KURT R. ILLIG, PHD

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CURRENT POSITION AND RESEARCH INTERESTS

Professor of Biology and Interdisciplinary Neuroscience, University of St. Thomas (2020-present)

My research centers on the olfactory cortical regions to understand general principles of how nervous system structures are organized and function. I am particularly interested in changes that occur with experience during learning, with habitat change, and during evolution. Using an experimental approach that combines genetic, anatomical, physiological, and behavioral methods, my goal is to understand the role of the cortex in sensory coding and memory, and the function of the nervous system in organismal behavior throughout evolutionary history.

PREVIOUS, CONCURRENT AND OTHER ACADEMIC POSITIONS

Chair, Biology Department, University of St. Thomas, 2017-2018
Adjunct Professor, Michigan State University Department of Integrative Biology, 2018
Director, Interdisciplinary Neuroscience Program, University of St. Thomas, 2010-2017
Adjunct Professor, University of St. Thomas Opus College of Business, 2015
Associate Professor of Biology and Neuroscience, University of St. Thomas, 2014-2020
Assistant Professor of Biology and Neuroscience, University of St. Thomas, 2009-2014
Research Assistant Professor, University of Virginia Neuroscience Graduate Program, 2006-2009
Research Assistant Professor, University of Virginia Psychology Department, 2002-2009

EDUCATION

Postdoctoral Fellowship, University of Wisconsin School of Medicine and Public Health, Department of Anatomy, 1998-2002.

Ph.D., University of Wisconsin-Madison, December 1997 (Psychology, Neuroscience). Dissertation: Retinal ganglion cell survival and plasticity of extrastriate visual cortex following neonatal damage to primary visual cortex.

B.S., Drake University, May, 1993 (Psychology, Biology). Senior thesis: The effects of central administration of neuroleptics on the stimulant-induced increase in responding for intracranial self-stimulation.

GRANTS FUNDED (TOTAL ~$1.93M)

NIH R15 NS116907 (2021-2024): Digital and open-source amplifier for oocyte ion channel measurements. $362,966.

Croatian Ministry of Science and Education (2017-2019): The effects of pollution on invasion success of a freshwater crustacean invader. HRK 407,341 (~$75,000)

University of St. Thomas STELAR Online Course Development Grant (2017): $5,000

Minnesota Legislative-Citizen Commission on Minnesota Resources (2014-2017): Estrogen exposure analyses in Minnesota's shallow lake wildlife. $136,000

University of St. Thomas Faculty Development (2013): Blended course development grant. $5,000

NIH R01 DC000338 (2007-2009): The anterior olfactory nucleus. $1,039,500

NIH R03 DC005557 (2004-2008): Spatial aspects of coding in piriform cortex. $228,604

NIH F32 DC00414 (2000-2002): Information processing in piriform cortex. $78,512

PROFESSIONAL ACTIVITIES

President, Faculty for Undergraduate Neuroscience (2020-present)
Editorial Board, *Journal of Undergraduate Neuroscience Education* (2016-present)
President-Elect, Faculty for Undergraduate Neuroscience (2019-2020)
Membership Chair, Association for Chemoreception Sciences (2016-2018)
Treasurer, Faculty for Undergraduate Neuroscience (2014-2016)
Treasurer-Elect, Faculty for Undergraduate Neuroscience (2012-2014)
Councilor, Faculty for Undergraduate Neuroscience (2010-2012)
Ad hoc reviewer, grant proposals: National Science Foundation, National Institutes of Health

Ad hoc reviewer, journals including: *The Journal of Neuroscience, Journal of Neurophysiology, The Journal of Comparative Neurology, Trends in Neuroscience, Cerebral Cortex*

AWARDS AND HONORS

Fellow, Faculty for Undergraduate Neuroscience; elected 2019
Gwen Andrew Award for outstanding teaching, University of Wisconsin-Madison, 1997
National Science Foundation Honorary Fellow, 1994
Experimental Psychology Award for outstanding research, Drake University, 1993

