

CURRICULUM VITAE

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ACADEMIC TRAINING

<u>INSTITUTION/LOCATION</u>	<u>DEGREE</u>	<u>DATES</u>	<u>FIELD OF STUDY</u>	<u>MENTOR</u>
University of Florida	Postdoctoral	1982-1984	Neuroscience	Barry Ache
Boston University	Ph.D.	1977-1982	Biology	Jelle Atema
Duke University	--	Spring 1976	Marine Biology	
University of North Carolina	B.S.	1972-1976	Biology	

PROFESSIONAL EXPERIENCE

Regents' Professor	Neuroscience and Biology, GSU	2008-present
Professor	Biology, GSU	1995-2008
Associate Professor	Biology, GSU	1990-1995
Assistant	Biology, GSU	1985-1990
Adjunct Faculty,	Bermuda Institute of Ocean Sciences	1996-2004
Postdoctoral Fellow	Whitney Laboratory, Univ. of Florida	1982-1984
Research/Teaching Assistant	Boston University	1978-1981
Research Technician	Dept. Medicine, Univ. of North Carolina	1976-1977

RESEARCH / PROFESSIONAL DEVELOPMENT

PUBLICATIONS

Journal Primary Articles

Submitted

Ernst, D.A., R.R. Fitak, M. Schmidt, C.D. Derby, S. Johnsen, and K.J. Lohmann. Pulse magnetization elicits differential gene expression in the spiny lobster central nervous system. (submitted to *J. Comp. Physiol. A*)

Published

128. Kozma, M.T., M. Schmidt, H. Ngo-Vu, S. Sparks, A. Senatore, and C.D. Derby. 2018. Chemoreceptor proteins in the Caribbean spiny lobster, *Panulirus argus*: expression of Ionotropic Receptors, Gustatory Receptors, and TRP channels in two chemosensory organs and brain. **PLoS ONE** 13(9): e0203935. <https://doi.org/10.1371/journal.pone.0203935>
127. Derby, C.D., A. Bharadwaj, and G. Chamberlain. 2018. Development of a sustainable natural chemostimulant for shrimp feed. **AquaFeed** 10: 39-43.
126. Santiago, A.J., M.N.A. Ahmed, S.-L. Wang, K. Damera, B. Wang, P.C. Tai, E.S. Gilbert, and C.D. Derby. 2016. Inhibition and dispersal of *Pseudomonas aeruginosa* biofilms by combination treatment of escapin intermediate products and hydrogen peroxide. **Antimicrob. Agents Chemother.** 60: 5554-5562.
125. Derby, C.D., F.H. Elsayed, S.A. Williams, C. González, M. Choe, A.S. Bharadwaj, and G.W. Chamberlain. 2016. Krill meal enhances performance of feed pellets through concentration-dependent prolongation of consumption by Pacific white shrimp, *Litopenaeus vannamei*. **Aquaculture** 458: 13–20. doi:10.1016/j.aquaculture.2016.02.028
124. Kamio, M., M. Schmidt, M.W. Germann, J. Kubanek, and C.D. Derby. 2014. The smell of moulting: *N*-acetylglucosamino-1,5-lactone is a moulting biomarker and candidate courtship signal in the urine of the blue crab, *Callinectes sapidus*. **J. Exp. Biol.** 217: 1286-1296.
123. Tadesse, T., C.D. Derby, and M. Schmidt. 2014. Mechanisms underlying odor-induced and spontaneous calcium signals in olfactory receptor neurons of spiny lobsters, *Panulirus argus*. **J. Comp. Physiol. A** 200: 53-76.
122. Derby, C.D., M. Tottempudi, T. Love-Chezem, and L.S. Wolfe. 2013. Ink from longfin inshore squid, *Doryteuthis pealeii*, as a chemical and visual defense against two predatory fishes, summer flounder, *Paralichthys dentatus*, and sea catfish, *Ariopsis felis*. **Biol. Bull.** 225: 152-160. [“Editor’s Pick” for this issue]
121. Love-Chezem, T., J.F. Aggio, and C.D. Derby. 2013. Defense through sensory inactivation: sea hare ink reduces sensory and motor responses of spiny lobsters to food odors. **J. Exp. Biol.** 216: 1364-1372. [This article was highlighted in ‘Inside JEB’ (JEB 216: iii, Sticky Secretions Save Sea Hares from Predators) as well as high-profile scientific and popular press, including Science magazine, National Geographic, Scientific American, Discover, New Scientist, The Scientist, Science News, BBC, NBC News, Yahoo News, AOL, and Huffington Post]
120. Maxwell, K.E., T.R. Matthews, R.D. Bertelsen, and C.D. Derby. 2013. Age and size structure of Caribbean spiny lobster, *Panulirus argus*, in a no-take marine reserve in the Florida Keys, USA. **Fisheries Res.** 144: 84-90.
119. Aggio, J.F., R. Tieu, A. Wei, and C.D. Derby. 2012. Oesophageal chemoreceptors of blue crabs, *Callinectes sapidus*, sense chemical deterrents and can block ingestion of food. **J. Exp. Biol.** 215: 1700-1710.
118. Nusnbaum, M., J.F. Aggio, and C.D. Derby. 2012. Taste-mediated behavioral and electrophysiological responses by the predatory fish *Ariopsis felis* to deterrent pigments from *Aplysia californica* ink. **J. Comp. Physiol. A** 198: 283-294.
117. Ko, K.-C., P.C. Tai, and C.D. Derby. 2012. Escapin, a bactericidal agent in ink secretion of the sea hare *Aplysia californica*, acts through irreversible DNA condensation in *E. coli*. **Antimicrob. Agents Chemother.** 56: 1725-1734.

116. Kicklighter, C.E., M. Kamio, L. Nguyen, M.W. Germann, and C.D. Derby. 2011. Mycosporine-like amino acids are multifunctional molecules in sea hares and their marine community. **Proc. Natl. Acad. Sci. USA** 108: 11494-11499.
115. Schmidt, M. and C.D. Derby. 2011. Cytoarchitecture and ultrastructure of neural stem cell niches and neurogenic complexes maintaining adult neurogenesis in the olfactory midbrain of spiny lobsters, *Panulirus argus*. **J. Comp. Neurol.** 519: 2283-2319. [Cover Article]
114. Kamio, M., C.E. Kicklighter, L. Nguyen, M.W. Germann, and C.D. Derby. 2011. Isolation and structural elucidation of novel mycosporine-like amino acids as alarm cues in the defensive ink secretion of the sea hare *Aplysia californica*. **Helvetica Chim. Acta** 94: 1012-1018.
113. Tadesse, T., M. Schmidt, W.W. Walthall, P.C. Tai, and C.D. Derby. 2011. Distribution and function of *splash*, an *achaete-scute* homolog in the adult olfactory organ of the Caribbean spiny lobster *Panulirus argus*. **Develop. Neurobiol.** 71: 316-335.
112. Kamio, M., T.V. Grimes, M.H. Hutchins, R. van Dam, and C.D. Derby. 2010. The purple pigment aplysiocyanin in sea hare ink deters predatory blue crabs through their chemical senses. **Anim. Behav.** 80: 89-100.
111. Kamio, M., L. Nguyen, S. Yaldiz, and C.D. Derby. 2010. How to produce a chemical defense: structural elucidation and anatomical distribution of aplysiocyanin and phycoerythrobilin in the sea hare *Aplysia californica*. **Chem. Biodivers.** 7: 1183-1197.
110. Nusnbaum, M. and C.D. Derby. 2010. Effects of sea hare ink secretion and its escapin-generated components on a variety of predatory fishes. **Biol. Bull.** 218: 282-292.
109. Nusnbaum, M. and C.D. Derby. 2010. Ink secretion protects sea hares by acting on the olfactory and non-olfactory chemical senses of a predatory fish. **Anim. Behav.** 79: 1067-1076.
108. Wood, J.B., A. Maynard, A. Lawlor, E.K. Sawyer, D. Simmons, K.E. Pennoyer, and C.D. Derby. 2010. Caribbean reef squid, *Sepioteuthis sepioidea*, use ink as a defense against predatory French grunts, *Haemulon flavolineatum*. **J. Exp. Mar. Biol. Ecol.** 388: 20-27.
107. Chien, H., T. Tadesse, H. Liu, M. Schmidt, W.W. Walthall, P.C. Tai, and C.D. Derby. 2009. Molecular cloning and characterization of homologs of the proneural genes *achaete-scute* and *hairy-enhancer of split* in the olfactory organ of the spiny lobster *Panulirus argus*. **J. Molec. Neurosci.** 39: 294-307.
106. Shabani, S., M. Kamio, and C.D. Derby. 2009. Spiny lobsters use urine-borne signals to communicate social status. **J. Exp. Biol.** 212: 2464-2474.
105. Matthews, T.R., K.E. Maxwell, R.D. Bertelsen, and C.D. Derby. 2009. Use of neurolipofuscin to determine population structure and growth rates of the Caribbean spiny lobster *Panulirus argus* in Florida, United States. **New Zealand J. Mar. Freshwater Res.** 43: 125-137.
104. Maxwell, K.E., T.R. Matthews, R.D. Bertelsen, and C.D. Derby. 2009. Using age to evaluate reproduction in Caribbean spiny lobsters, *Panulirus argus*, in the Florida Keys and Dry Tortugas, United States. **New Zealand J. Mar. Freshwater Res.** 43: 139-149.

