

Curriculum vitae
Neil James Vickers

Contact Information:

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University of Utah,
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Academic Appointments:

July 2008 – present: Professor, Department of Biology, University of Utah.
January 2008 – July 2014: Chair, Department of Biology, University of Utah.
July 2004 – June 2008: Associate Professor, Department of Biology, University of Utah.
September 1998 – June 2004: Assistant Professor, Department of Biology, University of Utah.

Academic Training:

January 1995-September 1998: Postdoctoral Research Associate with Drs. J.G. Hildebrand and T.A. Christensen at University of Arizona.
April 1993-December 1994: Postdoctoral Research Associate with Dr. T.C. Baker at Iowa State University.
April 1992-March 1993: Postdoctoral Research Associate with Dr. T.C. Baker at U.C. Riverside.

Education:

April 1988-March 1992: Ph.D. Advisor: Dr. T.C. Baker, Department of Entomology, U.C. Riverside.
Dissertation title: 'Pheromone-mediated olfactory and behavioral mechanisms in the tobacco budworm, *Heliothis virescens* (F.).
June 1987. B.Sc. (Honours) (2nd Class, Upper division) in Biology. Imperial College of Science and Technology, London, England.

Grants Awarded (since 1998):

A. Extramural Research Grants & Supplements

- 2012:** NSF – IOS (Activation). Integration of odor stimulus features during olfactory processing. \$425,000 (03/01/12 – 02/28/16). \$6000 REU supplement awarded July 2012.
- 2011:** NSF – IOS (Behavioral Systems). Doctoral Dissertation Improvement Grant: Olfactory modulation of thermoregulation and flight in moths. \$10,850; 09/15/11 – 08/31-13
- 2007:** NSF IOB. REU supplement to Genetic control of male moth behavior and olfaction. \$6,000
- 2007:** NSF, IOB. Collaborative research: Discrimination of complex mixtures in olfactory signaling. \$340,000; 05/01/07-04/30/10 (no-cost extension: 04/30/11)
- 2005:** NSF, IOB. REU supplement to Genetic control of male moth behavior and olfaction. \$11,500
- 2004:** NSF, IOB. Genetic control of male moth behavior and olfaction. \$323,095; 07/15/04 – 06/30/07
- 2001:** NIH, NIDCD. Discrimination of complex mixtures in olfactory signaling. \$332,763 (sub-contract); 02/01/01 – 01/31/04 (no-cost extension thru' 07/31/04). (P.I. C.E. Linn Jr. Cornell University. Total award: \$760,263)
- 2000:** NIH, NIDCD, James A. Shannon Director's Award. Discrimination of complex mixtures in olfactory signaling. \$50,000; 04/01/00 – 03/31/01 (P.I. C.E. Linn Jr. Cornell University)
- 2001:** NSF, IBN. REU supplement to Collaborative Research: Neuroethology of olfactory evolution in moths. \$5000
- 1999:** NSF, IBN (Sensory Systems). Collaborative Research: Neuroethology of olfactory evolution in moths. \$265,000; 9/15/99 – 9/14/02 (no-cost extension thru' 08/31/04)
Collaborator: T.C.Baker. \$81,749 awarded separately to Iowa State University
- 1999:** USDA NRICGP seed grant. Behavior and olfaction of courtship pheromones in female heliothine moths. \$46,115; 09/15/99 – 09/14/01 (no-cost extension thru' 09/14/02)

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B. Intramural Research & Equipment Grants

- 2011:** Research Instrumentation Funds (University of Utah). Grant for acquisition of camera for live-cell calcium imaging. \$57,500
- 2005:** Multimodal sensory integration in the moth brain. University of Utah Research Foundation (Seed Grant). \$27,000; 06/01/05 – 05/31/06
- 1999:** Olfactory basis of courtship behavior and female choice in moths. University of Utah Research Foundation (Seed Grant). \$23,874; 06/01/99 – 05/31/01

Bibliography:

Peer-reviewed Articles:

