The Coding of Visceral Senses in the Brain

The discoveries of the coding principles of vision, somatosensation, olfaction, gustation, and audition are all landmark achievements. By contrast, little is known about how the brain encodes information from the internal organs to generate our visceral senses. Most internal senses are signaled to the brain by the vagus nerve, which relays internal signals to the nucleus of the solitary tract (NTS) of the brainstem, the first information-processing hub of bodily cues in the brain. We developed a novel in vivo two-photon mouse brainstem calcium imaging platform, which allowed us, for the first time, to record the activities of thousands of NTS neurons. This approach enabled us to make a series of discoveries: (1) Diverse chemo- and mechanosensory signals within the same organ are represented by overlapping NTS populations; (2) by contrast, different internal organs are encoded by distinct neuronal populations that form dedicated “labeled lines”; (3) the brain creates a point-to-point map to represent internal organs, forming a “visceral homunculus” in the brainstem; (4) the spatial map of organs depends on local inhibition. Our study provides the first systematic analysis of the coding logic of visceral senses, laying the foundation for future research to understand interoceptive codes throughout the brain.

January 13, 2023 | 12:00 Noon – 1:00 PM
Hedco Neurosciences Building (HNB 100)
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