103. Song, C.K., L. M. Johnstone, D.H. Edwards, C.D. Derby, and M. Schmidt. 2009. Cellular basis of neurogenesis in the brain of crayfish, *Procambarus clarkii*: neurogenic areas in the olfactory midbrain from hatchlings to adults. **Arthrop. Struct. Develop.** 38: 339-360.
102. Kamio, M., K.-C. Ko, S. Zheng, B. Wang, S.L. Collins, G. Gadda, P.C. Tai, and C.D. Derby. 2009. The chemistry of escapin: identification and quantification of the components in the complex mixture generated by an L-amino acid oxidase in the defensive secretion of the sea snail *Aplysia californica*. **Chem. Eur. J.** 15: 1597-1604.
101. Sheybani, A., M. Nusnbaum, J. Caprio, and C.D. Derby. 2009. Responses of the sea catfish, *Ariopsis felis*, to chemical defenses from the sea hare, *Aplysia californica*. **J. Exp. Mar. Biol. Ecol.** 368: 153-160.
100. Ko, K.-C., B. Wang, P.C. Tai, and C.D. Derby. 2008. Identification of potent bactericidal compounds produced by escapin, an L-amino acid oxidase in the ink of the sea hare *Aplysia californica*. **Antimicrobial Agents and Chemotherapy** 52: 4455-4462.
99. Wood, J.B., K.E. Pennoyer, and C.D. Derby. 2008. Ink is a conspecific alarm cue in the Caribbean reef squid, *Sepioteuthis sepioidea*. **J. Exp. Mar. Biol. Ecol.** 367: 11-16.
98. Aggio, J.F. and C.D. Derby. 2008. Hydrogen peroxide and other components in the ink of sea hares are chemical defenses against predatory spiny lobsters acting through non-antennular chemoreceptors. **J. Exp. Mar. Biol. Ecol.** 363: 28-34.
97. Shabani, S., M. Kamio, and C.D. Derby. 2008. Spiny lobsters detect conspecific blood-borne alarm pheromones exclusively through olfactory sensilla. **J. Exp. Biol.** 211: 2600-2608.
96. Kamio, M., M. Reidenbach, and C.D. Derby. 2008. To paddle or not: determinants and consequences of courtship display by male blue crabs, *Callinectes sapidus*. **J. Exp. Biol.** 211: 1243-1248.
[This article was highlighted in 'JEB Inside', How Waving Males Attract the Ladies, JEB 211: iii, and was covered in Science magazine's Editor's Choice, National Geographic, New Scientist, Discovery Channel's Daily Planet, and others]
95. Horner, A.J., M. Schmidt, D.H. Edwards, and C.D. Derby. 2008. Role of the olfactory pathway in agonistic behavior of crayfish *Procambarus clarkii*. **Invert. Neurosci.** 8: 11-18.
94. Horner, A.J., M.J. Weissburg, and C.D. Derby. 2008. The olfactory pathway mediates sheltering behavior of Caribbean spiny lobsters, *Panulirus argus*, to conspecific urine signals. **J. Comp. Physiol. A** 194: 243-253.
93. Shabani, S., S. Yaldiz, L. Vu, and C.D. Derby. 2007. Acidity enhances the effectiveness of active chemical defensive secretions of sea hares, *Aplysia californica*, against spiny lobsters, *Panulirus interruptus*. **J. Comp. Physiol. A** 193: 1195-1204.
92. Kicklighter, C.E., M.W. Germann, M. Kamio, and C.D. Derby. 2007. Molecular identification of alarm cues in the defensive secretions of the sea hare *Aplysia californica*. **Anim. Behav.** 74: 1481-1492.
91. Steullet, P., D.H. Edwards, and C.D. Derby. 2007. An electric sense in crayfish? **Biol. Bull.** 213: 16-20.

90. Maxwell, K.E., T.R. Matthews, M.R.J. Sheehy, R.D. Bertelsen, C.D. Derby. 2007. Neurolipofuscin is a measure of age in the Caribbean spiny lobster, *Panulirus argus*, in Florida. **Biol. Bull.** 213: 55-66.
89. Derby, C.D., C.E. Kicklighter, P.M. Johnson, and X. Zhang. 2007. Chemical composition of inks of diverse marine molluscs suggests convergent chemical defenses. **J. Chem. Ecol.** 33: 1105-1113.
88. Song, C.-K., L.M. Johnstone, M. Schmidt, C.D. Derby, and D.H. Edwards. 2007. Social status influences neurogenesis in the brain of juvenile crayfish. **J. Exp. Biol.** 210: 1311-1324.
87. Horner, A.J., S.P. Nickles, M.J. Weissburg, and C.D. Derby. 2006. Source and specificity of chemical cues mediating shelter preference of Caribbean spiny lobsters (*Panulirus argus*). **Biol. Bull.** 211: 128-139.
86. Schmidt, M., H. Chien, T. Tadesse, M.E. Johns, and C.D. Derby. 2006. Rosette-type tegumental glands associated with aesthetasc sensilla in the olfactory organ of the Caribbean spiny lobster, *Panulirus argus*. **Cell Tissue Res.** 325: 369-395. [Cover article]
85. Kicklighter, C.E. and C.D. Derby. 2006. Multiple components in ink of the sea hare *Aplysia californica* are aversive to the sea anemone *Anthopleura sola*. **J. Exp. Mar. Biol. Ecol.** 334: 256-268.
84. Stepanyan, R., K. Day, J. Urban, D.H. Hardin, R.S. Shetty, C.D. Derby, B.W. Ache, and T.S. McClintock. 2006. Gene expression and specificity in the mature zone of the lobster olfactory organ. **Physiological Genomics** 25: 224-233.
83. Johnson, P.M., C.E. Kicklighter, M. Schmidt, M. Kamio, H. Yang, D. Elkin, W.C. Michel, P.C. Tai, and C.D. Derby. 2006. Packaging of chemicals in the defensive secretory glands of the sea hare *Aplysia californica*. **J. Exp. Biol.** 209: 78-88.
82. Yang, H., P.M. Johnson, K.-C. Ko, M. Kamio, M.W. Germann, C.D. Derby, and P.C. Tai. 2005. Cloning, characterization, and expression of escapin, a broadly antimicrobial FAD-containing L-amino acid oxidase from ink of the sea hare *Aplysia californica*. **J. Exp. Biol.** 208: 3609-3622.
81. Kicklighter, C.E., S. Shabani, P.M. Johnson, and C.D. Derby. 2005. Sea hares use novel antipredatory chemical defenses. **Current Biology** 15: 549-554. [This article was covered in *Science magazine*, *Nature magazine*, *Scientific American*, and many others.]
80. Schmidt, M. and C.D. Derby. 2005. Non-olfactory chemoreceptors in asymmetric setae activate antennular grooming behavior in the Caribbean spiny lobster, *Panulirus argus*. **J. Exp. Biol.** 208: 233-248.
79. Garm, A., S. Shabani, J.T. Høeg, and C.D. Derby. 2005. Chemosensory neurons in the mouthparts of the spiny lobsters *Panulirus argus* and *P. interruptus* (Crustacea: Decapoda). **J. Exp. Mar. Biol. Ecol.** 314: 175-186.
78. Garm, A., J.T. Høeg, and C.D. Derby. 2004. Mechanosensory neurons with bend- and osmo-sensitivity in mouthpart setae from the spiny lobster *Panulirus argus*. **Biol. Bull.** 207: 195-208.
77. Horner, A.J, M.J. Weissburg, and C.D. Derby. 2004. Dual antennular chemosensory pathways can mediate orientation by Caribbean spiny lobsters in naturalistic flow conditions. **J. Exp. Biol.** 207: 3785-3796.

