CURRICULUM VITAE
Richard B. Levine

Birthdate: April 4, 1951
Birthplace: Coudersport, Pa, USA

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Education

1969-71	University of Missouri-Columbia
1971-73	University of Oregon-Eugene, BS Biology
1974-75	University of Oregon-Eugene (graduate student)
1975-78	State University of New York-Albany, PhD Biology, 1978 (Thesis title: Inhibition of sensory interneurons in the cricket, Acheta domesticus, and its modification during development, Dr. R.K. Murphey, advisor).

Academic Appointments

2016-	Professor Emeritus of Neuroscience and Physiology, University of Arizona
1993-2016	Professor, Arizona Research Laboratories Division of Neurobiology (now Department of Neuroscience), and Department of Physiology, University of Arizona
1989-93	Associate Professor, Arizona Research Laboratories Division of Neurobiology, and Department of Physiology, University of Arizona
1986-89	Assistant Professor, Arizona Research Laboratories Division of Neurobiology, and Department of Physiology, University of Arizona
1982-86	Assistant Professor, Department of Biology, Rice University
1979-82	Postdoctoral Research Associate, Department of Zoology, University of Washington
1975-78	Graduate Student, Department of Biology, State University of New York

Other positions

1986-2005	Instructor, Neural Systems and Behavior, Marine Biological Laboratories, Woods Hole
2000-05	Co-Director, Neural Systems and Behavior, Marine Biological Laboratories

Invited Presentations at National and International Meetings

2006 Argentine Neuroscience Workshop, Cordoba Argentina
2002 International Conference on Invertebrate Neuroscience, Krakow Poland
1999 Göttingen Neurobiology Conference, Göttingen Germany
1997 Göttingen Neurobiology Conference, Göttingen Germany
1993 Steroid Hormones and the Brain, Washington DC
1993 American Soc. of Zoologists Annual Meeting, Los Angeles CA
1992 International Congress of Neuroethology, Montreal, Canada

Extramural Service

1987-90 Member, NSF Advisory Panel, Developmental Neuroscience
1994-98 Member, Editorial Board: Bioscience
1994-00 Member, Editorial Board: Developmental Neuroscience
2000-01 Member, Editorial Board: Invertebrate Neuroscience
2002-11 Member, Editorial Board: J. Neurophysiology
1988-93 Mentor, Minority Fellows Program, Society for Neuroscience
2004-08 Member, Chapters Committee, Society for Neuroscience
2007-11 Member, NIH Study Section BRT-A
2007, 2008 Member, NSF Graduate Fellowship Review Study Section

Ad Hoc reviewer for: Journal of Neuroscience, Journal of Comparative Neurology, Journal of Comparative Physiology, Cell and Tissue Research, Science, Journal of Neurobiology, Development, PNAS, PLOS-Biology. Journal of Experimental Biology, Journal of Applied Physiology and Developmental Biology

Intramural Service

1987-2007;
2009-2012 Member, Executive Committee of the Committee on Neuroscience, University of Arizona
1987-95 Member, Training Faculty, Training Program in Motor Control
1988-99 Chair, User's Committee, University Instrument Shop
1988-93 Chair, Graduate Student Advisory and Progress Committee, Committee on Neuroscience
1988 Member, Graduate Admissions Committee, Department of Physiology
1989-92 Member, Resources Committee, Graduate Program in Physiological Sciences
1990 Member, Faculty Search Committee, Department of Molecular and Cell Biology
1990 Chair, Faculty Search Committee, ARL Division of Neurobiology
1991 Member, Faculty Search Committee, Department of Physiology
1993-94 Chair, Postdoctoral Status Committee, University of Arizona
1995 Member, Program Committee, Physiological Sciences
1995-2000 Member, Executive Committee, Program in Insect Science
1996-99 Chair, Program Committee, Program in Physiological Sciences
1996-99; 2009-13; Member, Executive Committee, Program in Physiological Sciences

