

Cheng Lyu, Ph.D.
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2025 Winner: Cheng Lyu, Ph.D.

Cheng Lyu earned his bachelor's and master's degrees in physics from Peking University and completed his Ph.D. in Gaby Maimon's lab at Rockefeller University, where he studied the neural basis of path integration in *Drosophila*.

He is currently a postdoctoral researcher in Liqun Luo's lab at Stanford University, investigating how neural circuits are precisely assembled during development. Supported by the Stanford Science Fellows and the Gatsby Foundation, his work has shown that rewiring specific groups of olfactory neurons in flies can alter their behavioral responses to the same odors.

Cheng will soon establish his own laboratory at Westlake University, Hangzhou, China, where he aims to further explore how developmental changes in neural circuits shape animal behavior in ethologically meaningful ways.

Essay: "Respecifying partners"

How do neural circuits assemble with remarkable precision during brain development, and how can changes in this process alter behavior? Using the fruit fly olfactory system – where ~50 types of sensory neurons connect 1-to-1 with ~50 types of partner neurons – Cheng Lyu's research uncovered how the fly olfactory circuit reduces a seemingly intractable 3D wiring problem into simpler 1D choices. By systematically tracing, quantifying, and perturbing neuron development across many cell types, Cheng and his colleagues revealed that partner selection occurs along constrained trajectories, greatly simplifying the molecular codes for specificity. Building on this framework, he demonstrated that by tuning the combinatorial balance of attraction and repulsion, it is possible to rewire single neuron types to form alternative connections. These rewired circuits not only altered neural activity patterns but also reshaped social behaviors, such as male courtship. The work of Cheng and his colleagues links genetic variation to circuit assembly, function, and behavior, providing a foundation for understanding how developmental variations influence brain evolution and neurodevelopmental disease.