

CURRICULUM VITAE

Lynne Ann Oland

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Education:

- 1972 University of North Carolina, Chapel Hill, NC (B.S. Nursing)
1975 The Catholic University of America, Washington, DC (M.S. Nursing with minor in Curriculum and Instruction)
1985 University of North Carolina, Chapel Hill, NC (Ph.D. Physiology)
Thesis: The Barnacle's Visual System: Processing of Signals from the Median and Lateral Eyes.
Advisor: Dr. Ann E. Stuart

Professional Experience:

- Sept 2013-present Associate Department Head, Department of Neuroscience
May 2012-present *Research Scientist with Continuing Status*, Department of Neuroscience
Jul 2011- present *Research Professor*, Department of Neuroscience
May 2010-present Director, Undergraduate Program in Neuroscience and Cognitive Science
Feb 2004-Jul 2011 *Research Scientist*, Department of Neuroscience (formerly Division of Neurobiology in the Arizona Research Laboratories), University of Arizona
Jul 1995-Feb 2004 *Associate Research Scientist*, Division of Neurobiology, Arizona Research Laboratories, University of Arizona
Apr 1990- Jul 1995 *Assistant Research Scientist*, Division of Neurobiology, Arizona Research Laboratories, University of Arizona
Aug 1987-Mar 1990 *Research Associate*, Division of Neurobiology, Arizona Research Laboratories, University of Arizona
Jan 1985-Aug 1987 *Postdoctoral Fellow*, Department of Anatomy, Georgetown University, Wash. DC
Jan 1979-Jan 1985 *Graduate Student*, Department of Physiology, University of North Carolina at Chapel Hill
Sept 1975-May 1978 *Instructor*, School of Nursing, The Catholic University of America, Wash. DC
Jul 1972-Sept 1973 *Staff Nurse*, Fairfax Hospital, Falls Church, VA
May 1974-Aug 1974

Professional Memberships/Licensure:

Society for Neuroscience
Association for Chemoreception Sciences
Dana Alliance
Arizona Imaging and Microanalysis Society
Center for Insect Science, University of Arizona

RN, State of Arizona (inactive)

Honors and Awards:

2015 Galileo Circle Copernicus Award
2011 Outstanding Faculty Mentor Award, University Biology Research Program
2000 Certificate of Appreciation/Faculty Recognition from Mortar Board National Senior Honor Society
1987-88 NRSA Postdoctoral Fellowship, PHS
1985-87 NRSA Postdoctoral Fellowship, PHS
1979 University of North Carolina Limited Service Fellowship
1974 PHS Nurse Trainee
1972 Highest Scholastic Achievement Award, Sigma Theta Tau
1971 Sigma Theta Tau, National Honorary Nursing Society

Publications

Chapters in scholarly books and monographs

Oland LA (1978) Pain Perception. In: *Medical-Surgical Nursing: A Conceptual Approach*. Second edition. Jones, Jirovec, Dunbar (eds.), NY: McGraw Hill. [Chapter for a textbook]

Oland LA (1978) Privacy and Territoriality. *Human Needs and the Nursing Process*. In: Yura H, Walsh M (eds.), NY: Appleton. [Original ideas concerning application of data from studies on privacy and territoriality to the practice of nursing]

Oland LA, Oberlander H (1994) Growth and Interactions of Cells from the Insect Nervous System *in vitro*. In: *Insect Cell Biotechnology*. MacIntosh AH, Maramorosch K (eds.), Boca Raton: CRC Press, pp. 105-125. [Chapter reviewed state of the field]

Oland LA, Krull CE, Tolbert LP (1995) Glial cells play a key role in the construction of insect olfactory glomeruli. *Neuron-Glia Interrelations During Phylogeny*. In: Vernadakis A, Roots B (eds.), Totowa, NJ: The Humana Press, pp. 25-48. [Chapter reviewed current understanding of role of glia of glomerulus development]

Lei H, Oland LA, Riffell JA, Beyerlein A, Hildebrand JG (2010) Implications from microcircuits of a moth antennal lobe. In: *Handbook of Brain Microcircuits*, Shepherd G, Grillner S (eds.), New York: Oxford University Press. [Chapter reviewed current understanding of olfactory processing in insect glomeruli]

Peer-reviewed journal articles

* - Articles from doctoral work.

*Oland LA, French KA, Hayashi JH, Stuart AE (1983) The lateral visual pathway of the giant barnacle. *Journal of Neurophysiology* 49:516-27.

*Oland LA, Stuart AE (1986) Pattern of convergence of the receptors of the barnacle's three ocelli onto second-order cells. *Journal of Neurophysiology* 55: 882-895.

*Oland LA, Stuart AE, Hayashi JH, Callaway JC (1987) Voltage spread in an identified interneuron of the barnacle. *Journal of Neurophysiology* 58:1420-1430.

Oland LA, Tolbert LP (1987) Glial patterns during early development of antennal lobes of *Manduca sexta*: a comparison between normal lobes and lobes deprived of antennal axons. *Journal of Comparative Neurology* 255:196-207.

Oland LA, Tolbert LP, Mossman KL (1988) Radiation-induced reduction of the glial population during development disrupts the formation of olfactory glomeruli in an insect. *Journal of Neuroscience* 8:353-367.

Oland LA, Tolbert LP (1988) Effects of hydroxyurea parallel the effects of radiation in developing olfactory glomeruli in insects. *Journal of Comparative Neurology* 278:377-87.

Oland LA, Tolbert LP (1989) Patterns of glial proliferation during formation of olfactory glomeruli in an insect. *Glia* 2:10-24.

Tolbert LP, Oland LA (1989) A role for glia in the development of organized neuropilar structures. *Trends in Neuroscience* 12:70-75. [Review summarizing some of the work of the Tolbert lab]

Oland LA, Orr G, Tolbert LP (1990) Construction of a protoglomerular template by olfactory axons initiates the formation of olfactory glomeruli in the insect brain. *Journal of Neuroscience* 10:2096-2112.

Tolbert LP, Oland LA (1990) Glial cells form boundaries for developing insect olfactory glomeruli. *Experimental Neurology* 109:19-28. [Invited review summarizing work of the Tolbert lab]

Oland LA, Hayashi JH (1993) Effects of the steroid hormone 20-hydroxyecdysone and prior sensory input on the survival and growth of moth central olfactory neurons *in vitro*. *Journal of Neurobiology* 24:1170-1186.

Oland LA, Oberlander H (1994) Factors that influence the development of cultured neurons from the brain of the moth *Manduca sexta*. *In Vitro Cellular and Developmental Biology* 30A:709-716.

Krull CE, Oland LA, Faissner A, Schachner M, Tolbert LP (1994) *In vitro* analysis of neurite outgrowth indicates a potential role for tenascin-like molecules in the development of insect olfactory glomeruli. *Journal of Neurobiology* 25:989-1004.

