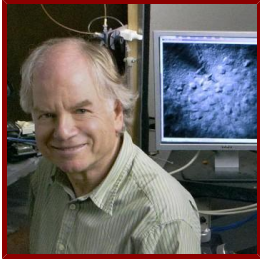


Stanford



Shaul Hestrin, PhD

Professor of Comparative Medicine

CONTACT INFORMATION

- **Alternate Contact**

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Bio

ACADEMIC APPOINTMENTS

- Professor, Comparative Medicine
- Member, Bio-X
- Member, Wu Tsai Neurosciences Institute

LINKS

- Hestrin Lab: <http://www.stanford.edu/~shestrin/>

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Cellular activity in neocortical circuits and behavior

The main interest of my lab is to understand how the properties of neocortical neurons, the circuits they form and the inputs they receive give rise to neuronal activity and behavior. Our approach includes behavioral studies, two-photon calcium imaging, in vivo whole cell recording in behaving animals and optogenetic methods to modulate activity of cortical neurons.

The neocortex represents about 80% of the human brain and is associated with wide range of functions including sensory perception, motor movement, memory and higher aspects of cognition. In the neocortex a major synaptic input originates from local cortical neurons. In addition, thalamic inputs, together with distant corticocortical inputs and neuromodulator inputs play critical role. How these diverse inputs combine at the cellular and circuit level to generate neuronal activity and behavior is the focus of our studies.

We have developed methods to define cell types using genetics and other means. In vitro approach allowed us to characterize the wiring pattern of microcircuits and the synaptic properties of specific connections. To investigate how neuronal properties and interactions generate neuronal activity under physiological conditions we study cortical neurons in vivo in behaving mice. By combining whole cell recordings, calcium imaging and optogenetics we study the subthreshold activity and

circuit activity that drive spike generation in cortical neurons. Importantly, by studying and manipulating neuronal responses as well as behavioral performance we can investigate the relation between neuronal activity and animal perception.

Teaching

COURSES

2019-20

- One Health Journal Club: COMPMED 200 (Aut, Win)

2018-19

- Neuro-Cellular Core: COMPMED 201, NEPR 201 (Win)
- One Health Journal Club: COMPMED 200 (Aut, Win, Spr)

2017-18

- Neuro-Cellular Core: COMPMED 201, NEPR 201 (Win)
- One Health Journal Club: COMPMED 200 (Aut, Win, Spr)

2016-17

- Comparative Medicine Seminar and One Health Journal Club: COMPMED 200 (Aut, Win, Spr)
- Neuro-Cellular Core: COMPMED 201, NEPR 201 (Aut)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Konstantin Kaganovsky, Isabel Low

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Neurosciences (Phd Program)