76. Johns, M.E., P.C. Tai, and C.D. Derby. 2004. Serine proteases in the lobster olfactory organ: their functional expression along a developmental axis, and the contribution of a CUB-serine protease. **J. Neurobiol.** 61: 377-391.
75. Harrison, P.J.H., H.S. Cate, and C.D. Derby. 2004. Localized ablation of olfactory receptor neurons induces both localized regeneration and widespread replacement of neurons in spiny lobsters. **J. Comp. Neurol.** 471: 72-84.
74. Stoss, T.D., M. Nickell, D. Hardin, C.D. Derby, and T.S. McClintock. 2004. Inducible transcript expressed by reactive epithelial cells at sites of olfactory sensory neuron proliferation. **J. Neurobiol.** 58: 355-368.
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71. Derby, C.D., H.S. Cate, P. Steullet, and P.J.H. Harrison. 2003. Comparison of turnover in the olfactory organ of early juvenile stage and adult Caribbean spiny lobsters. **Arthropod Structure & Development** 31: 297-311.
70. Steullet, P., D.R. Krützfeldt, G. Hamidani, T. Flavus, V. Ngo, and C.D. Derby. 2002. Dual parallel antennular chemosensory pathways mediate odor-associative learning and odor discrimination in the Caribbean spiny lobster *Panulirus argus*. **J. Exp. Biol.** 205: 851-867.
69. Cate, H.S. and C.D. Derby. 2002. Hooded sensilla homologues: structural variations of a widely distributed bimodal chemo-mechanosensillum. **J. Comp. Neurol.** 444: 345-357.
68. Cate, H.S. and C.D. Derby. 2002. Ultrastructure and physiology of the hooded sensillum, a bimodal chemo-mechanosensillum of lobsters. **J. Comp. Neurol.** 442: 293-307.
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57. Gentilcore, L.R. and C.D. Derby. 1998. Complex binding interactions between multicomponent mixtures and odorant receptors in the olfactory organ of the Caribbean spiny lobster *Panulirus argus*. **Chem. Senses** 23: 269-281.
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55. Derby, C.D., H.S. Cate, and L.R. Gentilcore. 1997. Perireception in olfaction: molecular weight sieving by aesthetasc sensillar cuticle determines odorant access to receptor sites in the Caribbean spiny lobster *Panulirus argus*. **J. Exp. Biol.** 200: 2073-2081.
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50. Sung, D.-Y., W.W. Walthall, and C.D. Derby. 1996. Identification and partial characterization of putative taurine receptor proteins from the olfactory organ of the spiny lobster. **Comp. Biochem. Physiol.** 115B: 19-26.
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38. Daniel, P.C., J.B. Fine, C.D. Derby, and M.-N. Girardot. 1994. Non-reciprocal cross-adaptation of spiking responses of individual olfactory receptor neurons of spiny lobsters: evidence for two excitatory transduction pathways. **Brain Res.** 643: 136-149.
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34. Derby, C.D., M.-N. Girardot, and P.C. Daniel. 1991. Responses of olfactory receptor cells of spiny lobsters to binary mixtures. II. Pattern mixture interactions. **J. Neurophysiol.** 66: 131-139.

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32. Fine-Levy, J.B. and C.D. Derby. 1991. Effect of stimulus intensity and stimulus quality on discrimination of odorant mixtures by spiny lobsters in an associative learning paradigm. **Physiol. Behav.** 49: 1163-1168.
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29. Blaustein, D., R.B. Simmons, and C.D. Derby. 1987. Ultrastructure in the central nervous system of the crayfish *Procambarus clarkii*. **Proc. Southeastern Electron Micros. Soc.**, Vol. 10: 35.
28. Derby, C.D. and D. Blaustein. 1987. Morphological and physiological characterization of individual olfactory interneurons connecting the brain and medulla terminalis of the crayfish. **Soc. Neurosci. Abstr.**, Vol. 13: 1408.
27. Girardot, M.-N. and C.D. Derby. 1987. Neural coding of quality of stimuli by the olfactory receptor cells in the spiny lobster: towards a unified model. **Soc. Neurosci. Abstr.**, Vol. 13: 1407.
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25. Wood, D.E., C.D. Derby, D.H. Edwards, and R.A. Gleeson. 1987. An analysis of the courtship display behavior in the blue crab (*Callinectes sapidus*). **Chem. Senses** 12: 709.
24. Fine-Levy, J.B. and C.D. Derby. 1987. Quality coding in olfaction by spiny lobsters: behavioral discrimination. **Chem. Senses** 12: 655.
23. Derby, C.D. and D. Blaustein. 1987. Morphological and physiological characterization of individual olfactory interneurons in the protocerebrum of the crayfish. **Chem. Senses** 12: 651-652.
22. Girardot, N. and C.D. Derby. 1987. Neural discrimination of odorant quality in the spiny lobster: multivariate analysis. **Chem. Senses** 12: 658-659.
21. Daniel, P.C. and C.D. Derby. 1987. An assessment of behavioral olfactory discrimination in the spiny lobster using a habituation paradigm. **Chem. Senses** 12: 648-649.
20. Daniel, P.C. and C.D. Derby. 1987. Mixture interaction analysis: a polynomial response summation model which incorporates the Beidler equation. **Chem. Senses** 12: 649.
19. Girardot, M.-N., J.B. Fine, and C.D. Derby. 1986. Coding of odorant quality by the olfactory system of the lobster: behavioral and neural analysis of discrimination of quality of single chemicals and chemical mixtures. **Soc. Neurosci. Abstr.**, Vol. 12: 1352.
18. Derby, C.D., W.E.S. Carr, and B.W. Ache. 1986. Purinergic receptors of the spiny lobster: external receptors on the olfactory organs and internal receptors in the brain. **Soc. Neurosci. Abstr.**, Vol. 12: 244.
17. Fine, J., C.D. Derby, and P.C. Daniel. 1986. Olfactory discrimination: behavioral abilities of the spiny lobster. **Chem. Senses** 11: 597.

16. Derby, C.D., W.E.S. Carr, and B.W. Ache. 1986. AMP receptors of the spiny lobster: external receptors on the olfactory organs and internal receptors in the brain. **Chem. Senses** 11: 593.
15. Blaustein, D., C.D. Derby, and A.C. Beall. 1986. The structure of chemosensory centers in the brain of spiny lobsters and crayfish. **Chem. Senses** 11: 582-583.
14. Carr, W.E.S. and C.D. Derby. 1985. Behavioral responses of shrimp to components of food odors indicate synergistic mixture interactions. **Chem. Senses** 10: 408.
13. Derby, C.D., R.A. Gleeson, and B.W. Ache. 1985. Mixture suppression in olfaction: identification of suppressants and analysis of peripheral and central components of suppression. **Chem. Senses** 10: 402.
12. Derby, C.D., R.A. Gleeson, and B.W. Ache. 1984. Peripheral and central events contribute to mixture suppression in the olfactory pathway. **Soc. Neurosci. Abstr.**, Vol. 10: 858.
11. Ache, B.W., C.D. Derby, R.A. Gleeson, and K.A. Hamilton. 1984. Coding of complex stimuli in a simple, glomerular-type brain. **Chem. Senses** 9.
10. Carr, W.E.S., C.D. Derby, P.L. Linser, R.A. Gleeson, and B.W. Ache. 1983. Behavioral and electrophysiological responses to 5'-AMP indicate crustaceans have external chemoreceptors related to internal purinergic receptors of vertebrates. **Soc. Neurosci. Abstr.**, Vol. 9: 78.
9. Ache, B.W. and C.D. Derby. 1983. Mixture suppression: neural integration of a complex odor. **Soc. Neurosci. Abstr.**, Vol. 9: 1023.
8. Derby, C.D., B.W. Ache, and K.A. Hamilton. 1983. Odor quality coding at three neuronal levels in a glomerular-type brain. **Soc. Neurosci. Abstr.**, Vol. 9: 1024.
7. Derby, C.D. 1981. Morphology and physiology of chemoreceptors in the walking legs of the lobster *Homarus americanus*. **Soc. Neurosci. Abstr.**, Vol. 7: 250.
6. Atema, J., B. Bryant, C. Derby, R. Elgin, and A. Stewart. 1980. Taste specialist receptors in omnivorous aquatic animals, catfish and lobsters. **In: Proceedings of the Seventh International Symposium on Olfaction and Taste.** (Ed., H. van der Starre). Information Retrieval, Ltd., London: 211.
5. Atema, J. and C. Derby. 1980. Ethological evidence for search images in predatory behavior. **Proc. Internat. Union of Physiol. Sci.** Vol. XIV. 28th International Congress of Physiol. Sciences. Budapest, Hungary: 54-55.
4. Derby, C.D. and J. Atema. 1980. L-Glutamate-specialist chemoreceptors on the legs of the lobster *Homarus americanus*. **Biol. Bull.** 159: 450.
3. Reilly, P., C. Derby, and J. Atema. 1979. Chemoreception in *Homarus americanus*: responses of primary receptors to secondary plant compounds. **Biol. Bull.** 157: 391
2. Derby, C.D. and J. Atema. 1979. Chemical search image: prey exposure improves selective chemical detection by a predator (*Homarus americanus*). **Biol. Bull.** 157: 365-366.
1. Derby, C.D. and J. Atema. 1978. Responses of walking leg chemoreceptors: the role of amino acids, proteins, and live prey body odors as feeding stimuli. **Biol. Bull.** 155: 433-434.

EXTRAMURAL GRANT SUPPORT

Current

- Florida Sea Grant: “Reduction in Trap-Related Mortality of Sublegal Caribbean Spiny Lobsters through the Development of an Artificial Bait Based on Natural Aggregation Pheromones.” Don Behringer (PI, Univ. Florida), Derby (co-PI, GSU). 8/1/18 – 7/31/20, \$200,000 total (GSU share, \$100,000).
- Lucta (Spain). “Research Agreement: Evaluation of Feed Attractants for Shrimp.” PI, Derby. 1/1/2019-12/31/2019. \$75,803.
- Maine Sea Grant: “Alternative Lobster Bait Attractant Testing.” Steven Jury (PI, Saint Joseph’s College, Maine), C. Derby (contributing scientist). Total 6/1/2019-5/31/2020. \$5,000.
- NIH, National Institute for General Medical Sciences, R25 *IMSD Atlanta: Promoting a Diverse Workforce in Neuroscience*. Frantz (PI), de Vries (coPI), Cox (Supporting), Derby (Supporting), Goode (Supporting), Wilczynski (Supporting). \$1.5 M. 7/1/2016-6/30/2021

Pending

- Georgia Sea Grant: “Field Testing a New Synthetic Sustainable Bait for Georgia’s Blue Crab Fishing Industry.” Derby (PI), G. Chamberlain and B. Fluech (coPIs). Submitted 4/26/2019. Request: \$118,162 (all GSU) for two years (2/2020 – 1/2022).