GRADUATE STUDENTS MENTORED

Rachel B. Kay, PhD University of Virginia (2010)
Elizabeth Amory Meyer, PhD University of Virginia (2007)
Jennifer M. Mirich, MS University of Virginia (2006)
Mark E. Domroese, MD, PhD University of Wisconsin-Madison (2002)
Jeffrey J. Ekstrand, MD, PhD University of Wisconsin-Madison (2002)
Dawn M.G. Johnson, PhD University of Wisconsin-Madison (1999)

TEACHING EXPERIENCE **indicates taught at the University of St. Thomas*

*Basic Anatomy and Physiology (*course for Master's Degree Program in Health Care Communication*)
*Biology of Sustainability (*introductory undergraduate course*); lab
*Comparative Anatomy and Physiology (*advanced undergraduate cour*se) with lab
*Computational Neuroscience (*advanced undergraduate course*) with lab
Conservation Medicine (*advanced undergraduate study-abroad course)* with lab
*Evolutionary Neuroscience (*advanced undergraduate course*) seminar
Gross Anatomy (*medical students*); lab
*Human and Comparative Neurology (*advanced undergraduate and graduate course*) with lab
*Human Biology *(introductory undergraduate course)* taught online with at-home lab
*Integrative Neuroscience (*advanced undergraduate course*) with lab
Introduction to Psychobiology (*introductory undergraduate course*)
Introductory Statistics (*introductory undergraduate course*) with lab
Neural Mechanisms of Behavior (*advanced undergraduate course*) with lab
*Neurobiology (*advanced undergraduate course*) with lab
*Neuroecology (*advanced undergraduate study-abroad course*) with lab
*Principles of Neuroscience (*introductory undergraduate course*) with lab
*Structure and Function of Sensory Cortex (*graduate and advanced undergraduate students*) seminar

UNDERGRADUATE STUDENT RESEARCH FUNDING

2017 University of St. Thomas Young Scholars Grant (Abby Heller)
2013 University of St. Thomas Young Scholars Grant (Elizabeth Smith)
2012 University of St. Thomas Young Scholars Grants (Elizabeth Smith and Anthony Spano)
2012 University of St. Thomas Collaborative Inquiry Grant (Chloe Lawyer)
2011 University of St. Thomas Young Scholars Grant (Chloe Lawyer)
2011 University of St. Thomas Collaborative Inquiry Grants (Nicholas Hafften and Anna Garske)
2010 University of St. Thomas Young Scholars Grants (Nicholas Hafften, Leah Streitman and Anna Zimmerman)
2009 University of St. Thomas Collaborative Inquiry Grant (Nicholas Hafften)
2007 Sigma Xi Undergraduate Research Grant (Jennifer Eudy)

PAPERS PUBLISHED IN PEER-REVIEWED JOURNALS **indicates undergraduate student coauthor*

Neuwirth LS, Quadros-Menella PS, Kang YY, Linden ML, Nahmani M, Abrams M, Leussis MP, **Illig KR** (2021) Revisiting diversity, equity, and inclusion commitments and instituting actionable changes in the Faculty for Undergraduate Neuroscience. *Journal of Undergraduate Neuroscience Education*, in press.

Bayline RJ, Morrison ME, **Illig KR**, Martinez-Acosta VG, Becker LA, Favero CB, McFarlane HG, Chase LA, Banks SML, Griffin GD, Robinson S, Rose JK, Tong MT, Basu AC, Chan JP (2020) Faculty for Undergraduate Neuroscience (FUN) statement on diversity, equity and inclusion. *Journal of Undergraduate Neuroscience Education*, 18(2): E4-E5.

Klipec WD, Rasmus KC, O'Neill C, Cao J, Lawyer CR*, Ostertag E, Bachtell RK, **Illig KR** and Cooper DC (2016) Loss of the *trpc4* gene is associated with a selective reduction in cocaine reward and reduced

spontaneous ventral tegmental area dopamine neuronal activity. *Behavioural Brain Research,* 306: 117-127.

Illig KR (2015) Techniques and technology to revise content delivery and model critical thinking in the neuroscience classroom. *Journal of Undergraduate Neuroscience Education*, 13: A160-A165.

