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CURRICULUM VITAE

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I. ACADEMIC RECORD

2001-present **Associate Professor**, University of Kentucky, Department of Biology
Distribution of Effort: 50% research, 40% teaching, 10% service: 1996-2012
Distribution of Effort: 30% research, 60% teaching, 10% service: 2012-2013

1996-2001 **Assistant Professor**, University of Kentucky, School of Biological Sciences,

1989 **Ph.D.**, Texas Tech University, Dept. of Physiology, Sch. of Medicine, Lubbock, Texas

1983 **B.S.**, (double major-**Chemistry & Zoology**), Texas Tech University, Lubbock, Texas

RESEARCH TRAINING

2006-summer and Fall **Sabbatical** at Seoul National University with Dr. Kaang's research group in the Department of Biological Sciences, College of Natural Sciences

1992-1996 **Postdoctoral** Fellow with Dr. H.L. Atwood
Univ. of Toronto School of Medicine, Dept. of Physiology, Toronto, Canada

1989-1992 **Postdoctoral** Fellow with Dr. J.G. Nicholls
Univ. of Basel, School of Medicine, Dept. of Pharmacology, Biocenter, Basel, Switzerland

1989 Summer research assistant with Dr. C.K. Govind. Marine Biological Laboratory, Woods Hole, Mass.

PROFESSIONAL CLINICAL EDUCATION

2011 Registered Nurse (**RN**) license in KY 2011.

2012 **BSN**-College of Nursing, University of Kentucky, Lexington, KY

II. GRANTS

Received

1. KY Department of Education. **Start 10/01/12 End 09/30/13.** Science Leadership Support Network - **Central Region** Year 3. # 3048109915. PI. is Kimberly Zeidler-Watters, Partnership Inst. for Math and Science. **CO-PI Robin Cooper.** Total \$97,500.
2. KY Department of Education. **Start 10/01/12 End 09/30/13.** Science Leadership Support Network – **Eastern Region** Year 3. # 3048109914. PI. is Kimberly Zeidler-Watters, Partnership Inst. for Math and Science. **Only one CO-PI Robin Cooper.** Total \$97,500.
3. Toyota Motor Manufacturing Kentucky for support of Kentucky Science and Engineering Fair. \$3,000. Dec. 14, 2011. (PI. Cooper) Funds to support the science fair and students travel to attend INTEL. Grant ID: XX52454953
4. 2010-2012 The P-12 Math and Science Outreach Unit of PIMSER in partnership with OSPA, UK College of Ed, and UK was awarded 2 of the 5 state Math and Science Partnership projects to design and facilitate a Science Leadership Support Network in the Central and Eastern region of the state. UK will receive \$195,000/project per year x 2 years so approx. \$800,000 total. The higher ed partners for the funded projects are: Central KY (Christine Schnittka, Becky McNall, and Robin Cooper). [Kim Zeidler, University of Kentucky is the PI]. Awarded in 2010.
5. Council on Postsecondary Education (2006-2007). US. Dept. of Education to States to meet the no child left behind act. The Teacher and Principal Training and Recruiting Fund authorizes allocations for the Improving Teacher Quality State Grant Program (CFDA #84.367B), which Kentucky calls the Improving Educator Quality Program. The program gives Kentucky the flexibility to fund high-quality teacher and principal training, grounded in scientifically based research, in all core academic subjects. In return, the state and the grant recipient will be held to stricter accountability measures to ensure improvement in the quality of educators and the performance of students. (**\$120,000, PI. Carol Hanley; Lead UK Contact is Robin Cooper**).
My unpaid role was to conduct teacher workshops and provide on-site support to Wolf and Woodford county participating high schools. This amounted to 2 visits to each school as well as a 1 week teacher workshop at UK for the 15 teachers. Other grant instructional participants visited other schools that enrolled in the year long thematic topics.
6. NIH-KBRIN (Kentucky Biomedical Research Infrastructure Network) Support of the National Institutes of Health and the National Center for Research Resources Grant P20 RR16481, Summer 2004. \$39,386. For teaching a 'hands-on' course in neurophysiology in conjunction with training students in use of transmission electron microscopy and statistical analysis of data.
7. NSF-IBN: **P.I., R.L. Cooper; August 2002 to July 2006.** \$232,000.
Presynaptic direct structure-function analysis.
8. NSF-OIB: **RET** Supplement to my NSF Grant for \$20,000 for Summer 2005 [RET is **Research Education for Teachers - Science teachers**].
9. Kentucky Young Researchers Program (Univ of KY internal grant). Two awards provided for

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- supplies related to mentoring research in the lab for high school students. \$1,000 (2004-2005).
10. NSF-IBN: **P.I., R.L. Cooper** (No Co-PI's); August 1998 to July 2001. \$140,000.
Presynaptic mechanisms in synaptic differentiation. Added a 1 yr no-cost extension till July 2002.
11. Research Equipment Initiative within the University of Kentucky. Awarded \$49,676 in February 2001 for creation of a confocal imaging and electrophysiology facility. **P.I. R.L. Cooper** and 4 participants.
12. NSF-ILI: Instrument and Laboratory Improvement. **P.I., R.L. Cooper**; with 3 Co-PI's. \$102,000. (50% match from University) Dates July 1998 to July 2000. Obtained 10 computer workstations with electrophysiological equipment to compliment the comparative physiology courses taught in biology at the University of Kentucky.
13. NSF-IBN: **REU** Supplement to my NSF Grant for \$5,000 for Aug. 2004 to July 2005 [REU is **Research Education for Undergraduates**]
14. NSF-IBN: **REU** Supplement to my NSF Grant for \$5,000 for January to Sept. 1999. (Laura Listerman) [REU is **Research Education for Undergraduates**]
15. NSF-IBN: **REU** Supplement to my NSF Grant for \$5,000 for January to Sept. 1999. (Jeff Strawn)
16. NSF-IBN: **REU** Supplement to my NSF Grant for \$5,000 for June to Dec. 2000. (R. Chase Southard)
17. NIH Equipment proposal for a confocal microscope. Dr. K. Albers P.I. (Dept. of Anatomy and Neurobiology; **Co-PI's: R.L. Cooper** and others in Anatomy dept.); Submitted March, 1997. "Multiuser confocal microscope imaging system"
Direct cost \$272,068. Dates are 4/1/98 to 3/31/01.
18. Teaching and Learning Center's Travel Grant 1996
University of Kentucky. To attend a meeting to incorporate innovative new ideas into the classroom.
19. Renewal of a Postdoctoral Fellowship from Network of 1994-1995
Centers of Excellence on Neural Regeneration and Functional Recovery. Canada
20. Postdoctoral Fellowship from Network of Centers of Excellence 1992-1994
on Neural Regeneration and Functional Recovery. Canada
21. Initiated and succeeded in obtaining an IBRO 1993
international neuroscience hands-on workshop in Summer
Seoul, South Korea.
Obtained funding (\$25,000 USD) for this workshop from IBRO and Brain Research Foundation, Tokyo.
22. Postdoctoral Fellowship from Swiss National Fund (\$45k USD/yr) 1989-1992

Participant on Awarded Grants

1. 2006. Tiered Mentoring Grant from Kentucky Dept. of Education. PI-David Taylor (Science Coordinator Fayette County Public Schools). I serve as a participant on the grant. I am to mentor high school science teachers to learn laboratory and experimental techniques.
2. 2002-present. At the University of Kentucky 5 faculty members are listed as mentors for

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Beckman Scholars. The University benefits by having good mentors for undergraduate research so that the University is eligible to receive funding from Arnold and Mabel Beckman Foundation to run a undergraduate **Beckman Scholars Program**. This has successfully been run from 2002-present with 3 renewals. I am listed as one of the mentors and have had four students as Beckman fellows work in my research group.

3. **NIH-NIMH Training Grant.** Title "Cellular and molecular neurosciences of sensory systems." Time period: July 1, 2001 to June 30, 2006. (PI - **Dr. Tom Getchell**, Dept of Physiology, UK. Med. Sch.). **Amount \$703,122.** My role on the training grant is a **participant** (give guest lectures and aid in teaching/mentoring graduate and postdoctoral trainees).

4. **Science Alliance** which is part of *Partnership Institute for Math and Science Education Reform (PIMSER)*. [Kim Zeidler, University of Kentucky is the PI]. I was placed on this grant as a scientist partner at UK. 2006- 2008. I was paid a summer salary from this grant to conduct high school teacher's workshops and lesson planning.

5. **Fayette County Public Schools: Facilitating Operational Communities for Understanding in Science (FOCUS).** I was placed on this grant as **the** scientist partner at the Univ of KY 2008-2009. (David Helm and Lori Bowen are the PI's on the grant). I obtain no salary. Only the teachers and staff are paid. This is an altruistic behavior on my part for our local public schools.

Teachers often lack the skills and content knowledge to create in-depth instructional units based on state standards. The resulting low levels of relevance and rigor can cause students to be disengaged in what they are learning in science class. With little time available to work together with each other or across grade levels, teachers often work in isolation. The *Facilitating Operational Communities for Understanding in Science (FOCUS)* Project establishes an ongoing science education partnership among Fayette County Public Schools Primary – 8th grade science teachers, district support faculty, **higher education (University of KY)** and organizations in the community.

Utilizing research proven strategies, the project focuses on:

- A. improving student achievement in science
- B. enhancing Primary – 8 science teachers' science content understanding
- C. enhancing Primary – 8 science teachers' implementation of research-based instructional practices
- D. enhancing Primary – 8 science teachers' access to high-quality curriculum resources

We have found that professional development and teacher collaboration is greatly enhanced when teachers and other stakeholders view their participation in an initiative as having application in their work. Project teachers are participating in a minimum of 80 hours of high quality PD per year, which includes 56 hours of job-embedded PD, 18 hours of content academy workshops, and at least 6 hours of field experiences. Participants are meeting 8 days this school year for job-embedded PD (56 hrs). We spend mornings developing content knowledge and learning specific elements for unit development using backwards design. With the support of lead teachers, participants spend afternoons in teams applying their new learning to constructing units of study, assessments, and congruent lessons. Participants work together to self- and peer-evaluate their work, looking at units across grade levels to ensure a tightly spiraled curriculum. The resulting high quality instructional resources are shared with the district and state to serve as models. Contacts: Lori Bowen and David Helm, Fayette County Schools.

6. **Toyota PEP Grant with Fayette County Public Schools (FCPS) 2011- 2012.** Title: "Biology Realignment and Curriculum Enhancement (BRACE)." I was placed on this grant as the scientist partner at the Univ of KY. No other faculty member at Univ of KY is a participant on the grant. (David Helm at FCPS is the PI's on the grant). \$ 30,000

Goals of the grant are:

1 – Align the current Kentucky Program of Studies for Biology with the recently released ACT Quality Core which the Biology End of Course Assessments will be based on

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- 2 – Training on implementation and use of equipment recently purchased DNA technology equipment (gel electrophoresis equipments, PCR thermo cycler, etc.)
- 3 – Continued work on the implementation of Science Literacy Standards released last year as a part of the career and college readiness standards for Language Arts

Pending grant proposals:

1. **2013 Submit Nov 26, 2013.** Kentucky Department of Education. *MUSE - modeling for understanding in science and engineering*. Kentucky's Mathematics and Science Partnership (MSP) 2013. Kentucky Department of Education **\$140,000** for year 1 (January, 2013 to September 30, 2013) and at **\$195,000** for the second year (October 1, 2013 to September 30, 2014), with a possible third year (at \$97,500). PI. is Kimberly Zeidler-Watters, Partnership Inst. for Math and Science. CO-PI Robin Cooper.

Grants submitted the past few years:

1. **NSF.** Title: Negative Feedback at Glutamatergic Motor Nerve Terminals in *Drosophila*. PI-Cooper and no Co-PIs. Request \$118,516 and suggested starting date Summer of 2008/ Jan 2009. (*not funded*)
2. **Kentucky Department of Education.** 2009 Mathematics and Science Partnerships Grant; P-12 Math and Science Outreach Unit Director, PIMSER (PI- Kimberly Zeidler, UK) request \$200,000. Submitted June 2008. (*not funded*)
3. **NSF.** Title: Olfactory system in crayfish: Sensitivity, development and autonomic response to olfaction in a sighted and blind cave species. PI-Cooper and no Co-PIs. Suggested starting date Summer of 2009. (*not funded*)
4. **NSF.** Title: The mechanistic effects of CO₂ on behavior and physiology at the skeletal NMJ of *Procambarus clarkii* and *Drosophila* as well as the larval heart of *Drosophila*. PI-Cooper and no Co-PIs. Suggested starting date Summer of 2009. (*not funded*)
5. **Kentucky Department of Education.** 2010. Kentucky's Mathematics and Science Partnership (MSP) program. P-12 Math and Science Outreach Unit Director, PIMSER (PI- Kimberly Zeidler, UK; I am the one science consultant and instructor on this proposal. I will be paid a salary). Total \$200,000. Submitted July 2010. (*not funded*)
6. **NSF.** Title: Vesicle pools and packaging within high- and low-output nerve terminals. PI-Cooper and no Co-PIs. Total \$124,345. Suggested starting date Summer of 2010. Submitted July 2010. (*not funded*)
7. PreProposal for the American Honda Foundation. "See Blue Mathematics Outreach Initiative". **Project Team:** The project team will consist of: Carl Lee, Professor of Mathematics in the Department of Mathematics, will serve as PI and Director of the Family Mathematics Night; Margaret Mohr-Schroeder, Assistant Professor of Mathematics Education in the Department of STEM Education, will serve as co-PI and Director of the Mathematics Clinic; Bruce Walcott,

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Professor of Electrical Engineering in the College of Engineering, will serve as co-PI and co-Director of the Middle School Summer STEM Camp; Craig Schroeder, Mathematics Coach for Fayette County Public Schools, will serve as co-PI and Director of the Middle School Summer STEM Camp; and Robin Cooper, Associate Professor of Biology in the Department of Biology, will serve as senior personnel and assist with the content modules for the summer STEM Camp. Submitted March 25, 2012.

III. PUBLICATIONS

Peer Reviewed Papers

1. Haesun, K.B., **Cooper, R.L.** and Holwerda, R.A. (1985) Stability of the Cu(II)-S bond in mercapto amino acid complexes of [2,2',2''Tris(dimethylamino) triethylamine] copper(II) and [Tris (2-pyridylmethyl) amine] copper(II). **Inorganic Chemistry** 24(7):1077-1081
2. **Cooper, R.L.**, McGrath, J.J., Dooley, S. and Kopetzky, M.T. (1989) Chronic exposure to carbon monoxide at high altitude: Effects on mean electrical axis. **Physiology and Behavior** 46:75-79
3. **Cooper, R.L.** and Govind, C.K. (1991) Axon composition of the proprioceptive PD nerve during growth and regeneration of lobster claws. **Journal of Experimental Zoology** 260:181-193
4. Fernández-de-Miguel, F., **Cooper, R.L.** and Adams, W.B. (1992) Synaptogenesis and calcium current distribution in cultured leech neurons. **Proceedings of the Royal Society (London) B.** 247:215-221
5. **Cooper, R.L.**, Fernández-de-Miguel, F., Adams, W.B. and Nicholls, J.G. (1992) Anterograde and retrograde effects of synapse formation on calcium currents and neurite outgrowth in cultured leech neurons. **Proceedings of the Royal Society (London) B.** 249:217-222
6. Hartman, H.B. and **Cooper, R.L.** (1994) Regeneration and molting effects on a proprioceptor organ in the Dungeness crab, *Cancer magister*. **Journal of Neurobiology** 25:461-471
7. **Cooper, R.L.** and Hartman, H.B. (1994) Responses of the bender apodeme tension receptors in the Dungeness crab, *Cancer magister*. **Comparative Biochemistry and Physiology** 109A:479-486
8. Atwood, H.L. and **Cooper, R.L.** (1995) Functional and structural parallels in crustaceans and *Drosophila* neuromuscular systems. **American Zoologist** 35(6):556- 565
9. **Cooper, R.L.**, Stewart, B.A., Wojtowicz, J.M., Wang, S., and Atwood, H.L. (1995) Quantal measurement and analysis methods compared for crayfish and *Drosophila* neuromuscular junctions and rat hippocampus. **Journal of Neuroscience Methods** 61:67-78
10. **Cooper, R.L.**, Marin, L., and Atwood, H.L. (1995) Synaptic differentiation of a single motor neuron: conjoint definition of transmitter release, presynaptic calcium signals, and ultrastructure. **Journal of Neuroscience** 15:4209-4222
11. **Cooper, R.L.**, Hampson, D. and Atwood, H.L. (1995) Synaptotagmin-like expression in the motor nerve terminals of crayfish. **Brain Research** 703:214-216
12. Atwood, H.L. and **Cooper, R.L.** (1996) Assessing ultrastructure of crustacean and insect

- neuromuscular junctions. **Journal of Neuroscience Methods** 69:51-58
13. **Cooper, R.L.**, and Cooper, M.M. (1996) Red pepper induced dermatitis in breast fed infants. **Dermatology** 93:61-62
 14. Atwood, H.L. and **Cooper, R.L.** (1996) Synaptic diversity and differentiation: Crustacean neuromuscular junctions. **Invertebrate Neuroscience** 1:291-307
 15. **Cooper, R.L.**, Harrington, C. Marin, L., and Atwood, H.L. (1996) Quantal release at visualized terminals of crayfish motor axon: Intraterminal and regional differences. **Journal of Comparative Neurology** 375:583-600
 16. Pekhletsy, R., **Cooper, R.L.**, Atwood, H.L., and Hampson, D. (1996) Expression profiling of mRNA obtained from single identified crustacean motor neurons:determination of specificity of hybridization. **Invertebrate Neuroscience** 1:341-349
 17. **Cooper, R.L.**, Winslow, J., Govind, C.K. and Atwood, H.L. (1996) Synaptic structural complexity as a factor enhancing probability of calcium-mediated transmitter release. **Journal of Neurophysiology** 75:2451-2466
 18. Bradacs, H., **Cooper, R.L.**, Msghina, M., and Atwood, H.L. (1997) Differential physiology and morphology of phasic and tonic motor axons in a crayfish limb extensor muscle. **Journal of Experimental Biology** 200:677-691
 19. Rastogi, K.S., **Cooper, R.L.**, Shi, J.Q. and Vranic, M. (1997) Quantitative measurement of islet glucagon response to hypoglycemia by confocal fluorescence imaging in diabetic rats: effects of phlorizin treatment. **Endocrine** 7:367-375
 20. **Cooper, R.L.** and Ruffner, M.E. (1998) Depression of synaptic efficacy at intermolt in crayfish neuromuscular junctions by 20-Hydroxyecdysone, a molting hormone. **Journal of Neurophysiology** 79:1931-1941
(*Ruffner was an undergraduate student in my laboratory at UK*)
 21. **Cooper, R.L.**, Warren, W.M. and Ashby, H.E. (1998) Activity of phasic motor neurons partially transforms the neuronal and muscle phenotype to a tonic-like state. **Muscle & Nerve** 21:921-931
(*Warren and Ashby were undergraduate students in my laboratory at UK*)
 22. **Cooper, R.L.** (1998) Development of sensory processes during limb regeneration in adult crayfish. **Journal of Experimental Biology** 201:1745-1752
 23. Neckameyer, W.S. and **Cooper, R.L.** (1998) GABA transporters in *Drosophila melanogaster*: developmental expression, behavior, and physiology. **Invertebrate Neuroscience** 3:279-294

24. Ruffner, M.E., Cromarty, S.I., and **Cooper, R.L. (1999)** Depression of synaptic efficacy in *Drosophila* neuromuscular junctions by the molting hormone (20-Hydroxyecdysone). **Journal of Neurophysiology** 81:788-794
(*Ruffner was an undergraduate student in my laboratory at UK, Dr. Cromarty visited my lab while applying for a postdoctoral fellowship through the BEACON training grant at UK.*)
25. **Cooper, R.L.** and Hartman, H.B. (1999) Quantification of responses from proprioceptive neurons in the limbs of the crab, *Cancer magister*. **Journal of Experimental Zoology** 284: 629-636
26. **Cooper, R.L.** and Neckameyer, W.S. (1999) Dopaminergic neuromodulation of motor neuron activity and neuromuscular function in *Drosophila melanogaster*. **Comparative Biochemistry and Physiology B** 122:199-210
27. Crider, M.E. and **Cooper, R.L. (1999)** The importance of the stimulation paradigm in determining facilitation and effects of neuromodulation. **Brain Research** 842: 324-331
(*Crider, M.E.-Thesis project done in my laboratory at UK*)
28. He, P., Southard, R.C., Whiteheart, S.W. and **Cooper, R.L. (1999)** Role of α -SNAP in promoting efficient neurotransmission at the crayfish neuromuscular junction. **Journal of Neurophysiology** 82:3406-3416 (*He, P.-Thesis project done in my laboratory at UK; Southard is an undergraduate in my laboratory; Whiteheart is my collaborator in the Dept. of Biochemistry at UK. Proteins were made in his laboratory and all the physiology was done in my laboratory.*)
29. Crider, M.E. and **Cooper, R.L. (2000)** Differentially facilitation of high- and low-output nerve terminals from a single motor neuron. **Journal of Applied Physiology** 88: 987-996
(*Crider, M.E.-Thesis project done in my laboratory at UK*)
30. LaFramboise, W., Griffis, B., Bonner, P., Warren, W., Scalise, D., Guthrie, R.D., and **Cooper, R.L. (2000)**. Muscle type-specific myosin isoforms in crustacean muscles. **Journal of Experimental Zoology** 286: 36-48
(*Dr. LaFramboise came to UK to give a talk on myosin expression in a mammalian model system. While he was here, we struck up a joint project with Dr. Bonner's laboratory and mine to examine myosin expression in crustacean muscles.*)
31. Listerman, L., Deskins, J., Bradacs, H., and **Cooper, R.L. (2000)** Measures of heart rate during social interactions in crayfish and effects of 5-HT. **Comparative Biochemistry and Physiology A**.125:251-264
(*Listerman and Deskins were undergraduates in my laboratory at UK, Bradacs is collaborator from Austria.*)
32. Sohn, J., Mykles, D.L., and **Cooper, R.L. (2000)**. The anatomical, physiological and biochemical characterization of muscles associated with the articulating membrane in the dorsal