Completed

- Integrated Aquaculture International / Sunrise Capital: “Development of Feed Attractants in the Aquaculture of Pacific White Shrimp *Litopenaeus vannamei*” PI, Derby. 8/1/2017-3/31/2019: \$60,000.
- Lucta (Spain). “Research Agreement: Evaluation of Feed Attractants for Shrimp.” PI, Derby. 3/1/2018- 12/31/2018. \$37,525.
- Integrated Aquaculture International: “Development of Feed Attractants in the Aquaculture of Pacific White Shrimp *Litopenaeus vannamei*” PI, Derby. 8/1/2016-7/31/2017: \$60,000
- United Soybean Board: “Use of Feed Attractants in High-Soy Diets to Increase Feed Consumption and Reduce Feed Waste by Pacific White Shrimp” (coPI, Derby; PI, George Chamberlain, of Integrated Aquaculture International), 5/1/2015-4/30/2016, GSU share is \$60,470 out of total \$120,395.
- Georgia Research Alliance Venture Project Phase IB Award (GRA.VL15.G3), “Escapin-derived antimicrobial compounds as the basis of biofilm disruption.” (PI: Derby, coPIs, PC Tai and Eric Gilbert). \$49,603. 2014-2016.
- National Science Foundation: “Neuroecology of Ink Defenses” (PI, Derby) (IOS-1036742), 9/1/2010 - 11/30/2015, \$350,191 total costs. 2010-2015.
- National Science Foundation: REU supplement to Neuroecology of Inking Defenses (PI, Derby) (IOS 1338385), \$6,000 total cost. 2013-2015
- Georgia Research Alliance Venture Project Phase IA Award (GRA.VL14.G1), “Escapin-derived compounds as the basis of antimicrobial and disinfection products.” (PI: Derby, coPI, Tai). \$25,000. 2014
- National Science Foundation: REU supplement to Neuroecology of Inking Defenses (PI, Derby) (IOS 1234038), \$6,000 total cost. 2012-2013

- National Science Foundation: REU supplement to Neuroecology of Inking Defenses (PI, Derby) (IOS-1130244), \$6,000 total cost. 2011-2012
- The Plum Foundation John E. Dowling Fellowship Fund and the Colwin Endowed Summer Research Fellowship Fund, Marine Biological Laboratory, Woods Hole, MA: \$10,630. 2011
- Symposium Support: Neuroecology-Neural Determinants of Ecological Processes from Individuals to Ecosystems (PI, Derby) National Science Foundation (IOS-1036012), 12/21/2010 \$15,000. 2010-2011
- National Science Foundation: “Sensory Mechanisms of Chemical Defenses” (PI, Derby) (NSF IOS-0614685 (\$301,311 total costs). 2006-2010
- REU supplement to Sensory Mechanisms of Chemical Defenses. (PI, Derby). (NSF IOS-0936187) \$6,000 total award 2009-2010
- REU supplement to 0936187 Sensory Mechanisms of Chemical Defenses. (PI, Derby). (NSF IOS-0827307) \$6,000 total award 2008-2009
- National Institutes of Health: (Derby, PI; co-investigators: P.C. Tai and T.S. McClintock): “Olfactory Development: Cell Proliferation and Maturation” NIDCD DC00312. Total 5-Year Amount: \$1,481,500. 2002-2008
- Naval Surface Warfare Center – Panama City: “Identification of Molecules that Inhibit Chewing by Blue Crabs” (PI, Derby): Total Costs: \$96,292. 2007-2008
- National Science Foundation: “Mechanisms of Chemical Defenses” (PI, Derby) (NSF IBN-0324435). Total award: \$300,000. 2003-2006
- National Fish & Wildlife Foundation: “Evaluation of Marine Reserves as Sanctuaries for Caribbean Spiny Lobster (*Panulirus argus*)”: (co-PI with T. Matthews). Total Award to GSU: \$34,000. 2002-2004:
- National Marine Fisheries Service/MARFIN: “The Use of Lipofuscin for Aging Caribbean Spiny Lobster (*Panulirus argus*)”; (co-PI, with Thomas Matthews). Total Award to GSU: \$65,780. 2003-2005
- Co-sponsor (with Julia Kubanek, Georgia Tech) of Postdoctoral Fellowship to Dr. Michiya Kamio, Center for Behavioral Neuroscience, 2-year total award: \$80,000. 2003-2005
- Venture Grant from the Center for Behavioral Neuroscience (M. Schmidt, D.H. Edwards and C.D. Derby, co-PIs) “The Role of Olfaction in Establishing Social Status in Crayfish” (Total Award: \$30,000). 2003-2004
- National Science Foundation: Graduate Fellowship from the Integrative Graduate Education and Research Traineeship Program: \$13,750 subcontract from Georgia Institute of Technology, to Amy Horner. 2003-2005.
- REU Supplement to Functional Organization of a Continuously Growing Compound Nose Awarded (PI, Derby) (NSF IOS 0118477) \$7,500 total award. 2001.
- National Science Foundation: “Functional Organization of a Continuously Growing Compound Nose” (PI, Derby) (NSF IBN 0077474). Total Award: \$309,929. 2000-2004.
- Co-sponsor (with P. Katz) of Postdoctoral Fellowship to Dr. Paul M. Johnson, NSF Center for Behavioral Neuroscience, one-year total award: \$39,000. 2002-2003
- Venture fund from NSF Center for Behavioral Neuroscience (D.H. Edwards and C.D. Derby, co-PIs) “Aggression, Serotonin, and Neurogenesis in the Crayfish CNS”

- (Total Award: \$30,000). 2000-2001.
- National Institutes of Health: "Peripheral and Central Processing of Odorant Mixtures" (PI, Derby) (NIH R01 DC00312); Total Award: \$490,000. 1997-2002.
 - National Institutes of Health: "Postdoctoral Research supplement for Underrepresented Minorities: Peripheral and Central Processing of Odorant Mixtures" (NIH R01 DC00312): Total Costs for FY 1997-8: \$51,682. 1997-1998.
 - National Institutes of Health: "Mixture Interactions in Olfaction;" Total Costs, \$670,000. 1993-1997
 - National Science Foundation: "Effects of Olfactory Mixture Interactions on Coding and Discrimination" (IBN-9109783); Total Costs: \$239,600. 1992-1995
 - National Science Foundation: "Electroreception in Aquatic Invertebrates" (IBN 95-14409; SGER Grant (Co-PIs: C. Derby and D. Edwards). Total Costs: \$50,500. 1995-1996
 - National Institutes of Health, Research Career Development Award: "Mixture Interactions in Olfaction: Effects and Mechanisms" (NIH K04 DC00002); Total Costs: \$340,000. 1990-1995
 - Sponsor of NIMH Predoctoral Fellowship to Debbie Wood (Sponsor, C. Derby): "Neurohormonal Control of Sexual Behavior in a Crustacean;" Total Costs: \$23,000. 1990-1992
 - National Institutes of Health: "Mixture Interactions in Olfaction: Discrimination of Binary Mixtures;" Total Costs, \$300,000. 1988-1991
 - The Whitehall Foundation: "Functional Organization and Neural Coding in a Crustacean Olfactory System" (renewal); Total Costs, \$60,000. 1988-1991
 - The Whitehall Foundation: "Functional Organization and Neural Coding in a Crustacean Olfactory System"; Total costs: \$107,000. 1985-1988
 - National Institutes of Health: "Neural Coding of Stimulus Quality in Olfaction"; Total costs: \$170,000. 1985-1988
 - National Science Foundation Grant: "Olfactory Purinoceptors: Their Physiology, Biochemistry and Relationship to Internal Receptor Types" (W.E.S. Carr, PI; B.W. Ache and C.D. Derby, CoPIs); Total costs: \$102,000. 1984-1986
 - Individual Postdoctoral Fellowship (National Research Service Award), National Institutes of Health (NINCDS): "Functional Nature of Convergence in Olfaction"1983-1984

INVITED PRESENTATIONS SINCE 1985

Invited Seminars at Universities

64. "Chemical communication in affiliation, aggression, and mating of decapod crustaceans," Ecology & Evolution Program, Michigan State University, November 29, 2018.
63. "Escape by inking: marine molluscs avoid predators using diverse chemicals and mechanisms." Neurobiology Department, Michigan State University, November 29, 2018.
62. "Chemical communication in affiliation, aggression, and mating of decapod crustaceans," Grand Valley State University, November 28, 2018.