- Crespo JG*, **Vickers NJ** and Goller F. **2014**. Male moths optimally balance take-off thoracic temperature and warm-up duration to reach a pheromone source quickly. *Animal Behaviour* 98:79-85
- Crespo JG*, **Vickers NJ** and Goller F. **2013**. Pre-flight warm-up muscle activation patterns are modulated by female pheromones. *Journal of Neurophysiology* 110:862-871
- Crespo JG*, Goller F and **Vickers NJ**. **2012**. Pheromone induced modulation of pre-flight warm-up behavior in male moths. *Journal of Experimental Biology* 215: 2203-2209
- Crespo JG* and **Vickers NJ**. **2012**. Agglomerular Antennal Lobe Organization in *Columbicola columbae* (Phthiraptera: Ischnocera). *Arthropod Structure and Development* 41:227-230
- Hillier NK* and **Vickers NJ**. **2011**. Hairpencil volatiles influence interspecific courtship and mating between two related moth species. *Journal of Chemical Ecology* 37: 1127-1136
- Hillier NK* and **Vickers NJ**. **2011**. Mixture interactions in moth olfactory physiology: Examining the effects of odorant mixture, concentration, distal stimulation and antennal nerve transection on sensillar responses. *Chemical Senses* 36: 93-108; doi:10.1093/chemse/bjq102
- Gould F, Estock M, Hillier NK*, Powell B, Groot AT, Ward CM, Emerson JL, Schal C, **Vickers NJ**. **2010**. Sexual isolation of male moths explained by a single pheromone response QTL containing four receptor genes. *Proceedings of the National Academy of Science* 107:8660-8665. DOI 10.1073/pnas.0910945107
- Schwarz J, Gries R, Hillier N, **Vickers N** and Gries G. **2009**. Phenology of semiochemical-mediated host foraging by the boxelder bug, *Boisea rubrolineata*, an aposomatic seed predator. *Journal of Chemical Ecology* 35:59-78. DOI 10/1007/s10886-008-9575-3
- Hillier NK* and **Vickers NJ**. **2007**. Physiology and antennal lobe projections of olfactory receptor neurons from sexually isomorphic sensilla on male *Heliothis virescens*. *Journal of Comparative Physiology A*. 193:649-663. DOI 10.1007/s00359-007-0220-3
- Hillier NK*, Kelly D* and **Vickers NJ**. **2006**. A specific male olfactory sensillum detects behaviorally antagonistic hairpencil odorants. *Journal of Insect Science* 7:04, available online: insectscience.org/7.04
- Robbins PS, Alm SR, Armstrong CD, Averill AL, Baker TC, Bauernfiend RJ, Baxendale FP, Braman SK, Brandenburg RL, Cash DB, Couch GJ, Cowles RS, Crocker RL, DeLamar ZD, Dittl TG, Fitzpatrick SM, Flanders KL, Forgatsch T, Gibb TJ, Gill BD, Gilrein DO, Gorsuch CS, Hammond AM, Hastings PD, Held DW, Heller PR, Hiskes RT, Holliman JL, Hudson WG, Klein MG, Krischik VL, Lee DJ, Linn Jr. CE, Luce NJ, MacKenzie KE, Mannion CM, Polavarapu S, Potter DA, Roelofs WL, Royals BM, Salsbury GA, Schiff NM, Shetlar DJ, Skinner M, Sparks BL, Sutschek JA, Sutschek TP, Swier SR, Sylvia MM, **Vickers NJ**, Vittum PJ, Weidman RB, Weber DC, Williamson RC, Villani MG. **2006**. Trapping *Phyllophaga* spp. (Coleoptera: Scarabaeidae: Melolonthinae) with sex attractants in the United States and Canada. 124pp. *Journal of Insect Science* 6:39, available online: insectscience.org/6.39.
- Lee S-G, **Vickers NJ** and Baker TC. **2006**. Glomerular targets of *Heliothis subflexa* male olfactory receptor neurons housed within long trichoid sensilla. *Chemical Senses* 31:821-834. DOI: 10.1093/chemse/bjl025
- Vickers NJ**. **2006**. Inheritance of olfactory preferences. I. Pheromone-mediated behavioral responses of

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- Heliothis subflexa* x *Heliothis virescens* hybrid males. *Brain, Behavior and Evolution* 68:63-74
- Baker TC, Quero C, Ochieng' SA and **Vickers NJ**. 2006. Inheritance of olfactory preferences. II. Olfactory receptor neuron responses from *Heliothis subflexa* x *Heliothis virescens* hybrid males. *Brain, Behavior and Evolution* 68:75-89
- Vickers NJ**. 2006. Inheritance of olfactory preferences. III. Processing of pheromonal signals in the antennal lobe of *Heliothis subflexa* x *Heliothis virescens* hybrid males. *Brain, Behavior and Evolution* 68:90-108
- Vetter RS, Millar JG, **Vickers NJ** and Baker TC. 2006. Mating disruption of carob moth, *Ectomyelois ceratoniae*, with a sex pheromone analog. *Southwestern Entomologist* 31:33-47
- Hillier NK*, Kleineidam C* and **Vickers NJ**. 2006. Physiology and glomerular projections of olfactory receptor neurons on the antenna of female *Heliothis virescens* (Lepidoptera: Noctuidae) responsive to behaviorally relevant odors. *Journal of Comparative Physiology A*. 192:199-219. (published on-line: 25 Oct. 2005)
- Vickers NJ**, Poole K and Linn Jr. CE. 2005. Plasticity in central olfactory processing and pheromone blend discrimination following inter-species antennal imaginal disc transplantation. *Journal of Comparative Neurology* 491:141-156
- Hillier NK* and **Vickers NJ**. 2004. The role of heliothine hairpencil compounds in female *Heliothis virescens* (Lepidoptera: Noctuidae) behavior and mate acceptance. *Chemical Senses* 29:499-511
- Baker TC, Ochieng' SA, Cossé AA, Lee S-G, Todd JL, Quero C and **Vickers NJ**. 2004. A comparison of responses from olfactory receptor neurons of *Heliothis subflexa* and *Heliothis virescens* to components of their sex pheromone. *Journal of Comparative Physiology A*. 190:155-165
- Vickers NJ**, Poole K and Linn Jr. CE. 2003. Consequences of interspecies antennal imaginal disc transplantation on organization of olfactory glomeruli and pheromone blend discrimination. *Journal of Comparative Neurology* 466:377-388
- Ochieng' SA, Poole K, Linn Jr. CE, **Vickers NJ**, Roelofs WL and Baker TC. 2003. Unusual pheromone receptor neuron responses in heliothine moth antennae derived from inter-species imaginal disc transplantation. *Journal of Comparative Physiology A*. 189:19-28
- Vickers NJ** and Christensen TA. 2003. Functional divergence of spatially conserved olfactory glomeruli in two related moth species. *Chemical Senses* 28:325-338
- Vickers NJ**. 2002. Defining a synthetic pheromone blend attractive to male *Heliothis subflexa* under wind tunnel conditions. *Journal of Chemical Ecology* 28: 1267-1279
- Vickers NJ**, Christensen TA, Baker TC and Hildebrand JG. 2001. Odour-plume dynamics influence the brain's olfactory code. *Nature* 410: 466-470
- Vickers NJ** Christensen TA and Hildebrand JG. 1998. Combinatorial odor discrimination in the brain: attractive and antagonist odor blends are represented in distinct combinations of uniquely identifiable glomeruli. *Journal of Comparative Neurology* 400: 35-57
- Vickers NJ** and Baker TC. 1997. Flight of *Heliothis virescens* males in the field in response to sex pheromone. *Physiological Entomology* 22: 277-285
- Vickers NJ** and Baker TC. 1997. Correlation between diminished responses to point source plumes and single filaments similarly tainted with a behavioral antagonist. *Journal of Comparative Physiology A*. 180: 523-536
- Vickers NJ** and Baker TC. 1996. Latencies of behavioral response to interception of filaments of sex pheromone and clean air influence flight track shape in *Heliothis virescens*(F.) males. *Journal of Comparative Physiology A*. 178: 831-847
- Vickers NJ** and Baker TC. 1994. Reiterative responses to single strands of odor promote sustained upwind flight and odor source location by moths. *Proceedings of the National Academy of Science* 91: 5756-5760
- Vickers NJ** and Baker TC. 1994. Visual feedback in the control of pheromone-mediated flight of *Heliothis virescens* males. *Journal of Insect Behavior* 7: 605-632
- Vickers NJ** and Baker TC. 1992. Male *Heliothis virescens* sustain upwind flight in response to experimentally pulsed filaments of their sex pheromone. *Journal of Insect Behavior* 5: 669-687