1993-99	Program Director, NIH Training Program in Developmental Neuroscience
1992-00	Program Director, Flinn Foundation Grant in Developmental Neuroscience
1995-05	Program Director, Program Project Grant: Neural Development
1997-2006	Program Director, NIH Training Program in Predoctoral Neuroscience
2000-03	Chair, Faculty Search Committee, ARL Division of Neurobiology
2001-06	Chair, Graduate Program in Physiological Sciences
2006	Member, 2 UA Search Committees (Head, Dept. Physiology; Dean, Graduate College)
2006-12	Member UA Diversity Coalition
2006-15	Member UA Pandemic Planning Committee
2005-14	Co-PD, NIH Systems Physiology Training Program, UA
2009-12	Member and Chair, Graduate Interdisciplinary Program Advisory Committee

Memberships

Society for Neuroscience
Society for Developmental Biology
Society for General Physiologists
International Society for Neuroethology
American Physiological Society

Research Interests

Developmental neurobiology
Neural basis and hormonal control of behavior
Control of mammalian breathing

Primary Publications

Palka J, Levine RB, Schubiger M (1977) The cercus to giant interneuron system of crickets. I. Some attributes of the sensory cells. Journal of Comparative Physiology 119:267-283

Levine RB, Murphey RK (1980) Pre- and postsynaptic inhibition of identified giant interneurons in the cricket, Acheta domesticus. Journal of Comparative Physiology 135:269-282

Levine RB, Murphey RK (1980) Loss of inhibitory synaptic input to cricket sensory interneurons. Journal of Neurophysiology 43:383-394

Murphey RK, Levine RB (1980) Mechanisms responsible for the changes observed in response properties of partially deafferented insect interneurons. Journal of Neurophysiology 43:367-382

Levine RB, Truman JW (1982) Metamorphosis of the insect nervous system: Changes in the morphology and synaptic interactions of identified neurons. Nature 299:250-252

Levine RB, and Truman JW (1983) Peptide activation of a simple neural circuit. Brain Research 279:335-338

Levine RB, Pak C, Linn D (1985) The structure, function and metamorphic reorganization of somatotopically projecting sensory neurons in *Manduca sexta* larvae. Journal of Comparative Physiology 157:1-13

Levine RB and Truman JW (1985) Dendritic reorganization of abdominal motor-neurons during metamorphosis of the moth, *Manduca sexta*. Journal of Neuroscience 5:2424-2431

Levine RB, Truman JW, Linn D, Bate CM (1986) Endocrine regulation of the form and function of axonal arbors during insect metamorphosis. Journal of Neuroscience 6:293-299

Kent KS, Levine RB (l988) Neural control of leg movements in a metamorphic insect: Sensory and motor elements of the larval thoracic legs in *Manduca sexta*. Journal of Comparative Neurology 271:559-576

Kent KS, Levine RB (l988) Neural control of leg movements in a metamorphic insect: Persistence of larval leg motor neurons to innervate the adult legs of *Manduca sexta*. Journal of Comparative Neurology 276:30-43

Levine RB (1989) Expansion of the central arborizations of persistent sensory neurons during insect metamorphosis: The role of the steroid hormone, 20-hydroxyecdysone. Journal of Neuroscience 9:1045-1054

Levine RB, Waldrop B, Tamarkin D (1989) The use of hormonally-induced mosaics to study alterations in the synaptic connections made by persistent sensory neurons during insect metamorphosis. Journal of Neurobiology 20:326-338

Waldrop B, Levine RB (1989) Development of the gin trap reflex in *Manduca sexta*: A comparison of larval and pupal motor responses. Journal of Comparative Physiology 165:743-753

Waldrop B, and Levine RB (1992) Intersegmental interneurons serving larval and pupal mechanosensory reflexes in the moth, *Manduca sexta.* Journal of Comparative Physiology 171:195-205

