

2007 Winner

Rachel Wilson, Ph.D.

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Rachel Wilson received her A.B. in chemistry from Harvard in 1996. In her graduate work with Roger Nicoll at the University of California, San Francisco, she showed that endogenous cannabinoids act as retrograde messengers at hippocampal synapses. In 2001, she joined Gilles Laurent's lab at Caltech as a postdoc. There, in collaboration with fellow-postdoc Glenn Turner, she developed methods for performing whole-cell recordings from neurons in the adult *Drosophila* brain *in vivo*. In 2004, she joined the Department of Neurobiology at Harvard Medical School. Her lab uses small neural circuits to study fundamental principles of sensory processing.

Neural Circuits Underlying Chemical Perception

Dr. Wilson's research is aimed at understanding how sensory stimuli are encoded in the electrical activity of specific groups of neurons in the brain. Her research team uses the tiny brain of the fruit fly, *Drosophila melanogaster*, as a simple model system for addressing this question. Electrophysiological recordings in living flies are used to monitor response to sensory stimuli, and genetic methods are used to label and manipulate specific types of neurons in sensory circuits.

In her prizewinning essay, Dr. Wilson describes a series of recent studies from her laboratory that probe how odors are encoded in the fruit fly brain. These studies show that as olfactory signals pass through brain circuits, they undergo a series of specific transformations that should make these signals more useful to the higher-order neurons that trigger behaviors. Ultimately, this research could be useful in helping engineers optimize artificial devices designed to detect odors associated with diseases or hazardous chemicals.