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- Vickers NJ** and Baker TC. **1991**. The effects of unilateral antennectomy on the flight behaviour of male *Heliothis virescens* in a pheromone plume. *Physiological Entomology* 16: 497-506
- Vickers NJ**, Christensen TA, Mustaparta H and Baker TC. **1991**. Chemical communication in Heliothine moths. III. Flight behavior of male *Helicoverpa zea* and *Heliothis virescens* in response to varying ratios of intra- and interspecific sex pheromone components. *Journal of Comparative Physiology A* 169: 275-280
- Löfstedt C, **Vickers NJ** and Baker TC. **1990**. Courtship, pheromone titre and determination of the male mating success in the Oriental fruit moth, *Grapholita molesta* (Lepidoptera: Tortricidae). *Entomologia Generalis* 15: 121-125
- Löfstedt C, **Vickers NJ**, Roelofs WL and Baker TC. **1989**. Diet related courtship success in the Oriental fruit moth, *Grapholita molesta* (Tortricidae). *Oikos* 55: 402-408

(author* = trainee in Vickers lab).

Book Chapters and Invited Reviews:

- Lei H and **Vickers NJ**. **2008**. Central processing of natural odor mixtures in insects. *Journal of Chemical Ecology* 34: 915-927.
- Vickers NJ**. **2006**. Winging it: moth flight behavior and responses of olfactory neurons are shaped by pheromone plume dynamics. *Chemical Senses* 31:155-166 (published on-line 8 Dec. 2005).
- Vickers NJ**. **2000**. Mechanisms of animal navigation in odor plumes. *Biological Bulletin* 198: 203-212.
- Vickers NJ**. **1999**. The effects of chemical and physical features of pheromone plumes upon the behavioral responses of moths. In R.E. Johnston et al. (eds.) *Chemical Signals in Vertebrates*. Kluwer Academic/Plenum Publishers, New York, pp.63-76.
- Vickers NJ**, Christensen TA and Hildebrand JG. **1998**. Integrating behavior with neurobiology: Odor mediated moth flight and olfactory discrimination by glomerular arrays. *Integrative Biology* 1: 224-230.
- Vickers NJ**, Christensen TA and Hildebrand JG. **1998**. Primary processing of pheromone odours: the functional organization of the macroglomerular complex in heliothine moths. *The Biochemist* 20:22-25.
- Vickers NJ** and Christensen TA. **1998**. A combinatorial model of odor discrimination using a small array of contiguous, chemically-defined glomeruli. In C. Murphy (ed.) *Olfaction and Taste XII: An International Symposium*. Annals of the New York Academy of Sciences 855: 514-516.
- Baker TC and **Vickers NJ**. **1997**. Pheromone-mediated flight in moths. In R.T. Cardé and A. Minks (eds.) *Insect Pheromone Research: New Directions*. Chapman and Hall, New York, pp.248-264.
- Baker TC and **Vickers NJ**. **1994**. Behavioral reaction times of male moths to pheromone filaments and visual stimuli: determinants of flight track shape and direction. In K. Kunhara, N. Suzuki, and H. Ogawa (eds.) *Olfaction and Taste XI*. Springer-Verlag, Tokyo, pp. 838-841.

Published Book Reviews:

- Vickers NJ** and Hiller NK. **2007**. Review: Methods in insect sensory neuroscience. *Quarterly Review of Biology* 82: 57.
- Vickers NJ**. **2004**. Review: Pheromones and animal behaviour: communication by smell and taste. *Journal of Chemical Ecology* 30: 881-882.
- Vickers NJ**. **2000**. Review: Insect olfaction. *Trends in Neuroscience* 23: 379.

Published Abstracts.

