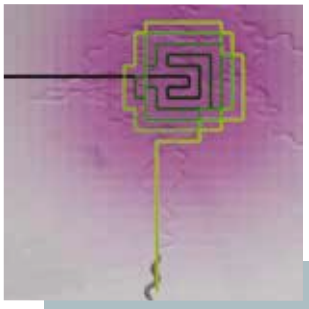

salk
Where cures begin.

Tatyana Sharpee

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The Problem

Vision and hearing are essential to our wellbeing. Although we often take these senses for granted, the ability to parse the environment around us into objects has largely defied our efforts to replicate it outside of the brain, for example, in computers and robots. Yet, understanding how these processes are carried out in the brain is essential not only for creating efficient computer and robotic systems but also for ameliorating the effects due to stroke and neurodegenerative disorders that, in some cases, can prevent someone from recognizing his or her own face in the mirror.

The Approach

Some of the most enigmatic parts of the human brain respond only to representations of natural stimuli. Researchers want to analyze reactions to these stimuli in order to find out how individual neurons represent such complex scenes and sounds. Tatyana Sharpee and her group are developing new statistical methods that make such analyses possible, as well as carrying out long-term observations of neural responses to natural stimuli. Sharpee's research is helping guide the development of new models that explain how the brain focuses on details or carries out a visual search. These findings have implications for not only how we see, but also how we respond to other senses, such as smell, sound and touch.

The Innovations and Discoveries

- Sharpee recently showed how even simple organisms can implement maximally efficient strategies when searching for food. This theory offers clues into the basic mechanisms of decision-making: how we decide whether to continue with a project or start a new one, for example.
- Sharpee and collaborators have recently developed a theory that explains when it becomes advantageous for an organism to use new types of neurons. This theory could help catalogue and determine the number of separate neuronal types in the brain.
- She also discovered that, when the brain is trying to pick a shape out of a background, there's a trade-off between the complexity of the shape and the possible positions it can be in and still be recognized—a shape that's not very complex can still be picked out of the background by the brain even if it's upside down or sideways, for example.

For more information, please visit:
http://www.salk.edu/faculty/sharpee.html

Computational Biology, Memory, Neurobiology, Neurological Disease, Systems Biology, Vision