# Spatial patterns of brain activity decode what people taste

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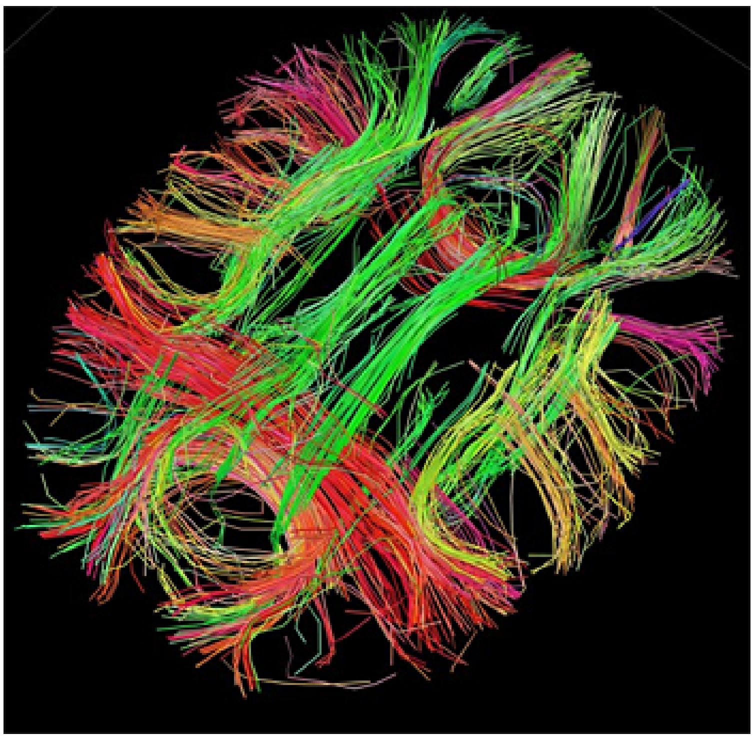

White matter fiber architecture of the brain. Credit: Human Connectome Project.

A team of researchers from the German Institute of Human Nutrition in Potsdam and the Charité University Hospital in Berlin have revealed how taste is encoded in patterns of neural activity in the human brain. Kathrin Ohla, the lead researcher on the team, said: "The ability to taste is crucial for food choice and the formation of food preferences.

Impairments in taste perception or hedonic experience of taste can cause deviant eating behavior, and may lead to mal- or supernutrition. Our research aims to extend the understanding of the neuronal mechanisms of taste perception and valuation. This knowledge is essential for the development of strategies to moderate deviant eating behavior." The study was published in *Current Biology*.

Tastants in the mouth activate specific receptors on the tongue corresponding to each of the basic tastes: sweet, salty, sour, bitter, and savory (umami). The signal is then transduced further to the brain. How the peripheral signal is used by the central nervous system to encode taste quality is largely unknown.

In the study, participants discriminated between sweet, salty, sour, and bitter tastants while their brain activity was recorded with electroencephalography (EEG), a method that measures minuscule electrical signals generated by billions of neurons in the human neocortex with millisecond resolution. Different tastes evoked different dynamic patterns of electrical activity. A machine learning algorithm could be trained to discriminate between these patterns. Thus, given a piece of data, the algorithm could decode from the pattern of brain-wide activity which taste a participant had received in that moment. This form of "mind reading" even made it possible to decode which of four tastants participants thought to have tasted when they were, in fact, incorrect: tastes that participants frequently confused with each other (e.g. sour and salty) were also frequently confused by the algorithm.

Kathrin Ohla said: "We were surprised to find that the onset of this decoding coincided with the earliest taste-evoked responses, within only 175 milliseconds, suggesting that quality is among the first attributes of a taste represented in the central gustatory system."

Niko Busch adds: "In future studies, we will go a step further and try to decipher from neural activity how pleasurable a taste was in addition to its category. This would be an important step to understanding how individual taste preferences are coded in the brain and of high relevance for clinical applications such as weight loss programs."

**More information:** Sébastien M. Crouzet, Niko A. Busch and Kathrin Ohla: Taste Quality Decoding Parallels Taste Sensations, *Current Biology* 2015, DOI: 10.1016/j.cub.2015.01.057

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