- Vickers NJ**. **2000**. Divergence of pheromone blends and olfactory processing in Heliothine moths. *ISOT/ECRO 2000*, p. 212.
- Jansma PL, Landis MA, Hansen LC, Merchant NC, **Vickers NJ** and Tolbert LP. **1997**. The use of data explorer as a 3-D reconstruction tool for microscopy data sets. *Microscopy and Microanalysis* 3,

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supplement 2: 1131-1132.

- Vickers NJ** and Baker TC. **1996.** The effects of plume fine-scale structure upon pheromone-mediated behaviors of male moths. *Proceedings of the XX International Congress of Entomology*, p.739.
- Vickers NJ** and Christensen TA. **1996.** Comparing the Functional and Anatomical Features of Odorant-Defined Glomeruli in Two Closely-Related Insect Species. *Chemical Senses* **21:** 684.
- Vickers NJ** and Baker TC. **1995.** Neuroethology of Attraction and Inhibition of Two Species of Heliothine Moth in Pheromone Plumes Tainted with Antagonistic Compounds. In M. Burrows et al. (eds) *Nervous Systems and Behavior, Proceedings of the 4th International Congress of Neuroethology*, p.400.
- Christensen TA, Mustaparta H, **Vickers NJ** and Hildebrand JG. **1995.** Same Input, Different Output: Two Strategies for Encoding Olfactory Information in the Brains of Two Closely-Related Heliothine Moths. In M. Burrows et al. (eds) *Nervous Systems and Behavior, Proceedings of the 4th International Congress of Neuroethology*, p.399

Invited Talks:

- University of Konstanz Germany July 2013. Odor Signals and Moth Behavior
- Science Night Live, Salt Lake City January 2013. Smell: Picking Insect Noses
- Würzburg, Germany July 2012. International Symposium. Olfaction in Insects Under Debate. Processing Olfactory Information in Higher Brain Centers of the Moth.
- Royal Entomological Society (Chatham, U.K.) September 2011. International Symposium – Chemical Ecology: Reception, Detection, Deception. Manipulating Moth Olfactory Pathways Provides Insights into Odour Perception.
- International Society of Neuroethology (Salamanca, Spain) August 2010. Symposium: Chemosensation Sexual Behaviors. Chemosensory contributions to moth pheromone-mediated behavior.
- Gordon Research Conference ‘Floral and Vegetative Odors’ (Oxford University) August 2009. Moving volatile mixtures in perceptual space: moth olfaction.
- Snowbird Neuroscience Symposium: ‘Genetic Models of Behavior’ October 2008. Shifting odors: mechanisms underlying divergence in male moth olfactory preferences
- Department of Neurobiology and Behavior, Cornell University, September 2007. Olfactory communication in moths: evolving novel blends and new preferences.
- Department of Biology, University of Utah, September 2007. The moth brain: Making sense from a symphony of information.
- Gordon Research Conference, Big Sky, Montana, August 2006. From scents to sense: odor plumes, brains and behavior.
- CNS-MMX, Bäckaskog Slott, Sweden, May 2006. Sex pheromones: evolving preferences and processing.
- Max Planck Institute for Chemical Ecology, Jena, Germany, February 2005. Chemical communication: picking the moth brain. Presented in New Directions in Plant-Insect Interactions Symposium
- Modulation of Chemosensory Signaling, Jackson Hole, January 2005. Antennal imaginal disc transplantation: insights into modulatory events.
- Entomological Society of America, November 2004. Dissecting the olfactory system with antennal imaginal disc transplants across species. Presented in Odorant Receptors and Plasticity of the Olfactory System Symposium.
- Biozentrum, University of Würzburg, Germany, July 2004. Sexual scents and the discriminating male moth brain.
- Department of Crop Science, Swedish University of Agricultural Sciences, October 2003. Sexual scents and the discriminating male moth brain.
- Department of Biology, University of Utah, September 2003. Sexual scents and the discriminating male moth brain.
- Department of Biology (Brown Bag Informal Seminar), University of Utah, July 2003. Sex smells: Why

