BIOGRAPHICAL SKETCH

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NAME	POSITION TITLE
SPITZER, Nicholas C.	**Distinguished Professor of Biological Sciences**
eRA COMMONS USER NAME (credential, e.g., agency login) **nickspitzer**	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Harvard University, Cambridge, MA	B.A.	1964	Biology
Harvard Medical School, Boston, MA		1964-1966	Medical Student
Harvard Medical School, Boston, MA	Ph.D.	1969	Neurobiology

A. Personal Statement

My research program has focused on the development of excitability in the embryonic nervous system and the roles of early forms of calcium-dependent electrical activity in neuronal differentiation. This work led to the discovery that calcium signaling regulates the specification of neurotransmitters in the spinal cord and brain at early stages of development of the *Xenopus* nervous system. Intriguingly, we recently found that sensory stimuli generating calcium-dependent electrical activity respecify the neurotransmitter neurons express: levels of ambient illumination, activating the retinohypothalamic pathway, cause changes in the numbers of neurons that express dopamine in the ventral suprachiasmatic nucleus, which in turn alter camouflage behavior (Dulcis & Spitzer, Nature 2008). This work on the developing amphibian nervous system led to the two major questions addressed in our current work: 1) do sensory stimuli respecify neurotransmitter expression in the brain of an adult mammal, the rat? 2) if so, does this have consequences for the animals' behavior?

B. Positions and Honors

Positions and Employment

1969-1970 Postdoctoral Fellow, Neurobiology Department, Harvard Medical School, Boston, MA
1970-1972 Postdoctoral Fellow, Biophysics Unit, University College London, London, England
1972-1977 Assistant Professor, Dept. of Biology, Univ. of California, San Diego, La Jolla, CA
1977-1982 Associate Professor, Dept. of Biology, UCSD
1982-present Professor, Distinguished Professor, Division of Biological Sciences, UCSD
1988-1990 Chair, Dept. of Biology, UCSD
1992-1993 Co-Chair, Dept. of Biology, UCSD
1993-1995 Vice Chair, Chair, Academic Senate, UCSD
1999-2003 Chair, Neurobiology Section, Division of Biological Sciences, UCSD
2003-present Co-Director, Kavli Institute for Brain and Mind, UCSD
2004-present Vice Chair, Neurobiology Section, Division of Biological Sciences, UCSD

Other Experience and Professional Memberships

1974-1976 A.P. Sloan Research Fellow
1980-1984 NIH Neurobiology B Study Section
1986-1990 Editorial Board, Journal of Neurobiology
1986-1992 Javits Neuroscience Investigator Award
1988-1992 NIH Neurological Disorders Program Project Study Section

1990-1991	John Simon Guggenheim Fellow
1993-1996	National Institute of Neurological Disorders and Stroke Council
1994-2000	March of Dimes, Basic Science Advisory Committee
1995-2002	Associate of the Neurosciences Research Program
1997-1998	Chair-Elect, Chair, Neuroscience Section of AAAS
1997-2000	Trustee, Grass Foundation
2000-2004	Councilor, Society for Neuroscience
2001-	Fellow, American Association for the Advancement of Science
2002-	Member, American Academy of Arts and Sciences
2011-	Editor-in-Chief, BrainFacts.org

C. Selected Peer-reviewed Publications (from 120)

Watt, S.D., Gu, X., Smith, R.D. and Spitzer, N.C. (2000). Specific frequencies of spontaneous Ca^{2+} transients upregulate GAD 67 transcripts in embryonic spinal neurons. *Mol. Cell. Neurosci.16*:376-387.

Spitzer, N.C., Lautermilch, N.J., Smith, R.D. and Gomez, T. M. (2000). Coding of neuronal differentiation by calcium transients. *BioEssays 22:* 811-817.

Gomez, T.M., Robles, E., Poo, M.-m. and Spitzer, N.C. (2001). Filopodial calcium transients promote substrate-dependent growth cone turning. *Science 291*: 1983-1987.

Ming, G., Scott T. Wong, S.T., Henley, J., Yuan, X, Song, H., Spitzer, N. and Poo. M. (2002). Adaptation in the chemotactic guidance of nerve growth cones. *Nature 417*: 411-418.

Gorbunova, Y.V. and Spitzer, N.C. (2002). Dynamic interactions of cyclic AMP transients and spontaneous Ca^{2+} spikes. *Nature 418*: 93-96.