Hayashi JH and Levine RB (1992) Calcuim and potassium currents in leg motoneurons during postembryonic development of the hawkmoth, *Manduca sexta*. Journal of Experimental Biology 171:15-42

Prugh J, Della Croce K and Levine RB (1992) Effects of the steriod hormone, 20-hydroxyecdysone, on the growth of neurites by identified insect motoneurons *in vitro*. Developmental Biology 154:331-347

Kent KS and Levine RB (1993) Dendritic reorganization of an identified neuron during metamorphosis of the moth *Manduca sexta*. Journal of Neurobiology 24:1-22

Pflüger HJ, Witten JL and Levine RB (1993) Fate of abdominal ventral unpaired median (VUM) neurons during metamorphosis of the hawkmoth, *Manduca sexta*. J. Comp. Neurol. 335:508-522

Luedeman R and Levine RB (1996) Neurons promote the division of muscle precursor cells cultured from the developing adult legs of *Manduca sexta.* Dev. Biol. 173, 51-68.

Tamarkin DA and Levine RB (1996) Synaptic interactions between a muscle-associated proprioceptor and intersemental muscle motoneurons in larval and adult *Manduca sexta*. J. Neurophysiol. 76:1597-1610

Johnston RM and Levine RB (1996) Locomotor behavior in the hawkmoth *Manduca sexta*: Kinematic and electromyographic analyses of the thoracic legs in larvae and adults. J. Exp. Biol. 199:759-774.

Consoulas, C, Kent, KS and Levine RB (1996) Remodeling of the peripheral processes and presynaptic terminals of leg motoneurons during metamorphosis of the hawkmoth, *Manduca sexta*. J. Comp. Neurol. 372:415-434.

Lemon, WC and Levine, RB (1996) Segmentally distributed metamorphic changes in neural circuits controlling abdominal bending in the hawkmoth Manduca sexta J. Comp. Physiol. 180:597-610.
Lemon, WC and Levine, RB (1996) Multisegmental motor activity in the segmentally restricted gin trap behavior in Manduca sexta pupae. J. Comp. Physiol. 180:611-619.
Johnston RM and Levine RB (1997) Crawling motor patterns in isolated larval nerve cords of *Manduca sexta.* J. Neurophysiol. 76:3178-3195.
Consoulas C, Anezaki M and Levine RB (1997) Development of thoracic leg muscles during metamorphosis of the hawkmoth, Manduca sexta. Cell and Tissue Res. 287:393-412.
Consoulas C and Levine RB (1997) Accumulation and proliferation of adult leg muscle precursors in Manduca are dependent on innervation. J. Neurobiol. 32:531-553.
Grunewald, B and Levine RB (1998) Ecdysteroid control of ionic current development in Manduca sexta motoneurons. J. Neurobiol. 37:211-223.
Consoulas, C and Levine RB (1998) Presynaptic function during muscle remodeling in insect metamorphosis. J. Neuroscience 18: 5817-5831
Johnston, RM, Consoulas, C, Pfluger, HJ and Levine, RB (1999) Patterned activation of unpaired median neurons during fictive crawling in Manduca larvae J. Exp. Biol. 202:103-113.
Matheson, SF and Levine RB (1999) Steroid hormone enhancement of neurite outgrowth in identified insect motor neurons involves specific effects on growth cone form and function. J. Neurobiol. 38:27-45.
Consoulas, C, Johnston, RM, Pfluger, HJ and Levine, RB (1999) Peripheral distribution of presynaptic release sites of abdominal motor and modulatory neurons in Manduca sexta larvae. J. Comp. Neurol. 410:4-19.
Duch C, Bayline R and Levine RB (2000) Postembryonic development of the dorsal longitudinal flight muscle and its innervation in Manduca sexta. J. Comp. Neurol.422:1-17
Rose, U and Levine, RB (2000) Comparison of identified leg motoneuron structure and function in larval and adult Manduca sexta. J. Comp. Physiol.186:327-336
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
Consoulas, C, Rose, U and Levine, RB (2000) Remodeling of the femoral chordotonal organ during metamorphosis of the hawkmoth, Manduca sexta. J. Comp. Neurol. 426:391-405
Bayline RJ, Duch C and Levine RB (2001) Nerve-muscle interactions regulate motor terminal growth and myoblast distribution during muscle development. Dev. Biol. 231: 348-363.
Duch C and Levine RB (2002) Changes in calcium signaling during postembryonic dendritic growth in Manduca. J. Neurophysiol. 87: 1415-1425
Consoulas, C, Restifo, LL and Levine, RB (2002) Dendritic remodeling and growth of motoneurons during metamorphosis of Drosophila Melanogaster. J. Neuroscience 22:4906-4917.
Johnston, R and Levine, RB (2002) Thoracic leg motoneurons in the isolated CNS of adult *Manduca* produce patterned activity in response to pilocarpine, which is distinct from that produced in larvae. Invert. Neurosci. 4:175-192.
Dulcis, D and Levine, RB (2003) Innervation of the heart of the adult fruit fly, Drosophila melanogaster. J. Comp. Neurol. 465:560-578.