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- pick the noses of bugs?
- AChemS, April 2003. 25 years of social communication: the relevance of behavioral studies to advances in the chemical senses. (Presented in AChemS – 25th Anniversary Symposium: Perspectives on the Chemical Senses)
- Department of Entomology, North Carolina State University, February 2002. Sensing scents: Picking the brains of moths.
- International Society of Chemical Ecology, Lake Tahoe, July 2001. Poking a nose in where it doesn't belong: effects of interspecific antennal transplants on olfaction.
- Department of Mathematics, University of Utah, November 2000. Love is in the air: moth pheromones and flight.
- Department of Biology, University of Utah, September 2000. Olfactory processing: picking the brains of heliothine moths.
- Department of Mechanical Engineering, University of Utah, March 1999. Pheromone, filaments and flying EAGs: Upwind flight and moth olfaction.
- Western Society of Naturalists, San Diego, December 1998. Chemical communication and orientation by flying insects.
- ARL, Division of Neurobiology, University of Arizona, October 1998. The neuroethology of pheromone discrimination in noctuid moths.
- Department of Entomology, Purdue University, Indiana, April 1998. Attraction by olfaction: the neuroethology of pheromone-mediated moth flight behavior.
- 2nd International Symposium on Insect Pheromones, Wageningen, Holland, March 1998. Functional organization of the macroglomerular complex in heliothine moths.
- Department of Biology, University of Utah, March 1998. Attraction by olfaction: the neuroethology of moth pheromone-mediated flight.
- Division of Insect Biology, U.C. Berkeley, February 1998. The role of arrays of olfactory glomeruli in moth pheromone-mediated flight.
- Neuroscience Community "Datablitz", University of Arizona, February 1998. Activity in arrays of olfactory glomeruli and the flight behavior of moths.
- National Center for Agricultural Utilization Research, Peoria, Illinois, January 1998. Attraction by olfaction: the behavior and brains of heliothine moths.
- DARPA/ONR Workshop on Plume Tracing and Odor Source Localization, Woods Hole, December 1997. I. Behavioral responses of moths to fine-scale plume structure. II. Olfactory processing of temporal and chemical features of odor plumes by moths.
- Chemical Signals in Vertebrates VIII, Cornell University, July 1997. Temporal and chemical features of pheromone plumes and the neuroethology of moth responses.
- Department of Entomology, U. C. Riverside, March 1997. Attraction by olfaction: neurobiology of male moth MGCs.
- XX International Congress of Entomology, Florence, August 1996. The effects of plume fine-scale structure upon pheromone-mediated behaviors of male moths.
- Imperial College, London, September 1994. Filaments, pheromone, and flying EAGs. The ONs and OFFs of pheromone-mediated flight.
- USDA IAABBRL, Gainesville, Florida, April 1994. Filaments and flying EAGs: The neuroethology of pheromone-mediated flight in *Heliothis virescens* males.
- AChemS Annual meeting, Sarasota, Florida, April 1994. Reiterative responses to single strands of odor promote sustained upwind flight and odor source location by moths.
- Nebraska Behavioral Biology Group, Creighton University, Omaha, April 1994. Filaments and flying EAGs: The neuroethology of pheromone-mediated flight in male moths.
- Department of Entomology, Iowa State University, September 1993. Filaments and flying EAGs: The pheromone-mediated flight of male *Heliothis virescens*.
- ARL, Division of Neurobiology, University of Arizona, June 1993. Pheromone-mediated flight behaviors of the tobacco budworm.

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Department of Entomology, U.C. Riverside, November 1992. Pheromone-mediated flight in *Heliothis virescens*.

Voluntary or submitted conference talks (presented by N.J. Vickers):

- Entomological Society of America (ESA), Reno, 2008. An integrative approach to understanding divergence in male moth pheromone preference.
- Biology Retreat, Snowbird, October 2005. Gone with the wind: locating an odor source under variable visual conditions.
- Biology Retreat, The Canyons, August 2001. Poking a nose in where it doesn't belong.
- Neuroscience mini-symposium, Snowbird, October 2000. Odor-blend discrimination in two closely-related moth species.
- Biology Retreat, Alta, October 1998. The smell of 'fear' omnes by scrambled bug brains.
- International Symposium on Olfaction and Taste XII/Association for Chemoreception Sciences XIX, San Diego, July 1997. A combinatorial model of odor discrimination using a small array of contiguous, chemically-defined glomeruli.
- ESA, Las Vegas, December 1995. Comparative physiology and morphology of pheromone-processing projection interneurons in two species of Heliothine moth.
- ESA, Dallas, December 1994. Pheromone-mediated flight in *Heliothis virescens*: Effects of filament concentration and blend quality.
- ESA, Indianapolis, December 1993. Frequency of sex pheromone filament contact determines straight versus zigzagging upwind flight in *Heliothis virescens*.
- ESA, Baltimore, December 1992. Correlation between electroantennogram activity and pheromone-mediated flight in the tobacco budworm.
- ESA, Reno, December 1991. The neuroethology of pheromone response in male *Heliothis virescens*.
- ESA, New Orleans, December 1990. Experimentally generated pheromone plume structure affects male *Heliothis virescens* flight behavior.
- International Chemoreception Workshop on Insects (ICWI), Kauai, October 1990. An experimentally generated plume reveals interesting aspects of odor perception in *Heliothis virescens*.
- ESA, San Antonio, December 1989. Aspects of the visual control of flight during pheromone-mediated upwind progress in *Heliothis virescens*.
- ESA, Louisville, December, 1988. Pheromone-mediated flight control in *Heliothis virescens*.
- ICWI, San Diego, October, 1988. Antennal ablation and its effect on upwind progress in male *Heliothis virescens*.

Co-authored talks (presenter indicated by *):

- Entomological Society of America, Ft. Lauderdale, December 2005. Olfactory receptor neuron responses from *Heliothis subflexa* x *Heliothis virescens* hybrid males. Baker TC*, Quero C, Ocheing' S, Vickers NJ.
- European Symposium on Insect Taste and Olfaction, Sardinia, Italy, November 2005. Behavior and ORN responses of hybrid heliothine moths explained by co-expression of two sex pheromone receptors on a single type of ORN. Baker, TC* and Vickers, NJ.
- International Society for Chemical Ecology, Washington, D.C., August 2005. Heliothine moth olfaction. Baker TC*, Vickers NJ, Lee S-G
- AChemS, Sarasota, April 2003. Processing of odor blends in the insect antennal lobe. Kleineidam C*, Linn Jr. CE, Vickers NJ.

Poster Presentations:

Association for Chemoreception Sciences (Sarasota, Florida).

- April 2010. Lee SG, Poole KR, Linn, Jr. CE, Vickers NJ. Behavioral and olfactory consequences of slipping imaginal discs between two moth species.