Borodinsky, L.N., Root, C.M., Cronin, J.A., Sann, S.B., Gu, X. and Spitzer, N.C. (2004). Activity-dependent homeostatic specification of transmitter expression in embryonic neurons. *Nature 429*: 523-530.

Conklin, M.W., Lin, M.S. and Spitzer, N.C. (2005) Local calcium transients contribute to disappearance of pFAK, focal complex removal and deadhesion of neuronal growth cones and fibroblasts. *Dev. Biol*. *287*: 201-212.

Spitzer, N.C. (2006). Electrical activity in early neuronal development. *Nature 444*: 707-712.

Borodinsky, L.N. and Spitzer, N.C. (2007). Activity-dependent neurotransmitter-receptor matching at the neuromuscular junction. *Proc. Natl. Acad. Sci. 104*: 335-340.

Sann, S.B., Xu, L., Nishimune, H., Sanes, J.R. and Spitzer, N.C. (2008) Neurite outgrowth and *in vivo* sensory innervation mediated by a $Ca_V2.2$ – laminin $\beta2$ stop signal. *J. Neurosci. 28*: 2366-2374.

Root, C.M., Velázquez-Ulloa, N.A., Monsalve, G.C., Minakova, E. and Spitzer, N.C. (2008) Embryonically expressed GABA and glutamate drive electrical activity regulating neurotransmitter specification. *J. Neurosci. 28*: 4777-4784.

Dulcis, D. and Spitzer, N.C. (2008) Illumination controls dopaminergic differentiation regulating behavior. *Nature* 456: 195-201.

Spitzer, N.C. and Borodinsky, L.N. (2008). Implications of activity-dependent neurotransmitter-receptor matching. *Phil. Trans. R. Soc. B. 363*: 1393-1399.

Chang, L.W. and Spitzer, N.C. (2009) Spontaneous calcium spike activity in embryonic spinal neurons is regulated by developmental expression of the Na^+, K^+-ATPase $\beta3$ subunit. *J. Neurosci*. *29*: 7877-7885.

Xiao, Q., Xu, L. and Spitzer, N.C. (2010) Muscle-dependent regulation of neurotransmitter specification and embryonic neuronal calcium spike activity. *J. Neurosci*. *30:* 5792-5801.

Marek, K.W., Kurtz, L.M. and Spitzer, N.C. (2010) cJun phosphorylation integrates calcium spike activity and *tlx3* expression to regulate neurotransmitter specification. *Nature Neurosci*. *13*: 944-950.

Demarque, M. and Spitzer, N.C. (2010) Activity-dependent expression of Lmx1b regulates specification of serotonergic neurons modulating swimming behavior. *Neuron* 67: 321-334.

Ben-Ari, Y., and Spitzer, N.C. (2010) Phenotypic checkpoints regulate neuronal development. *Trends in Neuroscience 33*: 485-492.

Velázquez-Ulloa, N.A., Spitzer, N.C. and Dulcis, D. (2011) Context-dependent dopamine specification by calcium activity across the central nervous system. *J. Neurosci. 31:* 78-88.

Nicol, X., Hong, K.P. and Spitzer, N.C. (2011) Spatial and temporal second messenger codes for growth cone turning. *Proc. Nat. Acad. Sci. USA*. 108: 13776-13781.

Other Support

Development of Neurons
Principal Investigator: Nicholas C. Spitzer
Agency: National Institute of Neurological Disorders and Stroke
Type: RO1 NS15918, Years 29-33; Period: 6/1/08-5/31/13
The long-term goals of this project are to understand the functions of calcium transients generated spontaneously in embryonic neurons.

Genetic Screens for Analysis of Ca-dependent Transmitter Specification
Principal Investigator: Nicholas C. Spitzer
Agency: National Institute of Neurological Disorders and Stroke
Type: R01 NS057690, Years 1-3; Period: 5/1/2009-4/30/2012
The long-term goals of this project are to identify molecules involved in activity-dependent transmitter respecification.

Sensory Stimulation-Dependent Neurotransmitter Respecification in the Aging Brain
Principal Investigator: Nicholas C. Spitzer; Co-Principal Investigator: Davide Dulcis
Agency: Ellison Medical Foundation
Type: Senior Investigator Award AG-SS-2432-10, Years 1-4; Period 10/1/10-9/30/14
The long-term goals of this project are to determine whether sensory stimuli lead to neurotransmitter respecification in the aging mammalian brain that lead to changes in behavior.