61. "Chemical communication in affiliation, aggression, and mating of decapod crustaceans," Eminent Speaker Lecture, University of Maryland Baltimore County, October 4, 2018.
60. "Chemical communication in affiliation, aggression, and mating of decapod crustaceans," University of Maryland Institute of Marine and Environmental Technology, October 3, 2018.
59. "Chemical communication in affiliation, aggression, and mating of decapod crustaceans," University of Wisconsin Milwaukee, March 30, 2018.
58. "Escape by inking: marine molluscs avoid predators using diverse chemicals and mechanisms." Kavli Seminar Series, University of Tennessee, April 27, 2017.
57. "Escape by inking: marine molluscs avoid predators using diverse chemicals and mechanisms." Dept. of Biology, University of Toronto Mississauga, March 17, 2017.
56. "Yuk! Yum! Yikes! and Huh? Mechanisms of chemical defense in avoiding predators by inking molluscs," Darwin Day Invited Speaker, Dept. of Biology, Minot State University, Minot, South Dakota, Feb. 11, 2016.
55. "Translational chemoreception: from the benthos to the bench and back," Dept. of Biological Sciences, Louisiana State University, Nov. 16, 2015.
54. "Encoding of olfactory information using crustacean as animal models," Dept. of Mathematics & Statistics, GSU, February 8, 2013.
53. "Chemical communication in affiliation, aggression, and mating of decapod crustaceans," University of Florida, April 20, 2012.
52. "Inking molluscs: the chemical biology of antipredatory and antimicrobial chemical defenses," Shandong University, China, October 16, 2011
51. "Yuk, yikes, and yum: mechanisms of chemical defense in avoiding predators by inking molluscs," Marine Biological Laboratory, Woods Hole, MA, July 28, 2011.
50. "Neuroecology of chemical defenses," Clayton State University, March 17, 2011.
49. "Chemical communication in affiliation, aggression, and mating of decapod crustaceans," Georgia Tech, September 9, 2010.
48. "A comparative view of adult neurogenesis," Tennessee State University, February 19, 2010.
47. "Yum, yuck, and yikes: sensory mechanisms of chemical defense by inking molluscs," Tennessee State University, February 19, 2010.
46. "Chemical communication in affiliation, aggression, and mating of decapod crustaceans," Clayton State University, October 22, 2009.
45. "Escape by inking: marine molluscs avoid predators using diverse chemicals and mechanisms", 2009 Edmund A. Arbas Memorial Lecture, Arizona Research Laboratories Division of Neurobiology, University of Arizona, January 23, 2009.
44. "Escape by inking: marine molluscs avoid predators with diverse chemicals and mechanisms": University of Lund, Zoology Dept., Sweden, October 16, 2008.
43. "Chemical communication in affiliation, aggression, and mating of decapod crustacean", George D. Grice, Jr. Lecture, at the College of Charleston, September 19, 2008.
42. "Escape by inking: marine molluscs avoid predators with diverse chemicals and mechanisms": University of Maryland College Park, April 18, 2008.
41. "Escape by inking: marine molluscs avoid predators with diverse chemicals and mechanisms": University of Maryland Baltimore County, April 17, 2008.

40. "Escape by inking: marine molluscs avoid predators with diverse chemicals and mechanisms": University of Hawaii, Coconut Island Marine Laboratory, March 2008.
39. "Escape by inking: marine molluscs avoid predators with diverse chemicals and mechanisms": UCLA, February 6, 2008.
38. "Antimicrobials and other bioactive chemicals in sea slug ink", Georgia State University. December 7, 2007.
37. "Escape by inking: marine molluscs avoid predators with diverse chemicals and mechanisms": Wake Forest University. November 7, 2007.
36. "Chemical defenses and communication in sea hares and other inking animals": University of Florida, The Whitney Laboratory. January 19, 2007.
35. "Chemical defenses of sea hares: novel and adaptive strategies for escape and defense via inking", Georgia State University. September 9, 2005.
34. "Life-long proliferation and turnover in the olfactory system of lobsters", Medical College of Georgia, Augusta. February 14, 2005.
33. "Life-long proliferation and turnover in the olfactory system of lobsters", University of South Carolina, Columbia. January 24, 2005.
32. "Chemical Defenses of Sea Hares: How to Manipulate Predators, Kill Microbes, and Warn Friends", University of Copenhagen, Denmark, October 21, 2004.
31. "Chemical Defenses", Assumption College, MA, March 1, 2004
30. "Postembryonic Development of Olfactory Systems", Univ. Virginia, Feb. 27, 2004.
29. "Tales of a Lobster's Nose", at Georgia Tech, May 2, 2002.
28. "Crustacean Chemoreception", at Kagoshima University, Japan, August 20, 2000.
27. "The Continuously Changing Olfactory System of the Spiny Lobster: Multiple Mechanisms for Growth, Turnover, and Response to Injury", at Fukuoka University, Japan, August 14, 2000.
26. "A Compound Nose: Functional Development, Odotopic Mapping, and Behavioral Role of Aesthetasc and Other Sensilla in the Crustacean Antennule", at the Marine Biological Laboratory, Woods Hole, MA, Oct. 6, 1999.
25. "A Compound Nose: Functional Development, Odotopic Mapping, and Behavioral Role of Aesthetasc and Other Sensilla in the Crustacean Antennule", at the Dept. of Biology, University of North Carolina, Chapel Hill, Oct. 4, 1999.
24. "Functional organization of crustacean noses: multiple pathways, multiple functions? The Whitney Laboratory, University of Florida, Dec. 11, 1998.
23. "Functional organization of crustacean noses: multiple pathways, multiple functions? Bowling Green State University, Dec. 4, 1998.
22. "Peripheral processing of odorant mixtures by the spiny lobster", University of Kentucky School of Medicine, March 12, 1997.
21. "Crustacean sensation", Bermuda Biological Station for Research, Aug. 14, 1996.
20. "Crustacean sensation: processing of sensory information", at Spelman College, December 4, 1995.
19. "Processing of odorant mixture information by the Caribbean spiny lobster: discriminating parts from the whole", at University of Arizona, Nov. 20, 1995.
18. "Three tales of crustacean sensation", at University of North Carolina at Charlotte, July 28, 1995.
17. "Transduction and discrimination of odorant mixtures by the Georgia spiny lobster," at University of North Carolina at Greensboro, February 3, 1995.

16. "Understanding responses to mixtures in the Georgia spiny lobster," at Marine Biological Laboratory, Woods Hole, MA, May 4, 1994.
15. "The role of peripheral chemosensory systems in the control of food-related behaviors of crustacean," at the Dept. of Biology, Fukuoka University, Fukuoka, Japan, July 19, 1993.
14. "Neurobiology of chemoreception in aquatic crustaceans," at University of North Carolina at Charlotte, April 24, 1992.
13. "Chemical sensing in feeding and reproduction," at Georgia Tech, April 17, 1992.
12. "Transduction and quality coding by the peripheral olfactory system of spiny lobsters," at University of Toronto, Scarborough College, on April 3, 1992.
11. "Coding of complex stimuli in the peripheral nervous system," at Emory University (Frontiers in Neuroscience; Mini-Series on Neuronal Signaling), January 17, 1992.
10. "Chemical sensing of odorant mixtures by the Georgia spiny lobster," at Hopkins Marine Station, Stanford University, CA, October 10, 1991.
9. "Chemoreception in sex and feeding behavior of crustaceans," at Dauphin Island Sea Lab, Dauphin Island, Alabama, on January 30, 1989.
8. "Neural and hormonal control of chemosensory behavior in crustaceans," at Boston University Marine Program, Marine Biological Laboratory, Woods Hole, MA, on December 7, 1988.
7. "Chemoreception in sex and feeding behavior of crustaceans," at Skidaway Institute of Oceanography, Savannah, GA, on August 26, 1988.
6. "Chemical sensing by crustaceans," at Duke University Marine Laboratory, Beaufort, NC, on March 23, 1988.
5. "Discrimination of quality of single chemicals and chemical mixtures in aquatic crustaceans," at Monell Chemical Senses Center, Philadelphia, PA, on December 9, 1986.
4. "Chemoreception in lobsters," at the Dept. of Chemistry, Georgia State University, Atlanta, GA, on November 17, 1986.
3. "Detection and discrimination of complex mixtures by the lobster," at Dept. of Biology, Georgia State University, Atlanta, GA, on April 25, 1986.
2. "Neural coding of complex odorants by crustaceans," at Dept. of Anatomy and Cell Biology, Emory University, Atlanta, GA, on April 17, 1985.
1. "Chemoreception in lobsters: neural codes of natural mixtures," at Dept. of Zoology and Physiology, Louisiana State University, Baton Rouge, LA, on March 22, 1985.

Invited Presentations at Symposia/Conferences/Courses since 1985

40. Keynote Speaker in the Session on "Senses, Neurons, and Behavior," at the 5th International Congress on Invertebrate Morphology, Vienna, Austria, August 2020.
39. "Towards identifying pheromones and their receptors in chemical communication in crustaceans," in the Symposium on Pheromones and Kairomones: Identities, Detection, and Modes of Action, at the 10th International Congress of Comparative Physiology and Biochemistry, Ottawa, Canada, August 2019.
38. "Aquatic chemoreception: chemical signals and how they are processed in the aquatic environment," lecture in International Course in Sensory Ecology, Lund, Sweden, October 2018.

