

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
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NAME Richard B. Levine	POSITION TITLE Professor Emeritus of Neuroscience		
eRA COMMONS USER NAME RBL4444			
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
University of Oregon	BS	12/73	Biology
State University of New York at Albany	PhD	12/78	Biology
University of Washington	Postdoctoral	08/82	Neurobiology

A. Personal Statement

I have been engaged in research in the development and function of sensory and motor circuits for over 30 years. Much of the work has focused on the role of steroid and peptide hormones. More recently, my laboratory investigated the voltage-gated ion channels that underlie the unique properties of identified motor neurons in the genetic model organism, *Drosophila*. The fruitfly provided a powerful genetic system for identifying and manipulating the ion channels expressed by specific neurons. Using both mutants and transgenic approaches we investigated the role of neuronal activity and calcium flux in dendritic growth, as well as the role of calcium and potassium channels in imparting cell-specific firing properties. Using whole-cell patch clamp techniques we investigated the role of specific calcium and potassium channels in rhythmic motor neuron activity during locomotion. In parallel we employed confocal microscopy and immunofluorescence to examine the role of motor neuron activity and calcium flux in the postembryonic development of dendritic structure. Over the past 7 years, in an ongoing collaboration with colleagues at the University of Arizona College of Medicine, I am investigating ontogenetic changes in the structural and functional properties of rat hypoglossal motor neurons. My laboratory has been involved in training students at both the graduate and undergraduate levels, and has provided a framework for mentoring students from underrepresented groups.

B. Positions and Honors. List in chronological order previous positions, concluding with your present position. List any honors. Include present membership on any Federal Government public advisory committee.

1975-78	Graduate Assistant, Department of Biology, State University of New York
1979-82	Postdoctoral Research Associate, Department of Zoology, University of Washington
1982-86	Assistant Professor, Department of Biology, Rice University
1986-89	Assistant Professor, Arizona Research Laboratories Division of Neurobiology, and Department of Physiology, University of Arizona College of Medicine
1989-93	Associate Professor, Arizona Research Laboratories Division of Neurobiology, and Department of Physiology, University of Arizona College of Medicine
1993-2016	Professor, Arizona Research Laboratories Division of Neurobiology (now Department of Neuroscience), and Department of Physiology, University of Arizona College of Medicine
2000-2005	Director, Neural Systems and Behavior Course, Marine Biological Laboratory, Woods Hole
2000-2005	Chair, Physiological Sciences Interdisciplinary Graduate Program, University of Arizona
2007-2012	Member NIH BRT-A Study Section
2006-2011	Member, Editorial Board Journal of Neurophysiology
2016-	Professor Emeritus, Department of Neuroscience, University of Arizona

C. Selected peer-reviewed publications (in chronological order). Do not include publications submitted or in preparation.

Most relevant to the current application

1. Pilarski JQ, Wakefield HE, Fuglevand AJ, Levine RB, Fregosi RF (2011) Developmental nicotine exposure alters neurotransmission and excitability in hypoglossal motoneurons. *J Neurophysiol.* 105:423-433 PubMed PMID: 21068261; PubMed Central PMCID: PMC3023378
2. Pilarski JQ, Wakefield HE, Fuglevand AJ, Levine RB, Fregosi RF. (2012) Increased nicotinic receptor desensitization in hypoglossal motor neurons following chronic developmental nicotine exposure. *J Neurophysiol.* 107(1):257-64 PubMed PMID: 22013232; PubMed Central PMCID: PMC3349681.
3. Ryglewski S, Lance K, Levine RB, Duch C. Ca(v)2 channels mediate low and high voltage-activated calcium currents in *Drosophila* motoneurons. *J Physiol.* 2012 Feb 15;590(Pt 4):809-25. Epub 2011 Dec 19. PubMed PMID: 22183725
4. Srinivasan S, Lance K, Levine RB. Contribution of EAG to excitability and potassium currents in *Drosophila* larval motoneurons. *J Neurophysiol.* 2012 May;107(10):2660-71. Epub 2012 Feb 8. PubMed PMID: 22323637; PubMed Central PMCID: PMC3362287
5. Powell GL, Levine RB, Frazier AM, Fregosi RF. Influence of developmental nicotine exposure on spike-timing precision and reliability in hypoglossal motoneurons. *J Neurophysiol.* 2015 Mar 15;113(6):1862-72. doi: 10.1152/jn.00838.2014. Epub 2014 Dec 30. PubMed PMID: 25552642; PubMed Central PMCID: PMC4359999.