- surface of the crayfish abdomen. **Journal of Experimental Zoology** 287:353-377.
(*Sohn was my MS student, Dr. Mykles is a collaborator at Colorado State Univ.*).
33. Southard, R.C., Haggard, J., Crider, M.E., Whiteheart, S.W. and **Cooper, R.L. (2000)** Influence of serotonin on the kinetics of vesicular release. **Brain Research** 871:16-28.
(*Southard and Haggard were undergraduates in my laboratory; Whiteheart is my collaborator in the Dept. of Biochemistry at UK., Crider-Thesis project done in my laboratory at UK.*)
 34. Li, H., Listerman, L., Doshi, D., and **Cooper, R.L. (2000)** Use of heart rate to measure intrinsic state of blind cave crayfish during social interactions. **Comparative Biochemistry and Physiology A**.127:55-70.(*Listerman and Deskins were undergraduates in my laboratory at UK.*)
 35. Kim, S., Atwood, H.L. and **Cooper, R.L. (2000)** What are the real sizes of synaptic vesicles in nerve terminals. **Brain Research** 877:209-217.
(*Kim is an Assistant Professor in Dept. of Mathematics at UK. I used data obtained in the laboratory of Dr. Atwood. I initiated the collaboration with Kim.*)
 36. Griffis, B., Bonner, P. and **Cooper, R.L. (2000)** Sensitivity of transformed (phasic to tonic) motor neurons to the neuromodulator 5-HT. **Comparative Biochemistry and Physiology A** 127: 495-504.
 37. Strawn, J.R., Neckameyer, W.S., and **Cooper, R.L. (2000)** The effects of 5-HT on sensory, central and motor neurons driving abdominal superficial flexor muscles in the crayfish. **Comparative Biochemistry and Physiology B** 127:533-550.
(*Strawn is an undergraduate in my laboratory at UK, Dr. Neckameyer is a collaborator in St. Louis.*)
 38. Feuerverger, A., Menzinger, M., Atwood, H.L., and **Cooper, R.L. (2000)**. Statistical methods for assessing the dimensions of synaptic vesicles in nerve terminals. **Journal of Neuroscience Methods** 103:181-190.
(*Drs. Feuerverger and Menzinger are collaborators at Univ. of Toronto, Statistics and Physical Chemistry depts. respectively. I visited their labs in 1999 in order to complete this project. I used data obtained in the laboratory of Dr. Atwood.*)
 39. Griffis, B., Moffett, S. and **Cooper, R.L. (2001)** Muscle phenotype remains unaltered after limb autotomy and unloading. **Journal of Experimental Zoology** 289:10-22.
(*Griffis, B.- is a PhD student who won a BEACON Fellowship for one year to work on projects related to my research; Dr. Moffett (Univ. of Washington) is a friend of mine. We had planned to do this project together, but she allowed me to put a student on the project instead. She was a collaborator for this project.*)
 40. Li, H., Harrison, D., Jones, G., Jones, D., and **Cooper, R.L. (2001)** Alterations in development, behavior, and physiology in *Drosophila* larva that have reduced ecdysone production. **Journal of Neurophysiology** 85:98-104. (*Li is my PhD student.*)

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41. **Cooper, R.L.**, Li, H., Long, L.Y., Cole, J., and Hopper, H.L. (2001) Anatomical comparisons of neural systems in sighted epigeal & troglotic crayfish species **Journal of Crustacean Biology** 21:360-374. (*Li is my PhD student, Long (Li's wife) helped out in axon counting, Cole and Hopper helped with assessing the cave crayfish and conducting experiments within the cave environment*).
42. Li, H., and **Cooper, R.L.** (2001) Effects of the ecdysoless mutant on synaptic efficacy and structure at the neuromuscular junction in *Drosophila* larvae during normal and prolonged development. **Neuroscience** 106:193-200. (*Li is my PhD student*).
43. Li, H. and **Cooper, R.L.** (2001) Spatial familiarity in the blind cave crayfish, Orconectes australis packardii. **Crustaceana** 74: 417-433. (*Li is my PhD student*).
44. Kellie, S., Greer, J. and **Cooper, R.L.** (2001) Alterations in habituation of the tail flip response in epigeal and troglotic crayfish. **Journal of Experimental Zoology** 290:163-176. (*Kellie and Greer were undergraduates in my laboratory at UK*).
45. Djokaj, S., **Cooper, R.L.** and Rathmayer, W. (2001) Effects of octopamine, serotonin, and cocktails of the two modulators on synaptic transmission at crustacean neuromuscular junctions. **Journal of Comparative Physiology A** 187 (2):145-154. (*The summer of 2000 I worked with Dr. Rathmayer at the Univ. of Konstanz, Germany to stimulate this joint project. Dr. Stefan Djokaj was a postdoctoral fellow in Dr. Rathmayer's group.*)
46. **Cooper, R.L.**, Chase, R.J., and Tabor, J. (2001) Altered responsiveness to 5-HT at the crayfish neuromuscular junction due to chronic p-CPA & m-CPP treatment. **Brain Research** 916:143-151. (*Rachel Chase and Jami Tabor were undergraduates in my laboratory at UK*).
47. Schapker, H., Breithaupt, T., Shuranova, Z., Burmistrov, Y. and **Cooper, R.L.** (2002) Heart rate and ventilatory correlative measures in crayfish during environmental disturbances & social interactions. **Comparative Biochemistry and Physiology A** 131:397-407. (*Schapker was a undergraduate student in my lab at the Univ. of KY. Dr. Breithaupt is a faculty member at the University of Konstanz, Germany. Drs. Shuranova and Burmistrov are a Russian husband and wife team that have been working on crayfish and other invertebrate behavior for over a half of century*).
48. Li, H. and **Cooper, R.L.** (2002) The effect of ambient light on blind cave crayfish: Social interactions. **Journal of Crustacean Biology** 22:449-458 (*Li was my PhD student*).
49. Strawn, J.R. and **Cooper, R.L.** (2002) The effects of ethanol on presynaptic components of synaptic transmission in a model glutamatergic synapse: The crayfish neuromuscular junction. **Comparative Biochemistry and Physiology C: Toxicology & Pharmacology** 131: 395-404. (*J.R. Strawn was undergraduate in my laboratory at UK*).
50. Mykles, D.L., Medler, S.A., Koenders, A., and **Cooper, R.L.** (2002) Myofibrillar protein

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- isoform expression is correlated with synaptic efficacy in slow fibres of the claw and leg opener muscles of crayfish and lobster. **Journal of Experimental Biology** 205 (4): 513-522. (*Dr. Mykles is a collaborator at Colorado State Univ. and an expert in running SDS gels of crustacean muscle as well as probing with specific antibodies to muscle proteins.*)
51. Tabor, J. and **Cooper, R.L.** (2002) Physiologically identified 5-HT₂ -like receptors at the crayfish neuromuscular junction. **Brain Research** 932:91-98. (*Jami Tabor was an undergraduate in my laboratory at UK.*)
 52. Brailoiu, E., **Cooper, R.L.**, and Dun, N.J. (2002) Sphingosine 1-phosphate enhances spontaneous transmitter release at the frog neuromuscular junction. **British Journal of Pharmacology** 136:1093-1097. (*Drs. Brailoiu and Dun are colleagues located at Dept. Pharm., College of Med., East Tenn. State Univ. The research was performed at East Tenn. State Univ.*.)
 53. Winslow, J.L., **Cooper, R.L.** and Atwood, H.L. (2002) Intracellular ionic concentration by calibration from fluorescence indicator emission spectra, its relationship to the Kd, Fmin, Fmax formula, and use Na-Green for presynaptic sodium. **Journal of Neuroscience Methods** 118:163-175. (*Dr. Winslow is a collaborator at Univ. of Toronto. I visited his lab in 1999 to complete this project.*)
 54. Li, H., Peng, X., and **Cooper, R.L.** (2002) Development of *Drosophila* larval neuromuscular junctions: Maintaining synaptic strength. **Neuroscience** 115:505-513.
 55. **Cooper, R.L.**, Ward, E., Braxton, R., Li, H., and Warren, W.M. (2003) The effects of serotonin and ecdysone on primary sensory neurons in crayfish. **Microscopy Research and Technique** 60: 336-345. (*Ward, Braxton, and Warren were undergraduates and Li was a graduate student in my laboratory*).
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 114. Bierbower, S.M. and **Cooper, R.L. (2012)** The mechanistic action of carbon dioxide on neural and NMJ communication. (**In Revision**).
 115. Majeed, Z.R., Nichols, C.D., and **Cooper, R.L. (2012)** Pharmacogenetic approach in directing inhibition of the larval heart in *Drosophila melanogaster*. (**Compiled** and sent to collaborator for his edits.)
 116. Majeed, Z.R., Titlow, J., Hartman, H.B. and **Cooper, R.L. (2012)** Proprioception and tension receptors in crab limbs: Student laboratory exercises. (**In preparation** for *Journal of Visualized Experiments (JoVE)*). . Professional movie and peer reviewed manuscript)
 117. Titlow, J., Majeed, Z.R., Nicholls, J.G. and **Cooper, R.L. (2012)** Identifiable neurons in the central nervous system of a leech via electrophysiology and morphology, sensory field maps in skin and synapse formation in culture: Student laboratory exercises. (**In Review** for *Journal of Visualized Experiments (JoVE)*). Professional movie and peer reviewed manuscript)
 118. Titlow, J., Majeed, Z.R., Hartman, H.B., Burns, E., and **Cooper, R.L. (2012)** Neural Circuit Recording from an Intact Cockroach Nervous System (**In Press** for *Journal of Visualized Experiments (JoVE)*). Professional movie and peer reviewed manuscript)
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Book Chapters

1. Atwood H.L., **Cooper R.L.**, Wojtowicz J.M. (1994) Non-uniformity and plasticity of quantal release at crustacean motor nerve terminals. In: *Advances in Second Messenger and Phosphoprotein Research. Molecular and Cellular Mechanisms of Neurotransmitter Release.* (Stjärne L, Greengard P, Grillner SE, Hökfelt TGM, and Ottoson DR, eds), pp 363-382. New York: Raven Press.
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Manual

Atwood, H.L. and **Cooper, R.L.** (1993) A laboratory manual on experimental neurophysiology written for the "6th INTENSIVE IBRO WORKSHOP ON BASIC NEUROSCIENCE" which was held in July 1993, Seoul, South Korea. (available upon request)

Papers written in the lab on projects conducted under my supervision

1. Cooper, A.S. (2007) Methods to measure circadian pattern in isolated adults. **Drosophila Information Service** 90:139-140.

IV. ABSTRACTS

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4. **Cooper, R.L.** and Hartman, H.B. (1987) Tension receptors associated with the produtor and reductor muscles at the CP joint in the crab. *Amer. Zool.* 27:128A
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22. **Cooper, R.L.**, Pekhletski, R., Hampson, D. and Atwood H.L. (1994) Assessing gene expression in single identified neurons that show long term adaption from increased activity. *Network Centres of Excellence meeting in June, 1994 in Toronto, Canada.*
23. **Cooper, R.L.**, Winslow, J.L., Govind, C.K., Marin, L. and Atwood, H.L. (1994) Interaction of calcium domains in complex synapses. *Network Centres of Excellence meeting in June, 1994 in Toronto, Canada.*
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- neurotransmitter release. Advances in Biomedical Engineering and Biosystems Science symposium held at the Univ. of Toronto from June 13-17, 1994.
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 27. Winslow, J.L., **Cooper, R.L.**, Govind, C.K., Pearce, J., Marin, L. and Atwood, H.L. (1994) Close presynaptic active zones may enhance facilitation. *Abst. Soc. Neurosci.* 20:550.5
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 29. Winslow, J.L., **Cooper, R.L.**, Govind, C.K., Pearce, J., Marin, L. and Atwood, H.L. (1995) Presynaptic active zone structure influences neurotransmitter release. Advances in Biomedical Engineering and Biosystems Science symposium held at the Univ. of Toronto from May 31-June 1, 1995.
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 31. **Cooper, R.L.**, Pekhletsy, R., Hampson, D. and Atwood, H.L. (1995) Differential gene expression in single identified neurons which exhibit long term adaptation due to increased activity. Network Centres of Excellence meeting in June, 1995 in Sainte-Adèle, Québec, Canada.
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 41. Quigley, P.A., **Cooper, R.L.**, Govind, C.K., and Atwood, H.L. (1996) Recruitment of active synapses at the crayfish neuromuscular junction visualized with the fluorescent dye FM1-43. *Abst. Soc. Neurosci.* 22: 309.9
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 - 50*⁺. Hao, L., Ward, E., Bradacs, H. and **Cooper, R.L.** (1997) Neuromodulator effects on primary sensory neurons: rapidly and slowly adapting proprioceptors. *Abst. Soc. Neurosci.* 313.8
 - 51⁺. **Cooper, R.L.**, Cromarty, S.I., Dityatev, A.E. and Zolman, J.F. (1997) Modulation of synaptic release at the crayfish NMJ by ecdysone, a molt related hormone. *Abst. Soc. Neurosci.* 148.5
 - 52*⁺. Warren, W., Ashby, H., Bonner, P. and **Cooper, R.L.** (1997) Effects of inducing neuronal Long-Term Adaptation on muscle fiber transformation and its sensitivity to neuromodulators. *Abst. Soc. Neurosci.* 148.8
 53. Dityatev, A. and **Cooper, R.L.** (1997) Assessing the mechanisms of synaptic depression in phasic neuromuscular junctions of the crayfish. *Abst. Soc. Neurosci.* 148.6
- * The above five posters were also presented at the Univ. of Kentucky Life Sciences Day, Nov. 12, 1997.
- ⁺ The above five posters were also presented at the Univ. of Kentucky Neurosciences Day, March. 9, 1998.

54. Ruffner, M.E. and **Cooper, R.L. (1997)** Modulation of synaptic release at the crayfish NMJ by ecdysone, a molt related hormone. Kentucky Academy of Science, Morehead State University, Morehead, KY. Nov. 15, 1997 (talk).
55. Huffman, M.P., Li, H. and **Cooper, R.L. (1998)** Negative phototactic behavior of the blind cave learning of blind cave crayfish. Tri-State Animal Learning and Behavior Conference held at the Univ. of Kentucky on March 27-28, 1998.
56. Li, H., Huffman, M.P., and **Cooper, R.L. (1998)** Spatial learning of blind cave crayfish in different sized environments. Tri-State Animal Learning and Behavior Conference held at the Univ. of Kentucky on March 27-28, 1998.
57. Griffs, B., LaFramboise, W., Bonner, P., Warren, W. and **Cooper, R.L. (1998)** Myosin isoforms are differentially expressed in crayfish muscle. Abst Soc. Neurosci. 656.6.
58. Deskins, J. Li, H., Bradacs, H. and **Cooper, R.L. (1998)** Measures of heart rate during given behaviors in crayfish. Abst Soc. Neurosci.177.17.
59. Southard, R.C., Winslow, J.L., He, P., Chen, D., Whiteheart, S.W. and **Cooper, R.L. (1998)** Influence of neuromodulators and vesicle docking related proteins on the kinetics of vesicular release. Abst Soc. Neurosci. 327.10.
60. Bing, Z., Dickey, B., Crowley, P. and **Cooper, R.L. (1998)** The non-genomic effects of ecdysone (20-HE) on crayfish abdominal muscles: in vitro and in vivo studies. Abst Soc. Neurosci.177.16.
61. **Cooper, R.L.**, Li, H., Cole, J.E. and Hopper, H.L. (1998) The neuroecology of cave crayfish: Behavioral & anatomical comparisons of vision in blind epigeal species raised in a cave & troglobitic species. Abst Soc. Neurosci. 468.10.
62. Neckameyer, W.S. and **Cooper, R.L. (1998)**The effects of neuromodulators on synaptic transmission at the *Drosophila* neuromuscular junctions. Abst Soc. Neurosci.327.11
63. Li, H., Huffman, P., Cole, J.L., Hopper H.L., and **Cooper, R.L. (1998)** The neuroecology of cave crayfish: Spatial learning among the of blind cave crayfish. Abst Soc. Neurosci.468.8.
64. Huffman, P. Li, H., Cole, J.L., Hopper H.L., Peretz, B., and **Cooper, R.L. (1998)** The neuroecology of cave crayfish: Social interactions. Abst Soc. Neurosci.468.9
65. He, P., Li, H., Bonner, P.H., Harrison, D., Jones, G., Jones, D., and **Cooper, R.L. (1998)** Non-genomic physiological responses of ecdysone (20-HE) at the neuromuscular junctions of larval *Drosophila* that lack the ability to produce ecdysone. Abst Soc. Neurosci.327.12.
66. Winslow, J.L., **Cooper, R.L.**, and Atwood, H.L. (1998) Presynaptic vesicles: Ca²⁺ diffusion barriers enhance transmitter release. Abst Soc. Neurosci.227.1.
67. Cole, J.L., Li, H., Hopper H.L., and **Cooper, R.L. (1998)** The neuroecology of cave crayfish: The importance of tactile vs. visual cues in determining behavior as related to spatial learning & social interaction. National Speleological Convention. Sevanee, TN. August 3-7,1998.
68. Listerman, L., and **Cooper, R.L. (1998)** The effects of neuromodulators on synaptic transmission: Crayfish neuromuscular junction. Kentucky Academy of Science 84th Annual Meeting. Louisville, KY Nov. 14, 1998.
69. Li, H. and **Cooper, R.L. (1999)** The neuroecology of the blind cave crayfish: social interactions. American Zoologist 38:201A
70. Doshi, D., Li, H., Listerman, L., and **Cooper, R.L. (1999)** Measures of heart rate during social interactions in visual epigeal and blind cave crayfish. American Zoologist 38:199A
71. Griffs, B., LaFramboise, W., Bonner, P., Warren, W. and **Cooper, R.L. (1999)** Myosin isoforms are differentially expressed in crayfish muscle. American Zoologist 38:200A (Honourable Mention for best student presentation)

72. Sohn, J. and **Cooper, R.L. (1999)** The anatomical and physiological characterization of muscles in the dorsal surface of the crayfish abdomen. *American Zoologist* 38:202A
73. Listerman, L., Doshi, D., and **Cooper, R.L. (1999)** Measures of heart rate during social interactions and injections of serotonin in visual epigeal and blind cave crayfish. East Coast Nerve Net, 25th Annual meeting. April 9-11 at **MBL, Woods Hole, MA.**
74. Strawn, J.R. and **Cooper, R.L. (1999)** The effects of serotonin on the control of motor neuron activity in crayfish. East Coast Nerve Net, 25th Annual meeting. April 9-11 at **MBL, Woods Hole, MA.**
75. Griffis, B., Bonner, P.H., and **Cooper, R.L. (1999)** Increased sensitivity of transformed (phasic to tonic-like) motoneurons to the neuromodulator 5-HT. *Abst Soc. Neurosci.* 25: 792.13
76. Strawn, J.R., Bonner, P.H., and **Cooper, R.L. (1999)** Motor command and synaptic transmission: Roles of CNS, sensory systems, and neuromodulation. *Abst Soc. Neurosci.* 25: 792.12
77. Kellie, S., Wagner, T.L.E., and **Cooper, R.L. (1999)** Habituation of the crayfish tail flip response. *Abst Soc. Neurosci.* 25: 792.15
78. Li, H., Harrison, D.A., and **Cooper, R.L. (1999)** Development of *Drosophila* larvae neuromuscular junction: Maintaining synaptic strength. *Abst Soc. Neurosci.* 25: 792.9
79. Listerman, L.R., Atwood, H.L., Marin, L., Bradacs, H. and **Cooper, R.L. (1999)** Does serotonin (5-HT) increase the pool of synaptic vesicles at the crayfish neuromuscular junction? *Abst Soc. Neurosci.* 25: 792.11
80. Sohn, J., Mykles, D.L., and **Cooper, R.L. (1999)** The anatomical, physiological and biochemical characterization of muscles associated with the articulating membrane in the dorsal surface of the crayfish abdomen. *Abst Soc. Neurosci.* 25: 792.14
81. Southard, R.C., Whiteheart, S.W., Zolman, J.F., and **Cooper, R.L. (1999)** Serotonin (5-HT) increases the rate of evoked neurotransmission at the crayfish NMJ. *Abst Soc. Neurosci.* 25: 792.10
82. Cole, J.L., Li, H., Long, L.Y., Hopper H.L., and **Cooper, R.L. (1999)** The neuroecology of cave crayfish: Behavioral & anatomical comparisons of visual systems in sighted epigeal & troglobitic species. National Speleological Convention. Filer, Idaho. July 12-16
83. Griffis, B., Moffett, S. and **Cooper, R.L. (1999)** Load does not influence muscle phenotype in crayfish. *American Zoologist* 39:246
84. Strawn, J.R., Neckameyer, W.S., and **Cooper, R.L. (1999)** The effects of 5-HT on sensory neurons, CNS command, and neuromuscular junctions of the crayfish abdominal superficial flexor. *American Zoologist* 39:245
85. Southard, R.C., Haggard, J., Whiteheart, S.W. and **Cooper, R.L. (1999)** Serotonin (5-HT) increases the rate of evoked neurotransmission at the crayfish NMJ. *American Zoologist* 39:243A
86. Shearer, J. and **Cooper, R.L. (1999)** The differential effects of 5-HT on tonic and phasic motor nerve terminals. *American Zoologist* 39:244A
87. Sohn, J., Mykles, D.L., and **Cooper, R.L. (1999)** The anatomical, physiological and biochemical characterization of muscles associated with the articulating membrane in the dorsal surface of the crayfish abdomen. *American Zoologist* 39:248A
88. Kellie, S. P. and **Cooper, R.L. (1999)** Mechanisms of synaptic depression in high output phasic motor neurons. *American Zoologist* 39:247A
89. Li, H., Harrison, D.A., and **Cooper, R.L. (1999)** Development of *Drosophila* larvae neuromuscular junction: Maintaining synaptic strength. *American Zoologist* 39:249A
90. **Cooper, R.L.,** Li, H., Southard, R.C. (2000) The non-genomic actions of 20-HE in *Drosophila* &

crustaceans. Symposium 'Ecdysone 2000' July, 2000 in Rapperswil, **Switzerland**.

Invited presenter.