37. "Aquatic chemoreception: chemical signals and how they are processed in the aquatic environment," lecture in International Course in Sensory Ecology, Lund, Sweden, October 2016.
36. "Aquatic chemoreception: chemical signals and how they are processed in the aquatic environment," lecture in International Course in Sensory Ecology, Lund, Sweden, October 2014.
35. "Sensory inactivation as an antipredatory defense," invited talk in the symposium on When Predators Attack: Sensing and Motion in Predatory-Prey Interactions, at the Annual Meeting of the Society for Integrative and Comparative Biology, San Francisco, CA, January 2013.
34. "Aquatic chemoreception: chemical signals and how they are processed in the aquatic environment", lecture in International Course in Sensory Ecology, Lund, Sweden, September 25, 2012.
33. "Escape by inking: marine molluscs avoid predators with diverse chemicals and mechanisms," Congress of the Brazilian Society for Chemical Ecology, Rio de Janeiro, Brasil, December 4, 2011.
32. "Neuroecology of chemical defenses," invited talk in the symposium on "Neuroecology," at the Annual Meeting of the Society for Integrative and Comparative Biology, Salt Lake City, Utah, January 2011.
31. "Aquatic chemoreception: chemical signals and how they are processed in the aquatic environment", lecture in International Course in Sensory Ecology, Lund, Sweden, October 10, 2010.
30. "Escape by inking: the neuroecology of predator avoidance by inking molluscs." 9th International Neuroethology Congress. August 4, 2010, Salamanca, Spain.
29. "Feeding attractants and deterrents for decapod crustaceans and their applications." Summer Meeting of The Crustacean Society, Tokyo, Japan, Sept 20-24, 2009.
28. "Mechanisms of chemical defense by inking molluscs against crustaceans: diverse chemicals and mechanisms." 5th Brazilian Crustacean Congress, Gramado, Brasil, Nov. 12 2008.
27. Chemical communication in affiliation, aggression, and mating of decapod crustaceans. 5th Brazilian Crustacean Congress, Gramado, Brasil, Nov. 11 2008.
26. "Chemical signals in the aquatic environment, and how they are detected", lecture in International Course in Sensory Ecology, Lund, Sweden, October 13, 2008.
25. "Chemoreception in love, affiliation, and arms races of decapod crustaceans: 2007 Mid-Year Meeting of The Crustacean Society, Coquimbo, Chile, October 15, 2007.
24. "Why Have a Diversity of Chemosensory Pathways in Noses?" National Evolutionary Synthesis Center Symposium on Origins and Evolution of Chemoreception, Durham, NC, June 4-6, 2007.
23. "Antimicrobials and Other Bioactive Chemicals in Sea Slug Ink", 3rd Annual Molecular Basis of Disease Symposium, May 18, 2007, Atlanta.
22. "Chemical signals in the aquatic environment, and how they are detected", lecture in International Course in Sensory Ecology, Lund, Sweden, October, 2006.
21. "Yuk, yum, and yikes: chemical defenses of inking animals", SouthEast Nerve Net, Atlanta, GA, March 31-April 1, 2006.

20. "Physiological genomics of lobster olfaction", T.S. McClintock, C.D. Derby, and B.W. Ache. At the 2006 Annual Meeting of the Society for Integrative and Comparative Biology, Orlando, FL, Jan. 8, 2006.
19. "All-in-one chemical defenses of sea hares: novel and adaptive strategies for escape and defense via inking", at the Harold Nations Annual Symposium, hosted by the School of Chemistry & Biochemistry, Georgia Institute of Technology, Oct. 14, 2005.
18. "Why do crustaceans have two parallel antennular chemosensory pathways", 9th European Symposium for Insect Taste and Olfaction, Villasimius, Italy, Sept. 27, 2005.
17. "Novel and adaptive strategies in chemical defense and chemical signaling in sea hares", at the conference on Biological and Computation Perspectives on Intelligent Systems", Friday Harbor Laboratories, Washington, June 7-10, 2005.
16. "Chemical signals in the aquatic environment, and how they are detected by crustaceans", lecture in International Course in Sensory Ecology, Lund, Sweden, October 20, 2004.
15. "Continuous turnover of neurons in the peripheral and central olfactory systems of lobsters", Keynote Talk at the SouthEast Nerve Net, Atlanta, GA, March 3, 2002.
14. "Continuous turnover of neurons in the peripheral and central olfactory systems of lobsters: mechanisms, regulation, and implications for functional organization", at the 7th European Symposium for Insect Taste and Olfaction, Villasimius, Italy, Sept. 22-28, 2001.
13. "Structural and functional plasticity in the postembryonic olfactory system", at the Atlanta Chapter of the Society for Neuroscience Spring Symposium, at Emory University, Atlanta. May 5, 2001.
12. "What is the Role of Parallel Pathways in Chemical Sensing?", at the Workshop on Invertebrate Sensory Information Processing: Implications for Biological Inspired Autonomous Systems, Woods Hole, MA, April 15-17, 2000.
11. "A Compound Nose: Functional Development, Odotopic Mapping, and Behavioral Role of Aesthetasc and Other Sensilla in the Crustacean Antennule", at the Frontiers in Crustacean Neurobiology, Hamburg, Germany, July 9, 1999.
10. Chair and Discussant in Symposium on "How Shall We Measure Stimulus Quality in the Chemical Senses", at the Gordon Research Conference on Chemical Senses, Newport, Rhode Island, August 18-23, 1996.
9. "Mechanisms of detection and discrimination of mixtures in the olfactory system of spiny lobsters," in Session on Chemoreception in Aquatic Organisms, at the 11th International Symposium on Olfaction & Taste, Sapporo, Japan, July 12-16, 1993.
8. "Sensory Coding by Peripheral Olfactory Cells of Invertebrates and Vertebrates", at the 'Workshop on Neurobiology of Vertebrate and Invertebrate Olfactory Systems: A Comparative Analysis', at the 13th Annual Meeting of the Association for Chemoreception Sciences, April 17-21, 1991.
7. "Simple and Complex Odorant Mixtures and the Spiny Lobster", at the 1990 Gordon Conference on Chemical Senses, Plymouth, NH, July 16-20, 1990.
6. "Olfactory processing in the crustacean brain," at the International Workshop on Chemoreception in Aquatic Animals, Louisiana Universities Marine Consortium, August 1988, Louisiana.

5. "Tuning of peripheral and central neurons of crustaceans," Symposium on New Directions in Chemoreception in Aquatic Organisms, 2nd International Congress of Comparative Physiology and Biochemistry, Baton Rouge, LA, on August 1-4, 1988.
4. "Summary of the International Symposium on Olfaction and Taste: Mixtures and olfactory physiology," at the 9th Annual Meeting of the Association of Chemoreception Sciences, Sarasota, FL, on April 29 - May 3, 1987.
3. "Olfactory discrimination of mixtures: behavioral, electrophysiological, and theoretical studies using the spiny lobster," at the International Symposium, Perception of Complex Smells and Tastes, Sarasota, FL, April 27-29, 1987.
2. "Physiology and functional organization of crustacean sensilla," Symposium on Feeding and Grooming Mechanisms in Selected Crustaceans, Annual Meeting of the American Society of Zoologists, Baltimore, MD, on December 27-30, 1985.
1. "Chemoreceptor cells in aquatic invertebrates: peripheral mechanisms of chemical signal processing," at the International Conference on Sensory Biology of Aquatic Animals, Sarasota, FL, on June 24-28, 1985.

PATENTS

Awarded

- "Antimicrobial compositions and methods of use." Patent No. US 9,380,784, awarded July 5, 2016 (application 13/055,221, provisional application 20110165261 filed July 7, 2011).
- "Antimicrobial compositions and methods of use" (Australian Pat. No. 2009273804, 32985GEO/BMN). Awarded June 2014.
- "Escapin protein, a broadly antimicrobial compound from ink of the sea hare *Aplysia californica*, and uses thereof." Patent No. US 7,329,517. Issued Feb 12, 2008 (Application No. 11/100,328, filed Apr 6 2005, and Provisional Application No. 60/561,115, filed on April 9, 2004).

Pending

- "Bactericidal compositions and methods for treating pathogenic biofilms." Application 15/089,365, filed March, 2015 (Provisional Patent Application 61/954,325, filed March 17, 2014).