Malun D, Oland LA, Tolbert LP (1994) Uniglomerular projection neurons participate in the early development of olfactory glomeruli in the moth *Manduca sexta*. *Journal of Comparative Neurology* 350:1-22.

Oland LA, Kirschenbaum SR, Pott WM, Mercer AR, Tolbert LP (1995) Development of an identified serotonergic neuron in the antennal lobe of the moth and effects of reduction in serotonin during construction of olfactory glomeruli. *Journal of Neurobiology* 28:248-267.

Oland LA, Tolbert LP (1996) Multiple factors shape the development of olfactory glomeruli: insights from an insect model system. *Journal of Neurobiology* 30:92-109. [Review summarizing the state of the field with emphasis on insights from the insect olfactory pathway]

Baumann PM, Oland LA, Tolbert LP (1996) Glial cells stabilize axonal protoglomeruli in the developing olfactory lobe of the moth *Manduca sexta*. *Journal of Comparative Neurology* 373:118-128.

Oland LA, Muller T, Kettenmann H, Hayashi J (1996) Preparation of primary cultures and acute slices of the nervous system of the moth *Manduca sexta*. *Journal of Neuroscience Methods* 69:103-112.

Oland LA, Pott WM, Bukhman G, Sun XJ, Tolbert LP (1996) Activity blockade does not prevent the construction of olfactory glomeruli in the moth *Manduca sexta*. *International Journal of Developmental Neuroscience* 14:983-996.

Oland LA, Pott WM, Higgins MR, Tolbert LP (1998) Targeted ingrowth and axon-glia cell relationships of olfactory receptor axons in the primary olfactory pathway of an insect. *Journal of Comparative Neurology* 398:119-138.

Oland LA, Tolbert LP (1998) Glomerulus development in the absence of a set of mitral-like neurons in the insect olfactory lobe. *Journal of Neurobiology* 36:41-52.

Kent K, Oland LA, Hildebrand JG (1999) Development of the labial pit organ glomerulus in the antennal lobe of the moth *Manduca sexta*: The role of afferent projections in the formation of an identified olfactory glomerulus. *Journal of Neurobiology* 40:28-44.

Oland LA, Marrero HG, Burger I (1999) Glial cells in the developing and adult olfactory lobe of the moth *Manduca sexta*. *Cell and Tissue Research* 297:527-45.

Rössler WR, Oland LA, Higgins MR, Hildebrand JG, Tolbert LP (1999) Development of a glia-rich axon-sorting zone in the olfactory pathway of the moth *Manduca sexta*. *Journal of Neuroscience* 19:9865-77.

Oland LA, Evans SE (2000) The tracheal system of the developing primary olfactory pathway of *Manduca sexta*: Tracheae do not play a guidance or targeting role for ingrowing receptor axons. *Arthropod Structure and Development* 29:185-196.

Wegerhoff R, Rössler W, Higgins M, Oland LA, Tolbert LP (2001) Fenvalerate treatment affects development of olfactory glomeruli in *Manduca sexta*. *Journal of Comparative Neurology* 430:533-41.

Lohr C, Oland LA, Tolbert LP (2001) Olfactory receptor axons influence the development of glial potassium currents in the antennal lobe of the moth *Manduca sexta*. *Glia* 36:309-320.

Gibson NJ, Rössler W, Nighorn AJ, Oland LA, Hildebrand JG, Tolbert LP (2001) Neuron-glia communication via nitric oxide is essential in establishing antennal-lobe structure in *Manduca sexta*. *Developmental Biology* 240:326-39.

Lohr C, Tucker S, Oland LA, Tolbert LP (2002) Development of depolarization-induced calcium transients in insect glial cells is dependent on the presence of afferent axons. *Journal of Neurobiology* 52:85-98.

Oland LA, Tolbert LP (2003) Key interactions between neurons and glial cells during neural development in insects. *Annual Review of Entomology* 48:89-110. [Invited review examining studies from insects]

Tolbert LP, Oland LA, Christensen TC, Goriely AR (2003) Neuronal and glial morphology in olfactory systems: Significance for information processing and underlying developmental mechanisms. *Brain and Mind* 4:27-49. [Invited review examining these issues across olfactory systems]

Oland LA, Pott WM, Howard CT, Inlow M, Buckingham J (2003) A diffusible factor attracts olfactory sensory axons toward their target in the developing brain of the moth. *Journal of Neurobiology* 56:24-40.

Tolbert LP, Oland LA, Tucker ES, Gibson NJ, Higgins MR, Lipscomb BW (2004) Bidirectional influences between neurons and glial cells in the developing olfactory system. *Progress in Neurobiology* 73:73-105. [Invited review examining these issues across olfactory systems]

Tucker ES, Oland LA, Tolbert LP (2004) *In vitro* analyses of interactions between olfactory receptor growth cones and glial cells that mediate axon sorting and glomerulus formation. *Journal of Comparative Neurology* 472:478-95.

Abeytunga DTU, Glick JJ, Gibson NJ, Oland LA, Somogyi A, Wysocki VH, Polt R (2004) Presence of unsaturated sphingomyelins and changes in their composition during the life cycle of the moth *Manduca sexta*. *Journal of Lipid Research* 45:1221-31.

Slavish JP, Friel DK, Oland LA, Polt R (2004) New PDMP analogues inhibit process outgrowth in an insect cell line. *Bioorganic Medicinal Chemistry Letters* 14:1487-90.

Heil JE, Oland LA, Lohr C (2007) Acetylcholine-mediated axon-glia signaling in the developing insect olfactory system. *European Journal of Neuroscience* 26:1227-41.

Abeytunga DT, Oland L, Somogyi A, Polt R. (2008) Structural studies on the neutral glycosphingolipids of *Manduca sexta*. *Bioorganic Chemistry* 36:70-6.

Oland LA, Biebelhausen JP, Tolbert LP (2008) The glial investment of the adult and developing antennal lobe of *Drosophila*. *Journal of Comparative Neurology* 509:526-550.

Gibson NJ, Tolbert LP, Oland LA (2009) Roles of specific membrane lipid domains in EGF receptor activation and cell adhesion molecule stabilization in a developing olfactory system. *PLoS One* 4:e7222.

Oland LA, Gibson NJ, Tolbert LP (2010) Localization of a GABA transporter to glial cells in the developing and adult olfactory pathway of the moth *Manduca sexta*. *Journal of Comparative Neurology* 518:815-38.

Oland LA, Tolbert LP. (2011) Roles of glial cells in neural circuit formation: Insights from insects. *Glia* 59:1273-1295. [Invited review of the literature for a special issue on invertebrate glia]

Koussa MA, Tolbert LP, Oland LA. (2011) Development of a glial network in the olfactory nerve: role of calcium and neuronal activity. *Neuron Glia Biology* 2:1-17.

Gibson NJ, Tolbert LP, Oland LA (2012) Activation of glial FGFRs is essential in bidirectional axon-glia signaling during development of the moth olfactory system. *PLoS One* 7: e33828.