91. Strawn, J.R., and **Cooper, R.L. (2000)** Ethanol induced changes in synaptic transmission: roles of pre- and post-synaptic mechanisms. *Abst Soc. Neurosci.*26: 331.1
92. Li, H., Harrison, D., Jones, G., Jones, D. and **Cooper, R.L. (2000)** Alterations in development, behavior, and physiology in *Drosophila* larva that have reduced ecdysone production. *Abst Soc. Neurosci.*26: 128.5
93. Kellie, S. P., Bradacs, H. and **Cooper, R.L. (2000)** Mechanisms of synaptic depression in high output phasic motor neurons. *Abst Soc. Neurosci.*26: 518.10
94. Shearer, J., Zolman, J.F., and **Cooper, R.L. (2000)** The differential effects of 5-HT on tonic and phasic motor nerve terminals. *Abst Soc. Neurosci.*26: 331.17
95. Winslow, J.L., **Cooper, R.L.**, and Atwood, H.L. (2000) Presynaptic sodium in response to low frequency stimulation measured using the fluorescence spectral ratio method. *Abst Soc. Neurosci.*26: 35.14
96. Shuranova, Zh., Burmistrov, Yu., **Cooper, R.L.** and Strawn, J.R. (2000) Autonomic nervous system in the crayfish? Presented at "Simpler Nervous Systems" VI East European Conference of the International Society for Invertebrate Neurobiology. Sept. 21-25, 2000, Moscow, **Russia**.
97. Tabor, J., Chase, R.J., and **Cooper, R.L. (2000)** Altered responsiveness to 5-HT at the crayfish neuromuscular junction. Kentucky Academy of Science. 86th Annual Meeting, Lexington, KY. December 2, 2000.
98. Strawn, J.R., and **Cooper, R.L. (2000)** Ethanol modulates presynaptic transmission at the neuromuscular junction. Kentucky Academy of Science 86th annual meeting, Lexington, KY. Dec. 2, 2000.
99. Schapker, H., **Cooper, R.L.**, Shuranova, Zh., Burmistrov, Yu., and Breithaupt, T. (2000) Heart rate and respiratory correlative measures in crayfish during social interaction and environmental cues. Kentucky Academy of Science 86th annual meeting, Lexington, KY. Dec. 2, 2000.
100. Kellie, S. P. and **Cooper, R.L. (2000)** Mechanisms of synaptic depression in high output phasic motor neurons. Kentucky Academy of Science 86th annual meeting, Lexington, KY. Dec. 2, 2000.
101. **Cooper, R.L.**, Tabor, J, and Chase, R.J. (2001) Altered responsiveness to 5-HT at the crayfish neuromuscular junction: receptor up- & down-regulation. *American Zoologist.* (Society for Integrative and Comparative Biology annual meeting. Chicago, IL., January 3-7).
102. (Translation: Shuranova, Zh., Burmistrov, Yu., Strawn, J.R., and **Cooper, R.L. (2001)** Evidence for an Invertebrate Autonomic Nervous System.18th Annual Russian Physiological Meeting.)
103. **Cooper, R.L.**, Tabor, J.N., Fox, A.J., and Brailoiu, E. (2001) 5-HT receptor subtype and potential mechanisms of 5-HT action at the crayfish NMJ. *Abst Soc. Neurosci.*27. (Society meeting Nov. 2001).
104. **Cooper, R.L.**, Tabor, J.N., Fox, A.J., and Brailoiu, E. (2001) 5-HT receptor subtype and potential mechanisms of 5-HT action at the crayfish NMJ. The 11th Neuropharmacology Conference. San Diego, CA.(Nov.).
105. **Cooper, R.L.**, H. Li, L. R. Listerman, S.P. Kellie, J. Greer, J. L. Cole, and H. L. Hopper (2001) Differences in behaviors, physiological responses and neural structure of cave crayfish to those of epigeal species. National Speleological Convention. Somerset, KY. July, 2001.
106. Shuranova, Zh., Burmistrov, Yu., **Cooper, R.L.** and Strawn, J.R. (2001) Do decapods possess an Autonomic Nervous System. 28th Göttingen Neurobiology Conference, Germany. Proceedings of

- the 4thn meeting of the German Neurosci. Society. 2:357.
107. Schapker, H., Breithaupt, T., Shuranova, Z., Burmistrov, Y. and **Cooper, R.L. (2002)** Heart and ventilatory measures in crayfish during environmental disturbances & social interactions. *American Zoologist*. (Society for Integrative and Comparative Biology annual meeting. Anaheim, CA., January 2-6).
 108. **Cooper, R.L.**, Shuranova, Z., Burmistrov, Y. (2002) Evidence for the autonomic nervous system in decapod crustaceans. *American Zoologist*. (Society for Integrative and Comparative Biology annual meeting. Anaheim, CA., January 2-6).
 109. Sparks, G., **Cooper, R.L.** and Dudel, J. (2002) Serotonin offsets saturation of synaptic release in crayfish motor nerve terminals. *American Zoologist*. (Society for Integrative and Comparative Biology annual meeting. Anaheim, CA., January 2-6).
 110. Xing, B., Shearer, J. and **Cooper, R.L. (2002)** The influence of culture media on synaptic transmission at larval *Drosophila* neuromuscular junction. *American Zoologist*. (Society for Integrative and Comparative Biology annual meeting. Anaheim, CA., January 2-6).
 111. Ball, R., Xing, B., Bonner, P., Shearer, J. and **Cooper, R.L. (2002)** The influence of culture medium on synaptic transmission at larval *Drosophila* neuromuscular junction. *South East Nerve Net*. 18th Annual meeting. Held at Georgia State University, Atlanta, GA.
 112. Brauch, R., Tilden, A.R., and **Cooper, R.L. (2002)** The effects of melatonin on synaptic transmission in crayfish and *Drosophila*. *South East Nerve Net*. 18th Annual meeting. Held at Georgia State University, Atlanta, GA.
 113. **Cooper, R.L.**, Tabor, J.N., Fox, A.J., Brailoiu, E. (2002) 5-HT receptor subtype and potential mechanisms of 5-HT action at the crayfish NMJ. *South East Nerve Net*. 18th Annual meeting. Held at Georgia State University, Atlanta, GA.
 114. Brailoiu, E., **Cooper, R.L.** and Dun, N.J. (2002) Sphingosine 1-phosphate enhances spontaneous transmitter release at the frog neuromuscular junction. *Abst Soc. Neurosci.*28, 249.20 (Society meeting Nov. 2002).
 115. Sparks, G., Dudel, J. and **Cooper, R.L. (2002)** The influence of the Na/Ca exchanger during short-term facilitation in motor nerve terminals. *Abst Soc. Neurosci.*28, 439.10 (Society meeting Nov. 2002).
 116. *Xing, B. and **Cooper, R.L. (2002)** The effects of reduced presynaptic calcium entry on development of motor nerve terminals in *Drosophila*. *Abst Soc. Neurosci.*28, 439.11 (Society meeting Nov. 2002).
 117. *Sparks, G., Brailoiu, E., Brailoiu, G.C., Dun, N.J. and **Cooper, R.L. (2003)** Effects of m-CPP in altering neuronal function: Blocking depolarization in invertebrate motor & sensory neurons but exciting rat sensory neurons. (Society for Integrative and Comparative Biology annual meeting. Toronto, Canada, January 4-7).
 118. Tilden, A.R., Brauch, R., Ball, R. Sweeney, K., Yurek, J. and **Cooper, R.L. (2003)** Modulatory effects of melatonin on neurotransmitter release and behavior in crayfish. (Society for Integrative and Comparative Biology annual meeting. Toronto, Canada, January 4-7).
 119. **Cooper, R.L.**, Viele, K., and Stromberg, A.J. (2003) Estimating the number of release sites and probability of firing within the nerve terminal by statistical analysis of synaptic charge. (Society for Integrative and Comparative Biology annual meeting. Toronto, Canada, January 4-7).
 120. *Johnstone, A., Brailoiu E. and **Cooper, R.L. (2003)** Alteration in synaptic transmission at the neuromuscular junction in crayfish, *Drosophila* and frog by exogenous application of the second messenger, IP6. (Society for Integrative and Comparative Biology annual meeting. Toronto,

- Canada, January 2-6).
121. *Pagé, M.-P., Hailes, W., and **Cooper, R.L. (2003)** Modification of the tail flip escape response in crayfish by neuromodulation and behavioral state. Univ. of KY Neuroscience day.
* Also presented at UK neuroscience day. #s 116, 117, 120
 122. **Cooper, R.L.**, Sparks, G.M. and Dasari, S. (2003) CNS and NMJ actions of MDMA (Ecstasy): Cholinergic & Glutamatergic synapses. (Society for Neuroscience meeting Nov. 2003).
 123. Mercier, A.J. and **Cooper, R.L. (2003)** Neuron-specific modulation of chemical synapses in crayfish by a FLRFamide peptide. (Society for Neuroscience meeting Nov. 2003).
 124. Johnstone, A., Brailoiu, E., Dun, N.J. and **Cooper, R.L. (2003)** Alterations in synaptic transmission were investigated at the neuromuscular junction in crayfish, *Drosophila* and frog by exogenous application of the second messenger, IP6. (Society for Neuroscience meeting Nov. 2003).
 125. Dasari, S. and **Cooper, R.L. (2003)** Sensory stimulation in semi-intact *Drosophila* larva induces CNS activity and recruitment of discernable motor units. (Society for Neuroscience meeting Nov. 2003).
 126. Sparks, G., Brailoiu, E., Brailoiu, G.C., Dun, N.J. and **Cooper, R.L. (2003)** Effects of m-CPP in altering neuronal function: Blocking depolarization in invertebrate motor & sensory neurons but exciting rat sensory neurons. Fifth Annual **Beckman Scholars Symposium**. Arnold and Mabel Beckman Foundation . Located at the Arnold and Mabel Beckman Center of the National Academies of Sciences and Engineering. Irvine, CA July 24 - 26.
 127. Shuranova, Zh., Burmistrov, Yu., and **Cooper, R.L. (2003)** Crayfish behavior in novel environment: Maintenance of escape tendency? VII East European Conference of the International Society for Invertebrate Neurobiology. Sept. 12-16. Kaliningrad-Svetlogorsk-Otrandnoe, Russia.
 128. Stoeppel, C. O'Connell, S., Hensley, A., Bhatt, D., Logsdon, S., Richardson, G., Johnstone, A., Lancaster, M., Viele, K., Kim, S., Dasari, S., **Cooper, R.L. (2004)** Integration of neurophysiology, anatomy and behavior with mathematics & statistics in a workshop course. Society for Neuroscience 2004 meeting SanDiego, CA.
 129. Dasari, S., Nichols, R., **Cooper, R.L. (2004)** Effects of 5-HT and MDMA on heart rate of 3rd instar *Drosophila melanogaster*. Society for Neuroscience 2004 meeting SanDiego, CA.
 130. Bhatt, D., Dasari, S., Brewer, L.D., **Cooper, R.L. (2004)** Characterization of Glutamate receptors at the *Drosophila* Neuromuscular Junction. Society for Neuroscience 2004 meeting SanDiego, CA.
 131. Johnstone, A.F.M., Lancaster, M., Viele, K., Stromberg, A., **Cooper, R.L. (2004)** Structure/Function Assessment of Crayfish Neuromuscular Junction. Society for Neuroscience 2004 meeting SanDiego, CA.
 132. Logsdon, S., Johnstone, A.F.M, **Cooper, R.L. (2004)** Differentially regulated pools of synaptic vesicles within motor nerve terminals. Society for Neuroscience 2004 meeting SanDiego, CA.
 133. Long, A.A., Xing, B., Harrison, D.A., **Cooper, R.L. (2004)** Developmental consequences of NMJs with reduced presynaptic calcium channel function. Society for Neuroscience 2004 meeting San Diego, CA.
 134. Badre, N., Martin, M.E., Bradacs, H., **Cooper, R.L. (2004)** The Effects of CO₂ on *Drosophila* larvae: Possible neural components. Society for Neuroscience 2004 meeting SanDiego, CA.
 135. Dasari, S., **Cooper, R.L. (2004)** Effects of serotonin and MDMA in modulating sensory-CNS-motor circuit in a semi-intact preparation of *Drosophila* larvae. An international meeting of *Drosophila* neurobiology. Neuchâtel, **Switzerland**. Sept. 4-8, 2004.

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136. Cooper, A.-S., Cooper, H., **Cooper R.L. (2005)** Behavioral characterization of *Drosophila melanogaster* larvae in relation to circadian patterns. Society for Integrative and Comparative Biology annual meeting. San Diego, CA, January 4-8.
137. Logsdon, S., Johnstone, A.F.M, **Cooper, R.L. (2005)** Regulation of synaptic transmission by controlling pools of synaptic vesicles. Posters-at-The-Capitol. Oral presentation by Ms. Logsdon to the KY legislation and Governor. Feb. 2005.
138. Cooper, A.-S., Johnstone, A.F.M., Moffett, S. and **Cooper R.L. (2005)** Nerve terminal pruning in conjunction with muscle atrophy by disuse & unloading. Society of Neuroscience annual meeting. Held in Washington, DC. in Nov.
139. Desai, M.S., G.M. Sparks, G.M. and **Cooper, R.L. (2005)** The influence of the na/ca exchanger during short-term facilitation in motor nerve terminals. Society of Neuroscience annual meeting. Held in Washington, DC. in Nov.
140. Badre, N. and **Cooper, R.L. (2005)** Reduced calcium channel function in the *Drosophila cacTS2* mutant on vision, olfaction and regulation of the heart. Society of Neuroscience annual meeting. Held in Washington, DC. in Nov.
141. Logsdon, S., Johnstone, A.F.M., Viele, K. and R. L. **Cooper, R.L. (2005)** The regulation of synaptic vesicles pools within motor nerve terminals during short-term facilitation and neuromodulation. Society of Neuroscience annual meeting. Held in Washington, DC. in Nov.
142. Johnstone, A.F.M., Kellie, S., Reneer, D.V., Viele, K., and **Cooper, R.L. (2005)** Presynaptic depression in phasic motor nerve terminals and influence of 5-HT on docked vesicles. Society of Neuroscience annual meeting. Held in Washington, DC. in Nov.
143. Dasari, S. and **Cooper, R.L. (2005)** Influence of the serotonergic system on physiology, development and behavior of *Drosophila melanogaster*. Society of Neuroscience annual meeting. Held in Washington, DC. in Nov.
144. Adami, M., Schapker, H., Breithaupt, T., Calosi, P., Bradacs, H., and **Cooper, R.L. (2005)** Heart and ventilatory measures in crayfish during social interactions. Society of Neuroscience annual meeting. Held in Washington, DC. in Nov.
145. Cullman-Clark, B., Dasari, S. and **Cooper, R.L. (2005)** Influence of 5-HT receptors on behavior and heart rate in *Drosophila melanogaster* larvae. Society of Neuroscience annual meeting. Held in Washington, DC. in Nov.
146. Viele, K. and **Cooper. R. (2005)** Mixtures of Evoked Synaptic Potentials. Invited Talk. Joint Meetings of the Interface Society and the Classification Society of North America. Washington University School of Medicine, St. Louis, Missouri. June 8-12, 2005.
147. Turner, C., Dasari, S., and **Cooper, R.L. (2005)** Influence of the dopamine and serotonergic systems on physiology, development and behavior of *Drosophila melanogaster*. Kentucky Academy of Sciences. Annual meeting. Eastern KY University, Richmond, KY. Nov. 10-12.
148. Bhatt, D., Bhatt, D., **Cooper, R.L. (2005)** Characterization of glutamate receptors at the *Drosophila* neuromuscular junction. Kentucky Academy of Sciences. Annual meeting. Eastern KY University, Richmond, KY. Nov. 10-12.
149. Hill, J., Dasari, S., Badre, N., Blackburn, J., Viele, K. 19 Middle School, 2 High School Teachers in Fayette County and **Cooper, R.L. (2005)** Influence of nicotine on physiology, development and behavior of *Drosophila melanogaster*: Useful approaches for public school projects. Kentucky Academy of Sciences. Annual meeting. Eastern KY University, Richmond, KY. Nov. 10-12.
150. Viele, K. and **Cooper. R. (2005)** (November). Statistical Methods for the Analysis of Excitatory Post-Synaptic Potentials. Department of Statistics, Carnegie Mellon University.

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151. Turner, C., Dasari, S., and **Cooper, R.L. (2006)** Influence of the dopamine and serotonergic systems on physiology, development and behavior of *Drosophila melanogaster*. Society for Integrative and Comparative Biology. Annual meeting. Orlando, FL. January 4-8.
152. **Cooper, R.L.**, Bhatt, D., Bhatt, D., and Viele, K. (2006) Pre- & post-synaptic actions of kainate: Negative feedback at glutamate-ergic nerve terminals. Society for Integrative and Comparative Biology. Annual meeting. Orlando, FL. January 4-8.
153. Cooper, A.-S., Moffett, S., Johnstone, A.F.M. and **Cooper, R.L. (2006)** Nerve terminal pruning in conjunction with muscle atrophy by disuse & unloading. Society for Integrative and Comparative Biology. Annual meeting. Orlando, FL. January 4-8.
154. Turner, C., Dasari, S. and **Cooper, R.L. (2006)** Influence of the Dopamine and Serotonergic System on Physiology, Development and Behavior of *Drosophila melanogaster*. BlueGrass local chapter of Society for Neuroscience annual meeting. Lexington, KY. March, 13.
155. Cooper, A.S., Johnstone, A.F.M., Moffett, S. and **Cooper, R.L. (2006)** Nerve terminal pruning in conjunction with muscle atrophy by disuse & unloading. BlueGrass local chapter of Society for Neuroscience annual meeting. Lexington, KY. March, 13.
156. Badre, N. and **Cooper, R.L. (2006)** Reduced Calcium Channel Function in the *Drosophila cacTS2* mutant on Vision, Olfaction and Regulation of the Heart. BlueGrass local chapter of Society for Neuroscience annual meeting. Lexington, KY. March, 13.
157. Bhatt, D., Bhatt, D. and **Cooper, R.L. (2006)** Characterization of glutamate receptors at the *Drosophila* neuromuscular junction. BlueGrass local chapter of Society for Neuroscience annual meeting. Lexington, KY. March, 13.
158. Hill, J. and **Cooper, R.L. (2006)** Influence of nicotine on physiology, development and behavior of *Drosophila melanogaster*. BlueGrass local chapter of Society for Neuroscience annual meeting. Lexington, KY. March, 13.
159. Kolasa, J., Adami, M., Schapker, H. and **Cooper, R.L. (2006)** Heart and ventilatory measures in crayfish during social interactions. BlueGrass local chapter of Society for Neuroscience annual meeting. Lexington, KY. March, 13.
160. Desai, M.S., Sparks, G.M. and **Cooper, R.L. (2006)** The influence of the Na/Ca exchanger during short-term facilitation in motor nerve terminals. BlueGrass local chapter of Society for Neuroscience annual meeting. Lexington, KY. March, 13.
161. Hughes, G., Kolasa, J., Bierbower, S., Adami, M. and **Cooper, R.L. (2006)** Heart and ventilatory measures in crayfish during altered environments and social interactions. Kentucky Academy of Sciences. Annual meeting. Moorehead Univ., Moorehead, KY. Nov. 9-11.
162. Turner, C., Pauly, J.R., and **Cooper, R.L. (2006)** Influence of the dopamine on physiology, development and behavior of *Drosophila melanogaster*. Society for Neuroscience annual meeting. Atlanta, GA.
163. Hill, J., Pauly, J.R., and **Cooper, R.L. (2006)** Influence of nicotine on physiology, development and behavior of *Drosophila melanogaster*. Society for Neuroscience annual meeting. Atlanta, GA.
164. Johnstone, A.F.M., Lancaster, M., Viele, K., and **Cooper, R.L. (2006)** Structure/function assessment of crayfish synapses at the neuromuscular junction. Society for Neuroscience annual meeting. Atlanta, GA.
165. Desai, M.S., Sparks, G.M. and **Cooper, R.L. (2006)** The influence of the Na/Ca exchanger during short-term facilitation in motor nerve terminals. Society for Neuroscience annual meeting. Atlanta, GA.
166. Badre, N. and **Cooper, R.L. (2006)** Reduced calcium channel function in the *Drosophila cacTS2*

- mutant on vision, olfaction and regulation of the heart. Society for Neuroscience annual meeting. Atlanta, GA.
167. Kolasa, J., Bierbower, S., Adami, M. and **Cooper, R.L. (2006)** Heart and ventilatory measures in crayfish during altered environments and social interactions. Society for Neuroscience annual meeting. Atlanta, GA.
 168. Dasari, S., Turner, A.C., Cullman-Clark, B., White, J., and **Cooper, R.L. (2006)** Effects of the serotonergic system on physiology, development, learning and behavior of *Drosophila melanogaster*. Society for Neuroscience annual meeting. Atlanta, GA.
 169. Bierbower, S., Shuranova, Zh., Burmistrov, Yu., and **Cooper, R.L. (2006)** Evidence for the autonomic nervous system in Decapod Crustaceans: A historical perspective. Society for Neuroscience annual meeting. Atlanta, GA.
 170. Bhatt, D., Bhatt, D. and **Cooper, R.L. (2006)** Characterization of glutamate receptors at the *Drosophila* neuromuscular junction. Society for Neuroscience annual meeting. Atlanta, GA.
 171. Cooper, A.-S., Viele, K. and **Cooper, R.L. (2006)** Differential regulation of synaptic transmission along the length of motor nerve terminals in larval *Drosophila*. Society for Neuroscience annual meeting. Atlanta, GA.
 172. Hayden, B., Desai, M., Viele, K. and **Cooper, R.L. (2006)** The nature of quantal release during short-term facilitation at the crayfish NMJ. Society for Neuroscience annual meeting. Atlanta, GA.
 173. Badre, N. and **Cooper, R.L. (2006)** Reduced calcium channel function in the *Drosophila* cacTS2 mutant on vision, olfaction and regulation of the heart. Eight Annual **Beckman Scholars Symposium**. Arnold and Mabel Beckman Foundation. Located at the Arnold and Mabel Beckman Center of the National Academies of Sciences and Engineering. Irvine, CA July 26 - 28.
 174. **Cooper, R.L.**, Dasari, S., Turner, A.C., White, C. and White, J. (2006) Effects of the serotonergic system on physiology, development, learning and behavior of *Drosophila melanogaster*. 1st International Conference on Synapses, Memory, Drug Addiction, and Pain. Dept. of Physiology, University of Toronto, Toronto, **Canada**. August 21-23. (by invitation)
 175. Desai, M.S., Sparks, G.M. **Cooper, R.L. (2006)** The influence of the Na⁺/Ca²⁺ exchanger during short-term facilitation in motor nerve terminals. 1st International Conference on Synapses, Memory, Drug Addiction, and Pain. Dept. of Physiology, University of Toronto, Toronto, **Canada**. August 21-23. (by invitation)
 176. Winslow, J.L., **Cooper, R.L.**, Atwood, H.L.. (2006) Size and history matters: Large presynaptic active zones can cause larger calcium responses hence more evoked neurotransmitter release than small active zones. 1st International Conference on Synapses, Memory, Drug Addiction, and Pain. Dept. of Physiology, University of Toronto, Toronto, **Canada**. August 21-23. (by invitation)
 177. Cooper, A.S., Johnstone, A.F.M., and **Cooper, R.L. (2006)** Nerve terminal pruning in conjunction with muscle atrophy by disuse & unloading. VIII East European Conference of the International Society for Invertebrate Neurobiology Simpler Nervous Systems. Kazan, **Russia**, Sept. 13-17. (by invitation).
 178. **Cooper, R.L.**, Dasari, S., Turner, A.C., Cullman-Clark, B., White, J. (2006) Effects of the serotonergic system on physiology, development, learning and behavior of *Drosophila melanogaster*. VIII East European Conference of the International Society for Invertebrate Neurobiology Simpler Nervous Systems. Kazan, **Russia**, Sept. 13-17. (by invitation).

