

# Limits of Sentience

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Whitehead Lecture 1, 2023

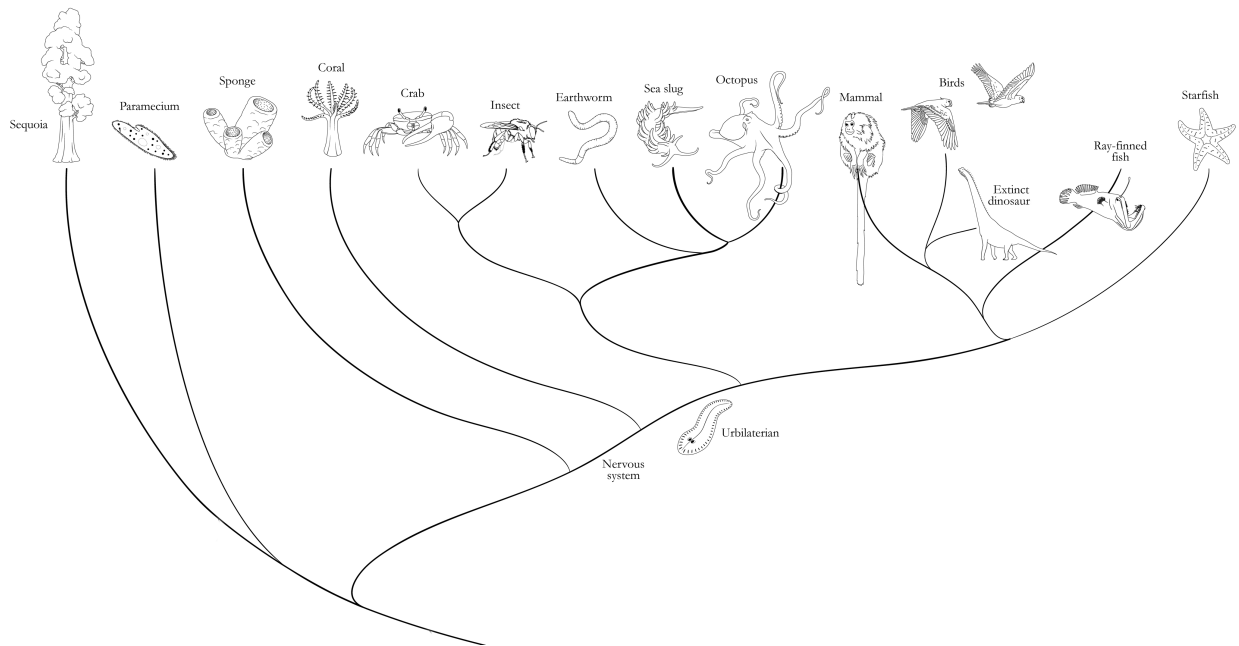
The demand for continuity has, over large tracts of science, proved itself to possess true prophetic power. We ought therefore ourselves sincerely to try every possible mode of conceiving the dawn of consciousness so that it may *not* appear equivalent to the irruption into the universe of a new nature, non-existent until then.

– William James, *The Principles of Psychology*, 1890

## 2. Animal Evolution and Agency

Minimal cognition as a feature of (all?) cellular life:

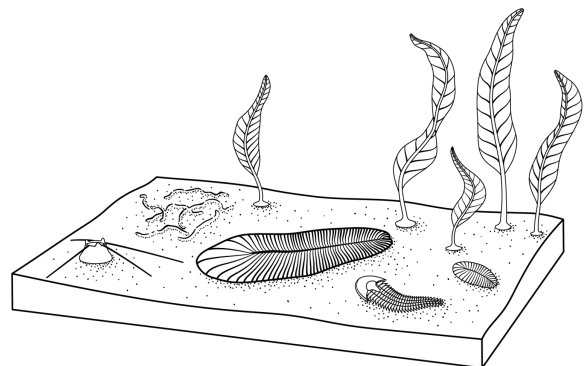
Lyon, "The cognitive cell: bacterial behavior reconsidered," *Front. Microbiol.* 2015



Nervous systems: Jékely et al. 2015, "An option space for early neural evolution," *Phil. Trans. B*, 2015; Detlev Arendt, "Elementary nervous systems," *Phil. Trans. B*, 2021

Before the Cambrian,  
Ediacaran life:

(Tree and Ediacaran drawings by Rebecca Gelernter)

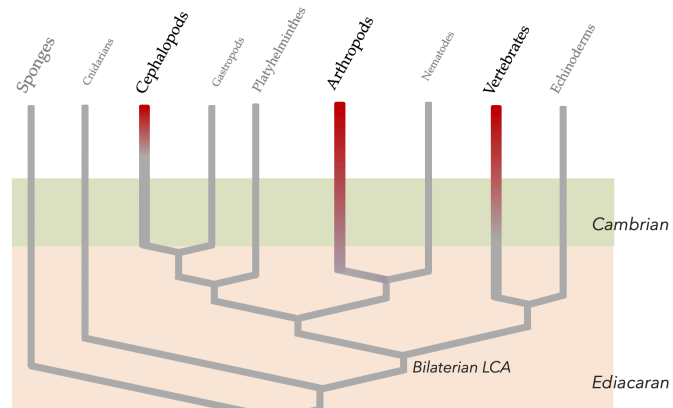


Cambrian (about 540-485 mya)

Life on land - arthropods led the way, from 440 mya.

Multiple origins of behavioral complexity: arthropods, cephalopods, vertebrates.

The multiple-origin picture is modulated by gradualism.