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- April 2006. Hillier NK, Hamilton J, Horovitz J, Vickers NJ, Gould FL. Shifts in the use of two aldehydes and the evolution of olfactory communication in heliothine moths.
Lee S, Carlsson MA, Hansson BS, Vickers N, Baker TC. Comparative functional morphology of male-specific glomeruli in two heliothine moth species, *Helicoverpa zea* and *Heliothis subflexa*.
- April 2005. Hillier NK, Vickers NJ, Groot AT, Bennett J, Gould FL. A simple shift in peripheral olfactory specificity is associated with divergent male moth behavioral preference.
- April 2004. Hillier NK, Vickers NJ, Linn C. Inter- and intra-species antennal imaginal disc transplants: behavior, sensory and central olfactory neurophysiology.
Vickers NJ, Hillier K, Groot A, Gould F. Olfactory communication: evolving new blends and novel preferences.
- April 2003. Vickers NJ. Genetic control of olfactory characteristics in male moths.
Hillier NK and Vickers NJ. The role of heliothine hairpencil compounds in female *Heliothis virescens* behavior and mating.
- April, 2002. Kleineidam C, Linn Jr. CE, and Vickers NJ. Representation of pheromone blends by projection neurons in heliothine moths.
- April, 2001. Linn Jr. C and Vickers N. Effect of antennal grafts between two moth species on olfactory processing of sex pheromones.
- April, 1999. Vickers NJ, Christensen TA, Baker TC and Hildebrand JG. Odor plume structure and dynamics: electrophysiological measurement and central processing.
- April, 1998. Vickers NJ and Christensen TA. Temporal structure of pheromone plumes: simultaneous recordings from electroantennograms and single projection neurons in the antennal lobes of male moths.[#]
- April, 1996. Vickers NJ and Christensen TA. Comparing the Functional and Anatomical Features of Odorant-Defined Glomeruli in Two Closely-Related Insect Species.
- April, 1995. Vickers NJ, Mafra-Neto A and Baker TC. Inhibition of upwind flight in a pheromone plume tainted with a behavioral antagonist is correlated with deformed responses to single filaments.
- April, 1994. Vickers NJ and Baker TC. Reiterative responses to single strands of odor promote sustained upwind flight and odor source location by moths.

Entomological Society of America

Austin, November 2013

Crespo JC, Vickers NJ and Goller F. Influence of ambient temperatures on the pre-flight and flight activities of pheromone-stimulated male moths

Reno, November 2008

Lee SG, Poole K, Linn Jr CE, Vickers NJ. Sex pheromone information processing in interspecies antennal imaginal disc transplants

Salt Lake City, November 2004

Hillier K, Vickers N. Physiology and glomerular projections of olfactory receptor neurons on the antenna of female *Heliothis virescens* (Lepidoptera:Noctuidae) responsive to behaviorally relevant odors.

Vickers NJ, Hillier K, Groot A, Gould F. Olfactory communication: evolving new blends and novel preferences.

San Diego, December 2001

Vickers NJ. Heritable characteristics influence olfactory discrimination by hybrid moths.

Montréal, December 2000

Vickers NJ. Courtship pheromones: behavior and olfaction in heliothine moths.

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Linn Jr. C, Vickers N. and Roelofs WL. Effect of antennal grafts between two moth species on olfactory processing of sex pheromones.**

Goettingen Conference (2003)

Kleineidam C, Vickers NJ and Linn CE. Lateral inhibition in the insect antennal lobe.

International Congress of Neuroethology

College Park, MD, August 2012

Crespo JC, Vickers NJ, Goller F. Recruitment of motor units in flight muscles accounts for pheromone-mediated modulation of pre-flight heating rates in male moths.

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Vancouver, BC, Canada, July 2007

Vickers NJ, Hillier K, Estock M, Katz R, Gould F. Shifting odors: mechanisms underlying divergence in male moth pheromone preference.

San Diego, CA, August 1998

Vickers NJ and Christensen TA. Integrating the chemical and temporal features of odor plumes in the insect olfactory system.

Cambridge, England, September, 1995

Vickers NJ and Baker TC. Neuroethology of Attraction and Inhibition of Two Species of Heliothine Moth in Pheromone Plumes Tainted with Antagonistic Compounds.*

Christensen TA, Mustaparta H, Vickers NJ and Hildebrand JG. Same Input, Different Output: Two Strategies for Encoding Olfactory Information in the Brains of Two Closely-Related Heliothine Moths.*

Society for Neuroscience

San Diego, October 2004

Fogarty CM, Vickers NJ. Lateral and medial cell body olfactory projection neurons in the moth antennal lobe: a morphological and physiological comparison.

New Orleans, November 2003

Fogarty CM and Vickers NJ. Integration of visual and olfactory cues during upwind flight by male heliothine moths.

Vickers NJ, Hillier K and Linn CE. Similar olfactory but different behavioral outcomes from inter- and intra-species antennal imaginal disc transplants.

Orlando, November 2002

Fogarty CM and Vickers NJ. Latency to casting after loss of an odor plume is affected by visual feedback.

Vickers, NJ and Linn Jr. CE. Processing of pheromone blends in the olfactory lobe following inter-species imaginal disc transplantation.

O'Chieng SA, Poole K, Linn C, Vickers N, Roelofs W and Baker T. Unusual pheromone receptor neuron responses in moth antennae derived from inter-species transplantation of antennal imaginal discs.

New Orleans, November 2000

Linn Jr. C, Vickers N and Roelofs WL. Effect of antennal grafts between two moth species on olfactory processing of sex pheromones.