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179. **Cooper, R.L.**, Dasari, S. and Turner, A.C. (2007) Effects of the serotonergic system on physiology, development, learning and behavior of *Drosophila melanogaster*. Society for Integrative and Comparative Biology. Annual meeting. January 3-7. AZ, USA.
180. Papoy, A.R., Desai, M.S., **Cooper, R.L.** (2007) Regulation of calcium by the SERCA, PMCA and NCX. Univ. of KY, Showcase of Scholars (2nd annual undergraduate research event).
181. Turner, C., Dasari, S., and **Cooper, R.L.** (2007) Influence of the dopamine on physiology, development and behavior of *Drosophila melanogaster*. Univ. of KY, Showcase of Scholars (2nd annual undergraduate research event).
182. McLaurine, T., Bierbower, S., **Cooper, R.L.** (2007) CO₂ environment: How bad could it be ? Univ. of KY, Showcase of Scholars (2nd annual undergraduate research event).
183. Spence, T. Bierbower, S., **Cooper, R.L.** (2007) Sensory: Do species do it differently? Univ. of KY, Showcase of Scholars (2nd annual undergraduate research event).
184. Bierbower, S.M., **Cooper, R.L.** (2007) The mechanistic effects of CO₂ on physiology and behavior in *Procambarus clarkii*. Society for Neuroscience Annual Meeting. San Diego, CA. 359.1
185. Desai, M.S., Viele, K. Hayden, B.J., **Cooper, R.L.** (2007) Quantal release during short-term facilitation in motor nerve terminals of the crayfish. Society for Neuroscience Annual Meeting. San Diego, CA. 359.2
186. Spence, T., McLaurine, T., Bierbower, S., **Cooper, R.L.** (2007) Sensory: Do species do it differently? Kentucky Academy of Sciences. Annual meeting. Univ. of Louisville, KY. Nov. 8-10.
187. Papoy, A.R., Desai, M.S., **Cooper, R.L.** (2007) Roles of the SERCA, PMCA and NCX in calcium regulation in the *Drosophila* larval heart. Kentucky Academy of Sciences. Annual meeting. Univ. of Louisville, KY. Nov. 8-10.
188. Cooper, A.S., **Cooper, R.L.**, Chae, H., Kim, C. (2008) The effects of capsaicin on *Drosophila*. Society for Integrative and Comparative Biology. Annual meeting. January 2-6, 2008, San Antonio, TX.
189. Lee, J.Y., Chung, W.Y., Logsdon, S., Johnstone, A. F. M., **Cooper, R.L.** (2008) The regulation of synaptic vesicle pools within motor nerve terminals. Society for Integrative and Comparative Biology. Annual meeting. January 2-6, 2008, San Antonio, TX.
190. Spence, T., McLaurine, T., Bierbower, S., **Cooper, R.L.** (2008) Chemosensory induced behavioral and physiological responses in crayfish. NCUR- National Council on Undergraduate Research. Salisbury University, Salisbury, MD.
191. Turner, C., Dasari, S., and **Cooper, R.L.** (2008) Influence of the serotonin and dopamine on physiology, development and behavior of *Drosophila melanogaster*. NCUR- National Council on Undergraduate Research. Salisbury University, Salisbury, MD.
192. Papoy, A.R., Desai, M.S. and **Cooper, R.L.** (2008) Roles of the SERCA, PMCA and NCX in calcium regulation in the *Drosophila* larval heart. NCUR- National Council on Undergraduate Research. Salisbury University, Salisbury, MD.
193. Desai, M.S., Sparks, G.M. **Cooper, R.L.** (2008) The influence of the Na⁺/Ca²⁺ exchanger and the PMC ATPase pump during short-term facilitation in motor nerve terminals. Annual meeting of the BlueGrass Chapter of the Society for Neuroscience. March 12, 2008. Univ. of KY.
194. Bierbower, S.M., **Cooper, R.L.** (2008) The mechanistic effects of CO₂ on physiology and behavior in *Procambarus clarkii*. Annual meeting of the BlueGrass Chapter of the Society for Neuroscience. March 12, 2008. Univ. of KY.
195. Lee, J.Y., Chung, W.Y., Logsdon, S., Johnstone, A. F. M., **Cooper, R.L.** (2008) The regulation of

- synaptic vesicle pools within motor nerve terminals. Annual meeting of the BlueGrass Chapter of the Society for Neuroscience. March 12, 2008. Univ. of KY.
196. Cooper, A.S., **Cooper, R.L.**, Chae, H., Kim, C. (2008) The effects of capsaicin on *Drosophila*. Annual meeting of the BlueGrass Chapter of the Society for Neuroscience. March 12, 2008. Univ. of KY.
 197. Stephens, D., Bierbower, S., Kolasa, J., Adami, M. and **Cooper, R.L.** (2008) Heart and ventilatory measures in crayfish during altered environments. Annual meeting of the BlueGrass Chapter of the Society for Neuroscience. March 12, 2008. Univ. of KY.
 198. Turner, C. and **Cooper, R.L.** (2008) The effects of an altered dopaminergic and serotonergic system on behavior, development, and physiology in *Drosophila melanogaster*. Annual meeting of the BlueGrass Chapter of the Society for Neuroscience. March 12, 2008. Univ. of KY.
 199. Turner, C. and **Cooper, R.L.** (2008) The effects of an altered dopaminergic and serotonergic system on behavior, development, and physiology in *Drosophila melanogaster*. 2008 South East Nerve Net meeting. Georgia State University, Atlanta, GA., USA.
 200. Cooper, A.S., **Cooper, R.L.**, Chae, H., Kim, C. (2008) The effects of capsaicin on *Drosophila*. 15th Annual meeting. Center for the Integrative Study of Animal Behavior Conference on Friday April 25th at Indiana University.
 201. Bierbower, S.M., **Cooper, R.L.** (2008) Comparative study of environmental modulation of intrinsic behavior in blind and sighted crayfish. 15th Annual meeting. Center for the Integrative Study of Animal Behavior Conference on Friday April 25th at Indiana University.
 202. Stephens, D., Bierbower, S.M. and **Cooper, R.L.** (2008) The effect of CO₂ on behavior and physiology in crayfish. Univ. of KY, Showcase of Scholars (3rd annual undergraduate research event).
 203. Allen, C., Naik, S., Bierbower, S.M. and **Cooper, R.L.** (2008) Task learning and memory retention in blind crayfish, *Orconectes australis packardii*. Univ. of KY, Showcase of Scholars (3rd annual undergraduate research event).
 204. McLaurine, T., Robinson, M., Spence, T., Bierbower, S.M. and **Cooper, R.L.** (2008) The role of olfactory: comparison of the autonomic response of multiple sensory modalities in crayfish. Univ. of KY, Showcase of Scholars (3rd annual undergraduate research event).
 205. Naik, S., Bierbower, S.M., Shuranova, Z., Burmistrov, Y. and **Cooper, R.L.** (2008) Task learning and memory retention in crayfish. Univ. of KY, Showcase of Scholars (3rd annual undergraduate research event).
 206. Holmes, K.N., Bierbower S.M. and **Cooper, R.L.** (2008) Effect of exercise duration and environment on the autonomic response in crayfish, *Procambarus clarkii*. Univ. of KY, Showcase of Scholars (3rd annual undergraduate research event).
 207. Wright, M.C., Bierbower, S.M. and **Cooper, R.L.** (2008) Effects of olfaction and environment on agonistic behavior in the crayfish, *procambarus clarkii*. Univ. of KY, Showcase of Scholars (3rd annual undergraduate research event).
 208. Papoy, A.R., Desai, M.S. and **Cooper, R.L.** (2008) Roles of the SERCA, PMCA and NCX in calcium regulation in the *Drosophila* larval heart. Univ. of KY, Showcase of Scholars (3rd annual undergraduate research event).
 209. Bocook, E. Bierbower, S.M. and **Cooper, R.L.** (2008) A quantifiable measure of interaction intensity influenced by environmental factors in blind crayfish. Univ. of KY, Showcase of Scholars (3rd annual undergraduate research event).
 210. Shrinivasan, V., Desai, M.S., Viele, K. and **Cooper, R.L.** (2008) Determining the characteristics

- of quantal events during short-term facilitation. Univ. of KY, Showcase of Scholars (3rd annual undergraduate research event).
211. Turner, A.C. and **Cooper, R.L. (2008)** The effects of an altered dopaminergic system on behavior, development, and physiology in *Drosophila melanogaster*. Univ. of KY, Showcase of Scholars (3rd annual undergraduate research event).
 212. Cooper, A.S., Kim, C. and **Cooper, R.L. (2008)** The effects of enhanced sensory perception on learning and memory retention in *Drosophila*. Annual meeting of Society for Neuroscience. Washington, DC.
 213. Lee, J.-Y., Bhatt, D., Bhatt, D., Chung, W.-Y., Lee, N.-T. and **Cooper, R.L. (2008)** Pre- & Post-synaptic Actions of Kainate: Negative Feedback at Glutamatergic Nerve Terminals. Annual meeting of Society for Neuroscience. Washington, DC.
 214. Bierbower, S.M. and **Cooper, R.L. (2008)** The effect of CO₂ on the neural circuitry of an identified behavior. Annual meeting of Society for Neuroscience. Washington, DC.
 215. Desai, M. and **Cooper, R.L. (2008)** Roles of the Sodium Calcium Exchanger (NCX), the Plasma Membrane Ca²⁺-ATPase (PMCA) and the Sarcoplasmic/Endoplasmic Reticulum Ca²⁺-ATPase (SERCA) in synaptic transmission at the Crayfish and *Drosophila* Neuromuscular Junctions. Annual meeting of Society for Neuroscience. Washington, DC.
 216. Turner, A.C. and **Cooper, R.L. (2008)** The Effects of an Altered Dopaminergic System on Behavior, Development, and Physiology in *Drosophila melanogaster*. Annual meeting of Society for Neuroscience. Washington, DC.
 217. Robinson, M., McLaurine, T., Spence, T., Bierbower, S.M. and **Cooper, R.L. (2008)** Comparison of the autonomic response of multiple sensory modalities in crayfish. Annual meeting of Society for Neuroscience. Washington, DC.
 218. Turner, A.C. and **Cooper, R.L. (2008)** The Effects of an altered dopaminergic system on behavior, development, and physiology in *Drosophila melanogaster*. The national annual meeting of TriBeta (Biology Honor Society). Held at Northern KY University.
 219. VanDyke, R., Viele, K. and **Cooper, R.L. (2008)** Classifying Self-Modeling Regressions in Synaptic Transmission Data. 4th conference on the Statistical Analysis of Neurological Data, **Pittsburgh, PA.** May 29-31, 2008.
 220. Turner, A.C. and **Cooper, R.L. (2008)** The effects of an altered dopaminergic system on behavior, development, and physiology in *Drosophila melanogaster*. Neurofly 2008 12th European *Drosophila* Neurobiology Conference. September 6 to 10, 2008. University of Würzburg, **Germany.**
 221. Wu, W.-H. Hill, J. and **Cooper, R.L. (2008)** Influence of nicotine on physiology, development and behavior of *Drosophila melanogaster*. Kentucky Academy of Sciences. Annual meeting. November 1, 2008, Lexington, KY (Univ. of KY campus).
 222. Ward, M., Desai-Shah, M., Papoy, A.R., and **Cooper, R.L. (2008)** Roles of the SERCA, PMCA and NCX in calcium regulation in the *Drosophila* larval heart. Kentucky Academy of Sciences. Annual meeting. November 1, 2008, Lexington, KY (Univ. of KY campus).
 223. Lee, J.-Y., Bhatt, D., Bhatt, D., Chung, W.-Y., Lee, N.-T. and **Cooper, R.L. (2008)** Pre- & Post-synaptic Actions of Kainate: Negative Feedback at Glutamatergic Nerve Terminals. Kentucky Academy of Sciences. Annual meeting. November 1, 2008, Lexington, KY (Univ. of KY campus).
 224. Srinivasan, V.K. Desai-Shah, M. Viele, K., Sparks, G., Nadolski, J., Hayden, J. and **Cooper, R.L. (2008)** Assessment of synaptic function during short-term facilitation in motor nerve terminals in

- the crayfish. Kentucky Academy of Sciences. Annual meeting. November 1, 2008, Lexington, KY (Univ. of KY campus).
225. Kerbl, D., Desai, M.S., Papoy, A.R., Ward, M. and **Cooper, R.L. (2008)** Regulation of larval *Drosophila* heart rate by calcium ion channels. Kentucky Academy of Sciences. Annual meeting. November 1, 2008, Lexington, KY (Univ. of KY campus).
226. Turner, A.C. and **Cooper, R.L. (2008)** The effects of an altered dopaminergic system on behavior, development, and physiology in *Drosophila melanogaster*. Kentucky Academy of Sciences. Annual meeting. November 1, 2008, Lexington, KY (Univ. of KY campus).
227. Bocook, E., Liberty, B., McQuerry, J., Bierbower, S.M. and **Cooper, R.L. (2008)** Social Interactions: Influence of sensory cues and environmental conditions on fighting strategy in blind crayfish. Kentucky Academy of Sciences. Annual meeting. November 1, 2008, Lexington, KY (Univ. of KY campus).
228. Liberty, B., McQuerry, J., Bocook, E., Bierbower, S.M. and **Cooper, R.L. (2008)** The role of sensory cues and environmental conditions on the fighting strategy in sighted crayfish. Kentucky Academy of Sciences. Annual meeting. November 1, 2008, Lexington, KY (Univ. of KY campus).
229. Allen, C., Naik, S., Bierbower, S.M. and **Cooper, R.L. (2008)** Can blind crayfish learn a motor task? Kentucky Academy of Sciences. Annual meeting. November 1, 2008, Lexington, KY (Univ. of KY campus).
230. Robinson, M., Mando, J., Baker, M., Bierbower, S.M. and **Cooper, R.L. (2008)** Across species comparison of the autonomic response of multiple sensory modalities in crayfish. Kentucky Academy of Sciences. Annual meeting. November 1, 2008, Lexington, KY (Univ. of KY campus).
231. Boyechko, Y., Galperin, V., Bierbower, S.M. and **Cooper, R.L. (2008)** Long-Term Memory Retention in Crayfish. Kentucky Academy of Sciences. Annual meeting. November 1, 2008, Lexington, KY (Univ. of KY campus).
232. Kelly, B., Bierbower, S.M. and **Cooper, R.L. (2008)** The Effects of CO₂ on Behavior and Physiology in Crayfish. Kentucky Academy of Sciences. Annual meeting. November 1, 2008, Lexington, KY (Univ. of KY campus).
233. Bierbower, S.M., Holmes, K. and **Cooper, R.L. (2009)** Effect of exercise and environment on the autonomic response in crayfish, *Procambarus clarkia*. Society for Integrative and Comparative Biology. Annual meeting. January 2-6, 2009, **Boston, Mass.**
234. Wu, W.-H. Hill, J. and **Cooper, R.L. (2009)** Influence of nicotine on physiology, development and behavior of *Drosophila melanogaster*. Society for Integrative and Comparative Biology. Annual meeting. January 2-6, 2009, **Boston, Mass.**
235. Lee, J.-Y., Bhatt, D., Bhatt, D., Chung, W.-Y., Lee, N.-T. and **Cooper, R.L. (2009)** Pre- & Post-synaptic Actions of Kainate: Negative Feedback at Glutamatergic Nerve Terminals. Society for Integrative and Comparative Biology. Annual meeting. January 2-6, 2009, **Boston, Mass.**
236. Turner, A.C. and **Cooper, R.L. (2009)** The effects of an altered dopaminergic system on behavior, development, and physiology in *Drosophila melanogaster*. Society for Integrative and Comparative Biology. Annual meeting. January 2-6, 2009, **Boston, Mass.**
237. Ward, M., Desai-Shah, M., Papoy, A.R., and **Cooper, R.L. (2009)** Roles of the SERCA, PMCA and NCX in calcium regulation in the *Drosophila* larval heart. Posters at the Capital. Frankfort, KY. February, 2009.
238. Bierbower, S.M., and **Cooper, R.L. (2009)** Motor Task Learning and Retention in Crayfish. 2nd

- Annual UK Cognitive Science Symposium. March 7, 2009.
239. Turner, A.C. and **Cooper, R.L. (2009)** The effects of an altered dopaminergic system on behavior, development, and physiology in *Drosophila melanogaster*. Society for Neuroscience Bluegrass chapter. March 18, 2009 Univ. of KY.
 240. Lee, J.-Y., Bhatt, D., Bhatt, D., Chung, W.-Y., Lee, N.-T. and **Cooper, R.L. (2009)** Pre- & Post-synaptic Actions of Kainate: Negative Feedback at Glutamatergic Nerve Terminals. Society for Neuroscience Bluegrass chapter. March 18, 2009 Univ. of KY.
 241. Wu, W.-H. Hill, J. and **Cooper, R.L. (2009)** Influence of nicotine on physiology, development and behavior of *Drosophila melanogaster*. Society for Neuroscience Bluegrass chapter. March 18, 2009 Univ. of KY.
 242. Cooper, A.S., Kim, C. and **Cooper, R.L. (2009)** The effects of enhanced sensory perception on learning and memory retention in *Drosophila*. Society for Neuroscience Bluegrass chapter. March 18, 2009 Univ. of KY.
 243. Robinson, M., McLaurine, T., Spence, T., Bierbower, S.M. and **Cooper, R.L. (2009)** Comparison of the autonomic response of multiple sensory modalities in crayfish. Society for Neuroscience Bluegrass chapter. March 18, 2009 Univ. of KY.
 244. Northcutt, C., Viele, K. and **Cooper, R.L. (2009)** Kinetics of the vesicle fusion pore regarding the physiological function at the neuromuscular junction of crayfish. Society for Neuroscience Bluegrass chapter. March 18, 2009 Univ. of KY.
 245. Bierbower, S.M., and **Cooper, R.L. (2009)** Motor Task Learning and Retention in Crayfish. Center for the Integrative Study of Animal Behavior Conference on Friday April 10th at **Indiana University**.
 246. Cooper, A.S., Kim, C., **Cooper, R.L. (2009)** The effects of enhanced sensory perception to learning and memory retention in *Drosophila*. 16th Annual meeting. Center for the Integrative Study of Animal Behavior Conference on Friday April 10th at **Indiana University**.
 247. Ward, M., Desai-Shah, M., Papoy, A.R., and **Cooper, R.L. (2009)** Roles of the SERCA, PMCA and NCX in calcium regulation in the *Drosophila* larval heart. 23rd National Conference on Undergraduate Research (**NCUR**), University of Wisconsin-La Crosse, La Crosse, Wisconsin. April 17, 2009.
 248. Turner, A.C. and **Cooper, R.L. (2009)** The Effects of an Altered Dopaminergic System on Behavior, Development, and Physiology in *Drosophila melanogaster*. 23rd National Conference on Undergraduate Research (**NCUR**), University of Wisconsin-La Crosse, La Crosse, Wisconsin. April 17, 2009.
 249. Robinson, M., Mando, J., Baker, M., Bierbower, S.M. and **Cooper, R.L. (2009)** Across species comparison of the autonomic response of multiple sensory modalities in crayfish. 23rd National Conference on Undergraduate Research (**NCUR**), University of Wisconsin-La Crosse, La Crosse, Wisconsin. April 17, 2009.
 250. Kelly, B., Bierbower, S.M. and **Cooper, R.L. (2009)** Paralytic effect of carbon dioxide on an identified behavior: Role of CNS. 4th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky.
 251. Gilberts, A., Bierbower, S.M. and **Cooper, R.L. (2009)** CNS control of scaphognathite patterns during a 'sympathetic-like' response in crayfish. 4th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky.
 252. Forsythe, L., Bierbower, S.M. and **Cooper, R.L. (2009)** Environmental factors influencing motor task learning and retention in crayfish. 4th Annual Showcase of Undergraduate Scholars,

- University of Kentucky, Lexington, Kentucky.
253. Galperin, V. Bierbower, S.M. and **Cooper, R.L. (2009)** Stress response due to inhibition of completing a learned motor task in crayfish. 4th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky.
 254. Baker, M., Robinson, M., Bierbower, S. M., and **Cooper, R. L. (2009)** Across species comparison of the autonomic response of multiple sensory modalities in crayfish. 4th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky.
 255. Liberty, B., McQuerry, J., Bocook, E., Bierbower, S.M. and **Cooper, R.L. (2009)** Comparative study of quantifiable environmental factors modulating intrinsic behavior in crayfish . 4th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky.
 256. Turner, A.C. and **Cooper, R.L. (2009)** The Effects of an Altered Dopaminergic System on Behavior, Development, and Physiology in *Drosophila melanogaster*. 4th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky.
 257. *ditto. Turner, A.C. and **Cooper, R.L. (2009)** The Effects of an Altered Dopaminergic System on Behavior, Development, and Physiology in *Drosophila melanogaster*. Eleventh Annual **Beckman Scholars Symposium**. Arnold and Mabel Beckman Foundation. Located at the Arnold and Mabel Beckman Center of the National Academies of Sciences and Engineering. Irvine, CA July 24 - 27.
 258. Bierbower, S.M. and **Cooper, R.L. (2009)** Synaptic mechanisms of action explaining carbon dioxide induced paralysis. Annual meeting of Society for Neuroscience. Chicago, USA.
 259. Cooper, A.S., Kim, C., **Cooper, R.L. (2009)** The effects of enhanced sensory perception to learning and memory retention in *Drosophila*. Annual meeting of Society for Neuroscience. Chicago, USA.
 260. Robinson, M., Mando, J., Baker, M., Bierbower, S.M. and **Cooper, R.L. (2009)** Using heart rate as a bioindex to assess various sensory perceptions in sighted and non-sighted crayfish. Annual meeting of Society for Neuroscience. Chicago, USA.
 261. Cooper, A.S., Kim, C., **Cooper, R.L. (2009)** The effects of enhanced sensory perception to learning and memory retention in *Drosophila*. Kentucky Academy of Sciences annual meeting. Nov. 2009 at Northern Kentucky University.
 262. Robinson, M., Mando, J., Baker, M., Bierbower, S.M. and **Cooper, R.L. (2009)** Using heart rate as a bioindex to assess various sensory perceptions in sighted and non-sighted crayfish. Kentucky Academy of Sciences annual meeting. Nov. 2009 at Northern Kentucky University.
 263. Baker, M., Robinson, M., Bierbower, S.M. and **Cooper, R.L. (2009)** Autonomic response to multiple sensory modalities in crayfish. Kentucky Academy of Sciences annual meeting. Nov. 2009 at Northern Kentucky University.
 264. VanDyke, R., Viele, K., **Cooper, R. (November 2009)**. Mixtures of Self-Modeling Regressions. University of Pennsylvania Biostatistics Seminar Series
 265. Cooper, A.S., Robinson, M., Baker, M., Bierbower, S.M. and **Cooper, R.L. (2010)** The effects of enhanced sensory perception to learning and memory retention in *Drosophila*. / Autonomic response to multiple sensory modalities in crayfish. Dual poster at the annual POSTERS -AT-THE -CAPITAL. Frankfort, KY. Jan. 2010.
 266. Cooper, A.S. and **Cooper, R.L. (2010)** The effects of enhanced sensory perception on learning and memory retention in *Drosophila*. American Association for the Advancement of Science (AAAS), San Diego, CA., Annual meeting. Feb. 2010. (poster and oral presentation).
 267. Wu, W.-H. and **Cooper, R.L. (2010)** The regulation of synaptic vesicles within crayfish NMJ.