AWARDS

- GSU College of Arts & Sciences Outstanding Faculty Scholarship Award 2000
- Georgia State University Outstanding Faculty Achievement Award 1994
- Outstanding Paper Award, Journal of Crustacean Biology 1988
- Kenji Nakanishi Research Award (for outstanding research in olfaction) 1987
- European Chemoreception Research Organization Travel Award 1984
- Postdoctoral Fellowship, Whitney Lab, Univ. of Florida 1982
- Outstanding Paper Award, Journal of Crustacean Biology 1982
- Belamarich Award (for outstanding graduate work), Biology, Boston Univ., 1982
- Sigma Xi Research Fund Award, Boston Univ. Chapter 1979
- Boston University Graduate Scholarship Award 1979
- Phi Beta Kappa 1976

PROFESSIONAL SERVICE

EDITOR AND EDITORIAL BOARDS

- Associate Editor, *The Biological Bulletin* 1996-present
- Member, Advisory Board, *Arthropod Structure & Development* 2006-present

GRANT STUDY SECTIONS AND REVIEW PANELS

NIH Study Sections

- Member of NIH CDRC Study Section (2006-2009)
- Member of NIH R03 Study Section (Council ZDC1 SRB-030S, 2000-2002)
- Member of NIH R21 Study Section (Council ZDC1 SRB-S07, 2002)

NSF Study Sections

- Member of NSF Panel, IOS/BIO Animal Behavior Panel, 2012
- Member of NSF Panel, IOS/BIO Organism-Environment Interaction, 2010
- Member of NSF Panel, IOS/BIO Neural Systems Cluster, Activation Panel, 2007

ORGANIZER OF CONFERENCES AND SYMPOSIA

- Member of the Program Committee, 35th Annual Meeting of the International Society for Chemical Ecology, June 2019
- Member of the Program Committee, Society for Integrative and Comparative Biology, 2014-2017
- Co-organizer and Co-Chair of Symposium on “Neuroecology: Neural Determinants of Ecological Processes from Individual to Ecosystems,” at the 2011 Annual Meeting of the Society for Integrative and Comparative Biology, Salt Lake City, UT, Jan. 3-7, 2011 [*The symposium was published in ‘Integrative and Comparative Biology’ and was covered in an article in New Scientist by Sujata Gupta*]
- Co-organizer and Co-Chair of Symposium on “Crustacean Chemoreception: Identification of Cues and their Its Applications”, at the 2009 Summer Meeting of The Crustacean Society, Tokyo, Japan, Sept. 20-24, 2009.
- Organizer and Chair of Symposium on “Neuroecology of Chemoreception”, at the 2008 International Symposium on Olfaction & Taste, July 21-26, 2008, San Francisco
- Co-organizer of Virtual Symposium on “The Neuroecology of Chemical Defense,” published December 2007 in *The Biological Bulletin*
- Organizer of “Why Have Neurogenesis in Adult Olfactory Systems?”, The Presidential Symposium at the 2006 Conference of the Association for Chemoreception Sciences, Sarasota Florida, April 29, 2006.

- Program Chair of the 25th Annual Meeting of the Association for Chemoreception Sciences, 2003
- Member of the Organizing Committee for the Annual Meeting of the Association for Chemoreception Sciences 1990, 2001-2007
- Member of the Local Organizing Committee for the Annual Meeting of the Society for Integrative & Comparative Biology 1999
- Member of the Organizing Committee for Annual Meeting of the American Society of Zoologists 1991

OFFICER IN PROFESSIONAL SOCIETIES

- Program Officer, Division of Neurobiology, Society for Integrative and Comparative Biology, 2014-2017.
- President and Executive Committee Member (as President-Elect, President, Past President, and Senior Advisor) of the Association for Chemoreception Sciences, 2004-2007
- Secretary of the Association of Chemoreception Sciences 1993-1996

MEMBERSHIP IN PROFESSIONAL SOCIETIES

- American Association for the Advancement of Sciences
- Association for Chemoreception Sciences
- Society for Neuroscience
- International Society for Neuroethology
- Society for Integrative and Comparative Biology
- The Crustacean Society

TEACHING

CURRENT CLASSROOM TEACHING

Neur 3020: Scientific Method in Neuroscience (2018)

Neur 4010: Cell & Molecular Neuroscience (2015, 2016, 2019)

Neur 8000: Introduction to Neuroscience (2017, 2018)

Neur 8710/Biol 8110: Concepts in Neurobiology (2019)

From 2000 to 2017, I taught each spring semester Neur 8710/Bio 8110. Topics included:

- Receptors and Signaling Systems
- Animal Communication
- Evolution of Animal Communication
- Evolution of Nervous Systems
- Adult Neurogenesis
- Pheromones
- Stem Cell Niche

- Olfaction

Lecturer in Graduate Course in “Sensory Ecology: An International Course for Postgraduates”, taught at Lund University, Sweden: Fall 2004, 2006, 2008, 2010, 2012, 2014, 2016, 2018.

PREVIOUS COURSES TAUGHT

- Bio 111: Human Anatomy and Physiology I
- Bio 112: Human Anatomy and Physiology II
- Bio 142: Introductory Biology II (Organisms in their Environment)
- Bio 403/603: Neurobiology & Behavior
- Bio 493: Undergraduate Topics in Neurobiology
- Bio 455/655: Neurobiology I: Cellular & Systems Neurobiology
- Bio 3840/7840: Animal Biology
- Bio 3850/7850: Animal Biology Laboratory
- Bio 4910: Undergraduate Research
- Bio 4999/6999: Directed Readings
- Bio 4970: Undergraduate Biology Seminar
- Bio 8110: Concepts in Neurobiology & Behavior
- Bio 8700: Graduate Biology Seminar
- Bio 8910: Topics in Biology
- Bio 8950: Topics in Neurobiology & Behavior
- Bio 8800 Graduate Research
- Bio 8999/9999: Dissertation Research
- Summer 1996, 1998, 2000, 2002, 2004: "Chemosensory Neurobiology in the Marine Environment". 3-week course at The Bermuda Biological Station for Research. Co-Director with Dr. Hank Trapido-Rosenthal and Tim McClintock.

DIRECTION OF RESEARCH BY INDIVIDUAL TRAINEES

Doctoral Students

CURRENT

- **Mihika T. Kozma**: “Identification of potential peripheral chemoreceptors in decapods and comparative analyses of chemoreception in Crustacea.” (2012-present).

GRADUATED

- **Ariel Santiago**: “Microbial Biofilms: An Evaluation of Ecological Interactions and the Use of Natural Products as Potential Therapeutic Agents.” Co-directed with Eric Gilbert (in Biology/Applied & Environmental Microbiology doctoral program. Graduated 2016.
- **Tizeta Tadesse**: “Molecular and Cellular Control of Neurogenesis and Regeneration in Adult Nervous Systems.” Graduated Summer 2012. 1st Position: Postdoctoral Fellow, Emory University.
- **Matthew Nusnbaum**: “Sensory Mechanisms of Defense by Sea Hares.” Graduated

Spring 2011. 1st Position: Assistant Professor, DeKalb Technical College. Current Position: Lecturer, Georgia State University

- **Ko-Chun Ko**: "Characterization of Bactericidal Mechanisms of Escapin, a Protein in the Ink of Sea Hares." Co-directed with P.C. Tai. Graduated Spring 2011.
- **Shkelzen Shabani**: "The Role of Chemical Senses in Predation, Risk Assessment, and Social Behavior of Spiny Lobsters". Graduated Fall 2008. Current Position: Assistant Professor, Minot State University, North Dakota.
- **Amy Horner**: "Dual Antennular Chemosensory Pathways in Caribbean Spiny Lobster, *Panulirus argus*." Graduated Fall 2006. Current Position: Lecturer, GSU
- **Paul M. Johnson** (joint student with University of Washington): "Multi-Component Chemical Defense in Seahares (Gastropods: Opisthobranchia): Antipredator Compounds Act as Both Honest and Deceptive Signals to Multiple Predator Species". Graduated 2002. Current Position: Special Agent, FBI
- **Holly Cate**: "Parallel Chemosensory Pathways in the Antennules of the Caribbean Spiny Lobster *Panulirus argus*: Structure and Function of Chemosensilla". Graduated Spring 2001. Current Position: Research Scientist, Howard Florey Institute, Sydney, Australia.
- **Min Zhang Levine**: "Molecular Cloning and Characterization of Proteins in the Olfactory Organ of the Spiny Lobster". Co-directed with P.C. Tai. Graduated Fall 2000. 1st Position: Postdoc at CDC.
- **Michele Burgess**: "The Biochemical and Physiological Characterization of Olfactory L-Glutamate Receptors in the Olfactory Organ of the Spiny Lobster." Graduated Summer 1996. 1st Position: Post-doctoral Fellow with Dr. Steve Traynelis, Dept. of Pharmacology, Emory University.
- **David Blaustein**: "Neuroanatomy of the Olfactory Pathway of Crustaceans." Graduated Winter 1993. Present Position: Senior Academic Professional, Dept. of Biology, Georgia State University.
- **Debra Wood**: "Neural and Hormonal Control of Courtship Display Behavior in the Blue Crab." Graduated Winter 1993. 1st Position: Postdoctoral Fellow with Dr. Ed Arbas, Division of Neurobiology, University of Arizona (with Individual NIH National Research Service Award Postdoctoral Fellowship).
- **Jacqueline Fine-Levy**: "Behavioral Discrimination and Neural Coding of the Quality and Intensity of Odorant Mixtures by the Spiny Lobster *Panulirus argus*." Graduated Summer 1991. Current Position: Associate Director of Outlicensing, External Scientific Affairs, Merck Research Laboratories.