Garske AK*, Lawyer CR*, Peterson BM* and **Illig KR** (2013) Adolescent changes in dopamine D1 receptor expression in orbitofrontal cortex and piriform cortex accompany an associative learning deficit. *PLoS ONE* 8(2): e56191. doi:10.1371/journal.pone.0056191.

Kay RB, Meyer EAA, **Illig KR** and Brunjes PC (2011) Spatial distribution of neural activity in the anterior olfactory nucleus evoked by odor and electrical stimulation. *The Journal of Comparative Neurology,*519: 277-289.

Illig KR and Eudy J* (2009) Contralateral projections of the rat anterior olfactory nucleus. *The Journal of Comparative Neurology,* 512: 115-123.

Illig KR (2007) Developmental changes in odor-evoked activity in rat piriform cortex. *Neuroscience*, 145: 370-376.

Meyer EA, **Illig KR** and Brunjes PC (2006) Differences in chemo- and cytoarchitectural features within *pars principalis* of the rat anterior olfactory nucleus suggest functional specialization. *The Journal of Comparative Neurology*, 498: 786-795.

Illig KR (2005) Projections from orbitofrontal cortex to piriform cortex in the rat suggest a modulatory role in olfactory information processing. *The Journal of Comparative Neurology*, 488: 224-231.

Brunjes PC, **Illig KR** and Meyer EAA (2005) A field guide to the anterior olfactory nucleus (cortex). *Brain Research Reviews,* 50: 305-335 (Review).

Mirich JM, **Illig KR** and Brunjes PC (2004) Experience-dependent activation of extracellular signal-related kinase (ERK) in the olfactory bulb. *The Journal of Comparative Neurology*, 479: 234-241.

Illig KR and Haberly LB (2003) Odor-evoked activity is spatially distributed in piriform cortex. *The Journal of Comparative Neurology*, 457: 361-373.

Ekstrand JJ, Domroese ME, Feig SL, **Illig KR** and Haberly LB (2001) Immunocytochemical analysis of basket cells in rat piriform cortex. *The Journal of Comparative Neurology*, 434: 308-328.

Illig KR, Danilov YP, Ahmad A, Kim CBY and Spear PD (2000) Functional plasticity in extrastriate visual cortex following neonatal visual cortex damage and monocular enucleation. *Brain Research*, 882: 241-250.

Johnson DMG, **Illig KR**, Behan M and Haberly LB (2000) New features of connectivity in piriform cortex visualized by intracellular injection of pyramidal cells suggest that "primary" olfactory cortex functions like "association" cortex in other sensory systems. *The Journal of Neuroscience* 20: 6974-6982.

Illig KR, King VR and Spear PD (1998) Monocular enucleation prevents retinal ganglion cell loss following early visual cortex lesions in cats. *Visual Neuroscience* 15: 1097-1105.

CHAPTERS AUTHORED FOR EDITED VOLUMES

Illig KR and Wilson DA (forthcoming) Olfactory cortex: Comparative anatomy. In: Kaas, J.H. (ed.) *Evolutionary Neuroscience, Second Edition.* New York: Elsevier.

Illig KR and Wilson, DA (2009) Olfactory cortex: Comparative anatomy. In: Kaas, J.H. (ed.) *Evolutionary Neuroscience.* New York: Elsevier.

Brunjes PC and **Illig KR** (2009) The anterior olfactory nucleus. In: Binder, M.D., Hirokawa, N. and Windhorst, U. (Eds.) *Encyclopedia of Neuroscience.* New York: Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-540-29678-2_261

Illig KR and Wilson DA (2008) Olfactory cortex: Comparative anatomy. In: Squire, L. et al. (eds.) *The New Encyclopedia of Neuroscience, pp*101-106. New York: Elsevier.

PAPERS PUBLISHED IN ONLINE ARCHIVES

Illig KR, Rasmus KC, Varnell AL, Ostertag EM, Klipec WD, Cooper DC (2011) TRPC4 ion channel protein is selectively expressed in a subpopulation of dopamine neurons in the ventral tegmental area. *Nature Precedings*, http://dx.doi.org/10.1038/npre.2011.6577.1

Illig KR (2011) Corticofugal projections from the anterior olfactory nucleus target principal cells in the olfactory bulb. *Nature Precedings*, http://dx.doi.org/10.1038/npre.2011.6641.1

INVITED PRESENTATIONS AND COLLOQUIA

"Demonstrating key outcomes: Neuroanatomy, neurophysiology, neurotransmitters, and behavior" University of Zagreb, Croatia, December 2018.