International Society of Chemical Ecology

Lake Tahoe, July 2001

Vickers NJ. Heritable characteristics influence olfactory discrimination by hybrid moths.[§]

Jena, Germany July 2007

Hillier NK, Vickers NJ, Estock M, Katz R, Gould FL. Mechanisms of olfactory preference: divergence of pheromone attraction in male moths

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ISOT/ECRO Joint meeting (Brighton, UK, July 2000)

Vickers NJ. Divergence of pheromone blends and olfactory processing in Heliothine moths. **

Society for Integrative and Comparative Biology

Austin, January 2014

Crespo JC, Vickers NJ and Goller F. Influence of ambient temperatures on the pre-flight and flight activities of pheromone-stimulated male moths

Charleston, SC, January 2012

Crespo JC, Vickers NJ, Goller F. Female pheromones modulate muscle activation patterns for pre-flight warm-up in male moths.

Salt Lake City, January 2011

Crespo JC, Goller F, Vickers NJ. Olfactory modulation of pre-flight shivering behavior in male moths. (Winner best poster presentation in the Comparative Physiology & Biochemistry Division)

Lee S-G, Linn Jr. CE, Poole K, Vickers NJ. Behavioral and physiological studies of sex pheromonal olfaction in interspecific antennal imaginal disc transplants.

also presented at Western Nerve Net, Tucson, AZ (Apr. 1998) and Intermountain Chapter of SFN, Salt Lake City, UT (Nov. 1998).

* also presented at The International Symposium on Neurons, Networks, and Motor Behavior (Nov. 1995) and Arizona Neuroscience 1996 (Jan. 1996). Tucson, AZ

** also presented at Chemosensory visualization workshop. Jackson Hole, WY. Feb. 2001.

§ also presented at Intermountain Chapter for SFN. Provo, UT. Oct. 2001.

Scientific Memberships and Affiliations (current)

2010 Society for Integrative and Comparative Biology

1998 Program in Neuroscience, University of Utah

1998 Genetics Training Grant, University of Utah (participant)

1995 International Society of Neuroethology

1991 Sigma Xi

1987 Associate of the Royal College of Science

Teaching:

Classes Taught:

Biology 7964, Advanced Topics in Ecology & Evolution 2010 – present: Behavioral mechanisms.

Biology 7963-2, Graduate Core Seminar Fall 1999: “Sixth Senses” in Animals, an integrative discussion of specialized sensory capabilities. 7 participants (co-taught with Dr. Franz Goller).

Biology 7963-1, Graduate Core Seminar Spring 1999: Animal Communication: Physiology, Behavior, Ecology, and Evolution. 15 participants (co-taught with Dr. Franz Goller).

Biology 3325, Comparative Physiology Laboratory. 2002 – present (Spring semester). 3 credit laboratory course. Stand-alone laboratory course, includes lecture and discussion sections as well as laboratory period each week.

Biology 3320, Comparative Physiology. 2000-2001. 3 credit lecture course.

Spring 2000 (co-taught with Dr. David Carrier); Spring 2001 (co-taught with Dr. Franz Goller)

Biology 3325, Comparative Physiology Laboratory. 2000-2001. 1 credit laboratory course.

Spring 2000 (co-taught with Dr. David Carrier); Spring 2001 (co-taught with Dr. Franz Goller).

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Trainees:

Post-Doctoral Students:

Christoph Kleineidam, Ph.D. (University of Würzburg, Germany). August 2001-December 2002.

Current position: Lecturer (non-tenure track), University of Konstanz, Germany

N. Kirk Hillier, Ph.D. (Memorial University, Newfoundland, Canada). October 2001- June 2007.

Current position: Assistant Professor (tenure-track), Dept. of Biology, Acadia University, Canada.

Seong-Gyu Lee, Ph.D. 2007 (Penn State University). August 2007 – April 2014.

José G. Crespo, Ph.D. 2014 (University of Utah). January 2014 – present.

Graduate Students:

Doctoral Students:

Christine Fogarty-Celestino B.S. SUNY Geneseo 2000. (Neuroscience Program, Graduate Research Fellowship 2003-2004), June 2001-August 2006. Current position: High-school science teacher.

Recipient of 2015 Governor's Medal of Science (education)

José G. Crespo August 2007 – December 2013.

Neuroscience Program Rotation students: Fred Federer, Christine Fogarty, Paula Lombardo, Linda Kübler, Arie Sitthichai.

Post-graduate students:

Matthew Pond (George Washington Medical School), Paul Dunlavy (Medical School), Allison Locatelli, Lindsey Enright, Jeffery Stagg

Undergraduate Students:

Alan Pack, Brooke Rhead, Harmony Baldwin (BioURP), David Kelly (BioURP, Steven D. Durrant Scholarship, Golden Key Scholarship), Keri Swearingen, James Celestino, Kim Iceman (BioURP, Biology Dept. Scholarship 2003-2004, 2004-2005, currently Assistant Professor, Valparaiso University), Brittany Sweeten, Mara Grimes-Graeme, June-woo Park, Christine Sembrano, Katy Schramm, Heidi Paine (BioURP), Alyssa Draper, Meggan McDowell (ACCESS), Jeffery Stagg, Madison Finch, Nathan Smith, Laura Slusser (ACCESS), Dustin Ragland

High School Students:

Elena Gradillas (summer 2001, graduated UCSD 2006); Shawn Komlos (summer 2003, currently at University of Utah), Molly Wheeler (summer 2006, 2007, graduated University of Utah 2013), Cesia Dominguez

Visiting Scholars:

Yongjun Du, Wenzhou Medical College, China. February 2011. Single cell electrophysiology

Henry Fadamiro, Auburn University. 2007. Single cell electrophysiology.