Dulcis, D and Levine, RB (2004) Remodeling of a larval skeletal muscle motoneuron to drive the posterior pacemaker in the adult moth, Manduca sexta. J. Comp. Neurol. 478:126-142.

Dulcis, D and Levine, RB (2005) Glutamatergic innervation of the heart initiates retrograde contractions in adult Drosophila melanogaster. J. Neuroscience 25: 271-280.

Dulcis, D., Levine, RB and Ewer, J (2005) Role of the neuropeptide CCAP in Drosophila cardiac function. J. Neurobiology 64:259-274

Consoulas, C. , Levine, RB and Restifo LL (2005) The steroid hormone-regulated gene Broad Complex is required for dendritic growth of motoneurons during metamorphosis of Drosophila. J. Comp. Neurol. 485: 321-337

Miller, JE and Levine, RB (2006) Steroid hormone activation of wandering in the isolated nervous system of Manduca sexta. J. Comp. Physiol. (2006) 192::1049-62

Scott A. Barbee, Patricia S. Estes, Anne-Marie Cziko, Jens Hillebrand, Rene A. Luedeman, Jeff M. Coller, Nick Johnson, Iris C. Howlett, Cuiyun Geng, Ryu Ueda, Andrea H. Brand, Sarah F. Newbury, James E. Wilhelm, Richard B. Levine, Akira Nakamura, Roy Parker and Mani Ramaswami, (2006) Staufen- and FMRP-Containing Neuronal RNPs Are Structurally and Functionally Related to Somatic P Bodies. Neuron 52: 997-1009

Hartwig, C; Worrell, J; Levine, RB; Ramaswami, M and Sanyal S. (2008) Normal dendrite growth in *Drosophila* motor neurons requires the AP-1 transcription Factor *Devel. Neurobiology.* 68(10):1225-42

Worrell, JC and Levine, RB (2008) Characterization of Voltage-Dependent Ca^{2+} Currents in Identified *Drosophila* Motoneurons *in situ*. *J Neurophysiol* 100:868-878.

Jennifer E. Schaefer, Jason W. Worrell, Richard B. Levine (2010) Role of intrinsic properties in Drosophila motoneuron recruitment during fictive crawling J Neurophysiol. 2010 Sep;104(3):1257-66

Pilarski, JQ, Wakefield, HE, Fuglevand, AJ, Levine, RB, Fregosi RF (2011) Chronic nicotine exposure during early development alters neurotransmission and motor neuron excitability in hypoglossal motoneurons. J. Neurophysiology Jan;105(1):423-33

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

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

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

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

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. Journal of Endocrinology Jul;155(7):2555-65. doi: 10.1210/en.2014-1065. Epub 2014 Apr 15.

