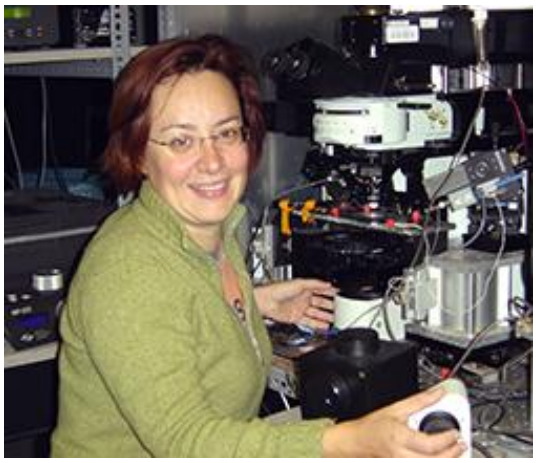
Sonia Gasparini, PhD
Assistant Professor of Cell Biology & Anatomy and Neuroscience



Degrees

1994-1998 PhD, University of Milano, Italy
1989-1994 BSc, University of Milano, Italy

Positions

2010-pres: Assistant Professor of Cell Biology and Anatomy and Neuroscience, Neuroscience Center, LSUHSC
2005-2010: Research Assistant Professor, Neuroscience Center, LSUHSC
2001-2004: Postdoctoral fellow, Neuroscience Center, LSUHSC, New Orleans, LA
1998-2000: Postdoctoral fellow, Biophysics Sector, SISSA-ISAS, Trieste Italy

Awards/Recognitions/Lectures

2009: Invited speaker at the Gordon Research Conference "Dendrites: Molecules, Structure and Function", Il Ciocco, Italy
2008: Dart Neuroscience Scholars Program in Learning and Memory Award (PI)
2007: Albert and Ellen Grass Faculty Program Award (PI)
2005: Albert and Ellen Grass Faculty Program Award (PI)
2002-2004: NARSAD Young Investigator Award
2002: Ochsner Clinic Foundation Research Award
2000: SINS (Italian Society for Neuroscience) Travel Fellowship
1997: Federation of Biochemical Societies Youth Travel Fund

Research Interests

Information processing and memory formation. Dendritic excitability and plasticity: synaptic transmission and voltage-dependent channel activity in hippocampal and entorhinal neurons

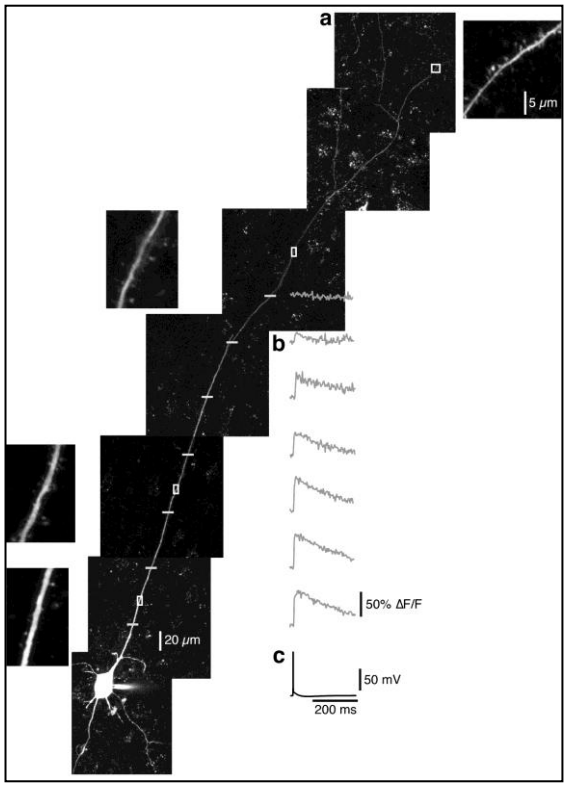
Research Interest Statement

<u>Dendritic integration in the entorhinal cortex (EC)</u>

The enthorhinal cortex is a key relay structure for the flow of information between the hippocampus and the neocortex. Not only does it act as a primary interface, it also plays a critical role in the computation of multi-sensory and cognitive modalities. The latter function is clearly supported by the direct involvement of the entorhinal cortex in neurodegenerative and psychiatric disorders such as Alzheimer's disease, epilepsy and schizophrenia. In particular, layer V neurons, being the main target of processed outputs leaving the hippocampal formation and sending their axons to cortical regions, play an important role in the consolidation and replay of memories, which involve hippocampal-neocortical communications.