Mallory HS, Gibson NJ, Hayashi JH, Nighorn AJ, Oland LA (2012) Direct and glia-mediated effects of GABA on development of central olfactory neurons. *Neuron Glia Biology* 7:143-161.

Invited Presentations

- 7/95 "Developing a research program", presented to the Graduate Student and Postdoctoral Fellow Brown Bag Lunch series, College of Nursing, University of Arizona, Tucson, AZ,
- 2/99 "Representation of music in the brain", invited as one of 3 speakers for a Professional Development Workshop, a weekly series sponsored by the School of Music,
- 6/99 "Growth and guidance of neuronal processes in the developing antennal (olfactory) lobe of the moth *Manduca sexta*: *In vitro* studies". Invited symposium speaker at the annual meeting of the Congress on In Vitro Biology, New Orleans,
- 2/01 "Uses of confocal microscopy in answering neurobiological questions". Invited speaker, Arizona Imaging Society annual meeting, Tucson, AZ,
- 5/02 "Roles for glial cells in the developing primary olfactory pathway". Invited speaker, University of Kaiserslautern, Kaiserslautern, Germany,
- 4/04 "A neuron-glia pas de deux underlies olfactory receptor axon sorting". Invited symposium speaker at the annual meeting of the Association for Chemoreception Sciences, Sarasota, FL.
- 6/08 "Signaling interactions between olfactory receptor axons and glial cells in the axon sorting zone of the developing olfactory pathway of the moth." Invited symposium speaker at the World Congress on In Vitro Biology, Tucson, AZ.
- 12/08 "A GABA transporter in the developing olfactory pathway of the moth." Oregon Univ. of the Health Sciences, Portland, OR.
- 4/09 "Roles for glia in regulating formation of neuronal groups in the moth olfactory lobe." Invited symposium speaker. Association for Chemoreception Sciences, Sarasota, FL.
- 3/11 "Not just hard-wired: Developmental plasticity in the olfactory system." Invited symposium speaker. Göttingen Neuroscience meeting, Göttingen, Germany.
- 3/11 "Role of glia in the sorting zone in the developing olfactory pathway." Invited speaker,

2/15 University of Würzburg, Germany
Workshop speaker for the Upper Valley Educators' Institute, VT, on "The Adolescent Brain"

Teaching

Classroom

1990-9 NRSC 701 - Communication in Neuroscience - Co-taught bi-annually with Leslie Tolbert, 50% responsibility

1992-6 H295 - Mechanics of the Mind - Co-taught with 5-6 other ARLDN faculty with equally shared responsibility.

1998-9 NRSC 195b - Contemporary Neuroscience: A Field Guide to the Brain –Developed and co-taught with Tom Christensen, 50% responsibility. Included community-based opportunities for students to interact with people challenged by developmental disorders, CNS injury, mental illness and degenerative disorders, as well as to interact with therapists, families, teachers and clinicians who work with these individuals. See Appendix for syllabus.

1998-2003 Physics 603 - IGERT lab - Cross-disciplinary lab for graduate students in biology, physics, and math. Developed neurophysiology component including lecture material and setting up the physiology rig. Contributed generally to course design and to designing the physical layout of the lab. Co-taught with Koen Visscher and Ray Goldstein, equally shared responsibility for first two course offerings, decreased to 20% for third offering, and to guest lecturer and occasional consultant in 2003.

2001-2003 NRSC 195c - A Field Guide to the Brain - Co-taught with Tom Christensen, 50% responsibility. A slightly revised version of NRSC 195b.

2004-6, & 2008-9 NRSC 195c – A Field Guide to the Brain: Focus on Brain Injury, 100% responsibility.

2005-2006, 2009 NRSC 282 – The Biology of Sensation –30% responsibility. Co-taught with Theodore Glatke and Leslie Tolbert. Course director in 2009.

2011-2013 NSCS 170c1 – NATS Tier 1. Frontiers in the Brain. Co-instructor with Carole Beal. 50% responsibility

2014- NSCS 170c1 – NATS Tier 1. Frontiers in the Brain. Course director, 100% responsibility

2016- NSCS 450 – Neurons and Glial Cells in health and Disease. To be co-taught with Leslie Tolbert, 50% responsibility

Program Development

2009-2010 Chaired School of Mind, Brain and Behavior committee to develop a new Neuroscience and Cognitive Science Undergraduate major.

Program Direction

2010- Faculty director of the Neuroscience and Cognitive Science Undergraduate Program

Laboratory/independent study

Postdoctoral fellows

8/95-9/97 Hector Marrero (currently a senior scientist at Univ. Massachusetts)

10/99-3/01 Christian Lohr (currently a staff scientist at Univ. Muenster, Germany)

In addition, I helped to supervise other postdoctoral fellows in the lab, including Wolfgang Rössler, Nick Gibson, Brian Lipscomb and Tony Day.

Graduate students

- 1996 NRSC 599 - independent study in scientific writing for Baylah David (Psychology)
- 1996-1998 Katja Selchow (Neuroscience graduate student in the Hildebrand lab). I served on her Dissertation committee and worked closely with her for the morphology experiments that comprised about a third of her dissertation.)
- 1998-2003 Eric Tucker (CBA graduate student in the Tolbert lab) - I worked especially closely with Eric to develop the glial culture system and live-cell imaging protocols that were essential to his dissertation experiments.
- 2000-2003 Megumi Kaneko (Neuroscience graduate student in the Nighorn lab) - I worked closely with Megumi on the *in vitro* and immunocytochemical portions of her dissertation work to examine the role of the Eph/ephrin system in development of the olfactory pathway in the moth.
- 2003-2005 Jennifer Crane (Neuroscience graduate student in the Tolbert lab) - I worked closely with Jennie as she explored development of the olfactory pathway in *Drosophila*.
- 2004-2008 Larry Chandler (Masters student in the Teachers Program) - I had full responsibility for supervising Larry's work on his study of the development of uniglomerular projection neurons in the *Manduca* antennal lobe.
- 2010- Stephanie Gage (Neuroscience graduate student in the Nighorn lab) – I serve on her dissertation committee.
- 2010- Benjamin Goldman (EEB graduate student) – Did a rotation in the lab in the fall of 2010; continuing collaboration on his project. I serve on his dissertation committee.
- 2010- Sarah MacNamee (Neuroscience graduate student) – Joined lab in 2011 and successfully competed for an NSF pre-doctoral fellowship.
- 2011- Meaghan Torvund (Neuroscience graduate student) - graduate rotation in the lab. I serve on her dissertation committee
- 2013-2015 Sara Lewis (Neuroscience graduate student) – I served on her dissertation committee

In addition, I have provided significant supervision and guidance for all of the other graduate students who have pursued their degree in the Tolbert lab, done rotations through the lab, or completed part of their dissertation work in the lab (Sue Dubuque, Anita Rado, Delia Hernandez, Dave Donnell, and Mischella Grill). I also worked on an ad hoc basis with Jake Slavish and Will Taylor in the Polt lab (Chemistry) during most of 2001-03.