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- Annual meeting. Society for Neuroscience Bluegrass Chapter. March 17, 2010 Univ. of KY.
268. Leksrisawat, B., Cooper, A.S., and **Cooper, R.L. (2010)** Response properties in the crayfish abdomen: Educational aspects. Annual meeting for Society for Neuroscience Bluegrass Chapter. March 17, 2010 Univ. of KY. (* **won an \$100 award at the meeting. Best undergrad poster**).
269. Tucker, M., Bierbower, S.M. and **Cooper, R.L. (2010)** The effect of CO₂ on the neural circuitry of an identified behavior. 5th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky. April 2010.
270. Gilberts, A., Wigginton, A.J., Bierbower, S.M., Xu, S. and **Cooper, R.L. (2010)** Effects of environmental Cd²⁺ on crayfish: Behavior and physiology. 5th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky. April 2010.
271. Armbruster, J., Wu, W.-H. and **Cooper, R.L. (2010)** The regulation of synaptic vesicles pool in nerve terminals. 5th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky. April 2010.
272. Martin, J.M., Robinson, M., **Cooper, R.L. (2010)** Modeling of biological cell membranes using a classroom-practical laboratory setup, with emphasis on neuronal axon ion exchange. 5th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky. April 2010.
273. Robinson, M., Bierbower, S., **Cooper, R.L. (2010)** Assessing various sensory perceptions in sighted and non-sighted crayfish using heart rate as a bioindex. 5th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky. April 2010.
274. Cooper, A.S. and **Cooper, R.L. (2010)** The effects of enhanced sensory perception on learning and memory retention in *Drosophila*. 5th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky. April 2010.
275. Robinson, M., **Cooper, R.L.**, Bierbower, S. (2010) Using heart rate as a bioindex to assess various sensory perceptions in sighted and non-sighted crayfish. The 19th Annual Meeting of International Behavioral Neuroscience Society. **Sardinia, Italy**. June 8-13, 2010.
276. Cooper, A.S., Johnstone, A.F.M., and **Cooper, R.L. (2010)** Nerve terminal pruning in conjunction with muscle atrophy by disuse & unloading. The Center for Muscle Biology symposium. University of Kentucky. June 1, 2010.
277. Robinson, M., **Cooper, R.L.**, and Bierbower, S. (2010) Using heart rate as a bioindex to assess various sensory perceptions in sighted and non-sighted crayfish. Twelfth Annual **Beckman Scholars Symposium**. Arnold and Mabel Beckman Foundation. Located at the Arnold and Mabel Beckman Center of the National Academies of Sciences and Engineering. Irvine, CA July.
278. Wu, W.-H. and **Cooper, R.L. (2011)** Packaging and physiological separation of the RRP and RP of vesicles within various types of presynaptic terminals. Annual meeting. Society for Neuroscience Bluegrass Chapter. March 31. University of Kentucky, Lexington, Kentucky.
279. Robinson, A.D., Wu, W.H. and **Cooper, R.L. (2011)** Ephaptic transmission between motor neurons. Annual meeting. Society for Neuroscience Bluegrass Chapter. March 31. University of Kentucky, Lexington, Kentucky.
280. Cooper, A., Gilberts, A., Baierlein, B., Leksrisawat, B., Thurow, A., Robinson, M.M., Martin, J.M. and **Cooper, R.L. (2011)** Creating Interactive Neurophysiology Laboratory Experiments for the Students at the University of Kentucky. Annual meeting. Society for Neuroscience Bluegrass Chapter. March 31. University of Kentucky, Lexington, Kentucky.
281. Cooper, A., Gilberts, A., Baierlein, B., Leksrisawat, B., Thurow, A., Robinson, M.M., Martin, J.M. and **Cooper, R.L. (2011)** Creating Interactive Neurophysiology Laboratory Experiments for the

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- Students at the University of Kentucky. 6th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky. April.
282. Chung, Y.S., Graff, J., Cooper, R.M., **Cooper, R.L.** (2011) The acute and chronic effect of temperature on heart and ventilatory rate in prawns. 6th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky. April.
283. Robinson, A.D., Wu, W.H, **Cooper, R.L.** (2011) Ephaptic transmission between motor neurons. Univ. of KY, Showcase of Scholars. 6th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky. April.
284. Wu, W.-H. and **Cooper, R.L.** (2011) Packaging and physiological separation of the RRP and RP of vesicles within various types of presynaptic terminals. Annual meeting of Society for Neuroscience. Washington, DC, USA.
285. Robinson, A.D., Wu, W.H, **Cooper R.L.**(2011) Ephaptic transmission between motor neurons. Annual meeting of Society for Neuroscience. Washington, DC, USA.
286. Majeed, Z.R., **Cooper, R.L.** and Nichols, C.D. (2011) Effect of DREADD receptor activation in *Drosophila* motoneurons on synaptic transmission. Annual meeting of Society for Neuroscience. Washington, DC, USA.
287. Cooper, A., Gilberts, A., Baierlein, B., Leksrisawat, B., Thurow, A., Robinson, M.M., Martin, J.M. Holsinger, R.C., and **Cooper, R.L.** (2011) Creating Interactive Neurophysiology Laboratory Experiments for the Students at the University of Kentucky. Annual meeting of Society for Neuroscience. Washington, DC, USA.
288. Cooper, R.M., Chung, Y.S. Holsinger, R.C. and **Cooper, R.L.** (2011) Development of neurophysiology laboratory experiments for high schools in Kentucky. Annual meeting of Society for Neuroscience. Washington, DC, USA.
289. Crum M., Robinson, M.M. and **Cooper, R.L.** (2011) Model of hypercalcemia in crayfish with correlates to a human pathophysiological condition. Annual meeting of Society for Neuroscience. Washington, DC, USA.
290. Potenza, J.B., Mercier, A.J. and **Cooper, R.L.** (2011) Physiological investigations with the crayfish hindgut. The Center for Muscle Biology Univ. of KY., Modeling Workshop for trainees in Muscle Biology. July 27, 2011. (*JBP won an award for best presentation*).
291. Wu, W.-H. and **Cooper, R.L.** (2011) Packaging and physiological separation of the RRP and RP of vesicles within various types of presynaptic terminals. 26th Meeting of the Ohio Physiological Society, University of Cincinnati, October 6–7, Cincinnati, Ohio.
292. Holsinger, R.C., Potenza, J.B., LeBlancq, M.J., Mercier, A.J. and **Cooper, R.L.** (2011) Modulating the neural control and direct actions on the crayfish hindgut: Serotonin, octopamine and dopamine. 26th Meeting of the Ohio Physiological Society, University of Cincinnati, October 6–7, Cincinnati, Ohio.
293. Cooper, A.S., Johnstone, A.F.M., and **Cooper, R.L.** (2011) Nerve terminal pruning in conjunction with muscle atrophy by disuse & unloading. 26th Meeting of the Ohio Physiological Society, University of Cincinnati, October 6–7, Cincinnati, Ohio.
294. Cooper, R.M., Schapker-Finucane, H. Adami, H. and **Cooper, R.L.** (2011) Heart and ventilatory measures in crayfish during copulation. The Kentucky Academy of Science annual meeting. Nov. 4-5, 2011, Murray State University, Murray, Kentucky.
295. Potenza, J.B., Holsinger, R.C., LeBlancq, M.J., Mercier, A.J. and **Cooper, R.L.** (2011) Crayfish hindgut: A model system for examining central and peripheral control mechanisms. The Kentucky Academy of Science annual meeting. Nov. 4-5, 2011, Murray State University,

- Murray, Kentucky.
296. Cooper, A.S. and **Cooper, R.L. (2011)** Transection of a motor nerve results in a rapid synaptic depression. The Kentucky Academy of Science annual meeting. Nov. 4-5, 2011, Murray State University, Murray, Kentucky.
 297. Crum M., Robinson, M.M., Robinson, A.D. and **Cooper, R.L. (2011)** Pathophysiological conditions with hypercalcemia: Neuron, CNS, intestine, and behavior. The Kentucky Academy of Science annual meeting. Nov. 4-5, 2011, Murray State University, Murray, Kentucky.
 298. Cooper, R.M., Schapker-Finucane, H. Adami, H. and **Cooper, R.L. (2012)** Heart and ventilatory measures in crayfish during copulation. Society for Integrative and Comparative Biology. Annual meeting. January 3-7, 2012, Charleston, South Carolina.
 299. Holsinger, R.C., Potenza, J.B., Mercier, A.J. and **Cooper, R.L. (2012)** Physiological investigations with the crayfish hindgut. Society for Integrative and Comparative Biology. Annual meeting. January 3-7, 2012, Charleston, South Carolina.
 300. **Cooper, R.L.**, Nadolski, J., Smith, L.A., Krall, R.M., Cooper, H.W. and Holsinger, R.C (2012) Providing a simple understanding of respiration-related buffering for nurses and their clients. The Southern Nursing Research Society, 26th Annual Conference. February 22-25, 2012. New Orleans, LA.
 301. Burns, E., Potenza, J.B., Holsinger, R.C., LeBlancq, M.J., Maslink, C., Mercier, A.J., and **Cooper, R.L. (2012)**. Crayfish hindgut: A model system for examining central and peripheral control mechanisms. Spring Neuroscience Day, University of Kentucky, Lexington, Kentucky. March 29, 2012.
 302. Cooper, A.S. and **Cooper, R.L. (2012)**. Transection of a motor nerve results in a rapid synaptic depression. Spring Neuroscience Day, University of Kentucky, Lexington, Kentucky. March 29, 2012.
 303. Wu, W.-H. and **Cooper, R.L. (2012)** Packaging and physiological separation of the RRP and RP of vesicles within various types of presynaptic terminals. Spring Neuroscience Day, University of Kentucky, Lexington, Kentucky. March 29, 2012.
 304. Majeed, Z.R., Nichols, C.D. and **Cooper, R.L. (2012)** Effect of DREADD receptor activation in *Drosophila* motoneurons on synaptic transmission. Spring Neuroscience Day, University of Kentucky, Lexington, Kentucky. March 29, 2012.
 305. Crum, M., Robinson, M.M., Robinson, A.D. and **Cooper, R.L. (2012)**. Pathophysiological conditions with hypercalcemia: Neuron, CNS, intestine, and behavior. Spring Neuroscience Day, University of Kentucky, Lexington, Kentucky. March 29, 2012.
 306. Titlow, J., Ghosh, S., **Cooper, R.L.**, Harrison, D. and Rymond, B. (2012). A modifier of spinal muscular atrophy may be involved in motor behavior and stress response. Spring Neuroscience Day, University of Kentucky, Lexington, Kentucky. March 29, 2012.
 307. **Cooper, R.L.**, Titlow, J. and Majeed, Z.R. (2012) Introduction of a new neurophysiology laboratory for students at the University of Kentucky. Spring Neuroscience Day, University of Kentucky, Lexington, Kentucky. March 29, 2012.
 308. Ghosh, S., Titlow, J., **Cooper, R.L.**, Harrison, D. and Rymond, B. (2012). SERF1 gene function in *Drosophila melanogaster*. 53rd Annual Drosophila Research Conference. Chicago, IL March 7-11, 2012.
 309. Chung, Y.S., Graff, J., Cooper, R.M., **Cooper, R.L. (2012)** The acute and chronic effect of temperature on heart and ventilatory rate in prawns. Korean Student Technical & Leadership Conference. Chicago, IL March 16-18, 2012.

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310. LeBlancq, M.J., Maslink, C., Burns, E., Potenza, J.B., Holsinger, R.C., **Cooper, R.L.**, Mercier, A.J. (2012) Neural control of the crayfish hindgut. East Coast Nerve Net. Woods Hole Marine Biological Laboratory. Woods Hole, MA. March 22-24, 2012.
311. **Cooper, R.L.**, Sipe, G., Nadolski, J., Smith, L.A., Holsinger, R.C., Cooper, H., Krall, R.M., Johnson, D. and Zeidler-Watters, K. (2012). Classroom activity on buffering related to respiration for high school and introductory college courses in biological sciences. UK College of Nursing 8th Annual Student Scholarship Showcase. March 30, 2012. (Oral presentation).
312. Dixon, R., Spitz, N., Holsinger, R.C., Rose, S., Cooper, H., Krall, R.M., Johnson, D. and Zeidler-Watters, K., **Cooper, R.L.** (2012). STEM & Health: Stressors on the circulatory system. 7th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky. Lexington, Kentucky. April 25, 2012.
313. Sipe, G., Nadolski, J., Smith, L.A., Holsinger, R.C., Cooper, H., Krall, R.M., Johnson, D. and Zeidler-Watters, K., **Cooper, R.L.** (2012). Classroom activity on buffering related to respiration for high school and introductory college courses in biological sciences. 7th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky. April 25, 2012.
314. Cooper, A.S. and **Cooper, R.L.** (2012). Transection of a motor nerve results in a rapid synaptic depression. 7th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky. April 25, 2012.
315. Burns, E., Potenza, J.B., Holsinger, R.C., LeBlancq, M.J., Maslink, C., Mercier, A.J., and **Cooper, R.L.** (2012). Crayfish hindgut: A model system for examining central and peripheral control mechanisms. 7th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky. April 25, 2012.
316. Crum, M., Robinson, M.M., Robinson, A.D. and **Cooper, R.L.** (2012). Pathophysiological conditions with hypercalcemia: Neuron, CNS, intestine, and behavior. 7th Annual Showcase of Undergraduate Scholars, University of Kentucky, Lexington, Kentucky. April 25, 2012.
317. Nichols, C.D., Becnel, J., Johnson, O., Majeed, Z.R., Tran, V., Yu, B., Roth, B.L. and **Cooper, R.L.** (2012). DREADD receptor control of behavior, signalling, and physiology in the model organism *Drosophila melanogaster*. Meeting on: Optogenetics and Pharmacogenetics in Neuronal Function and Dysfunction. Hilton Riverside, New Orleans, LA, USA. 11-12 October 2012. Sponored by Thorlabs (Photonics).
318. Majeed, Z.R., **Cooper, R.L.**, and Nichols, C.D. (2012). The influence of DREAD receptors activation in the CNS of *Drosophila melanogaster*. Annual meeting of Society for Neuroscience. New Orleans, LA., USA.
319. **Cooper, R.L.**, Titlow, J. and Majeed, Z.R. (2012). Introduction of a new neurophysiology laboratory for students at the University of Kentucky. Annual meeting of Society for Neuroscience. New Orleans, LA., USA.
320. Titlow, J., Turner, C.A. and **Cooper, R.L.** (2012). Come discuss DA's involvement in *Drosophila* behavior and development Annual meeting of Society for Neuroscience. New Orleans, LA., USA.
321. Crum, M., DeCastro, L., Robinson, M.M., Robinson, A.D. and **Cooper, R.L.** (2012). Effects of hypercalcemia in a crayfish model : Neuron, CNS, intestine, and behavior. Annual meeting of Society for Neuroscience. New Orleans, LA., USA.
322. Cooper, A.S. and **Cooper, R.L.** (2012). Transection of a motor nerve results in a rapid synaptic depression. Annual meeting of Society for Neuroscience. New Orleans, LA., USA.
323. Wu, W.-H. and **Cooper, R.L.** (2012) The regulation and packaging of synaptic vesicles related

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- to recruitment within glutamatergic synapses. Annual meeting of Society for Neuroscience. New Orleans, LA., USA.
324. Titlow, J., and **Cooper, R.L. (2012)**. Behaviors and neural circuits modulated by dopamine. Sept. 30-Oct.3, 2012. Behavioral Neurogenetics of *Drosophila* larva. HHMI Janelia Conference. Virginia, USA.
325. Cooper, A.S. and **Cooper, R.L. (2012)** Transection of a motor nerve results in a rapid synaptic depression. The Kentucky Academy of Science annual meeting. Oct.19-20, 2012, Eastern Kentucky University, Richmond, Kentucky.
326. Rufer, J.M, King, K., Titlow, J. and **Cooper, R.L. (2012)**. Ritalin and other dopaminergic drugs affect CNS function and development in *Drosophila* larvae. The Kentucky Academy of Science annual meeting. Oct.19-20, 2012, Eastern Kentucky University, Richmond, Kentucky.
327. Majeed, Z.R., Nichols, C.D. and **Cooper, R.L. (2012)**. Pharmacogenetic approach in directing inhibition of the larval heart in *Drosophila melanogaster*. The Kentucky Academy of Science annual meeting. Oct.19-20, 2012, Eastern Kentucky University, Richmond, Kentucky.
** Won 1st place.
328. Wu, W.-H. and **Cooper, R.L. (2012)**. The regulation and packaging of synaptic vesicles related to recruitment within glutamatergic synapses. The Kentucky Academy of Science annual meeting. Oct.19-20, 2012, Eastern Kentucky University, Richmond, Kentucky.
329. Stacy, A., Majeed, Z.R. and **Cooper, R.L. (2012)**. Characterization of 5-HT (serotonin) receptor subtypes in *Drosophila melanogaster* larval heart. The Kentucky Academy of Science annual meeting. Oct.19-20, 2012, Eastern Kentucky University, Richmond, Kentucky.
330. Burns, E. Potenza, J.B., Holsinger, R.C., LeBlancq, M.J., Maslink, C., Mercier, A.J. and **Cooper, R.L. (2012)**. Crayfish hindgut: A model system for examining central and peripheral control mechanisms. The Kentucky Academy of Science annual meeting. Oct.19-20, 2012, Eastern Kentucky University, Richmond, Kentucky.
331. Krall, R.M., Rose, S., Cooper, H., Mayo, S., Johnson, D., Zeidler-Watters, K. and **Cooper, R.L. (2012)**. STEM & Health: Stressors on the circulatory system. The Kentucky Academy of Science annual meeting. Oct.19-20, 2012, Eastern Kentucky University, Richmond, Kentucky.
332. King, K., Rufer, J.M, Titlow, J. and **Cooper, R.L. (2012)**. Pharmacological analysis of dopamine modulation in the developing fruit fly heart. The Kentucky Academy of Science annual meeting. Oct.19-20, 2012, Eastern Kentucky University, Richmond, Kentucky.
333. Keathley, J. Titlow, J. and **Cooper, R.L. (2012)**. Carbohydrate energy considerations for cardiac function in *Drosophila melanogaster* larvae. The Kentucky Academy of Science annual meeting. Oct.19-20, 2012, Eastern Kentucky University, Richmond, Kentucky.
334. Titlow, J.S., Smith, J. and **Cooper, R.L. (2012)**. Genotyping abnormal behavior- Lessons from the fruit fly. The Kentucky Academy of Science annual meeting. Oct.19-20, 2012, Eastern Kentucky University, Richmond, Kentucky.
335. Kong, W.-K., Wu, W.-H. and **Cooper, R.L. (2012)**. The action of stimulating adenylyl cyclase within motor nerve terminals in the regulation of synaptic vesicles. The Kentucky Academy of Science annual meeting. Oct.19-20, 2012, Eastern Kentucky University, Richmond, Kentucky.

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336. Majeed, Z.R., Nichols, C.D. and **Cooper, R.L. (2012)**. Pharmacogenetic approach in directing inhibition of the larval heart in *Drosophila melanogaster*. The Center for Muscle Biology Univ. of KY. Oct. 25, 2012.
337. Stacy, A., Majeed, Z.R. and **Cooper, R.L. (2012)**. Characterization of 5-HT (serotonin) receptor subtypes in *Drosophila melanogaster* larval heart. The Center for Muscle Biology Univ. of KY. Oct. 25, 2012.
338. Titlow, J., King, K., Rufer, J.M, and **Cooper, R.L. (2012)**. Fruit fly heart rate is modulated by dopamine through canonical metabotropic pathways. The Center for Muscle Biology Univ. of KY. Oct. 25, 2012.
339. Keathley, J. Titlow, J. and **Cooper, R.L. (2012)**. Influence of carbohydrate transport in *Drosophila* cardiac function. The Center for Muscle Biology Univ. of KY. Oct. 25, 2012.
340. Holsinger, R.C. and **Cooper, R.L. (2013)**. The effect of regional phenotypic differences of *Procambarus clarkii* opener muscle on sarcomere length, fiber diameter, and force development. Society for Integrative and Comparative Biology. Annual meeting. January 3-7, 2013, San Francisco, California.
341. **Cooper, R.L.**, Majeed, Z.R., Titlow, J., Stacy, A., King, K., Rufer, J.M., Nichols, C.D. (2013) Pharmacogenetic approaches in altering heart rate in *Drosophila* larvae. The American Physiological Society annual meeting. April 20-24, 2013. Boston, MA. USA
342. **Cooper, R.L.**, Krall, R.M., Cooper, H., Mayo, S., Johnson, D., Zeidler-Watters, K. and Rose, S. (2013) STEM & Health: Stressors on the circulatory system. The American Physiological Society annual meeting. April 20-24, 2013. Boston, MA. USA

Abstracts of projects conducted under my supervision

1. Cooper, A.S. (2008) The Effects of Serotonin on Circadian Pattern and Behaviors in *Drosophila*. Kentucky Academy of Sciences. Annual meeting. November 1, 2008, Lexington, KY (Univ of KY campus).
2. Cooper, A.S. (2009) The Effects of Serotonin on Circadian Pattern and Behaviors in *Drosophila*. Society for Integrative and Comparative Biology. Annual meeting. January 2-6, 2009, Boston, Mass.