"Sex, drugs and risky behavior: How adolescence contributes to evolutionary success." Bradley University, Peoria, IL, March 2017.
"How the dog sees the world." Keynote speaker, annual meeting of Search and Rescue Dogs of Colorado, Fort Collins CO, July 2017.
"Blended vs traditional courses: Assessing student learning and attitudes." Presented at: Teaching Neuroscience: Online Learning, professional development workshop at the Society for Neuroscience annual meeting, Washington DC, November 2014.
"Techniques and technology to revise content delivery and model critical thinking in the neuroscience classroom." Presented at the Faculty for Undergraduate Neuroscience Workshop, Ithaca NY, June 2014.
Speaker, Brain Awareness Week, March 2014
"Neuroscience and the Soul." Presented with Terry Nichols, PhD for the Science and Theology Network, University of St. Thomas, October 2013.
Panelist, University of St. Thomas "Freed Speech" event, April 2013.
"Sex, drugs and risky behavior: How adolescence contributes to evolutionary success." Invited by the Minnesota Humanists on the occasion of Charles Darwin's Birthday, February 2013.
"Using case studies to teach neuroscience." Presented at: Teaching Neuroscience Using Case Studies, professional development workshop at the Society for Neuroscience annual meeting, Chicago IL, October 2009.
"Rostral olfactory cortex." Part of the Presidential Symposium, annual meeting of the Association for Chemoreception Sciences, Sarasota FL, April, 2009.
"Cortical mechanisms for sensory processing, learning and behavior." University of Texas-Southwestern Medical Center, Dallas TX, June 2008.
"Higher-order information processing in the olfactory cortex." Emory University, Yerkes National Primate Center and Atlanta Center for Behavioral Neuroscience, Atlanta GA, January 2006.
"Information coding in the olfactory system." Cornell University, Ithaca NY, May 2004.
"Information processing in the olfactory system: Implications for learning and memory." Drake University Neuroscience Colloquium, Des Moines IA, April 2002.
"Olfactory cortex and associative memory: Analysis and predictions based on a distributed neural networks approach." Chaos and Complex Systems Seminar, University of Wisconsin-Madison, December 1998.
"Visual response plasticity in extrastriate cortical neurons after neonatal damage to primary visual cortex and monocular enucleation." University of Wisconsin Medical School, February 1997.

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Association for Chemoreception Sciences
Faculty for Undergraduate Neuroscience
Geological Society of America
International Brain Research Organization
Society for Neuroscience

PEER-REVIEWED ABSTRACTS AND PRESENTATIONS (n = 44) **undergraduate coauthor*

Illig, KR, Griffin GD, Morrision, ME (2021) Faculty for Undergraduate Neuroscience (FUN): Supporting undergraduate faculty and students.
Westra P*, Radke J*, Westberry JM and **Illig KR** (2019) Effect of environmental estrogens on crayfish aggressive behavior. *Presented at the Association for Chemoreception Sciences meeting, Bonita Springs, FL*
Baker EP*, Leininger K*, Fuller A*, Westberry JM and **Illig KR** (2017) Sex-specific associative learning deficits in adolescent rats are mediated by endogenous androgens. *Presented at the Society for Neuroscience Annual Meeting, Washington DC*
Illig KR and Bartell SE (2017) Environmental estrogen exposure is correlated with the size of a sexually dimorphic brain region in the painted turtle (*Chrysemys picta*). *Presented at the Society of Environmental Toxicology & Chemistry North America 38th Annual Meeting, Minneapolis, MN*
Bartell SE and **Illig KR** (2017) Development of ELISA for the measurement of vitellogenin (Vtg) in blood of the painted turtle *(Chrysemys picta)*. *Presented at the 25th Midwest Chapter Meeting of the Society of Environmental Toxicology & Chemistry, Minneapolis, MN*
McGuire JT and **Illig KR** (2016) The role of undergraduate medical geology curriculum in the context of new federal STEM priorities. *Presented at the Geological Society of America Meeting, Denver, CO*
Smith EA*, Hanson KA*, Lawyer CR*, **Illig KR** (2014) Odor-Guided Associative Learning in Adolescent Female Rats. *Presented at the Association for Chemoreception Sciences meeting, Bonita Springs, FL*