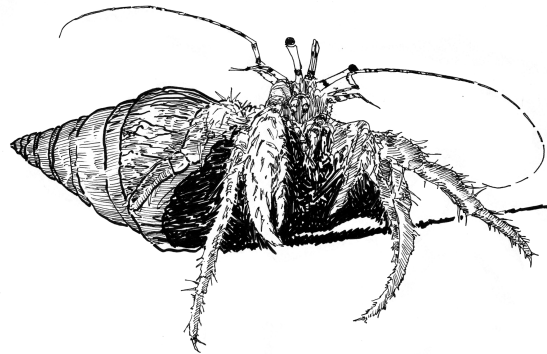


### 3. The Biology of Subjectivity and Experience

1. A set of features with a broadly cognitive or functional character. Subjectivity and agency.

Elwood, "Evidence for pain in decapod crustaceans," *Animal Welfare*, 2012.

"In other cases, terrestrial [hermit] crabs appear to predict that a fight will occur between two large crabs and form an assemblage. They wait for one crab, typically the largest in the group, to attack another to attempt to take its shell.... Other crabs assemble in a line, again in size order, and wait until the defender is evicted. At that point, the victor moves into the vacated shell and the victor's discarded shell might immediately be taken by the first crab in the line. Shells are then swapped down the line leaving the evicted defender with an unsuitable shell, and such crabs may not survive for very long."  
"Hermit crabs, shells, and sentience," 2022



Hermit and octopus by Alberto Rava

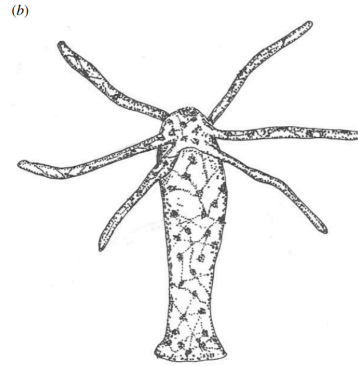
2. Features of nervous systems. A combination of cell-to-cell network influences and large-scale oscillatory patterns (seen in EEG in humans). Their origin and role controversial.

Passano, "Primitive Nervous Systems," *PNAS* 1963.

Singer, "Neuronal oscillations: Unavoidable and useful?" *Eur. J. Neuro*, 2018.

Crick and Koch, "Towards a neurobiological theory of consciousness," *Seminars in Neuro.*, 1990

Van Swinderen, "The remote roots of consciousness in fruit-fly selective attention?" *Bioessays*, 2005.



*Hydra*. From Arendt.

The tendency towards [exp. profile-like] integration: Passano 1963; Ginsburg and Jablonka, *The Evolution of the Sensitive Soul*, 2019; Kaplan and Zimmer, "Brain-Wide Representations of Ongoing Behavior: A Universal Principle?" *Curr. Opin. Neurobio.* 2020.

Narrow pathway views:

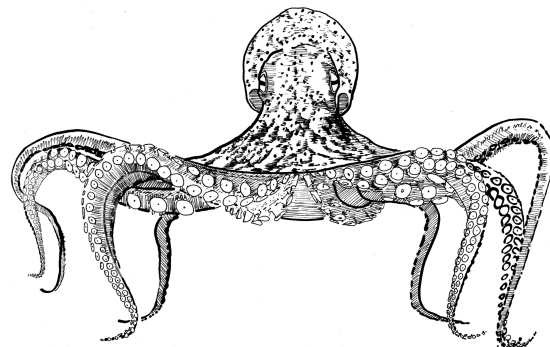
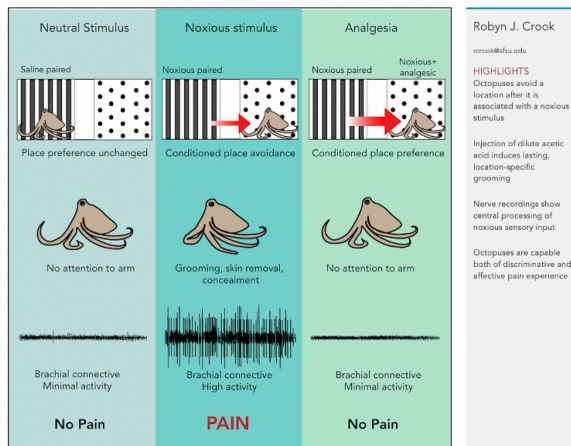
Frith: "The key insight driving research on this topic is that much precise and well-adapted behaviour in a fully awake person can occur without consciousness." ("The neural basis of consciousness," *Psychological Medicine*, 2019)

Dehaene, *Consciousness and the Brain* (2014) – a central work.

\* Data might show that you can do X1 unconsciously while being conscious of something else, and can do X2 unconsciously while being conscious of something else.... It would not follow is that you can do X1, X2,... (etc.) all together, without being conscious of *anything*.

Robyn Crook, *Cell* 2021.

Behavioral and neurophysiological evidence suggests affective pain experience in octopus



Putnam, "Psychological predicates," 1967.

#### 4. Limits, Gradations, Irruptions

[T]he notion of degrees of consciousness is of dubious coherence. According to the standard conception of consciousness, a creature is conscious if and only if it possesses a subjective point of view.... Arguably, the property of having a subjective point of view is not gradable – it cannot come in degrees.

In this way it resembles being a member of the United Nations rather than being healthy, which clearly can come in degrees.

(Bayne, Hohwy, and Owen, "Are There Levels of Consciousness?" *TRiCS*, 2016)

My "Gradualism and the evolution of experience," *Phil. Topics*, 2020.

Tye, *Vagueness and the Evolution of Consciousness: Through the Looking Glass*, 2021.