Undergraduate students

I assumed primary responsibility for the following students:

- 9/91-5/94 Patricia Baumann (MCB) – Senior Honors Thesis, first author on peer-reviewed paper in *J Comp Neurol* on stabilization of axonal protoglomeruli by glial cells
- 1/97-5/00 Michelle Lai (MCB) - poster presentations (Undergraduate Biology Research Program, Association for Chemoreception Sciences); independent study and Senior Honors thesis
- 1/95-5/96 Ingrid Burger (MCB) - co-author on a peer-reviewed paper in *Cell and Tissue Research* on glial cell morphology and distribution in the developing antennal lobe; independent

- study for one semester.
- 5/97-12/97 Sara Evans (Biochemistry) - co-author on a peer-reviewed paper in *Arthropod Structure and Development* on tracheal investment of the developing antennal lobe; independent study and Senior thesis
- 8/98-12/00 Jocelyn Buckingham (Interdisciplinary Major in Neuroscience) - poster presentation (Undergraduate Biology Research Program); co-author on a peer-reviewed paper in *Journal of Neurobiology* on antennal explant outgrowth; independent study
- 5/00-12/00 Chris Biland (Physical Therapy) - a student from the Polt lab (Chemistry) who worked closely with me on his project to study the effects of several ceramide analogues on neurite outgrowth in *Manduca* neuronal cultures
- 8/00-5/01 William Taylor (Biochemistry) - a student from the Polt lab (Chemistry). Part of his Senior thesis focused on ceramide analogue effects on *Manduca* embryonic cell line
- 8/01-12/01 Stacey Black (Chemistry) - a student from the Polt lab (Chemistry) who worked closely with me on her project to study the effects of several ceramide analogues on neurite outgrowth in *Manduca* neuronal cultures
- 6/04 – 5/07 John Biebelhausen (Psychology) – brought *Drosophila* into the lab. Thesis focuses on the role of fasciclin II in antennal lobe development and on development of the glial investment of the developing lobe. Co-author on peer-reviewed paper in *J Comp Neurol*. Currently a hospitalist at the University of Colorado, having completed his MD/MBA at Tufts University in 2011.
- 1/03 – 1/05 Lacey Alhandy (Business) - began as a work/study student, was accepted into the Undergraduate Biology Research Program, and studied development of the multiglomerular projection neurons using dye labeling and confocal microscopy.
- 9/05-12/09 Emily Ricq (Chemistry, Honors, Flynn) – working under joint supervision of Robin Polt and me on the role of glycosphingolipids in development. Won an internship to work in the Marie Curie Institute in Paris for June through Dec 2008. In Dec 2009, received the College of Science Outstanding Senior Award. Currently in graduate school in Chemistry at Harvard.
- 1/07- 5/09 Jane Lim (Molecular and Cellular Biology, International studies, Honors) – working on role of neuroglial in olfactory development in *Drosophila*. Completed MD at UA; currently in residency at UCLA.
- 6/07-5/11 Mounir Koussa (Chemistry, Biochemistry and Molecular Biophysics, Honors) – working on electrophysiology of glial cells in the olfactory pathway of the moth. Selected for Van de Verde Scholarship, for Microscopy Society of America Undergraduate Research Award, for Michael A Wells Scholarship, and for the UA Galileo Circle Scholarship.. Presented his work as a poster at the 2009 SFN meeting. Was awarded the Outstanding Undergraduate Research Award for the College of Science. Awarded PhD in neurobiology at Harvard. Currently starting his own biotech company.
- 10/09-5/11 Jason Town (Physiology) – *Drosophila* – screen for pathfinding or glial defects in primary visual pathway. Peace Corp volunteer in Burkina-Faso, Africa. Now applying for graduate school in Biocomputing.
- 12/09-5/11 Paul Diamond (Political Science, Chemistry, Pre-Physiology) – *Manduca* – role of neuroglial in receptor axon outgrowth and pathfinding. Completed dental school at the Univ. of Pittsburg.
- 11/09-5/12 Marcel Sayre (Neuroscience and Cognitive Science (NSCS)) *Manduca* – screen for

- pathfinding or glial defects in primary visual pathway.
- 09/10-05/13 Si Woo Lee (MCB, Biomedical engineering) – *Drosophila* – investment of the larval ventral ganglion neuropil by motorneuron and glial processes. Microscopy Society of America Undergraduate Research Award, Galileo Circle Scholarship
- 08/11-5/13 Kayla Loomis (MCB) – *Manduca* – role of glial cell adhesion molecules on growth cone behavior.
- 08/11- Amanda Levy (Music, NSCS) – *Manduca* – reconstruction of glial network in the sorting zone region of the olfactory pathway. Honors College Undergraduate Research Awards
- 10/11-5/12 Kevin Chai (Biology) – *Drosophila* – calcium imaging in the antennal lobe in multiple fly species
- 05/12- Nancy Anaya (NSCS) – *Manduca* – whole-cell electrophysiology recordings from glial cells in the olfactory nerve, working under an NSF Western Alliance for Expanding Student Opportunities Award
- 01/13-04/13 Jessica Fletcher (Pre-NSCS) – *Manduca* – glial migration in the olfactory nerve
- 08/13- Cathy Tran (NSCS/Pre-Pharm) – *Drosophila* – locomotory behavior after pharmacological and RNA interference with glial function; astrocyte morphology
- 01/14- Ernesto Hernandez (NCSC) – *Drosophila* - cellular expression pattern of various drivers planned for use in RNAi and/or physiology experiments; astrocyte morphology and heterogeneity in the ventral nerve cord using Flp-out technique
- 2014- Julie Charlton (NSCS) – *Drosophila* – morphology of individual glial cells in the ventral nerve cord via intracellular recording; extent of gap junctional connectivity among glial cells; effect of picrotoxin treatment on glial morphology
- 2014- Kendra Liu (NSCS) – *Manduca* – reconstruction of the growth cones of olfactory receptor axons relative to glial processes in the sorting zone of the olfactory nerve; *Drosophila* – 3D reconstruction of glial process and synapses; electron microscopy of the motor neuropil in the ventral nerve cord
- 2015- Dara Farhadi (NSCS/Physiology) – *Drosophila*, glial network and correlation of astrocyte domains with neuronal functional domains
- 2015- Leah Kaplan (Biomed engineering, Communication) – *Drosophila* – immunocytochemistry of various markers with the ventral nerve cord neuropil; construction of an atlas of the ventral nerve cord

I have taken a less primary, but nevertheless consistent and significant guidance role with all (16) of the other students who have spent one or more semesters in the Tolbert lab since 1995.