Masters Students

CURRENT

- **Kymberly Grantham**: M.S. Biology. "Ionotropic receptors in the chemical senses of crayfish" (co-direct with Manfred Schmidt) (2017-2019).

GRADUATED

- **Shea Sparks**: M.S. Neuroscience. "Ionotropic receptors in the chemical senses of American lobsters and spiny lobsters" (co-direct with Manfred Schmidt) (2017-2019). Graduated Spring 2019.
- **Sarah Miller**: M.S. Neuroscience, "Mapping chemoreceptor expression in the model

- crustacean *Daphnia magna*." Graduated Fall 2017.
- **Farida Elsayed**: M.S. Biology, "Behavioral studies of chemoreception by the Pacific white shrimp *Litopenaeus vannamei*: testing of proprietary chemical mixtures that augment attractability and palatability of feed pellets used in shrimp aquaculture. Graduated Spring 2016.
 - **Chia-Ching Lin**: M.S. Biology. Co-directing with Eric Gilbert and P.C. Tai. Graduated 2015.
 - **Shu-Lin Wang**: "The effect of combination treatment of escapin intermediate product (EIP) and hydrogen peroxide (H₂O₂) on *Pseudomonas aeruginosa* PAO1 biofilms." Co-directed with Eric Gilbert and P.C. Tai. Graduated in summer 2015.
 - **Yenni Luu**: "Comparative analysis of two models of adult neurogenesis in decapod crustaceans." 2014.
 - **Marwa Nabil**: "Assessment of escapin intermediate products: effect on biofilms of *Pseudomonas aeruginosa*. Co-directed with Eric Gilbert and P.C. Tai. Graduate in summer 2013.
 - **Mihika Tottempudi**: "Mechanisms of bactericidal activity of escapin, a protein in the ink of sea hares." Co-directed with P.C. Tai. Graduated in summer 2012.
 - **Tiffany Love-Chezem**: "Chemical defenses of cephalopods and sea hares." Graduated Spring 2012.
 - **Kerry Maxwell**: "The Use of Lipofuscin for Aging Caribbean Spiny lobsters, *Panulirus argus*". Graduated Spring 2006. Current Position: Scientist, Florida Fish and Wildlife Commission.
 - **Malcolm Johns**: "Proteases in the olfactory organ: serine- and other proteases are functionally expressed and have a developmental axis in the spiny lobster *Panulirus argus*". Graduated Summer 2005.
 - **Huijie Liu**: Thesis Title: "Molecular Cloning of Genes from the Olfactory Organ of the Spiny Lobster *Panulirus argus*: Homologs of *hairy*, *atonal*, *cytochrome P450*, and *cyclophilin A*. Co-directed with P.C. Tai. Graduated Fall 2003
 - **Lisa Gentilcore**: "Neural Coding of Complex Odorant Mixtures in the Spiny Lobster, *Panulirus argus*." Graduated Spring 1997.
 - **Sandra Levitt**: "Electroreception in Crayfish". Graduated 1995.
 - **Dae-Yong Sung**: "Identification and Partial Characterization of Putative Taurine Receptor Proteins From the Olfactory Organ of the Spiny Lobster." Graduated Summer 1995.

Research Scientists and Postdoctoral Fellows

- Dr. Manfred Schmidt: 2002-2016 (Research Scientist & Adjunct Faculty)
 - Present Position: Faculty at GSU
- Dr. Juan Aggio: 2006-2012.
 - Present Position: High school science teacher
- Dr. Michiya Kamio: 2003-2010
 - Present Position: Asst. Professor, Tokyo University of Marine Science & Technology
- Dr. Hsin Chien: 2003-2007
 - Present Position: Researcher at Emory University
- Dr. Cynthia Kicklighter: 2003-2006

- Present Position: Associate Professor, Goucher College, Maryland
- Dr. P.M. Johnson: 2002-2003.
- Present Position: Special Agent, FBI
- Dr. Holly Cate: 2001.
- Present Position: Senior Research Scientist, University of Melbourne, Australia.
- Dr. Paul Harrison: 1998-2001.
- Present Position: Managing Director and R&D Manager, Mainstream Aquaculture Pty Ltd, Sydney, Australia
- Dr. Pascal Steullet: 1994-2000.
- Present Position: Faculty, Center for Research in Psychiatric Neuroscience, University of Lausanne, Switzerland.
- Dr. Marion McClary 1997-1998.
- Present Position: Associate Professor, Fairleigh-Dickinson University.
- Dr. Stuart Cromarty 1995-1997.
- Present Position: Associate Professor, Assumption College, MA
- Dr. Marc Weissburg 1992-1996.
- Present Position: Professor, Georgia Institute of Technology.
- Dr. Andrew Livermore 1993-1995.
- 1st Position: Assistant Professor, Charles Sturt University, Bathurst, Australia.
- Current Position: North American Region Manager, Sensory & Consumer Insights, International Flavors & Fragrances Inc.
- Dr. Kirby Olson 1991-1993.
- 1st Position: Specialist at Georgia Environment Protection Division
- Dr. Ted Simon 1991-1992.
- Present Position: Toxicologist at U.S. Environmental Protection Agency.
- Dr. Peter Daniel 1986-1990.
- Present Position: Associate Professor, Dept. of Biology, Hofstra University
- Dr. Marie-Nadia Girardot 1986-1988.
- Present Position: Director of Research, Biomedical Research Inc., Atlanta

Undergraduate Students

Each year, Manfred Schmidt and I direct several undergraduates working in our lab. Students who have worked in our lab since 2010 are:

- Tiphani Grimes
- Jessica Haulk
- Amy Wei
- Ryan Tieu
- Sierra Moore
- Lanna Wolfe
- Vu Ngo
- Vaibhav Shah
- Ariel Burgess
- Juan Perez
- Casey Seldon
- Brandon Kapalko

- Samantha Williams (2014-2015)
- Cristian Gonzalez (2015)
- Jordon Cook (co-direct with Manfred Schmidt) (2014-2016)
- Anuj Patel (co-direct with Manfred Schmidt) (2015-2016)
- Zack Allen (co-direct with Manfred Schmidt) (2015-2016)
- MiNa Choe (2015-2017) (*won “1st Place for the Best Poster in the Natural & Computational Sciences” and “Sustainability” awards at the 2016 Georgia State Undergraduate Research Conference*)
- Janae Miller (2016-2017)
- Shahreen Elahi (2016-2017)
- Neal Shukla (2016-2018)
- Kymberly Grantham (co-direct with Manfred Schmidt) (2015-2017)
- Srilaxmi Kishor (co-direct with Manfred Schmidt) (2015-2016)
- Shea Sparks (co-direct with Manfred Schmidt) (2016-2018) (*won 2nd Place for Best Poster in the Natural & Computational Sciences and the 2018 Georgia State Undergraduate Research Conference*)
- Uhmaima Shaikh (co-direct with Manfred Schmidt) (2017)
- Anna Xiao (co-direct with Manfred Schmidt) (2016-2018)
- Daniel Pulido (co-direct with Manfred Schmidt) (2017-2019)
- Aaliya Ahmed (2016-2019). Honor’s Thesis – “The Second Antennae of the American lobster *Homarus americanus*: Sensory and Secretory Systems” – co-directed with Manfred Schmidt. Aaliya won 1st Place for Best Oral Presentation in Natural & Computational Neuroscience at the 2019 Georgia State Undergraduate Research Conference.
- Dana Eap (2018-present)
- Matthew Rump (2019-present)

SERVICE

Neuroscience Institute

- Director of Graduate Studies (2014-present)
- Executive Committee (2014-2016, 2017-present)

College of Arts & Sciences

- Associate Dean, Natural & Computational Sciences 2000-2013
- Graduate Council 1988-1991
- Chair, Pre-Medical Advisory Committee 1994-1996
- Pre-Medical Advisory Committee 1987-1989

University

- Member, Fellowship Committee of the 2CI in Primate Social Cognition, Evolution & Behavior
- University Faculty Senate 1993-2008, 2010-2013
- Member of Search Committee for Vice-President for Research & Sponsored Programs 1999-2000
- Member of the Fiscal Advisory Committee to the President 1998-1999
- Vice-Chair of the Committee for Research, University Senate 1993-1994

- Chair of Subcommittee for Review of Centers, University Senate 1993-1994
- Chair of Committee for Research, University Senate 1994-1998
- Ad hoc Committee to Review the VP for Research 1996
- Committee for Re-accreditation by the SACS 1996
- Chair of Ad Hoc Committee to Review the Research Office and Search Committee for Associate Vice-President for Research and Technology 1995-1996

Department of Biology

- Associate Chair 1998-2000
- Director of the Neurobiology & Behavior Program 1993-1998
- Graduate Director 1991-1993
- Curriculum Committee 1985-1988
- Graduate Committee 1985-1998
- Executive Committee 1985-1991, 1993, 1998-2000

Other

- External Consultant, Review of Department of Biology, State University of New York – Staten Island, May 2-4, 2018
- Advisory Committee for Spelman College's Research Infrastructure for Minority Institutions Program 1997-2000