Wealing JC, Cholanian M, Flanigan EG, Levine RB, Fregosi RF. Diverse physiological properties of hypoglossal motoneurons innervating intrinsic and extrinsic tongue muscles.

J Neurophysiol. 2019 Nov 1;122(5):2054-2060. doi: 10.1152/jn.00478.2019. Epub 2019 Sep 18. PMID: 31533009; PMCID: PMC6879950.
Wollman LB, Levine RB, Fregosi RF. Developmental plasticity of GABAergic neurotransmission to brainstem motoneurons. J Physiol. 2018 Dec;596(23):5993-6008. doi: 10.1113/JP274923. Epub 2018 Feb 25. PMID: 29352468; PMCID: PMC6265538.
Wollman LB, Levine RB, Fregosi RF. Developmental nicotine exposure alters glycinergic neurotransmission to hypoglossal motoneurons in neonatal rats. J Neurophysiol. 2018 Sep 1;120(3):1135-1142. doi: 10.1152/jn.00600.2017. Epub 2018 May 30. PMID: 29847237; PMCID: PMC6171071.
Buls Wollman L, Clarke J, DeLucia CM, Levine RB, Fregosi RF. Developmental Nicotine Exposure Alters Synaptic Input to Hypoglossal Motoneurons and Is Associated with Altered Function of Upper Airway Muscles. eNeuro. 2019 Nov 15;6(6):ENEURO.0299-19.2019. doi: 10.1523/ENEURO.0299-19.2019. PMID: 31712219; PMCID: PMC6860987.
Cholanian M, Wealing J, Levine RB, Fregosi RF. Developmental nicotine exposure alters potassium currents in hypoglossal motoneurons of neonatal rat. J Neurophysiol. 2017 Apr 1;117(4):1544-1552. doi: 10.1152/jn.00774.2016. Epub 2017 Feb 1. PMID: 28148643; PMCID: PMC5376599.
Cholanian M, Powell GL, Levine RB, Fregosi RF. Influence of developmental nicotine exposure on glutamatergic neurotransmission in rhythmically active hypoglossal motoneurons. Exp Neurol. 2017 Jan;287(Pt 2):254-260. doi: 10.1016/j.expneurol.2016.07.023. Epub 2016 Jul 29. PMID: 27477858; PMCID: PMC5120997.
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 Oct;76(10):1138-49. doi: 10.1002/dneu.22380. Epub 2016 Feb 17. PMID: 26818254; PMCID: PMC4965345.
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 Oct;76(10):1125-37. doi: 10.1002/dneu.22379. Epub 2016 Feb 8. PMID: 26818139; PMCID: PMC4965347.
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. PMID: 25552642; PMCID: PMC4359999.

Wollman LB, Levine RB, Fregosi RF. Developmental plasticity of GABAergic neurotransmission to brainstem motoneurons. J Physiol. 2018 Dec;596(23):5993-6008. doi: 10.1113/JP274923. Epub 2018 Feb 25. PMID: 29352468; PMCID: PMC6265538.

Wealing JC, Cholanian M, Flanigan EG, Levine RB, Fregosi RF. Diverse physiological properties of hypoglossal motoneurons innervating intrinsic and extrinsic tongue muscles. J Neurophysiol. 2019 Nov 1;122(5):2054-2060. doi: 10.1152/jn.00478.2019. Epub 2019 Sep 18. PMID: 31533009; PMCID: PMC6879950.