Other

- 7/95-9/95 Zdenka Syrova (graduate student from the Entomology Institute, Czech Republic) - to use immunocytochemical techniques to study peptide expression in developing olfactory pathway
- 8/97-10/97 Rainer Wegerhoff (University of Kiel, Germany) -Visiting Scholar - to study the effect of pyrethroids on the development of glomeruli
- 2001 Nina Zabenica (Sahuarita High School) - science fair project on the projection of axons from antennal rootlets into the antennal nerve branches using dye labeling and confocal microscopy, won second place at the regional level
- 2002-03 Thusitha Abeytunga (University of Colombo, Sri Lanka) - Visiting Scholar in the Polt lab

with whom I worked closely on a project to use *Manduca* to isolate and study the effects on neural development of native glycosphingolipids and ceramide analogues.

- 5/09 Qiang Zhao (post-doctoral fellow from Cornell University) – to learn cell culture techniques for patch-clamp experiments on moth neurons
- 09/12- Cathy Tran (Tucson High School) – *Drosophila* locomotion after glial cell ablation or transporter disruption. Will continue in the lab as a UAZ student.
- 01/13-5/13 Arri Bertram (Basis High School, Tucson) – *Drosophila* locomotion after innexin disruption, localization of glial processes in the *Drosophila* VNC
- 05/13- Neha Godbole (Canyon del Oro High School, Tucson) – *Drosophila* - analysis of glial-process-to-synapse distance in electron microscopic images of the motor neuropil of the 3rd instar ventral nerve cord

Collaborations

- 1995 - 2006 Jon Hayashi, FMC to examine voltage and ligand-gated currents in glia from the antennal lobe.
- 1997 - 2005 Karla Kent, Oregon Health Sciences Univ., to compare development of the labial pit organ glomerulus with that of ordinary glomeruli.
- 1998 - 2012 Robin Polt, Chemistry, Univ. of Arizona, to determine whether glycosphingolipids play a role in the development of the insect nervous system, with particular focus on the olfactory pathway.
- 2002 - 2012 Chris Lohr, Univ. of Hamburg, Germany, to study the development of the neuropil glia with a focus on their electrophysiology, especially transmitter-gated responses.
- 2005 - 2012 Philip Copenhaver, OHSU, to study CAM-based signaling interactions.
- 2010- 2015 Noah Whiteman, Ecology and Evolutionary Biology, Univ. of Arizona, to examine selective-pressure-driven changes in the architecture and function of the olfactory lobe.

Grants

- 1995-2000 NIH-NINDS Neural development: Intercellular and humoral control
P.I.: Richard B. Levine
Project 2: Glial development during glomerulus formation
P.I.: L. Oland, \$102,000 annual direct costs. 50% effort.
- 2000-2006 NIH-NINDS Neural development: Intercellular and humoral control
P.I.: Richard B. Levine
Project 2: Glial development during glomerulus formation, P.I.: L. Oland, \$99,000 annual direct costs. 50% effort.
Core B - Cell Culture Facility, P.I.: L. Oland since fall 2002. 5% effort.
- 2007-2013 NIH-NINDS Glial and axonal interactions mediating olfactory receptor axon sorting
P.I.: L. Oland, \$200,000 direct costs. 20% effort. Co-PI with Alan Nighorn.
- 2009-2012 ARRA supplement to our NIH grant that allowed us to hire a technician and to purchase a cryostat and a qPCR machine. Total supplement: \$206,981
- 2014- NSF Activity-dependent development of the glial network in *Drosophila* ventral nerve cord. \$125,000 annual direct costs. 2 summer months effort

Small or shared grants

- 1997 NIH, Shared instrumentation grant, Co-PI, direct costs: \$390,204
- 1998 Microscopy Society of America Undergraduate Research Grant to Michelle Lai under my supervision, \$500
- 1998 Supplement to NIH Program Project grant for Stacy Thompson (Applied Math graduate student), \$3600.
- 2003 NIH-NIDCD Conference: Progress and Issues in Olfactory Development
P.I.: L. Oland, \$28,200 direct costs.
- 2003 NSF: Conference: Progress and Directions in Olfactory System Development
P.I.: L. Oland, \$5,000 direct costs.
- 2009 Microscopy Society of America Undergraduate Research Grant to Mounir Koussa under my supervision, \$2500
- 2010 UA Center for Insect Science Seed Grant, P.I.: N. Whiteman, \$5,000 direct costs,
- 2011 Microscopy Society of America Undergraduate Research Grant to Si Woo Lee under my supervision, \$2500
- 2012-13 UA Center for Insect Science Seed Grant, P.I.: N. Whiteman, \$10,000 direct costs,
- 2012, 2013 Western Alliance for Enhancing Student Opportunities/NSF (Fall 2012, Spring and Summer 2013), \$1500/semester, \$600 supplies
- 2014-2016 Sherman Fairchild Foundation, P.I.: L. Oland, to fund NSCS Summer Research Program, \$64,180/yr in direct costs
- 2014 UA TRIF funding, P.I.: L. Oland, Award for infrastructure in optics and imaging: Scientific Visualization System, for *Imaris* Image Analysis software and a powerful computer to run it. Housed at UITS as a campus-wide imaging resource. \$50,800

Service to Scientific Community

Internal

- 1995 Reviewed student applications for admission to the Undergraduate Biology Research Program
- 1996-1997 Member of the Employee Recognition Committee, ARL
- 1996-2002 Shared responsibility for Cell Culture Facility with R. Levine.
- 1996 Reviewed potential video acquisitions for AHSC library
- 1997-1999 Co-ordinated the Development Evening Meeting series in the ARLDN
- 2001 Reviewed grant proposals for the Faculty Small Grants Award program
- 2001 Member of an ARLDN faculty search committee
- 2001- Participant in student recruitment for the Committee on Neuroscience
- 2002- 2014 Supervisor for the Cell Culture Facility
- 2005- Supervisor for the Imaging Facility
- 2006 Participant on Flandrau Science Center Advisory Panel
- 2006- Participant in Brain Awareness Week activities at the Flandrau Science Center
- 2006-9, 11-12 Member, UBRP Selection Committee
- 2006 Member, UBRP summer program selection committee
- 2007- Member, Chair 2009-2012, advisory board for the Sonoran University Center for Excellence in Developmental Disabilities
- 2008, 2010 Presenter, Research Ethics to students attending the UBRP Ethics Retreat

2008-9 Member, CIS Travel Award Selection Committee
2010 Served on the College of Nursing APR committee
2012-14 Member Department of Neuroscience Faculty Search Committees
2013- Associate Department Head, Department of Neuroscience

