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Distinguished Women in Science: A Lecture Series

Genes, Environment, and the Building Blocks of Behavior

by
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How does the brain generate flexible responses to the environment based on context, motivation, and experience? We study these complex questions in a very simple animal, the nematode worm *Caenorhabditis elegans.* Although it has only 302 neurons in its brain, it shares many genes with humans. Its remarkably sophisticated behaviors include preferences for odors, food sources, and other animals that vary based on environmental conditions, internal modulatory states, and genetic variation. By monitoring and manipulating the neurons and genes in real time, we can see how the circuits of the worm's "wiring diagram" are remodeled by neuromodulators reflecting internal states, which help select appropriate behavioral responses from a larger number of latent circuits. Interactions between these modulators -- conserved molecules like serotonin and oxytocin -- and fast motor circuits can initiate and maintain long-lasting behavioral states.