Lawyer CR*, Garske AK*, Peterson BM*, **Illig KR** (2012) Changes in odor-guided learning mirror changes in cortical dopamine function. *Presented at the Association for Chemoreception Sciences meeting, Huntington Beach, CA*

Zimmerman AK* and **Illig KR** (2011) Age-related changes in dopamine receptor expression in olfactory cortical areas. *Association for Chemoreception Sciences meeting, St. Petersburg, FL*

Zimmerman AK*, Peterson BM* and **Illig KR** (2010) Development of dopaminergic circuitry in orbitofrontal cortex. *Faculty for Undergraduate Neuroscience meeting, San Diego, CA*

Hafften N* and **Illig KR** (2010) Projections from the anterior olfactory nucleus of rodents suggest a role in odor identification. *Faculty for Undergraduate Neuroscience meeting, San Diego, CA*

Illig KR (2009) Anterior olfactory nucleus projections target the olfactory bulb. *Chemical Senses*.

Illig KR, Fleming M*, Sachs S*, Quinn S* and Erisir A (2008) Ultrastructural analyses of glutamatergic input to piriform cortex during development. In: *Abstract Viewer/Itinerary Planner.* Washington, DC: Society for Neuroscience.

Kay RB, Eudy JD*, **Illig KR** and Brunjes PC (2008) Projections within the anterior olfactory nucleus and to piriform cortex. In: *Abstract Viewer/Itinerary Planner.* Washington, DC: Society for Neuroscience.

Kay RB, **Illig KR** and Brunjes PC (2008) Ipsilateral projections within the anterior olfactory nucleus. *Presented at the International Symposium on Olfaction and Taste, San Francisco, CA*

Illig KR (2007) Projections from the anterior olfactory nucleus target olfactory bulb structures. Program number 503.10. In: *Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience.

Kay RB, Meyer EAA, **Illig KR** and Brunjes PC (2007) Differences in the distribution of activity in the anterior olfactory nucleus following odor exposure or electrical bulb stimulation. Program number 712.9. In: *Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience.

Illig KR and Eudy J* (2007) Projections of the Anterior Olfactory Nucleus. *Chemical Senses*.

Meyer EAA, Kay RB, **Illig KR** and Brunjes PC (2007) Spatial distribution of activity in the anterior olfactory nucleus following odor exposure. *Chemical Senses,* 32.

Illig KR and Kay RB* (2006) Differences in odor responses between anterior and posterior piriform cortex. *Chemical Senses*, 31: A74.

Meyer EAA, **Illig KR** and Brunjes PC (2006) Cytoarchitectural differences within the anterior olfactory nucleus. *Chemical Senses,* 31: A17.

Illig KR (2005) Odor responses in olfactory cortical areas suggest parallel distributed processing of olfactory information. Program number 279.6. In: *Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience.

Meyer EAA, **Illig KR** and Brunjes PC (2005) The anterior olfactory cortex exhibits regional differences in odor evoked activity. Program number 278.4. In: *Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience.

Illig KR (2004) Odor-evoked activity in piriform cortex revealed by *in situ* hybridization for activity-regulated genes. Program number 869.12. In: *Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience.

Meyer EAA, **Illig KR** and Brunjes PC (2004) Regional differences in cytoarchitecture in the anterior olfactory cortex. Program number 869.11. In: *Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience.

Illig KR and Shurling DC* (2003) Orbitofrontal projections to piriform cortex suggest a modulatory role in olfactory processing. Program number 548.6. In: *Abstract Viewer/Itinerary Planner*. Washington, DC: Society for Neuroscience.

Illig KR (2003) Spatial patterns of odor-evoked activity in piriform cortex change during development. *Chemical Senses*, 28:558/A73.