External

1987- Ad hoc reviewer for: *J. Neuroscience, J. Comp. Neurol., J. Neurobiol., Glia, Dev. Biol, Cell and Tiss. Res., J Electron Micr. Techniq., J. Insect Physiol., Arthropod Struct. Dev., In Vitro Cell. J Comp Neurol, J Comp Physiol, J Neurosci Meth, Dev Dynamics*
1995 Ad hoc reviewer for NIH program project application.
1997 Ad hoc outside reviewer - NSF grant
1996-1998 Secretary for Arizona Imaging and Microscopy Society
1998-2000 President, Tucson Chapter of the Society for Neuroscience
2001-2003 Ad hoc reviewer for NIH-NIDCD R03 proposals (1 study section each year)
2002, 2005 Ad hoc outside reviewer for the Canadian Institutes of Health Research
2002-3 Chair of the organizing committee for an international conference held in Tucson in Jan. 2003; wrote proposals for and received full funding from the NIH and NSF. Meeting report appeared in: Brunjes PC, Greer CA (2003) Progress and Directions in Olfactory Development, *Neuron*, 38:371-74.
2005 Ad hoc reviewer for the US/Israel Binational Science Foundation, the Pacific Northwest National Laboratory, and the NSF
2006 - Ad hoc reviewer for the Pacific Northwest National Laboratory and the Australian Research Council (3-4/yr from each)
2007-9 Ad hoc reviewer for NIDCD special study sections (2-3/yr)
2009 Ad hoc reviewer, NIH High-end Instrumentation (S10) study section.
2009-10 Speaker for Society for Neuroscience Workshop on "Setting up a Research Laboratory"-
Mentoring
2013- Member, Dana Alliance
2015-16 Ad hoc reviewer, NSF Graduate Student Fellowship program

Outreach

1987- Presenter/speaker in school classrooms, laboratory demonstrations for elementary through high school classes as well as legislators and adult groups, 1-2 talks per year to civic and seniors' groups and to local chapters of organizations for specific disabilities (autism, FAS), participant in Career Days, TUSD Summer Science Program.
1992-93 Corresponding scientist for Boston Museum of Science, *Science-by-Mail* program.
1999-00 As part of my role as President of the Tucson Chapter of the Society for Neuroscience, I organized Brain Awareness Week activities including finding speakers to go to classrooms and civic/seniors groups and running Brain Festival 2000 at the Flandrau Science Center. The Brain Festival included hands-on demonstrations, invited speakers, posters, and neuroscience-related movies.
2001-06 Demonstrations for Brain Awareness Week at the Flandrau Science Center (U AZ).
2003 Demonstration for public school students at the local Science Center in conjunction with the annual Association for Chemoreception Sciences meeting Outreach program.
2004 Panel member for an Association for Women in Science workshop on networking.

2005	Speaker – Brain development and autism – part of a workshop for TUSD special education teachers
2006-10	Faculty advisor for Best Buddies, a student club focused on individuals with developmental disabilities
2007	Speaker – Adolescent brain development– part of a workshop for TUSD special education teachers
2007	Speaker - New Start program, UA - neuroscience careers
2009	Speaker on fetal alcohol syndrome and brain development – sponsored by local chapter of FAS and AZ Division of Developmental Disabilities
2009-	Developed and coordinate, with Jean-Marc Fellous, a <i>Brain Works</i> booth for the UA Book Festival’s Science Pavilion. Very well attended (>1500 visitors/yr to the booth) and received, and gave both undergraduate and graduate students an opportunity for Neuroscience outreach.
2010	Gave a presentation on glial cells to the undergraduate UA Neuroscience Club
2010	Served as a judge for the Biological Engineering Chemical Undergraduate Research (BECUR) conference on campus.
2010	Gave a teacher workshop for Bio5 on proprioception and reaction-time activities for the middle-school and high-school classroom
2011	Worked with Flandrau Science Center personnel to produce a small short-term exhibit at the center on Neuroscience at the University.
2014-15	Speaker for KEYS program (for high school students working in university labs over the summer

Work in Progress

Major components of research program

- Modulation of motor neuron activity by interaction between neurons and glial cells in the larval *Drosophila* ventral nerve cord. The goal is to determine the functional influence of glial cells on the activity of motor neurons and on the locomotory behavior of the animal. We have characterized the membrane properties and currents in astrocytes in the ventral nerve cord, finding them to be highly similar to those found in vertebrate astrocytes. Morphologically, *Drosophila* astrocytes are somewhat heterogeneous, but again like their vertebrate counterparts, occupy distinct domains separate from those of other astrocytes, overlapping only distally. They appear to form a network connected at their distal branches by gap junctions. 3D reconstructions made from serial sections imaged in the electron microscope show that glial processes do not ensheath synapses, though they may closely approach synapses. Nevertheless, recordings from astrocytes in animals in which motor neurons are expressing channel rhodopsin show that activity in motor neurons induced by light elicits an inward going current in the glial cells. That current is mediated by a glutamate transporter. Genetically targeted RNAi that reduces the glutamate transporter in the astrocytes also affects locomotion. The overall goal is to identify signaling pathways between the two cell types.
- Effects of neuronal activity on glial development. With the goal of understanding how development of the glial network and the neuronal circuits with which they interface are coordinated to optimize

their functional relationship, we are using *Drosophila* genetics to reduce neuronal activity during the period of larval development in which glial processes normally are invading and branching within the neuropil. The suite of techniques described above are being deployed to examine the effects of reduced neuronal activity on astrocytes, from behavior to electrophysiology to microscopy, including type and characteristics of currents, glial shape and domain, and output of the motor circuit in the form of locomotion.

- Evolution of the architecture of the olfactory lobe in *Drosophila*. This work is in collaboration with Dr. Noah Whiteman (EEB). The goal is to determine whether, and if so, how, specialist species alter the configuration of the olfactory lobe compartments that receive receptor sub-type specific input when receptor sub-types are lost. This project takes advantage of the recent publication of the genome for >20 separate *Drosophila* species.

Appendix I

Abstracts (70 abstracts)

French KA, Hayashi JH, Oland LA, Stuart AE (1980) The lateral visual pathway of the giant barnacle. Soc Neurosci Abstr 6:349.

Oland LA, Stuart AE (1983) The absence of synaptic interaction among the median and lateral photoreceptors of the barnacle and a comparison of the responses of second-order cells to their input. Soc Neurosci Abstr 9:679.

Stuart AE, Hayashi JH, Oland LA (1983) Voltage spread in an interneuron of the barnacle's visual system. Soc Neurosci Abstr 9:679.

Oland LA, Stuart AE (1984) Functionally independent arbors in an interneuron. Soc Neurosci Abstr 10:658.

Oland LA, Tolbert LP (1986) Reduction of glial population by gamma-irradiation disrupts development of glomeruli in *Manduca sexta* antennal lobe. Soc Neurosci Abstr 12:929.

Oland LA, Tolbert LP (1987) Hydroxyurea-induced effects parallel radiation-induced effects on the developing olfactory glomeruli in *Manduca sexta*. Soc Neurosci Abstr 13:1144.

Oland LA, Tolbert LP (1988) Glial changes during formation of olfactory glomeruli in an insect brain. Soc Neurosci Abstr 14:423.

Oland LA, Orr G, Tolbert LP (1989) The first events in the formation of insect olfactory glomeruli involve sensory axons and olfactory-lobe glia but not olfactory-lobe neurons. Soc Neurosci Abstr 15:445.