To understand the function of EC layer V neurons, it is essential to understand how they integrate the inputs they receive to generate the output that is transferred to the neocortex; this complex process depends on the neuronal morphology and the density and properties of dendritic voltage-

dependent channels. Despite their fundamental role in the consolidation and replay of memories, very little is known about the integrative features of these neurons.



a) two-photon image stacks of an EC layer V pyramidal neuron filled with Oregon Green BAPTA-1 (100 µM). The white boxes outline regions of the apical dendrite that are expanded on the sides. b) Ca^{2+} transients (expressed as ΔF/F) generated in response to a somatic action potential (c) measured with a line scan at the locations marked by gray lines.

By elucidating the mechanisms of dendritic integration in the entorhinal cortex, these studies will increase our knowledge of memory processing. Relating pathological effects to electrophysiological properties of neuronal compartments that have not been fully explored, such as dendrites, may shed light on basic neuronal properties and provide insights for novel points of therapeutic intervention and disease prevention.

Current research projects: In our research, we employ electrophysiological techniques (dendritic and somatic patch clamp recordings) coupled with electrical stimulation and multi-photon imaging (see figure at left) and uncaging of caged neurotransmitters (such as glutamate) on brain slices. Using these techniques, we are currently studying the properties of the synaptic inputs and how they are integrated with voltage-dependent currents, the initiation of active processes in the dendrites (i.e. dendritic spikes) and their impact on the somatic output in hippocampal CA1 neurons and neurons of the deep layers of the entorhinal cortex. The ultimate goal is to relate the input-output features of these neurons to the different behavioral states and memory formation.

Teaching Activities:

2010- present:	Co-director of the Introduction to Research Resources course (INTER 101)
2010- present:	Lecturer in the Cell and Molecular Biology course (INTER 121), topic Membrane Properties and Electrical Potential
2008- present:	Lecturer in the Synaptic Organization of the Brain course (ANAT 264), topic Hippocampus
2007- present:	Lecturer in the Biological Systems B course (INTER 132), topic Passive and Active Properties of Dendrites and Axons
2006- present:	Lecturer in the Investigative Neuroscience course (NEURO 203), topic Membrane Potential and Action Potential
2006- present:	Lecturer in the Molecular Neurobiology course (NEURO 250), topic Structure and Function of Voltage-Gated Ion Channels

Key Recent Papers

Ascoli, G.*, Gasparini, S.*, Medinilla, V. & Migliore, M. (2010). Local control of post-inhibitory rebound spiking in CA1 pyramidal neuron dendrites. J. Neurosci. 30: 6434-6442. **These authors contributed equally*

Gasparini, S., Losonczy, A., Chen, X., Johnston, D. & Magee J. C. (2007). Associative pairing enhances action potential back-propagation in radial oblique branches of CA1 pyramidal neurons. J Physiol. 580: 787-800

Gasparini S. & Magee, J. C. (2006). State-dependent dendritic computation in hippocampal CA1 pyramidal neurons. J. Neurosci. 26: 2088-2100

Gasparini, S., Migliore, M. & Magee, J. C. (2004). On the initiation and propagation of dendritic spikes in CA1 pyramidal neurons. J. Neurosci. 24: 11046-11056

Gasparini, S. & Magee, J. C. (2002). Phosphorylation-dependent differences in the activation properties of distal and proximal dendritic Na+ channels in rat CA1 hippocampal neurons. J. Physiol. 541: 665-672

Funding

"Synaptic Integration in Radial Oblique Dendrites"
Principal Investigator: Sonia Gasparini, PhD
Agency: NINDS/NIH (R01NS35865). Period: 9/15/2006-01/31/2011

"Dendritic Integration in the Entorhinal Cortex"
Principal Investigator: Sonia Gasparini, PhD
Agency: NINDS/NIH (R01NS69714). Period: 4/1/2010-03/31/2015