Invited Reviews

Murphey RK, Matsumoto SG, Levine RB (1977) Does experience play a role in the development of insect neuronal circuitry? In: Hoyle G (ed) Identified Neurons and Behavior of Arthropods. New York, Plenum Press, pp 495-506

Truman JW, Levine RB (1981) Insect ecdysis: A study of the action of hormones on the nervous system. Verhandlungen der Deutschen Zoologischen Gesellschaft. Stuttgart, Gustav Fischer Verlag, pp 110-118

Truman JW, Levine RB (1982) The action of peptides and cyclic nucleotides on the nervous system of an insect. Federation Proceedings 41:2929-2932

Truman JW, Schwartz LM, Levine RB (1983) Neuronal death during metamorphosis of a moth. In: Neuroscience Research Program Bulletin. MIT Press 20:900-905

Levine RB, Truman JW (1983) Neuronal differentiation during metamorphosis of a moth. In: Neurosciences Research Program Bulletin. MIT Press 20:906-911

Truman JW, Levine RB (1983) Cellular events in the nervous system during metamorphosis in the insect, *Manduca sexta*. In: Barker J, Mckelvy J (eds) Current Methods in Cellular Neurobiology. New York, John Wiley and Sons 4:15-48

Levine RB (1984) Changes in neuronal circuits during insect metamorphosis. Journal of Experimental Biology 112:27-44

Truman JW, Levine RB, Weeks JC (1985) Reorganization of the nervous system during metamorphosis of the moth, *Manduca sexta*. In: Balls M, Bownes M (eds) British Society for Developmental Biology Symposium. Oxford, Claredon Press 9:127-144

Truman JW, Weeks JC, Levine RB (1986) Developmental plasticity during metamorphosis of an insect nervous system. In: Cohen MJ, Strumwasser F (eds) Comparative Neurobiology: Modes of Communication in Nervous Systems. New York, John Wiley & Sons, pp 25-44

Levine RB (1986) Reorganization of the insect nervous system during metamorphosis. Trends in Neuroscience 9:315-319

Levine RB (1987) Neural reorganization and its endocrine control during insect metamorphosis. In: Hunt RK (ed) Current Topics in Developmental Biology, 21:341-365

Levine RB, Weeks JC, (1989) Reorganization of neural systems and behavior during insect metamorphosis. In: Carew TJ, Kelley D (eds) Perspectives in Neural Systems and Behavior. New York, Alan Liss. pp 195-228

Weeks JC, Levine RB (1990) Postembryonic neuronal plasticity and its hormonal control during insect metamorphosis. In: Annual Review of Neuroscience 13:183-194

Levine RB, Weeks JC (1990) Hormonally mediated changes in simple reflex circuits during metamorphosis in *Manduca*. Journal of Neurobiology 21:1022-1036

Weeks JC, Levine RB (1991) Endocrine influences on the postembryonic fates of identified neurons during insect metamorphosis. In: Shankland M, Macagno E (eds) Determinants of Neuronal Identity. New York, Academic Press. pp 293-322.

Levine RB, Fahrbach SE and Weeks JC (1991) Steroid hormones and the reorganization of the nervous system during insect metamorphosis. Seminars in Neuroscience 3:437-448.

Kent KS, Consoulas C, Duncan K, Johnston R, Luedeman R and Levine RB (1995) Remodelling of neuromuscular systems during insect metamorphosis. Am. Zool. 35:578-584.

Levine RB, Morton DB and Restifo LL (1995) Remodeling of the insect nervous system. Current Opinion in Neurobiology 5:28-35.
Levine RB and Weeks JC (1996) Cell culture approaches to understanding the actions of steroid hormones on the developing nervous system. Developmental Neuroscience 18:73-86.
Weeks JC and Levine RB (1996) Hormonal control of behavior. Current Opinion in Neurobiology 5:809-815.
Arbas EA, Levine RB and Strausfeld NJ (1997) Invertebrate Nervous Systems; In: Handbook of Physiology, Section 13, Volume II pp 751-852.; WH Dantzler ed. (Oxford Press)
Consoulas C, Duch C, Bayline RJ and Levine RB (2000) Behavioral transitions during metamorphosis: Remodeling of neural and motor systems. Brain Res. Bull. 53:571-584