Reports/newsletter articles in non-peer reviewed publications

1. **Cooper, R.L.**, Cole, J., and Hopper, H.L. (1998) The plight of the blind cave crayfish: A cover advisory. National Speleological Society News. 56(3):75.
2. **Cooper, R.L. (1998)** Ectoparasites (branchiobdellids) on egg hatching. International Association of Astacology newsletter, Crayfish News. 20:20-21.
3. Li, H., Sohn, J. and **Cooper, R.L. (1999)** The Blue Swamp Crayfish ? International Association of Astacology newsletter, Crayfish News. 21:3-4
4. **Cooper, R.L. (2001)** Our Backyard Journal. Warren County Citizens for Managed Growth. This was a short report on the concerns of the cave species that will be in danger by the development of the transpark in Warren Co., KY. (*Parts of my report were used in the newspaper*).
5. **Cooper, R.L. (1999-2001)** The Society for Integrative and Comparative Biology (Formerly known as American Society of Zoologists) Spring newsletter write up. I wrote notes commenting on the

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highlights of events within our group. As Secretary for the Division of Neurobiology (DNB) of this society, I have to send out electronic mail to all our constituents on the events and news within our international organization.

6. **Cooper, R.L.** and Cooper, Ann-Simone. (2002) Self mutilation in crayfish *Procambarus clarkii*. International Association of Astacology Newsletter, ISSN 1023-8174, Crayfish News. 24:4-5.
7. Satterlie, R.A. and **Cooper, R.L.** (2004) Recent Developments In Neurobiology: Introduction To The Symposium. Text is a dedication of the symposium to the years of research by Dr. H. L. Atwood in the field of synaptic transmission. Society for Integrative and Comparative Biology 44:1-3.
8. Cooper, R.M. and **Cooper, R.L.** (2007) A method to measure associative learning for different size larvae. **Drosophila Information Service** 90:45-47.
9. **Cooper, R.L.** (2011) Respecting a Korean health custom in a Western society. Nursing Reports 1: e6. doi: 10.4081/nursrep.2011.e6

Laboratory exercises for Bio350 (Animal Physiology) at the Univ of KY.

1. Martin, J.M., Atwood, H.L. and **Cooper, R.L.** (2010) Modeling biological membranes with circuit boards and measuring electrical signals in axons: Student laboratory exercises.
2. Baierlein, B., Thurow, A.L. and **Cooper, R.L.** (2010) Human ECG laboratory experiment.
3. Martin, J.M., Robinson, M.M., Atwood, H.L. and **Cooper, R.L.** (2010) Conduction properties of nerve cells
4. Leksrisawat, B., Cooper, A.S. and **Cooper, R.L.** (2010) Muscle receptor organs in the crayfish abdomen: A student laboratory exercise in proprioception.
5. Cooper, A.S., Leksrisawat, B., Cooper, R.M. and **Cooper, R.L.** (2010) Mechanosensory input & integration in the central nervous system: A student laboratory exercise.
6. Martin, J.M. and **Cooper, R.L.** (2010) Heart rate response to induced stimuli in freshwater shrimp: A student laboratory exercise.
7. Baierlein, B. Thurow, A.L. Atwood, H.L. and **Cooper, R.L.** (2010) Membrane potentials, synaptic responses, neuronal circuitry, neuromodulation and muscle histology using the crayfish: Student laboratory exercises.
8. Thurow, A.L., Baierlein, B. and **Cooper, R.L.** (2010) Human ECG laboratory experiment.
9. Holsinger, R. and **Cooper, R.L.** (2010) Responses to hormones in invertebrates: Student laboratory exercises.
10. Leksrisawat, B., Cooper, A.S. and **Cooper, R.L.** (2010) A laboratory exercise in osmoregulation.
11. Cooper, A.S., Leksrisawat, B., Mercier, A.J. and **Cooper R.L.** (2010) Physiological experimentation with the crayfish hindgut: A student laboratory exercise.

Laboratory exercises for Bio450 (Neurophysiology Lab) at the Univ of KY, 2012.

All of these labs will have a movie of “how to do the lab” in time. Currently, each one has a detailed protocol.

1. Ro Martin, J.M., Atwood, H.L. and **Cooper, R.L. (2012)** Modeling biological membranes with circuit boards and measuring electrical signals in axons: Student laboratory exercises. (*updated version from the Bio350 lab that was developed*)
2. Hartman, H.B. and **Cooper, R.L. (2012)** Properties of annelid giant axons.
{Movie made how to do the lab by Burns, E. Stacy, A.L., and **Cooper, R.L. 2012**}
3. **Cooper, R.L.**, Baierlein, B., Holsinger, R.C., Thurow, A.L. Atwood, H.L. (2012) The effects of K⁺ and Na⁺ on resting membrane potentials using the crayfish: Student laboratory exercises
4. **Cooper, R.L.**, Atwood, H.L. (2012) Synaptic Responses, Neuronal Circuitry and Neuromodulation Using the Crayfish: Student Laboratory Exercises. (some parts taken from the lab developed for Bio350 experimental labs in Baierlein, et al., 2010)
5. Majeed, Z.R., Titlow, J., Hartman, H.B., Burns, E., and **Cooper, R.L. (2012)** Proprioception: Response properties of joint receptors.
6. Majeed, Z.R., Titlow, J., Hartman, H.B., Burns, E., and **Cooper, R.L. (2012)** Tension receptors in crab limbs: Responses related to muscle force.
7. Stacy, A.L., Burns, E. and **Cooper, R.L. (2012)** Electroencephalogram (EEG) lab. {Movie made on how to do the lab. Posted on YouTube <http://youtu.be/IsDLbXH9e4Q> }
8. **Cooper, R.L.**, and Atwood, H.L. (2012) Quantal analysis of synaptic transmission: Crayfish NMJ record quantal responses.
9. Titlow, J., Majeed, Z.R., Nicholls, J.G. and **Cooper, R.L. (2012)** Identifiable neurons in the central nervous system of a leech.
10. Majeed, Z.R., Titlow, J., Nicholls, J.G. and **Cooper, R.L. (2012)** Sensory field maps in the skin of a leech for touch, pressure and nociceptive neurons.
11. Titlow, J., Majeed, Z.R., Nicholls, J.G. and **Cooper, R.L. (2012)** Electrophysiological examining synapse formation in culture between identifiable neurons: Central neurons of leech.
12. Titlow, J., Majeed, Z.R., Hartman, H.B., Burns, E., and **Cooper, R.L. (2012)** Mechanosensory integration: Input and output of mechanosensory information in the cockroach wind escape reflex

Conferences attended without presenting an abstract or paper (Continuing Education – Nursing)

2011 - Annual Meeting. American Assembly for Men in Nursing. Oct.20th. Lexington, KY

2012 - Annual Meeting. The Kentucky Public Health Association <http://www.kpha-ky.org/Home.aspx>.
Louisville, KY. March 27-30, 2012

V. RESEARCH STATEMENT

The research goals of my program are focused on understanding the physiological mechanisms underlying synaptic plasticity of neurons, especially motor neurons which make synapses on muscle fibers. My research program is a multifaceted approach to the study of specific neuromodulatory molecules whose actions are relevant to the whole animal.

At a social level, animals show distinct differences in behavior and in responses to sensory cues. For example, among human siblings there may be dominant, outgoing individuals, as well as shy and introverted ones. The focus of much research in this broad area has been on the central nervous system and has recently expanded into studies of the expression of particular genes in the nervous system, in a variety of animal species. The hope is to be able to get a handle on the mechanisms of how neurons are activated or turned off and how they communication with each other are be modulated to elicit particular responses.

Such research in higher animals has proven to be a daunting task and many of the breakthroughs in neuroscience have arisen due to understanding of basic principles in simpler systems and then extrapolating to more highly evolved organisms, such as humans. The invertebrate arthropods have long provided key models, especially crayfish and *Drosophila* (T.H. Huxley, *The Crayfish*.1880; T.H. Morgan, 1900) for investigating neurophysiological principles. One advantage of invertebrates is that individual cells can be examined by a range of techniques from anatomical analysis to molecular genetics and electrophysiology, to obtain insights that are not possible, at present, in higher-animal model systems. In particular, the neuromuscular junctions of crayfish and *Drosophila* serve as models to investigate the basics principles of chemical synaptic transmission relevant to all chemical synapses in all animals.

The neuromuscular junctions (NMJs) in these preparations lend themselves to experimentation on synaptic plasticity. The activity of individual varicosities on identified single cells can be analyzed, the varicosities and cells marked, and those same synaptic sites later identified for structural investigation by electron microscopy. These techniques allow us to study synaptic differences during **development** of the animal and **short term plasticity** of synapses due to activity and/or actions of **neuromodulators** which can lead to altered behavioral states.

The past **NSF funded research** in my laboratory was concerned with the actions of neuromodulators (substances that can alter neuronal activity) on chemical communication of motor neurons with muscles using the crayfish as the model system. Because of the wide variety of behavioral effects which they elicit, neuromodulators are recognized as important signaling molecules in all animals. Many modulators can serve as either a neurotransmitter or a paracrine signaling factor in central or peripheral nervous systems. One neuromodulator in particular, serotonin (5-HT), has received considerable attention in both the news media and in the scientific literature because it has been implicated in the behavioral expression of dominance, aggression, and assertiveness in many animals, including humans.

The main two **specific aims of my NSF funded research** were: (1) To investigate differences in short-term facilitation among synapses of a single neuron innervating two target muscle fiber types (fast and slow) in the absence and presence of neuromodulators; and (2) To investigate the hypothesis that the identified intrinsic differences in release mechanisms among tonic motor neurons are more susceptible to neuromodulation than are those of phasic motor neurons.

In addition while investigating these topics, several off-shoot projects developed from this main focus. The additional, primarily undergraduate projects, provide a better understanding of the bigger picture in neuromodulator action on whole animal behavior and how it relates to the alterations that

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we had already quantified at synapses of neuromuscular junctions. We have now published several papers in this research area, to prime for additional future NSF proposals.

The widespread distribution of 5-HT in the peripheral nervous systems of invertebrates implies that the transmitter is not directed at a discrete target tissue but rather over a wide area; interactions with receptors on several different target cells are possible. This could result in relatively fast, as well as slow, long-lasting modifications of transmission efficacy at synapses where other transmitters are released. Previous studies of the crustacean nervous system have demonstrated correlation of the physiology of relatively few neurons and muscles with particular behaviors. The drive of the motor neurons can readily be examined by stimulation of various known sensory neurons, enabling one to assess their role in altering motor neuron activity. In addition, the integration of sensory information in the ventral nerve cord which affects the motor output is accessible for study. Lastly, the biophysical properties of muscle fibers that can affect the postsynaptic response are readily approachable. Thus, the crustacean nervous system enables one to investigate each component in a behavior-eliciting pathway from sensory neurons -to- ganglia- to- motor neurons - to- muscle fibers (Strawn et al., 2000-in press). We have taken an active interest in assessing actions of neuromodulators in modulation of whole-animal behavior. We want to determine whether or not behavioral states feed back over time and alter neuronal function. Since there are indeed circular aspects in understanding synaptic plasticity one must tackle this problem in multiple ways.

Over the last year we have also been focusing in on how animals can alter properties of neurotransmission by behaviors expressed during both development and as adults, which is partially related to neuroendocrine factors. These kinds of studies can be approached by subjecting animals to various physiological and ecological stresses. This line of research encompasses genetic, physiological, behavioral and evolutionary aspects of the organisms under investigation (visual crayfish, blind cave crayfish, and *Drosophila*). An example of one aspect of this broad, life-cycle encompassing research interest is that when 2 crayfish are placed together they will fight until one of the combatants withdraws. The success is based largely on physical size. The establishment of dominant and submissive behavior by individuals has effects on their survival and reproduction and thus of the species as a whole.

A number of recent findings have implicated the levels of neuromodulators in the nervous system to be the sole factor in establishing dominant or submissive status. Serotonin (5-HT) in particular has been implicated in the control of aggression in crustaceans and most vertebrate species, including humans. There is growing skepticism in the research community to the magnitude of importance that has been placed on 5-HT alone. I plan to substantiate if 5-HT is really a major player in establishing the behavioral status of crayfish by developing bioassays which monitor the levels in the blood while the animals are establishing their social status. I have recently published two papers related to this matter by monitoring heart rate in socially behaving animals. Various factors such as hunger, visual cues, parasitism and pheromones are currently being addressed in relation to social status among crayfish in my laboratory. I am also addressing learned versus innate behaviors among visual, visually impaired and cave-adapted blind crayfish in establishing combats and posturing positions. This will bring the works full circle to genetic variations over evolutionary time scales among species and the effects of neuromodulators on neural circuits which have evolved to carry out given behaviors. The pilot investigations have opened new horizons to be tackled in the terms of neuromodulators actions on neuronal function that results in altered behaviors as well as abnormal development of the nervous system.

The investigation of neuromodulation in the crayfish has made me aware of the limitations in genetic manipulability of key factors when trying to address slightly different factors such as selective

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regulation of hormone levels. For this reason I embarked on projects making use of *Drosophila* as a tool to investigate the actions of the neuromodulator ecdysone in rapid non-genomic and long-term genomic actions on synaptic transmission at the NMJ. Preliminary phases of this project have already been published in three manuscripts.

I am joined by various investigators around the world in addressing the mechanisms underlying maintenance and modulation of synaptic strength during development and maturation. Many aspects still remain to be uncovered, in particular the cellular physiology which transduces electrical signals regulating vesicle release in presynaptic neurons to issues dealing with receiving and responding to the neurotransmitter signals on the postsynaptic cells.

Future directions:

Through the use of recently developed proteins and fluorescent dyes, we have begun to investigate mechanistic questions of neurotransmitter release. Intracellular injection of vesicular docking proteins into the large axons of crustacean motor neurons in the absence or presence of neuromodulators allows one to investigate if the intracellular signaling systems involved work independently or synergistically to affect synaptic efficacy and ultrastructure. The crayfish leg opener muscle has provided a great deal of insight into the basic mechanisms of synaptic transmission because it allows neurotransmitter release to be directly related to synaptic physiology and structure (Atwood et al., 1994; Atwood and Cooper, 1995, 1996a, b; Cooper et al., 1995a,b; 1996a,b). In this preparation, the relatively low output of each varicosity along the nerve terminals allows the use of quantal analysis and statistical evaluation of individual vesicular release events.

The initial investigations of a synaptically-relevant molecule, alpha-SNAP (He et al., 1999; MS Thesis from my lab) suggest that other molecules may be used similarly to address their functional significance in synaptic transmission. Molecules that dock synaptic vesicles are of special interest. There is particular current interest in molecules like 5-HT and octopamine (OA) (and their attendant signaling cascades) because of their ability to alter synaptic transmission. When applied singly to the NMJ, 5-HT and OA enhanced transmission, but if 5-HT is applied after OA, synaptic efficacy is reduced. Since these compounds co-exist in the hemolymph, I decided to investigate their effects at the neuromuscular junction following sequential and combined exposure in order to better understand their actions within the animal. To my surprise, we found that in some preparations, OA showed the well known enhancement of transmitter release, but there was also a number of junctions that showed reduced transmitter output. This is in accord with a recent finding that OA also reduces transmitter release at larval *Drosophila* neuromuscular junctions (Nishikawa and Kikodoro 1999), although for other insect preparations an increase of EJP amplitudes by OA is reported (for review see Roeder, 1999). In crayfish and crab NMJs, 5-HT always potentiated transmitter release and this effect was invariably reduced in the presence of OA, suggesting that when the two amines are present together they antagonistically modulate transmitter release. We address, with quantal analysis, the presynaptic actions of 5-HT, OA and a mixture of the two neuromodulators to begin to understand the underlying mechanisms of action. I currently have a manuscript in preparation with Dr. Rathmayer (Univ. of Konstanz, Germany) on this matter. It is thus likely, considering our recent physiological results that activation of the cAMP mediated processes from initial OA stimulation can dampen the subsequent IP₃ mediated responses induced by the rapid actions of 5-HT. The long term action of 5-HT mediated through cAMP

(Dixon and Atwood, 1989) may also be reduced if the same downstream actions are already activated by the prior presence of OA and a complete recovery has not been allowed to occur.

Much work remains to determine which proteins and/or additional cytoplasmic messenger systems may be recruited into or out of action in the presence of just 5-HT or OA alone. This may then lead to an understanding of the antagonist actions of OA to subsequent 5-HT applications as we have reported. Besides 5-HT and OA there are numerous other neuromodulators working in concert that influence synaptic function and which ultimately may also help to regulate the behavior of the whole animal.

In the future, I intend to address the interactions of various cascades with calcium regulation inside nerve terminals and their relation to neural activity.

Regulation of Receptors for Neuromodulators

It is well established that receptors undergo up- and down-regulation via alteration of their expression levels and/or densities on cell surfaces (Azaryan et al., 1998). Altered cellular activity as well as the action of agonists or antagonists being bound to a receptor can induce regulation in the levels of functional receptors (Kokay and Mercer, 1997; Welner et al., 1989; Fone et al., 1998). For example it has been shown that 5-HT_{1A} receptors will demonstrate desensitization when either an agonist or antagonist is present (Hensler and Truett, 1998). Even naturally induced down regulation of 5-HT_{2c} receptors can be induced as a result of exercise (Broocks et al., 1999). The 5-HT₁ and 5-HT₂ receptor agonist 1-(3-Chlorophenyl) piperazine dihydrochloride (m-CPP) has been observed in rats to down regulate receptor numbers (Fone, et al., 1998). The precise mechanism of action in regulation of the 5-HT receptors has not yet been elucidated.

The purpose of this project is to address the issue of up- and down-regulation of the sensitivity of responsiveness to exogenously applied 5-HT at the neuromuscular junctions of crayfish which have reduced endogenous 5-HT levels (enzymatic inhibition of the synthesis of 5-HT) or have chronic presence of an agonist in their hemolymph. Reduction of systemic levels of 5-HT in the crayfish is likely to result in up-regulation of 5-HT receptors since these animals normally contain 5-HT in their hemolymph (open circulatory system). In contrast, chronic high levels of the 5-HT agonist m-CPP, would likely result in a down-regulation of the 5-HT receptors so that exogenous application of 5-HT would show reduced responsiveness as compared to sham injected animals. In preliminary studies, we have demonstrated alterations in the sensitivity to exogenous application of 5-HT at the crayfish neuromuscular junction after altering levels of the endogenous production of 5-HT and exposure to a 5-HT agonist. Future work will be focused at identifying the types of 5-HT receptors present that the crayfish NMJ and the mechanisms behind the physiological responses that we have observed in sensitivity to 5-HT.

Several other projects will be pursued simultaneously in the future related to developing novel methods to assess synaptic transmission. Past methods of quantal analysis that I have developed have been well-received by the scientific community. At present I am developing novel statistical methods to describe fluctuation in synaptic responses. These responses are examined with the concept in mind that structural elements of the synapse may be the basis for differences in fluctuation among the various types of synapses. In order to develop this line of study, I needed to further establish new ways to more accurately quantify synaptic structures observed in electron micrographs. These studies have recently been published in Kim et al., 2000 and Feurverger et al., 2000. It is very important to understand, quantitatively, the scale of morphological features in 3-D when viewing the morphology in 2-D in order

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to draw comparisons between specimens. This is especially relevant to my projects of ultrastructural differences in high- and low-output synapses and interconversion of phasic to tonic motor neurons as well as developmental issues of the neuromuscular junctions.

Multiple research disciplines are being examined separately but they are **all interrelated and focus** on the issue of **synaptic function**. With the successful outcome of published findings over the years from my research program, I believe this approach will continue to bear fruit and be extramurally funded.

VI. STUDENT TRAINING

PhD degrees awarded from my laboratory

1. Li Hao 1997-2001 *Current position working for GlaxoSmithKline (Mgr Analytics) Biotech company in Research Triangle Park, North Carolina.*
 - (i) Neuromodulator effects on the function of primary sensory neurons.
 - (ii) Cave crayfish behavior.
 - (iii) Development of NMJs in *Drosophila*.
2. Andrew Johnstone 2002 -2007. *Current position: Postdoctoral Fellow at EPA in a neurobiology unit North Carolina*
Physiological and anatomical assessment of synapses at the crayfish neuromuscular junction.
3. Sameera Dasari 2003-2007. *Current position: 2nd Postdoctoral Fellow in the Physiology Department at Dartmouth. 1st postdoc was at Michigan State University in neurobiology.*
Influence of the serotonergic system on physiology, development, and behavior of *Drosophila melanogaster*.
4. Mohati Desai Spring 2005-2008 (defended in 2008, graduated in 2009).
The influence of Ca²⁺ regulation in synaptic facilitation of motor nerve terminals in crayfish and *Drosophila* as well as in the physiological regulation of larval *Drosophila* heart. *Current position: Postdoctoral Fellow at Rutgers University in Dr. Jorge Golowasch.*
5. Sonya Bierbower 2006-Spring 2010
Environmental effects on behavior and physiology in crayfish.
Current position: Postdoctoral Fellow at UT Health Sciences Center in San Antonio with Dr Mark Shapiro.

MS degrees awarded from research done in my laboratory

1. Misty Crider 1996-1998; **Advisor**
Short term facilitation and the neuromodulation of synaptic transmission at the crayfish opener neuromuscular junction
2. Ping He 1997- 1998; **Advisor**
Role of α -SNAP in promoting efficient neurotransmission at the crayfish neuromuscular junction
3. Johann Sohn 1998-1999; **Advisor**
The anatomical and physiological characterization of muscles in the dorsal surface of the crayfish abdomen
4. Joe Kramer 1998-1999; Member (advisor- Dr. Bonner); Thesis project done in my lab.
Neural control of muscle phenotype in the crayfish
5. Joe Shearer Fall 1999-2001 (MS student, after rotations switched to plan B - MS) **Advisor**
 1. Synaptic differentiation of motor neurons in crayfish.
 2. Developmental mechanisms of motor neurons in *Drosophila*.

6. Bin Xing 2002-2003; **Advisor**
Synaptic plasticity at the *Drosophila* NMJ
7. Amanda Ashleigh Long 2003-2004; **Advisor**
Synaptic plasticity at the *Drosophila* NMJ
8. Capt. Junyoung Lee 2007-2009; **Advisor** (Stipend paid by the Korean Government)
Furthering pharmacological and physiological assessment of the glutamatergic receptors at the *Drosophila* neuromuscular junction.