Illig KR and Haberly LB (2001) Odor-evoked cellular activity detected by Fos immunocytochemistry is in principal cells in piriform cortex. *Chemical Senses*, 26: 1087-1088.

Illig KR and Haberly LB (2000) Odor-specific regional activation of rat piriform cortex. *Chemical Senses*, 25: 605.

Haberly LB, **Illig KR**, Behan M, Ekstrand JJ, Johnson DMG and Domroese ME (2000) Anatomy and physiology of piriform cortex suggest functional roles equivalent to higher order cortex in other sensory systems. *Chemical Senses*, 25: 594.

Illig KR and Haberly LB (1999) Differences in olfactory response properties of cells in anterior and posterior piriform cortex. *Society for Neuroscience Abstracts*, 25, 2186.

Illig KR, Danilov YP, Ahmad A, Kim CBY, and Spear PD (1997) Sparing retinal ganglion cells leads to higher spatial frequency tuning in extrastriate cortex following neonatal primary visual cortex damage. *Society for Neuroscience Abstracts*, 23, 1029.

Illig KR, King VR and Spear PD (1996) Monocular enucleation prevents retinal ganglion cell loss following early visual cortex damage in cats. *Society for Neuroscience Abstracts*, 22, 1725.

Danilov YP, King VR, Ahmad A, **Illig KR** and Spear PD (1996) Compensation of direction and orientation sensitivity in cat posteromedial lateral suprasylvian extrastriate cortex after neonatal visual cortex damage. *Society for Neuroscience Abstracts*, 22, 1061.

Cooper DC*, Klipec WD, Koeltzow TE* and **Illig KR*** (1994) Separating reinforcing and locomotor effects of amphetamine administration in nucleus accumbens on responding maintained by intracranial self-stimulation: The role of α_1 noradrenergic and D_1 dopaminergic receptors. *Presented at the annual meeting of the Association for Behavior Analysis, Atlanta, GA*

Koeltzow TE*, Klipec WD, Cooper DC*, Alpern H and **Illig KR*** (1994) The effects of prazosin pretreatment on amphetamine-induced locomotor behavior in mice. *Presented at the annual meeting of the Association for Behavior Analysis, Atlanta, GA*

Illig KR*, Klipec WD and Jones W* (1993) The effects of prenatal and postnatal exposure to amphetamine, fencamfamine and cocaine on development in cross-fostered rats. *The FASEB Journal*, 7, A254.

Cooper DC*, Klipec WD and **Illig KR*** (1993) The effects of prenatal exposure to fencamfamine and amphetamine on central nervous system excitability. *The FASEB Journal*, 7, A254.

Klipec WD and **Illig KR*** (1993) The effects of amphetamine and fencamfamine on responding for intracranial self-stimulation using a titrated progressive fixed ratio reinforcement schedule. *Presented at the annual meeting of the Association for Behavior Analysis, Chicago, IL*

Klipec WD, **Illig KR***, Chesnokova N and Cooper DC* (1993) The effects of fencamfamine and amphetamine on responding for intracranial self-stimulation on a progressive fixed ratio schedule of reinforcement. *The FASEB Journal*, 7, A857.

Klipec WD, Lawler D*, Catlin S*, Wahling C* and **Illig KR*** (1993) The effects of pre and postnatal exposure to amphetamine, fencamfamine and cocaine on maternal behavior and development in rat pups. *Society for Neuroscience Abstracts*, 19, 1732.

Koeltzow TE*, Klipec WD, Cooper DC*, and **Illig KR*** (1993) The effects of prenatal exposure to fencamfamine and amphetamine on development in mice. *The FASEB Journal*, 7, A253.

Illig KR*, Klipec WD, Goetting R, Cohen D* and Thomason M* (1992) The effects of pre-and perinatal exposure to fencamfamine, amphetamine and cocaine on neonatal reflexes and open field activity in rats. *The FASEB Journal*, 6, A985.

Grannes D*, Klipec WD, Goetting R, Redman M*, Graham M*, **Illig KR*,** Spellman K, Smyth L and Wallander B (1992) Y-maze learning in rats following pre- and perinatal exposure to fencamfamine, amphetamine and cocaine. *The FASEB Journal*, 6, A986.