Ten additional recent publications of importance to the field (in chronological order)

1. Duch C and Levine, RB (2000) Remodeling of membrane properties and dendritic architecture accompanies the postembryonic conversion of a slow into a fast motoneuron. *J. Neuroscience.* 20:6950-6961.
2. Duch C and Levine RB (2002) Changes in calcium signaling during postembryonic dendritic growth in *Manduca*. *J. Neurophysiol.* 87: 1415-1425
3. Consoulas, C, Restifo, LL and Levine, RB (2002) Dendritic remodeling and growth of motoneurons during metamorphosis of *Drosophila Melanogaster*. *J. Neuroscience* 22:4906-4917.
4. Dulcis, D and Levine, RB (2005) Glutamatergic innervation of the heart initiates retrograde contractions in adult *Drosophila melanogaster*. *J. Neuroscience* 25: 271-280.
5. Worrell, JC and Levine, RB (2008) Characterization of Voltage-Dependent Ca²⁺ Currents in Identified *Drosophila* Motoneurons *in situ*. *J Neurophysiol* 100:868-878. PubMed PMID: 18550721; PubMed Central PMCID: PMC2525733
6. Schaefer, JE, Worrell, JW, Levine, RB (2010) Role of intrinsic properties in *Drosophila* motoneuron recruitment during fictive crawling *J Neurophysiol.* 2010 Sep;104(3):1257-66 PubMed PMID: 20573969; PubMed Central PMCID: PMC2944697
7. Srinivasan S, Lance K, Levine RB. Segmental differences in firing properties and potassium currents in *Drosophila* larval motoneurons. *J Neurophysiol.* 2012 Mar;107(5):1356-65. Epub 2011 Dec 7. PubMed PMID: 22157123; PubMed Central PMCID: PMC3311690.
8. Cholanian M, Krajewski-Hall SJ, Levine RB, McMullen NT and Rance NE (2014) Electrophysiology of Arcuate Neurokinin B Neurons in Female Tac2-EGFP Transgenic Mice. *Endocrinology.* 2014 Jul;155(7):2555-65. doi: 10.1210/en.2014-1065. Epub 2014 Apr 15. PubMed PMID: 24735328; PubMed Central PMCID: PMC4060187.
9. Wollman LB, Haggerty J, Pilarski JQ, Levine RB, Fregosi RF. Developmental nicotine exposure alters cholinergic control of respiratory frequency in neonatal rats. *Dev Neurobiol.* 2016 Jan 28. doi: 10.1002/dneu.22380. [Epub ahead of print] PubMed PMID: 26818254.
10. Powell GL, Gaddy J, Xu F, Fregosi RF, Levine RB. Developmental Nicotine Exposure disrupts dendritic arborization patterns of hypoglossal motoneurons in

the neonatal rat. Dev Neurobiol. 2016 Jan 28. doi: 10.1002/dneu.22379. [Epub ahead of print] PubMed PMID: 26818139.

D. Research Support. List selected ongoing or completed (during the last three years) research projects (federal and non-federal support). Begin with the projects that are most relevant to the research proposed in this application. Briefly indicate the overall goals of the projects and your role (e.g. PI, Co-Investigator, Consultant) in the research project. Do not list award amounts or percent effort in projects.

Ongoing

- **NIH, 1R01 HD071302 Chronic nicotine and synaptic transmission in brainstem respiratory neurons.**

8/2012 – 7/2017

PI, Fregosi RF, Co-PI, Levine RB.

The goals of this project are to examine the influence of *in utero* nicotine exposure on inhibitory synaptic transmission, soma-dendritic morphology and inhibitory neurotransmitter receptor expression in neonatal hypoglossal motoneurons.

Recently Completed

- **American Heart Association, 12GRNT12050345. Influence of Developmental Nicotine Exposure on the Function and Structure of Brainstem Respiratory neurons.**

7/2012 – 6/2014

PI, Fregosi RF, Co-PI, Levine RB

The goal of this proposal was to examine the influence of *in utero* nicotine exposure on excitatory glutamatergic neurotransmission and the expression of AMPA receptors in neonatal hypoglossal motoneurons.

- **NIH R01 NS057637, Postembryonic development of drosophila motoneurons.**

2/2007 – 5/2012

PI, RB Levine

The goal of this project was to use genetic approaches and whole-cell voltage-clamp to understand the roles of voltage-gated calcium and potassium channels and activity-dependent developmental processes that influence the differentiation and postembryonic development of motoneurons.

- **NSF 094905, Probing Motoneuron Dendritic Integration during Locomotion with Targeted Ion Channel Manipulation in Drosophila**

6/2010 – 5/2013

RB Levine, C Duch, Co-PIs

The goal of this project is to use genetic approaches and whole-cell voltage-clamp to understand the roles of voltage-gated calcium and potassium channels in determining the recruitment patterns of identified motoneurons during locomotion.