Graduate students (*rotating or some of their work done in my lab*)

1. Bruce Griffis 1997-1998 (PhD student with Dr. Bonner) Regulation of muscle phenotype.
2. Emily Neiman Spring-Summer 1999, (PhD BEACON rotation graduate student).
3. Bryan Spohn Spring 1997, (BEACON rotation graduate student).
4. Laura Listerman Fall 2001 (MS graduate student in the Physical Therapy program) Came back to the lab to finish up a project.
5. Gina Richardson 2006, rotation graduate student.
6. Antony Kariuki 2008 Fall
7. Jessica Laswell Mentoring for MIC graduate student project at UK. Dept of Education (summer 2010)

Current Graduate Students

1. Wen Hui Wu Graduate student. Fall 2008 (PhD student; postquals)
2. Zana R. Majeed Graduate student. Spring 2011 (PhD student; prequals)
3. Rachel C. Holsinger Graduate student. Summer 2011 (MS student; thesis)
4. Josh Titlow Graduate student, Spring 2012 (PhD student)
5. Weikai Kong Rotating Graduate student, summer 2012(will pursue a non-thesis MS by May 2013)

Undergraduate students

(present)

1. Ann S. Cooper Summer & Fall 09, Spring, Summer 2010, Spring, Summer, Fall 2011, Spring, summer 2012, Spring 2013
2. Ellen Burns Spring, summer 2012 (Bio395; UK Chellgren fellow), Fall 2012
Ribble Scholar, Spring 2013
3. Kayla King Summer 2012 (UK medical school out reach program summer student), Fall 2012, Spring 2013
4. Audra Stacy Fall 2012. **Ribble Scholar**, Spring 2013
5. Aubrey Bankemper Spring 2013
6. Tripp Crosthwaite Spring 2013
7. Jessica Browne Spring 2013

(past)

1. Harty Ashby, Spring 1996 (Undergraduate Research)
2. Dan Franklin, Fall 1997 (Undergraduate Research)
3. Wendy Warren, Spring, Summer & Fall 1997 (Undergraduate Research, Howard Hughes Medical

- Institute Undergraduate Fellowship).
4. Marvin Ruffner, Spring, Summer & Fall 1997 (Undergraduate Research, Howard Hughes Medical Institute Undergraduate Fellowship).
 5. J. Deskin, Spring 1998 (Undergraduate Research)
 6. Devan Doshi, Summer 1998 (**Volunteer for Undergraduate Research**) Biology student at The George Washington University, Washington D.C.
 7. Elizabeth Ward, Summer, Fall 1997 and Spring 1998 (Undergraduate Research, Research and creativity grant for \$ 2,500).
 8. M.P. Huffman, Summer and Fall 1997, Spring 1998 (Undergraduate Research, Howard Hughes Medical Institute Undergraduate Fellowship).
 9. Laura Paula Ashby, Summer 1998 (Undergraduate Research)
 10. Jarrett Greer, Fall 1998, Spring 1999 (Undergraduate Research)
 11. Rachel Chase, Spring, Summer and Fall 1998. (Undergraduate Research, Howard Hughes Medical Institute Undergraduate Fellowship).
Fall 1998 & Spring 1999-**Ribble Scholar**.
 12. Jenny Haggard, (Undergraduate Research, Howard Hughes Medical Institute Undergraduate Fellowship- summer 1999)
 13. Laura Listerman, Summer & Fall 1998, Spring & Fall 1999 (Undergraduate Research, Howard Hughes Medical Institute Undergraduate Fellowship; **REU-NSF fellowship**).
 14. Jeremy Dore, Fall 1999 (Undergraduate Research).
 15. Jeffrey R. Strawn, Fall 1998, Spring & Fall 1999, Spring 2000 (Undergraduate Research; **REU-NSF fellowship**)
 16. Ann Phan, Fall 1999, Spring, Fall 2000; & Spring 2001 (Undergraduate Research).
 17. R. Chase Southard, Spring, Summer & Fall 1998; Spring & Fall 1999; Spring, Summer, Fall 2000; & Spring 2001. (Undergraduate Research, Howard Hughes Medical Institute Undergraduate Fellowship; **REU-NSF fellowship**).
 18. Scott Kellie, Spring, Summer & Fall 1999; Spring & Fall 2000-**Ribble Scholar**; & Spring 2001 Howard Hughes Medical Institute Undergraduate Fellowship- summer 1999.
 19. Amanda Fox, Fall 2000 & Spring 2001 -**Ribble Scholar**.
 20. Jami Tabor, Fall 2000 & Spring 2001 -**Ribble Scholar**.
 21. Recannah Braxton, Summer 2001, UK Outreach Center Student, She was from Alabama.
 22. Carter Florence, Summer 2001, UK -Women in Science outreach program.
 23. Kristin Adams, Summer 2001, UK -Women in Science outreach program.
 24. Heidi Schapker, Fall 2000, Spring 2001 & Fall 2001
 25. Ahmet Donmezer, Spring 2001, Summer 2001 & Fall 2001
 26. Rebecca Brauch, Spring 2002 & Fall 2003
 27. Tara Willson, Spring 2002
 28. Anna Simpson, Fall 2001 & Spring 2002
 29. Ryan Ball, Fall 2001, Spring 2002 & (Research and creativity grant for Summer 2002)
 30. Garrett Sparks, Fall 2001, Spring 2002, Summer 2002, Fall 2002, Spring 2003, Summer 2003 (Ribble Fellow & **Arnold and Mabel Beckman Foundation Fellow- \$17,600/year**)
 31. Walter Hailes, Fall 2002
 32. Maurice Pagé, Fall 2002, Spring 2003, Summer 2003 (Ribble Fellow)

33. Mary Martin, Spring & Summer & Fall 2004 **Ribble Scholar** Dept. of Biology, NSF-REU funded.
34. Hye-Mi Lee, Fall 2003 & Spring & Fall 2004 (Undergraduate Research)
35. Justin L. Blackburn, Spring & Summer & Fall 2004 **Ribble Scholar** Dept. of Biology
36. Stephanie Logsdon, Fall 2003, Spring & Fall 2004-**Ribble Scholar**, Spring 2005 (Undergraduate Research, Research and creativity grant, UK for \$ 2,500 & **Arnold and Mabel Beckman Foundation Fellow- \$17,600/year**).
37. Deval Bhatt, Spring & Summer & Fall 2004 **Ribble Scholar**, Spring 2005. Dept. of Biology, NSF-REU funded.
38. Dexter V. Reneer, Spring 2005 (Internship- from Centre College, KY)
39. Megan D. Adami, Spring & Fall 2005, NSF-REU funded.
40. Joseph White, Spring 2006.
41. Forrest Harrison, Fall 2005, Spring 2006.
42. Blaire Cullman-Clark, Spring & Fall 2005, NSF-REU funded, Spring 2006.
43. Danielle Goulding, Spring 2006.
44. Chalice White, Summer 2006
45. Jessica Lane Hill, Fall 2005, Spring & Summer 2006, Fall 2006
46. Nicolas Badre, Fall 2003, Spring & Fall 2004; Spring, summer, Fall 2005; Summer & Fall 2006. **Arnold and Mabel Beckman Foundation Fellow- \$19,000/year for 2005-2006**. Spring 2007
47. Devki Manan Bhatt, Fall 2005, Spring & Summer 2006, Fall 2006, Spring 2007
48. Brent Hayden, Spring 2006, Fall 2006, Spring 2007
49. Kaitlyn McClelland Spring 2007
50. Terry Williams Spring 2007
51. Geoffrey Hughes Fall 2006, Spring 2007
52. Thomas Cunningham Spring 2007
53. Marshal R. Detherage Summer and Fall 2007
54. Justin Kolasa Spring, Summer & Fall 2006, Spring, Summer & Fall 2007
55. Catherine Ormerod Summer & Fall 2007
56. Zachary Warriner Fall 2007
57. Garnett Coy Fall 2007
58. Tyler McLaurine Spring, Fall 2007, Spring 2008
59. Tori Spence Spring, Fall 2007, Spring 2008 **Ribble Scholar**
60. Doyle Stephens Jr. Spring, Fall 2007, Spring 2008 **Ribble Scholar**
61. Andrew Papoy Spring, Summer & Fall 2007, Spring 2008 **Ribble Scholar**
62. Keith Holmes Fall 2007, Spring 2008 **Ribble Scholar**
63. Mary C. Wright Fall 2007, Spring 2008
64. Jayme Mitchell Spring 2008
65. Courtney Allen Spring & Fall 2008;
66. David Kerbl Summer & Fall 2008
67. Jin-Young Kim Summer & Fall 2008
68. Joshua Eason Summer 2008
69. Madison Allen Summer 2008
70. Joe Mando Summer & Fall 2008
71. Jenifer Jackson Summer 2008

72. Ray Geyer	Summer 2008
73. Vadim Galperin	Summer 2008
74. Vinay Srinivasan	Spring, Summer & Fall 2008; Ribble Scholar; Spring 2009
75. Sahill Naik	Spring & Fall 2008; Ribble Scholar; Spring 2009
76. Becca Liberty	Summer & Fall 2008; Spring 2009
77. Barbara G Kelly	Summer & Fall 2008; Spring 2009
78. Yuri Boyechko	Fall 2008 & Spring 2009
79. Jessica McQuerry	Fall 2008 & Spring 2009
80. Logan Forsythe	Spring 2009
81. A. Clay Turner	Summer 2006, Fall 2006, Spring, Summer & Fall 2007, Spring, Summer & Fall 2008; Ribble Scholar; Arnold and Mabel Beckman Foundation Fellow- \$21,000/year 2008-2009). Spring 2009, Summer 09
82. Easter Bocook	Spring & Fall 2008; Ribble Scholar; Spring 2009, Summer 09 (UK Medical School fellowship for summer research for medical students)
83. Matthew Ward	Summer & Fall 2008, Summer & Fall 09
84. Michael B. Baker	Fall 2008 & Spring & Fall 2009
85. Zachary D Raney	Summer & Fall 09
86. Martha Robinson	Spring & Fall 2008; Ribble Scholar; Spring 2009, Summer 09; Arnold and Mabel Beckman Foundation Fellow- \$21,000/year 2009-2010)
87. Allison Gilberts	Spring & Fall 2009, Spring 2010
88. Alison Thurow	Spring 2010
89. Jonathan Martin	Spring 2010
90. Jessica Simpson	Spring 2010
91. Justin Armbruster	Spring 2010
92. Michelle Tucker	Spring 2010
93. Brittany Baierlein	Spring 2010, Fall 2010
94. Bonnie Leksrisawat	Spring 2010, Fall 2010
95. Ashley K Buchanan	Fall 2010
96. Sarah O'Nan	Fall 2010
97. Randi (Randaline) Barnett	Fall 2010
98. Jensen B. Potenza	Summer 2011 (Student from Transylvania University, KY)
99. Chioma Anosike	Fall 2011 (Bio395)
100. Emily Houston	Fall 2011 (Bio199)
101. Ariel D. Robinson	Fall 2010 (Ag Biotech), Spring, Fall 2011, Spring 2012
102. Michael Crum	Summer & Fall 2011, Spring, summer 2012
103. Nathan Spitz	Spring, summer 2012
104. Yoo Sun Chung	Spring, Summer, Fall 2011, Spring, summer 2012
105. Jenna Mae Rufer	Summer 2012 (KBRIN summer student)
106. Jeremy Keathley	Fall 2012

***Note:** 20 of the above undergraduate students that worked one semester in the laboratory have come back to continue their projects for 1 full year or more.

High School/Middle School students

(present)

1. Leo de Castro 2011-2013 Henry Clay High School (sophomore)
2. Richard M. Cooper 2010-2012, Lafayette High School. UKRP fellowship \$500
3. Clara de Castro 2012-2013 Sayre High School (Freshman)
4. Robin Swoveland 2012-2013 Dunbar High School (Junior)
5. Elizabeth Schwarcze 2012-2013 Sayre High School (Junior)

(past)

1. A. Clay Turner Lafayette High School. Fall 2004-Spring 2005, 1st UKRP fellowship \$500. Fall 2005- Spring 2006 (Sr. research project). UKRP fellowship 2nd \$500. Won an Intel award at the International INTEL Sci. fair (\$40K scholarship).

2. High school student that come to the lab for observing experiments.
Ms. Jane Markowitz (Fall 2006)

3. Meagan Griffin Sayer High School. Spring and Fall 2006. UKRP fellowship \$500.

4. Braxton Adkins Tates Creek High. He came to shadow the lab for 1 week in the summer of 2009 before starting at Univ of KY as a biology major.
5. Ann S. Cooper Morton Middle School. Fall & Spring 2003, Fall & Spring 2004, UKRP 1st fellowship \$500.
Lafayette High School. Summer, Fall 2005, UKRP fellowship 2nd \$500, Fall 2006, Spring 2007; UKRP 3rd fellowship \$500 for Fall 07-Spring 08. ; UKRP 4th fellowship \$500 for Fall 08-Spring 09
Won **4th place International INTEL** in the category of Behavioral Science award at the International INTEL Sci. fair 2007.
Won **2nd place International INTEL** in the category of Animal Sciences at the International INTEL Sci. fair 2008.
Fall 2009 1st in category of Behavioral Sciences for all High Schools students at Regional UK sci fair

6. Richard Cooper Morton Middle School. Fall 2006, Spring 2007, Fall 2007, Spring 2008
5th grade: Overall winner for all 5th through 8th grades- 2006 County Science Fair
6th grade: 2nd at the STATE sci fair held at EKU 2007 for Engineering
7th grade: 1st overall (all grades 5th-8th) at Regional Intel/Discoverey Channel affiliated fair.
7. Shuang Xu Spring 2008, Dunbar High School MSTC student. UKRP fellowship \$500.
Fall 2009 2nd Overall for all High Schools students at Regional UK sci fair.
Won **3rd place International INTEL** in the category of Animal Sciences at the International INTEL Sci. fair 2009.
8. Maddie Delgado Summer 2008, Lexington Catholic High School. UKRP fellowship \$500
9. Curtis Northcutt Summer 2008, Lafayette High School. UKRP fellowship \$500
Fall 2009 3rd Overall for all High Schools students at Regional UK sci fair.
Presented at **International INTEL.**
10. Justin Graff 2008-2009, Henry Clay High School. UKRP fellowship \$500
Fall 2009 2nd in category of Animal Sciences for all High Schools students at Regional UK sci fair
2009-2010, Second year in the lab on a new project. UKRP fellowship \$500
Placed 2nd in division at County fair. Regional fair- placed 3rd OVERALL best of fair for all high schools in all categories.

11. Kylah Rymond 2009-2010, Henry Clay High School. UKRP fellowship \$500
Placed 1st in division at County fair. Regional fair- placed 3rd in Animal Science

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12. Valarie Sarge 2011-2012 Dunbar High School (sophomore). Won 3rd overall place at State Level. Presented at **International INTEL**.

VII. Research Collaborations

Dr. Kert Viele (Dept. of Statistics, UK. 2000-to present)

Currently we are collaborating on a statistical problem with synaptic transmission related to neuromodulation. **NSF grant proposal** was funded for these efforts. **Manuscript published.**

Dr. Seongjai Kim (Dept. of Mathematics, UK. 2000-to present)

I have continued projects that develop quantitative **stereological methods** for reconstructing the dimensions and spatial distribution of synaptic structures in the pre- and post-synaptic tissue from conventional transmission electron microscopy. Dr. Kim has the computational abilities to provide programs for the analysis of the biological problems that I address. **Manuscript published.**

Dr. Wendi Neckameyer (2 week visit 1997 & visit in March 1999)

Dept. of Pharmacol. and Physiol., St Louis Univ. Sch. of Med., St. Louis, MO, USA

Investigating differential expression of GABA transporters and aminergic synthesis in distinct arthropod species. This research is multidisciplinary, and includes molecular, biochemical, electrophysiology, behavioral and genetic approaches towards understanding the regulation of synaptic transmission. This work has resulted in 2 pubs + 5 abstracts.

Dr. Sidney Whiteheart (Dept. Biochemistry, Med. Sch., UK)

Project: Molecular & physiological investigation of synaptically significant molecules involved in transmission at the NMJ.

Dr. Philip Bonner (School of Biological Sciences, UK)

Project: Muscle plasticity based on levels of neural activity. Two papers published together.

Dr. Haymo Bradacs (Univ. of Graz, AUSTRIA)

We are continuing our collaborative efforts in assessing the role of neuromodulators on synaptic efficacy among motor neurons that display varied intrinsic activity patterns. Paper published in 1997 on the initial phases of this project. A second paper is currently in preparation.

Dr. James Winslow (Univ. of Toronto, Dept. of Biomed. Eng., CANADA)

We are continuing our collaborative project on Ca^{2+} domains at active zones among neurons that display synapses with complex structures, such as with active zones of different sizes and their relative closeness to each other.

Paper published two years ago on the first phase of this long range project. Second and third papers are in the process of being written.

Dr. Donald Mykles (Colorado State Univ., Fort Collins, CO.)

Examining the regulation of muscle isoforms in specific types of crustacean muscles.

Two manuscripts published.

Dr. Alexander Dityatev (Univ. of Hamburg, Dept. of Molekulare Neurobiologie, GERMANY)

Developing improved methods of quantal analysis to assess synaptic efficacy at the NMJ.

Papers to be written are being discussed. The preliminary findings were presented at last year's Neuroscience meeting.

Dr. Josef Dudel (Physiologisches Institut Technische Universität München, München, GERMANY). Dr. Dudel and I are working on the mechanism in the limitations of synaptic transmission among motor neurons.

Dr. Eugen Brailoiu, Assistant Professor, Department of Pharmacology, James H. Quillen College of Medicine, East Tennessee State University, Johnson City, TN 37614. We are working on neuromodulation of synaptic transmission in frog, insect and crustacean preparations. Two manuscripts published together.

Visiting colleagues to learn techniques in my laboratory or to interact:

1. Dr. Wendi Neckameyer (2 week visit 1997 & visit in March 1999). Dept. of Pharmacol. and Physiol., St Louis Univ. Sch. of Med., St. Louis, MO, USA. (She learned physiological techniques related to *Drosophila* neuromuscular transmission)
2. Mr. Markus Klose (week visit in March 2000). Dept. of Biological Sciences, Brock University, St. Catharines, Ontario, **Canada**. (He came to learn quantal analysis related to neuromodulation of *Drosophila* neuromuscular transmission)
3. Dr. Thomas Breithaupt, Assistant Professor. University of Konstanz, Konstanz, **Germany**. Two week visit in August, 2000 to learn an approach of monitoring heart rate in crayfish while they undergo social interaction. In addition, we worked together on a joint project in the use of olfactory cues in cave crayfish during social interactions.
4. Dr. Joffre Mercier, Full professor. Department of Biological Sciences, Brock University, St. Catharines, Ontario, **Canada**. An 8 week visit in 2002. He came to work in my lab to learn some new preparations in which to investigate mechanisms of synaptic modulation by neuropeptides.
5. Mr. Hyun Sik Yang, Medical student at Seoul National University, Seoul, **South Korea**. He spent January through February 2004 in my lab to learn neurophysiology techniques related to measures of ephaptic communication between neurons.
6. Ms. Yulia Akbergenova, PhD graduate student from Lehigh University, PA. 2005. She came to the lab to learn *Drosophila* neurophysiology and dissection techniques. **Now a postdoc at MIT.**
7. Mr. Jong Hoon Lee. He visited during the summer of 2006. His home school was Yeungnam University in Daegu, **South Korea**. He came to my lab to learn neurophysiology and animal behavior related with fruit flies (*Drosophila*). He was a 2nd year undergraduate biology major at the time of his visit.
8. Mr. Hyoseok Chae. A visiting graduate student from Chonnam National University, Gwangju, **Korea**. His PhD mentor is Dr. Chang Kim at Chonnam National University. He came to my lab to conduct research on sensory neurons in *Drosophila* larvae. Electrophysiological recordings from primary sensory neurons is the focus. Dec. 5, 2006 to Feb 2007.
9. **Sabbatical Professor.** Dr. and Colonial WooYoung Chung. Korean Military Academy in Seoul, **Korea**. He spent 1 year (Spring 2007-2008) in the lab to learn more about physiological

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recordings at neuromuscular junctions. He was also responsible for bringing 1 graduate student, all expenses paid by the Korean Military Academy, to UK to complete a MS in my laboratory.
10. Ms. Erica Chao (PhD student) from Colorado State University spent 2 weeks in mine and Dr. Ken Campbell's (Dept of Physiology) lab learning techniques of single muscle fiber force recordings. (summer 2008)

VIII. NATIONAL/INTERNATIONAL SERVICE - Editing & Reviewing

2007-present. CHIEF EDITOR for *International Journal of Zoological Research*

This journal is published by Academic Journals Inc., NY, USA

Scope of the journal includes: behaviour, biochemistry and physiology, developmental biology, ecology, genetics, morphology and ultrastructure, parasitology and pathology, and systematics and evolution. Academic Journals Inc. is dedicated to publishing the finest peer-reviewed research in all fields of science and technology on the basis of its originality, importance, interdisciplinary interest, timeliness, accessibility, elegance and surprising conclusions. Please see new www site:

<http://www.scialert.net/eboard.php?issn=1811-9778>

2011-present. Editorial Board of *Frontiers in Skeletal Muscle Physiology*.

http://community.frontiersin.org/people/RobinCooper_1/31932

2012-present. CHIEF EDITOR for *Asian Journal of Animal and Veterinary Advances*

This journal is published by Academic Journals Inc., NY, USA

Asian Journal of Animal and Veterinary Advances is a high-quality peer-reviewed well indexed scientific journal publishing original research findings on all aspects of animal and veterinary sciences. Scope of the journal includes: pathology, microbiology, parasitology, physiology, pharmacology, physiology, veterinary medicine, poultry science, animal genetics and breeding, animal husbandry, animal reproduction and animal nutrition.

Please see new www site: <http://scialert.net/jindex.php?issn=1683-9919>

MANUSCRIPT REVIEWS

Reviewed manuscripts/chapters from the following journals or publishers since 1997.

Academic Press (2009 x 6) Various manuscripts for their various journals.

African Journal of Biotechnology (2012)

American Journal of Physiology - Regulatory, Integrative and Comparative Physiology (2012)

Animal Physiology. From genes to organisms (2004) 3 chapters. Cited as a reviewer for textbook (editors Sherwood, Klandorf, and Yancy).

