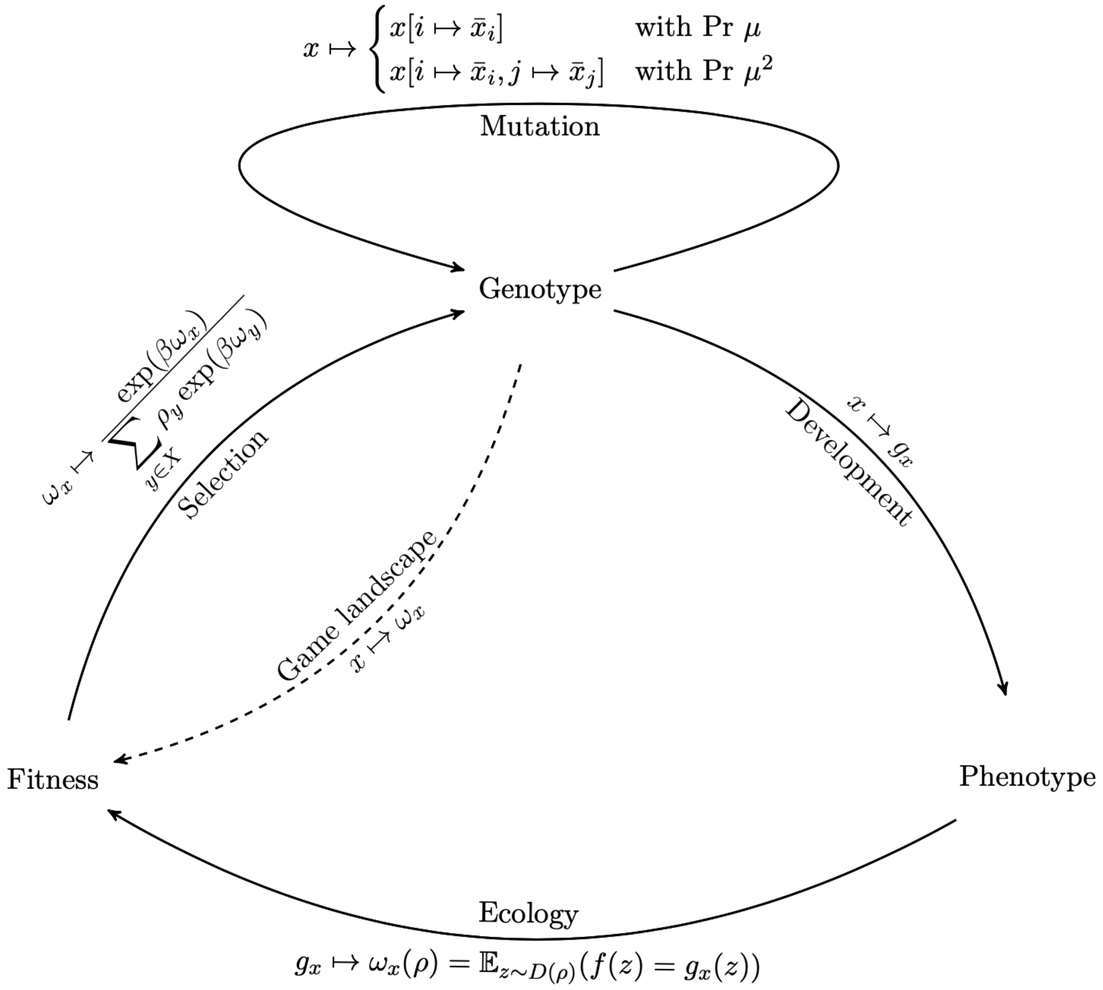
-Cisek, 2019

(Cisek 2019)

Food for thought

- How does Cisek's phylogenetic refinement theory really contrast with traditional views on the evolution of the brain & cognition?
- What implications does this theory pose for the nature of cognition?
- What critical assumption does Cisek's theory rely on regarding the purpose of evolution? Is this assumption realistic?

Algorithmic Darwinism



[T]reat Darwinian evolution as a special kind of computational learning from statistical queries. The statistical queries represent a genotype's fitness over a distribution of challenges. And this distribution of challenges along with the best response to them specify a given abiotic environment or static fitness landscape.

- Kaznatcheev, 2001

(Kaznatcheev 2021)