Tolbert LP, Oland LA, Orr G (1989) Intercellular interactions among insect olfactory cells in culture. Soc Neurosci Abstr 15:445.

Oland LA, Tolbert LP (1990) Differential morphological responses to ecdysteroid of cultured neurons from insect antennal lobe. Soc Neurosci Abstr 16:648.

Oland LA, Hayashi JH, Tolbert LP (1992) Effect of the steroid hormone 20-hydroxyecdysone on the branching patterns of cultured neurons from the developing olfactory lobe of the moth. Soc Neurosci Abstr 18:230.

Hayashi JH, Oland LA, Hildebrand JG (1992) The development of potassium currents in cultured insect olfactory neurons. Soc Neurosci Abstr 18:230.

Oland LA, Mercer AR, Kirschenbaum SR, Tolbert LP (1993) The 5-HT neuron in the olfactory lobe of *Manduca sexta* does not participate in protoglomerulus formation. Soc Neurosci Abstr 19:443.

Malun D, Oland LA, Tolbert LP (1993) Do uniglomerular output neurons participate in forming the template for olfactory glomeruli in the moth? Soc Neurosci Abstr 19:443.

Oland LA, Muller T, Kettenmann H (1994) Glial-cell development during formation of glomerular boundaries as revealed by whole-cell recordings from slice preparations of developing moth olfactory lobe. Soc Neurosci Abstr 20:690.

Baumann P, Oland LA, Tolbert LP (1994) The effect of reduction in glial number on branching patterns in the developing insect olfactory lobe. Soc Neurosci Abstr 20:690.

Kirchhof B, Mercer AR, Oland LA, Hildebrand JG. Effects of serotonin on the growth *in vitro* of antennal lobe interneurons of the sphinx moth, *Manduca sexta*. Internatl J Neurosci 81:237-238.

Oland LA, Bukhman G, Pott WM, Tolbert LP (1995) Olfactory glomeruli in the moth form in the absence of TTX-sensitive activity. Soc Neurosci Abstr 21:568.

Oland LA, Pott WM, Higgins MR, Baumann PM, Tolbert LP (1996) Evidence that developing olfactory axons are attracted to their targets. Chem Senses 21:652.

Marrero HM, Oland LA (1996) Voltage-gated currents in glial cells associated with olfactory glomeruli developing in the antennal lobe of the moth. Soc Neurosci Abstr 22:311.

Oland LA, Pott WM, Lai M (1997) Glomerular development in slice and organotypic cultures from moth olfactory lobe. Chem Senses 22:764.

Selchow KI, Christensen TA, Oland LA, Hildebrand JG (1997) Neural processing of plant-associated odors in the antennal lobe of the moth, *Manduca sexta*. Chem Senses 22:790.

Eckholdt PE, Higgins MH, Oland LA, Nardi J, Tolbert LP (1997) Anti-fasciclin antibody as a marker for olfactory axon ingrowth and specialization during the development of the moth *Manduca sexta*. Microscopy Res Techniq.

Oland LA, Kent KS, Hildebrand JG (1997) The labial pit organ glomerulus, a unique, experimentally tractable glomerulus in the insect olfactory lobe. Soc Neurosci Abstr 23:1826.

Higgins MR, Eckholdt PA, Gibson NJ, Oland LA, Copenhaver PF, Tolbert LP (1998) Cues guiding olfactory axons to their targets in the brain of *Manduca sexta*. Soc Neurosci Abstr 24:1142.

Oland LA, Pott WM, Tolbert LP (1998) Guidance and sorting of olfactory receptor axons in the moth *Manduca sexta*. Soc Neurosci Abstr 24:1142.

Torruellas J, Kumar L, Oland LA, Hayashi JH (1998) Blockade of insect calcium channels expressed in primary neuronal cultures of *Manduca sexta* with the straw itch mite toxin, TOX 34. Soc Neurosci Abstr 24:1080.

Oland LA, Rössler WR, Hildebrand JG, Tolbert LP (1999) Origin of cells in the the axon sorting zone in the olfactory pathway of the moth *Manduca sexta*. Soc Neurosci Abstr 25:752.

Higgins MR, Oland LA, Hernandez D, Tucker E, nighorn A, Copenhaver PF, Tolbert LP (1999) Studies of the intercellular interactions that guide olfactory axons to their targets in the brain of *Manduca sexta*. Soc Neurosci Abstr 25:753.

Tolbert LP, Oland LA, Roessler WR, Higgins M, Hildebrand JG (2000) Glial cells in the receptor-axon sorting zone: Another neuron-glia interaction plays a key role in olfactory development. Internatl Sympos Olfact Taste.

Oland LA, Pott WM (2000) An attractive diffusible signal helps to guide olfactory axons to the antennal lobe of the moth *Manduca sexta*. Soc Neurosci Abstr #604.10.

Lohr C, Oland LA (2000) Glial ion currents in the developing olfactory lobe of the moth *Manduca sexta*. Soc Neurosci Abstr #604.9.

Tucker ES, Oland LA, Tolbert LP (2000) *In vitro* study of interactions between olfactory receptor growth cones and glial cells of the axonal sorting zone. Soc Neurosci Abstr #604.11.

Polt R, Oland L, Biland C, Glick J, Novak B, Slavish J, Taylor W, McGovern K, Hildebrand J. (2000) D-threo-PDMP and structural analogs alter GSL expression in *Manduca sexta* and reduce neurite extension in explants. *National Academy of Sciences' Colloquium: Molecular Kinesis in Cellular Function and Plasticity*, Beckman Center, Irvine, CA.

Oland LA, Pott WM, Tolbert LP (2001) Behavior of olfactory receptor axons growing near and in explants of the axon sorting zone of the moth olfactory system. Chemical Senses 26:1102.

Tucker ES, Oland LA, Tolbert LP (2001) *In vitro* analysis of interactions between olfactory receptor growth cones and centrally derived glia. Chemical Senses 26:1101.

Tolbert LP, Oland LA, Rössler WR, Higgins MR, Hildebrand JG (2001) Glial cells in the receptor axon sorting zone: another neuron-glia interaction plays a key role in olfactory development. ISOT XIII, Brighton, UK Chemical Senses 26:43-44.

Oland LA, Tolbert LP (2001) Interactions between olfactory receptor axons and glia cells in the isolated sorting zone of the antennal (olfactory) nerve of the moth. Soc Neurosci Abstr #140.2.

Lohr C, Oland LA (2001) Development of ion channels in glial cells of the olfactory lobe of the moth *Manduca sexta*. In : N. Elsner & G.W. Kreutzberg (eds). Proceedings of the 28th Göttingen Neurobiology Conference 2001; Vol. II, 848, Georg Thieme Verlag Stuttgart.

Tucker ES, Oland LA, Tolbert LP (2002) Growing olfactory receptor axons from *Manduca sexta* display different interactions with central and peripheral glia *in vitro*. Chemical Senses 27:A14.