Publications

PUBLICATIONS

- **Correlation of Synaptic Inputs in the Visual Cortex of Awake, Behaving Mice.** *Neuron*
Arroyo, S., Bennett, C., Hestrin, S.
2018
- **Feature-Specific Organization of Feedback Pathways in Mouse Visual Cortex** *CURRENT BIOLOGY*
Huh, C. L., Peach, J. P., Bennett, C., Vega, R. M., Hestrin, S.
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- **Layer 6 corticothalamic neurons activate a cortical output layer, layer 5a.** *journal of neuroscience*
Kim, J., Matney, C. J., Blankenship, A., Hestrin, S., Brown, S. P.
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- **Controlling brain states.** *Neuron*
Bennett, C., Arroyo, S., Hestrin, S.
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- **Nicotinic modulation of cortical circuits** *FRONTIERS IN NEURAL CIRCUITS*
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- **Subthreshold mechanisms underlying state-dependent modulation of visual responses.** *Neuron*
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 - **New insights into the classification and nomenclature of cortical GABAergic interneurons** *NATURE REVIEWS NEUROSCIENCE*
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Hestrin, S.
2011; 334 (6054): 315-316
 - **Noradrenaline Enhances Signal-to-Noise Ratio of Inhibitory Inputs in the Dorsal Cochlear Nucleus** *NEURON*
Hestrin, S.
2011; 71 (2): 197-198
 - **Synaptogenesis of Electrical and GABAergic Synapses of Fast-Spiking Inhibitory Neurons in the Neocortex** *JOURNAL OF NEUROSCIENCE*
Pangratz-Fuehrer, S., Hestrin, S.
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 - **Cell-type identity: a key to unlocking the function of neocortical circuits** *CURRENT OPINION IN NEUROBIOLOGY*
Brown, S. P., Hestrin, S.
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 - **Intracortical circuits of pyramidal neurons reflect their long-range axonal targets** *NATURE*
Brown, S. P., Hestrin, S.
2009; 457 (7233): 1133-U89
 - **Cannabinoid sensitivity and synaptic properties of 2 GABAergic networks in the neocortex** *CEREBRAL CORTEX*
Galarreta, M., Erdelyi, F., Szabo, G., Hestrin, S.
2008; 18 (10): 2296-2305
 - **Petilla terminology: nomenclature of features of GABAergic interneurons of the cerebral cortex** *NATURE REVIEWS NEUROSCIENCE*
Ascoli, G. A., Alonso-Nanclares, L., Anderson, S. A., Barrionuevo, G., Benavides-Piccione, R., Burkhalter, A., Buzsaki, G., Cauli, B., DeFelipe, J., Fairen, A., Feldmeyer, D., Fishell, G., Fregnac, et al
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 - **D-1-like dopamine receptor activation modulates GABAergic inhibition but not electrical coupling between neocortical fast-spiking interneurons** *JOURNAL OF NEUROSCIENCE*
Towers, S. K., Hestrin, S.
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Zsiros, V., Hestrin, S.
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 - **Synchronous versus asynchronous transmitter release: a tale of two types of inhibitory neurons.** *Nature Neuroscience*
Hestrin, S., Galarreta, M

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- **Electrical synapses define networks of neocortical GABAergic neurons** *Trends in Neurosciences*
Hestrin, S., Galarreta, M.
2005; 28: 304-309
- **Electrical coupling among irregular-spiking GABAergic interneurons expressing cannabinoid receptors** *JOURNAL OF NEUROSCIENCE*
Galarreta, M., Erdelyi, F., Szabo, G., Hestrin, S.
2004; 24 (44): 9770-9778
- **Synaptic interactions of late-spiking neocortical neurons in layer 1** *JOURNAL OF NEUROSCIENCE*
Chu, Z. G., Galarreta, M., Hestrin, S.
2003; 23 (1): 96-102
- **Electrical and chemical synapses among parvalbumin fast-spiking GABAergic interneurons in adult mouse neocortex** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
Galarreta, M., Hestrin, S.
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- **Spike transmission and synchrony detection in networks of GABAergic interneurons** *SCIENCE*
Galarreta, M., Hestrin, S.
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- **Electrical synapses between GABA-releasing interneurons** *NATURE REVIEWS NEUROSCIENCE*
Galarreta, M., Hestrin, S.
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Galarreta, M., Hestrin, S.
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 - **Correlation between kinetics and RNA splicing of alpha-amino-3-hydroxy-5-methylisoxazole-4-propionic acid receptors in neocortical neurons** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
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 - **PROPERTIES OF EXCITATORY POSTSYNAPTIC CURRENTS RECORDED INVITRO FROM RAT HIPPOCAMPAL INTERNEURONS** *JOURNAL OF PHYSIOLOGY-LONDON*
Sah, P., Hestrin, S., Nicoll, R. A.
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Hestrin, S., Perkel, D. J., Sah, P., Manabe, T., Renner, P., Nicoll, R. A.
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Sah, P., Hestrin, S., Nicoll, R. A.
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- **KINETICS OF ACTIVATION OF ACETYLCHOLINE-RECEPTORS IN A MOUSE MUSCLE-CELL LINE UNDER A RANGE OF ACETYLCHOLINE CONCENTRATIONS** *BIOPHYSICAL JOURNAL*
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- **THE EFFECTS OF A MYASTHENIC SERUM ON THE ACETYLCHOLINE-RECEPTORS OF C2 MYOTUBES .2. FUNCTIONAL INACTIVATION OF THE RECEPTOR** *JOURNAL OF NEUROSCIENCE*
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- **ACTIVATION OF ACETYLCHOLINE-RECEPTORS CAUSES THE PARTITION OF HYDROPHOBIC CATIONS INTO POSTSYNAPTIC MEMBRANE-VESICLES** *NATURE*
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