Service Activities:

Opponent for examination of Mikael Carlsson Ph.D. dissertation, October 2003: A sensory map of the odour world in the moth brain. Swedish University of Agricultural Sciences, Alnarp, Sweden.

Reviews for RPT Decisions:

Cornell University (1), University of Oklahoma (1), Swedish University of Agricultural Sciences (1).

Committees:

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Graduate Student Committees. (Ph.D. in Biology unless stated):

Ph.D.: Jose Crespo (graduated 2014, Chair), Fred Federer (Neuroscience, graduated 2010), Christine Fogarty (Neuroscience, Chair; graduated 2006), Richard Green (graduated 2003), Thomas Hills (graduated 2002), Elizabeth Jarrell (left program 2008), Mark Lehmkuhle (Bioengineering, graduated 2004), Dukgun Kim (MS: July 2008), Stephen Odom (current), Stephanie Plamondon (Neuroscience, graduated 2007), Craig Walker (graduated 2006), Rebecca Walter (graduated 2007), Sara Zala (graduated 2003).

Departmental. General: Admissions (co-chair, 2006 – 2007), Auxiliary Faculty Oversight (2007), BioURP Steering (2003-2004, 2005-present), Curriculum (1999-2001), Communications (2001-2003), Computer (2002-2004), Executive (2004-2005, 2007), Safety (2003-2006), Teaching Labs (Spring 2005-2007)

Search Committees: Biochemistry Search (2000-2001), EEOP (2004-2005).

College of Science: Convocation Committee - Biology Representative (2003), Science Day (Biology representative, 2007)

Campus: Interdepartmental Program in Neuroscience, Graduate Admissions (1999-2006, co-chair 2000, chair 2001-2006).

Seminar Speakers Hosted:

<u>Biology</u>	Dr. Yehuda Ben-Shahar, Biology, Washington University (March 2011) Dr. Bill Hansson, Evolutionary Neuroethology, Max Planck Institute, Jena, Germany (Spring 2007) Dr. Karen Mesce, Entomology and Neuroscience, U. Minnesota (Spring 2006) Dr. Robert Raguso, Biological Sciences, U. South Carolina (Spring 2005) Dr. Fred Gould, Entomology, NCSU (Spring 2003) Dr. Richard Zimmer, Biology, UCLA (Spring 2000)
<u>Neuroscience</u>	Dr. Tom Christensen, Neurobiology, U. Arizona (Spring 2005) Dr. John Hildebrand, Neurobiology, U. Arizona (Spring 2001)

Grant Review Panels:

NSF, IOS – Activation pre-proposal panel (virtual panel). March 2014. Written reviews of 17 proposals. Total # of pre-proposals reviewed by panel: 62.

NSF, IOS – Activation pre-proposal panel. March 2013. Written reviews of 16 proposals. Total # of pre-proposals reviewed by panel: 91.

NSF, IOS – Neural Systems Cluster CAREER panel (virtual panel due to Hurricane). October 2012. Written reviews of 11 proposals. Total # of grants reviewed by panel: 60

NSF, IOS – Activation pre-proposal panel (virtual panel). March 2012. Written reviews of 19 pre-proposals. Total # of pre-proposals reviewed by panel: 32

NIH, CSR – Vector Biology. October 2010. Written reviews of 4 grants. Total # of grants reviewed by panel: 49

NSF, October 2007. Written reviews of 11 grants. Total # of grants reviewed by panel: 76

USDA, Organismal and Population Biology of Arthropods and Nematodes. March 2007. Written reviews of 17 grants. Total # of grants reviewed by panel: 100

USDA, Organismal and Population Biology of Arthropods and Nematodes. April 2006. Written reviews of 15 grants. Total # of grants reviewed by panel: 93

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Ad hoc manuscript and grant proposal reviews (since 1998):

Original contributions:

Over 125 articles peer reviewed for journals including Biological Bulletin, Brain Behavior & Evolution, Cell & Tissue Research, Chemical Senses, European Journal of Neuroscience, J. Chem. Ecol., J. Comp. Neurol., J. Comp. Physiol. A, J. Economic Entomology, J. Experimental Biology, J. Insect Behavior, J. Insect Physiology, J. Neurophysiology, J. Neuroscience, Physiology and Behavior, PLoS – One, Proceedings of the National Academy of Science, Proceedings of the Royal Society B, Science

Grant Proposals: ad-hoc review (number of proposals reviewed in parentheses):

Great Lakes Fisheries Commission (1)

NSF – various Directorates (15)

USDA (2), USDA-SBIR (1)

Other Activities (in chronological order):

BioLuminaries seminar organizer: series of talks by Biology alumni aimed at providing career information to current Biology undergraduates (2012 – 2013, 2014 – 2015)

Sterling Scholar judge (February 2013, 2014, 2015)

Salt Lake Valley Science and Engineering Fair Judge (Dept. of Biology scholarship): 2009 - 2013

Science Overnight orientation: 2009, 2010, 2011, 2012

Academy of Math, Engineering and Science High School, science fair judge (Chair) March 2006 – 2010

College of Science Day: Workshop

Animal Orientation 2010

Making Sense of Scents 1999, 2000, 2001

Organizing Committee. Modulation of Chemosensory Signaling, Jackson Hole, WY Jan 2005

Chair, Local Arrangements Committee, Entomological Society of America Pacific Branch Meeting, Park City, June 24-27th, 2001.