Oland LA (2002) Interactions between neuropil-associated glial cells and the dendrites of neurons in the developing olfactory lobe of the moth *Manduca sexta*. Euroglia, Rome, May 2002.

Oland LA, Gibson NJ, Tolbert LP (2002) Possible roles for tenascin-like molecules and neuropil glial cells in shaping dendrites of antennal (olfactory) lobe neurons. Soc Neurosci Abstr #132.8.

Oland LA, Howard CT, Tolbert LP (2003) Glia in the axon sorting zone of the moth primary olfactory pathway alter axon responses to subsequent glial encounters. Chemical Senses 28:A78.

Oland LA and Tolbert LP (2003) Olfactory receptor neuron interactions with target neurons in the olfactory (antennal) lobe of the moth. Soc Neurosci Abstr #887.4.

Higgins MR, Nighorn A, Abdelwahab M, Oland LA, Tolbert LP (2004) Testing roles of fasciclin II in the developing olfactory pathway in *Manduca sexta*. Soc Neurosci Abstr #41.17.

Oland LA, Gibson NJ, Mallory HS, Tucker ES, Tolbert LP (2004) Nitric oxide from olfactory receptor neurons enhances formation of a peripheral glial cell network. Soc Neurosci Abstr #41.16.

Oland LA (2005) A neuron-glia pas de deux underlies olfactory receptor axon sorting. Chemical Senses 30: 265-78. [Invited symposium speaker]

Oland LA, Gibson NJ, Tolbert LP (2005) NO-mediated signaling from olfactory receptor axons to peripheral ensheathing glia in the moth olfactory pathway. Chemical Senses 30:265-278.

Mallory H, Nighorn AJ, Hayashi JH, Oland LA (2005) Neuropil glia and interneurons in the olfactory (antennal) lobe of the moth *Manduca sexta* respond to GABA during early glomerulus development. Soc Neurosci Abstr #254.11.

Oland LA, Gibson NJ, Higgins MR, Tolbert LP (2006) Axonal sorting mediated by interactions of ingrowing axons with glial cells. Glia in Health and Disease Cold Spring Harbor conference, 7/20-24/06.

Gibson NJ, Oland LA, Higgins MR, Tolbert LP (2006) Lipid raft modulation of cell signaling events in the sorting of olfactory receptor axons in the developing olfactory system of an insect model. Soc Neurosci Abstr #224.16.

Gibson N, Oland L, Higgins M, Tolbert L (2007) Modulation of olfactory receptor axon sorting and targeting by lipid raft-associated signaling molecules. Chemical Senses 32(6): A54.

Oland LA, Biebelhausen J, Tolbert LP (2007) Development of the glial investment of glomeruli in the *Drosophila* olfactory lobe. Chemical Senses 32(6): A100.

Oland LA, Gibson NJ, Tolbert LP (2007) Regulation of olfactory receptor axon sorting and targeting by signaling between axons and glial cells in the sorting zone of the developing moth olfactory pathway. ESITO, Sept 2007.

Higgins MR, Pham C, Oland LA, Tolbert LP, Nighorn A (2007) Knockdown of olfactory axon guidance molecules in *Manduca sexta*. Soc Neurosci Abstr #135.6.

Gibson NJ, Oland LA, Tolbert LP (2007) Regulation of olfactory receptor axon sorting and targeting by signaling between axons and glial cells in the sorting zone of the moth olfactory pathway. Soc Neurosci Abstr #870.8.

Tolbert LP, Gibson NJ, Oland LA (2008) A GABA transporter is expressed by subsets of glial cells in the developing and adult olfactory lobe of *Manduca sexta*. Soc NSci Abstr #625.12.

Gibson, NJ, Pearson JT, Tolbert LP, Oland LA (2008) Diversity among glial cells that play critical roles in sorting of olfactory receptor axons. Soc NSci Abstr #625.17.

Gibson NJ, Higgins MR, Tolbert LP, Nighorn AJ (2008) Signaling interactions between axons and glial cells regulating olfactory receptor axon sorting and targeting in the developing olfactory pathway of the moth. International Congress on Entomology, Durban, SA, July 2008.

Oland LA, Gibson NJ, Pearson JT, Tolbert LP (2008) Neuroglial and FGFR interactions in development of the glia-rich axon sorting zone in the moth olfactory pathway. International Symposium on Olfaction and Taste. Abstr #97.

Oland LA, Gibson NJ, Tolbert LP (2009) Adult and developmental expression of a GABA transporter by a subset of centrally derived glial cells in the antennal lobe of the moth. ASChemS abstr. P225.

Koussa M, Hayashi JH, Tolbert LP, Oland LA (2009) Morphological and electrophysiological development of peripheral glial cells in the olfactory nerve of the moth *Manduca sexta*. Soc Neurosci Abstr #824.22.

Gibson NJ, Tolbert LP, Oland LA (2009) Activation of glial FGF receptors is essential in bidirectional axon-glia signaling during development of the moth olfactory system. Soc Neurosci Abstr #610.6.

Koussa MA, Tolbert LP, Oland LA (2010) Calcium currents in the formation of glial networks investing the olfactory nerve of the moth. Soc Nsci Abstr #646.2.

Oland LA, Pearson JT, Gibson NJ, Tolbert LP (2010) In vitro tests of roles for IgCAMs and growth factor receptors in sorting of olfactory axons during development. Soc Nsci Abstr #273.17.

Oland LA (2011) Not just hard-wired: Developmental plasticity in the *Manduca* olfactory system. Göttingen Nsci Abstr Symposium on Levels of Plasticity in Insects.

Koussa M, Tolbert LP, Oland LA (2011) Glia-neuron interactions in the formation of glial networks investing the olfactory nerve. ASChemS Abstr #234.

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MacNamee SE, Oland LA (2013) Astrocyte-like glial cells respond to neuronal activity with an inward current. Cold Spring Harbor Laboratory Neurobiology of *Drosophila* Meeting. October 2013, Cold Spring Harbor, NY.

MacNamee SE, Tolbert LP, Oland LA (2014) Physiology of *Drosophila* astrocyte-like glial cells: intrinsic properties and response to channelrhodopsin-mediated neuronal activity. Washington, DC. Soc NSci Abstr. #577.14.

MacNamee SE, Liu KE, Gerhard S, Fetter RD, Tolbert LP, Cardona A, Oland LA (2015) *Drosophila* astrocytes transport glutamate at identified synapses. Chicago, IL, Soc NSci Abstr. #296.01.

Charlton JA, Lance KN, Tran CT, MacNamee SE, Tolbert LP, Oland LA (2015) Modulation of neural activity affects astrocyte morphology in *Drosophila melanogaster*. Chicago, IL, Soc NSci Abstr. #296.02

Hernandez E, Lance KN, Charlton JA, MacNamee SE, Oland LA, Tolbert LP (2015) Morphological analysis of astrocyte-like glial cells in the *Drosophila* ventral nerve cord. Chicago, IL, Soc NSci Abstr. #296.03.

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