Behaviour (2012)

BioMedical Central (2006)

Brain Research (2002, 2003x3, 2004, 2005x2, 2011)

Brain Research Bulletin (2002)

Canadian Journal of Zoology (2003)

Cell & Tissue Research (2001, 2003, 2006)

Circulation (2009)

Crustacean Nervous System (2011) Peer reviewed a chapter for the editor of this book.
Development (2003)
European Journal of Neuroscience (2005, 2006, 2007, 2008)
Genes, Brain and Behavior (2006, 2007)
Hormones and Behavior (2000)
Impulse (Journal for undergraduate research in Neuroscience, ISSN) (2005,2006)
Insect Biochemistry and Molecular Biology (1997,1998)
Invertebrate Biology (2010)
Journal of Comparative Biochemistry and Physiology (1998,1999,2002,2003,2007,2008,
2011x2)
Journal of Comparative Neurology (1998, 1999, 2001x3, 2003)
Journal of Comparative Physiology – A (2008)
Journal of Crustacean Biology (2000, 2003, 2004, 2005)
Journal of Experimental Biology (1998; 2007, 2008x2, 2012x2)
Journal of Experimental Zoology (2001x2; 2007)
Journal of European Neuroscience (2005, 2006, 2008)
Journal of Microscopy (2011)
Journal of Neurochemistry (2005)
Journal of Neurophysiology (1998, 2000, 2001x2)
Journal of Neurobiology (2000, 2003)
Journal of Neuroscience (2004, 2005x2, 2007, 2008x2)
Journal of Neuroscience Methods (2005x2, 2007x2; 2008; 2010)
Journal of Physiology-London (2005, 2009)
Journal of Visualized Experiments (JoVE) (3x2011)
Marine Biotechnology (2008x2)
Maryland Sea Grant (book chapter): Biology of Blue Crab (2000)
Medical Engineering & Physics (2007)
Molecular and Cellular Neuroscience (2010)
Neuroscience IBRO (2000, 2001, 2008, 2009, 2010, 2012)
Neuroscience Letters (2002)
Neurosignals (2011x2)
PEPTIDES (2007)
Physiological Genomics (2004)
Physiology & Behavior (2012)
PLoS ONE (2010x2, 2011)
Prentice Hall (reviewed 5 chapters, 150 pgs of a potential text book on animal behavior) (1998)
Synapse (2005, 2012)
The Biological Bulletin (1999)
The Journal of Insect Physiology (2009)
The Journal of Undergraduate Neuroscience Education (2006)
Zoological Studies (2001)

GRANT REVIEWS

1998-1999

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1. NSF external grant reviewer, IBN- Neuroscience section. (Program director- Dr. Daniel K. Hartline).
2. NSF external grant reviewer, Computational Neuroscience section. (Program director - Dr. Daniel K. Hartline).
3. External grant reviewer, Thomas F. Kate Miller Jeffress Memorial Trust, Commonwealth of Virginia.

1999-2000

1. **NSF** external grant reviewer, Computational Neuroscience section. (Program director- Dr. Roy White).
2. **Natural Environment Research Council.** This granting agency is in the United Kingdom.

2000-2001

1. **NSF** external grant reviewer, Integrative Animal Biology. (Program dir. - Dr. W.E. Zamer).

2002-2003

1. **NSF** external grant reviewer, Computational Neuroscience section. (Program dir. - Dr. Chris Platt).
2. **NSF** external grant reviewer, Behavioural Neuroscience section. (Program dir.- Dr. Carol Van Hartesveldt).
3. **NSF** external grant reviewer, Neuronal and Glial mechanisms. (Program dir.- Dr. Soo-Siang Lim). Two different proposals.
4. **U.S. Dept. of State.** The International Science and Technology Center (ISTC), U.S. Civilian Research and Development Foundation. (Program director- Dr. Mark Porter, Arlington, VA).

2004

1. **United States-Israel Binational Science Foundation:** Review Research Proposals
2. **NSF** external grant reviewer. Faculty Early Career Development. (Program dir.- Fred Stollnitz).

2005

1. **NSF** external grant reviewer. (Program dir.- Ione Hunt Von Herbing).
2. **NSF** external grant reviewer. (Program dir.- Paul B. Farel).
3. **NSERC Canada.** External grant reviewer.

2006

1. **NSF** external grant reviewer. (Program dir.- Paul B. Farel).

2007

1. Panel reviewer for **National Science Foundation.** Course, Curriculum, and Laboratory Improvement (CCLI) program. Held in Arlington, VA. ~ 25 proposals.
2. **NSF** external grant reviewer. (Program dir.- Paul B. Farel).
3. **NSF** external grant reviewer. (Program dir.- Diane M. Witt).
4. **NSF** external grant reviewer. (Program dir.- J Steven de Belle).

2008

1. Panel reviewer for **NIH.** ZRG1 F03B-D study section. Reviews of new investigator grants. Held in Washington, DC. 44 proposals. Nov. 12-14, 2008. Michael A. Lang was the SRO.

2010

1. **Swiss National Science Foundation.** External reviewer. Topic: Neurobiology (Wendy Altherr)

2. NSF external grant reviewer. (Program dir.- Mark D. Kirk)

2011

1. NSF external grant reviewer. (Program dir.-Karen A. Mesce)

ADMINISTRATIVE SOCIETY FUNCTIONS

1998-2001

Society for Integrative and Comparative Biology (Formally known as American Society of Zoologists)
I was elected, in an international ballot, as **Secretary** for the Division of Neurobiology (DNB) of this society. The term was for 3 years (1998-2001) and my role was to help in the annual meeting and send out electronic mail to all our constituents on the events and news within our international organization.

1998-2013

Served as the **Member at Large (1998-1999)**, **President elect (2001-2002)** and **President (2002-2003)** for the Society for Neuroscience-Kentucky chapter. My role as Member at Large was to organize the national Brain Awareness Week among the local elementary, middle, and high schools and to help coordinate external events to better promote knowledge about the field of neuroscience (1998-1999). In **2002-2004**, I designed and maintained the WWW site for the Society for Neuroscience-Kentucky chapter. **2012-2013 Outreach Coordinator** for the chapter.

2003-2005

Society for Integrative and Comparative Biology (Formally known as American Society of Zoologists)
I was elected, in an international election, as **Chair** for the Division of Neurobiology (DNB) of this society.

2005-2007

Society for Integrative and Comparative Biology (Formally known as American Society of Zoologists).
I was elected to serve as **Chair** for the Education Council on the executive board of SICB (Society wide-International, executive board member).

2003-2007. Director of the Central KY Regional Science and Engineering Fair, Inc. This is a new entity I brought to the University of KY. This provides an opportunity for 33 counties in KY to send their K4-12 students to compete in the **DISCOVERY CHANNEL CHALLENGE** or **INTEL-ISEF** recognized science fairs. This also provided UK with some credibility for PR into the community. **THIS TOOK A CONSIDERABLE AMOUNT OF TIME AND EFFORT.** (I would estimate 3 to 4 weeks of total time each year.)

2006-2007 Vice president for the Kentucky Academy of Sciences (KAS). This then leads by default to President Elect for 2007-2008 and then **President of the KAS for 2008-2009.** This is a state wide organization to promote science education in the state of KY.

2008-2009 President for the Kentucky Academy of Sciences (KAS). Organization of this year's annual meeting at UK Oct 31-Nov. 1st. 600 people attended this meeting. This is a state wide organization to promote science education in the state of KY.

2012-2013 Outreach Coordinator for the Society for Neuroscience-Kentucky chapter.

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2012-2013 President for the Kentucky Chapter for the American Physiological Society.

I started the state wide chapter in the summer of 2012 and now we are organizing our 1st state wide meetings.

National Outreach Activity

1. MadSci Network

WWW based group science help line for all ages (focus group Neurobiology).

MadSci Network see <http://www.madsci.org>

This site and distribution is run by faculty and grad students out of Washington Univ., St Louis, MO. I have answered questions and participated in discussion groups around the world on topics related to neuroscience. The answers to questions, in some cases, take a good deal of time to answer correctly with literature citations. The questions range from basic science to clinical relevant problems.

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2. **Camp Quest**

Since 2006 summer I have been actively involved in education at Camp Quest (OH camp). I spend 1 week each summer helping at the camp to teach kids about Biology with hands on activity as well as classroom type of setting with a lecture on various topics.

3. **Camp Quest, INC.** I am the registered agent for the INC. INC is filed in Fayette, Co, KY.

4. June 2011, **ABLE (Association for Biology Laboratory Education) Conference workshop.** I taught a workshop for university level biology teachers. "Effect of Environment and Modulators on GI and Heart Function in Invertebrates: Shrimp and *Drosophila*". This was a cost out of my own personal pocket for travel, registration and supplies for the workshop (~\$1,000). <http://www.ableweb.org/conf/able2011/index.htm>

5. Submitted 4 workshop proposals for 2012 **National Science Teachers Association (NSTA)** Regional Conference in Louisville (October 18-20). Three were accepted and presented .

(1) Cooper, R.L., Holsinger, R.C., Rose, S., Cooper, H., Krall, R.M., Johnson, D. and Zeidler-Watters, K. (2012). STEM & Health: Stressors on the circulatory system related with excess body fat. **PRESENTED**

(2) Cooper, R.L., Holsinger, R.C., Krall, R.M., Johnson, D. and Zeidler-Watters, K. (2012). Human Respiration Laboratory Experiment with a Geometric Calibration.

(3) Holsinger, R.C., Cooper, R.L., Krall, R.M., Johnson, D. and Zeidler-Watters, K. (2012). Effect of Environment and Modulators on Hindgut and Heart Function in Invertebrates: Crustaceans and *Drosophila*. **PRESENTED**

(4) Holsinger, R.C., Cooper, R.L., Cooper, H., Krall, R.M., Johnson, D. and Zeidler-Watters, K. (2012). Classroom activity on buffering related to respiration for high school and introductory college courses in biological sciences. **PRESENTED**

SOCIETY MEMBERSHIPS

Society for Integrative and Comparative Biology (Formerly known as American Society of Zoologists) (Division of Neurobiology) July 1998 to June 2001 **Secretary** for the Division of Neurobiology and **Chair** from 2002 to 2005.

Society for Neuroscience

Blue Grass Grotto - as a biologist.

National Speleological Society - as a biologist

National League for Nursing, since 2011

American Nurses Association, since 2011

Southern Nursing Research Society (SNRS), since 2011

IX. Invited Lectures

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- March 1990 Dept. Seminar. Zoological Inst., Univ. of Basel, Basel, **Switzerland**
"Joint and tension receptors in the limbs of crustaceans"
- April 1990 CNRS, Laboratoire de Neurosciences fonctionelles, Marseille, **France**
"Function and development of proprioceptors in the limbs of crustaceans"
- July 1990 Faculty of Biology, Univ. of Konstanz, **Germany**
"Single unit analysis of proprioceptors in limbs of crustaceans"
- Sept. 1990 Dept. of Physiol., Univ. of Bristol, Sch. of Veterinary Sci., Bristol, **England**
"Development and function of proprioceptors in crabs and lobsters"
- Oct. 1990 "Biosymposium", A Ciba-Geigy sponsored event for the Biocenter, Univ. of Basel, Basel, **Switzerland** (Ciba-Geigy, Switzerland)
"How do cell-to-cell contacts influence the properties of ion channels in neurons?"
- Sept. 1991 CNRS, Inst. de Pharm. Molec. et Cellulaire, Sophia-Antipolis, **France**
"Synapse formation induces changes in the distribution of calcium currents in leech neurons in culture"
- Nov. 1991 Inst. of Neuroscience, Univ. of Oregon, Eugene, Oregon, USA
"Synaptogenesis and calcium current distribution in cultured leech neurons"
- Jan. 1992 Pharma. Div. Preclinical Res., F Hoffmann-La-Roche Ltd. Basel, **Switzerland**
"Alterations in calcium current distribution induced by synapse formation"
- Dec. 1992 Dept. of Physiol., MRC group seminar, Univ. of Toronto, Toronto, **Canada**.
"Calcium current distribution on neurons before and after synapse formation"
- Dec. 1992 Dept. of Biol. Sci., Columbia Univ., N.Y., N.Y., USA.
"Calcium current distribution before and after synapse formation by leech neurons"
- Jan. 1993 Dept. of Biol. Sci., Duquesne Univ., Pittsburgh, Penn., USA
"Calcium current distribution on neurons before and after synapse formation"
- Feb. 1995 Dept. of Biology, York Univ., North York, Ontario, **Canada**
"Synaptic plasticity in crustaceans and *Drosophila*: On the search for synaptically significant molecules"
- March 1995 Playfair Neuroscience Seminar, The Toronto Hospital, TorontoWestern division
"Synaptic plasticity: Interface between physiological and molecular approaches, with observations on amplification and analysis of genetic material from single identified neurons."
- Nov. 1995 Dept. of Biology, Univ. of Kentucky, Lexington, Kentucky

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"Synaptic plasticity of neurons: Interface between physiological, structure and molecular approaches, with observations on mRNA amplification obtained from single identified neurons."

- May 1996 Dept. of Physiology, School of Medicine, Univ. of Montréal, Montréal, Québec, **Canada**
"Synaptic diversity and differentiation studied at physiological, morphological and molecular levels: Crustacean neuromuscular junctions"
- Oct. 1996 Center for Biomedical Engineering, Univ. of Kentucky, Lexington, KY.
Joint and tension receptors in the limbs of crustaceans
- Jan. 1997 Dept. Pharmacology, School of Medicine, Univ. of Saint Louis, St. Louis, MO.
Molecular clues to neuronal plasticity
- Jan. 1997 Dept. Molecular and Cell Physiology, Univ. of Cincinnati Sch. of Medicine, Cinn., OH,
"Synapse formation induces changes in the distribution of calcium currents in leech neurons in culture"
- Jan. 1998 Dept. of Biology, Georgia State University, Atlanta, GA.
Neurobiology Club Monthly Seminar
Physiological and morphological differentiation at Crustacean and *Drosophila* neuromuscular junctions
Departmental Seminar
The holistic effects of neuromodulators on crayfish and *Drosophila* behavior, neuromuscular transmission, and sensory function.
- Feb. 1998 Dept. of Anatomy and Neurobiology, Univ. of Kentucky, Lexington, KY.
Physiological and morphological differentiation at Crustacean and *Drosophila* neuromuscular junctions
- March 1998 Dept. of Biol. Sci., Duquesne Univ., Pittsburgh, Penn.
Physiological and morphological differentiation at Crustacean and *Drosophila* neuromuscular junctions
- October 1998 Dept. of Zoology, Miami University, Oxford, OH.
Actions of neuromodulators on physiological and morphological differentiated crustacean and *Drosophila* neuromuscular junctions in relation to whole animal behavior
- April 1999 Dept. of Life Sciences, Murray State Univ., Murray, KY.
Actions of neuromodulators on physiological and morphological differentiated crustacean and *Drosophila* neuromuscular junctions in relation to whole animal behavior
- July 1999 International Symposium, 'Frontiers in Crustacean Neurobiology', Conference in Hamburg - Blankenese, **GERMANY**. July 8-11, 1999. **Invited speaker**
Influence of neuromodulators and vesicle docking related proteins on the kinetics of

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vesicular release. Chapter submitted for a book as a result of the conference.

- Feb. 11, 2000 Seminar. Midway College, Midway, KY.
My PhD student (Hao Li) and I conducted a dual talk. I presented an overview of on going research with biospeleology and Mr. Li presented his work on cave crayfish social behaviors.
- March 1, 2000 Departmental Seminar. Eastern Kentucky University, Richmond, KY.
My PhD student (Hao Li) and I conducted a dual talk. I presented an overview of on going research with biospeleology and Mr. Li presented his work on cave crayfish social behaviors.
- March 24, 2000 Dept. of Pharmacology, School of Medicine, East Tennessee State University, Johnson City, TN.
Neuromodulators mechanisms of action on the synaptic steps in chemical transmission at NMJs of *Drosophila* & crustaceans.
- May 8, 2000 Faculty of Biology, University of Konstanz, Konstanz, **GERMANY**
The role of neuromodulators on differentiated crustacean and *Drosophila* neuromuscular junctions in relation to whole animal behavior
- May 17, 2000 Institut fuer Zoologie, Universitaet Graz, Graz, **AUSTRIA**
The effects of neuromodulators on sensory neurons, CNS command, and neuromuscular junctions in the crayfish and *Drosophila* in relation to the animal's behavior
- July 20, 2000 Physiologisches Institut Technische Universitaet Munchen, Munchen, **GERMANY**
Actions of neuromodulators on synaptic transmission in *Drosophila* & crustaceans
- July 27, 2000 International Symposium Ecdysone 2000 in Rapperswil, **SWITZERLAND**.
The non-genomic actions of 20-HE in *Drosophila* & crustaceans
- Sept. 11, 2000 Univ. of Illinois, Illinois, USA. Dept. of Entomology.
The non-genomic and genomic actions of 20-HE in *Drosophila* and crustaceans during development
- Oct. 24, 2000 Univ. of Kentucky, Sch. of Biological Sciences (tenure & promotion talk)
The effects of neuromodulators on sensory neurons, CNS command, and neuromuscular junctions in the crayfish and *Drosophila* in relation to the animal's behavior
- May 30, 2001 Dept. of Physiol., Sch. of Medicine, Univ. of Toronto, Toronto, **Canada**.
Development of the larval *Drosophila* NMJ and potential influences of 20-HE
- Feb. 1, 2002 Dept. of Entomology, Univ. of KY, Lexington, KY. Dept. Seminar
Modulation in the development of the larval *Drosophila* NMJ

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- April 25, 2002 Dept. of Biological Structure & Function, Oregon Health & Science University, Portland, OR. Dept. Seminar. Development of the larval *Drosophila* NMJ: Maintaining homeostasis
(*Purpose: Short listed for an associate professor position in the Dept. of Structure and Function*)
- May 20, 2002 Dept. Biology, Seoul National University, Seoul, **South Korea**. Invited as a presenter as part of a NRL workshop on Synaptic Plasticity & Invertebrate Neurobiology, that had a very prestigious roster. For example, **Dr. Paul Greengard** (Rockefeller Institute) that won the **Noble Prize** in medicine and physiology in 2000 was the keynote speaker. My topic was on the "Development of the larval *Drosophila* NMJ: Maintaining homeostasis"
- June 10, 2002 Department of Chemistry, Korean Military Academy, Seoul, **South Korea**. Class room presentation to 3rd year cadets (2 hrs). Physiology of Synaptic Transmission: Modulation and Biological toxins.
- Oct. 19, 2003 Sloan's Valley Conservation Task Force meeting. Sommerset, KY. Report on the ongoing research of cave biology taking place in the field. In addition, I provided a 40 minute research talk on "A comparisons of antennule structure in surface and cave-dwelling crayfish".
- Dec. 10, 2003 Dept. of Physiology, Sch. of Med., Univ of KY., Dept. Seminar. "Synaptic plasticity, development & neuromodulation at neuromuscular junctions".
- April 19, 2004 Dept. of Biology, Univ of Cincinnati, OH, Dept. Seminar. "Neuromodulation in the CNS and at the neuromuscular junctions of arthropods".
- April 26, 2004 Korean BioScientist Association at the University of Kentucky (KBAUK). Provide an overview of current research in my program.
- Oct. 7, 2004 Dept. of Biol. Sci., Lehigh University, PA. Dept. Seminar. "Neuromodulation of synaptic transmission".
- Feb. 24, 2005 Dept. of Pharmacology, Sch. of Med., Univ of KY., Dept. Seminar. "Pharmacology of invertebrate synapses: From serotonin systems to the actions of carbon dioxide on glutamate receptors".
- April 2005 Dept. of Biology, Abilene Christian University, Abilene, TX. "Neuromodulation in the CNS and at the neuromuscular junctions of arthropods".
- May 2005 Department of Physiology, Faculty of Medicine and Health Sciences, United Arab Emirates University, Al Ain, **United Arab Emirates**. Modulation of neuronal function in circuits of crayfish and *Drosophila*.
- May 2006 Department of Biological Sciences, College of Natural Sciences. Seoul National

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University, **Seoul, South Korea**. Neuromodulation of synaptic transmission in crayfish and *Drosophila*. Host Dr. Kaang. May 29, 2006.

- June 2006 Seoul National University, Department of Biological Sciences, College of Natural Sciences. **Seoul, South Korea**. More to learn from invertebrates related to synaptic transmission. Host Dr. Kaang. For symposium of National Research Laboratory group research grant. June 14, 2006.
- June 2006 Chonnam National University, **Gwangju, Korea**. The effect of neuromodulators on development and function as well as actions of CO₂ in *Drosophila* larvae. Host Dr. Chang Kim. June 20, 2006.
- June 2006 Seoul National University Medical School, Department of Physiology. **Seoul, South Korea**. Differentiation in synaptic transmission. Host Dr. Ho & Dr. Lee. June 24, 2006.
- August 2006 Neuromodulation of synaptic transmission in crayfish and *Drosophila*.
1st International Conference on Synapses, Memory, Drug Addiction, and Pain.
Dept. of Physiology, University of Toronto, Toronto, **Canada**.
- Sept. 2006 Invited by the Russian Academy of Sciences. VIII East European Conference of the International Society for Invertebrate Neurobiology. Held at Kazan Medical School. **RUSSIA**. Host: Prof. P.M. Balaban - meeting chairman.
- Sept. 2006 Department of Neuroscience, Cell Biology and Physiology, Wright State University, Boonshoft School of Medicine, OH, USA. Neuromodulation of synaptic transmission in crayfish and *Drosophila*. Host Dr. Kathrin Englisch.
- March 2007 Dept. of Pharmacology, Southern Illinois University School of Medicine, Springfield, IL. Neuromodulation in the CNS and at the neuromuscular junctions of arthropods. Host Dr. Victor V. Uteshev.
- January 2008 Overview of on-going research projects and views on graduate education. Transylvania University, Lexington, KY. Invited by undergraduate science students. Host: Monica Hagan.
- April 20, 2009 Ca²⁺ regulation that influences synaptic transmission: Comparison between crayfish and *Drosophila* NMJs. **Cornell University**, Neurobiology and Behavior, Mudd Hall Ithaca, NY. Host: Dr. Bruce R. Johnson.
- Sept. 2, 2011 Regulation and modulation of vesicle pools during synaptic transmission within motor nerve terminals of the crayfish and *Drosophila* model systems. **Dartmouth Medical School**, Department of Physiology and Neurobiology. Lebanon, NH.

Jan. 14, 2012 Properties of synaptic transmission. Korean-American Scientists and
Engineers Association Kentucky Chapter (KSEA-KY) Winter Conference
and Annual Dinner. University of Kentucky, Lexington, KY. Jan. 2013

March 5, 2012 Modulation of vesicle pools during synaptic transmission within motor nerve terminals.
Centre College, Department of Life Sciences. Danville, KY.

Sept 12, 2012 The effects of deep tissue injury (muscle) and healing processes. Center for Muscle
Biology, **Department of Physiology**, University of Kentucky.

X. UNIVERSITY OF KENTUCKY SERVICE

1. Served as the **Member at Large (1998-1999)**, **President elect (2001-2002)** and **President (2002-2003)** for the Society for Neuroscience-Kentucky chapter. My role as Member at Large was to organize the national Brain Awareness Week among the local elementary, middle, and high schools and to help coordinate external events to better promote knowledge about the field of neuroscience (1998-1999). In **2002-2004**, I designed and maintained the WWW site for the Society for Neuroscience-Kentucky chapter.

2. Faculty sponsor for The Wilding Society. This is a student organization that promotes camping, hiking and getting involved in conversational issues within the state of Kentucky. (The society started in 1998) (1998-2000).

3. A **member** of the executive committee for CEEB (Center for Ecology, Evolution & Behavior) at UK. My role is to help out in administrative matters. (1998-present).

4. Within the Univ. of KY there is an organization termed the Interdepartmental Neuroscience Program (**INP**). My affiliation with this group was to organize and coordinate the **seminar speaker series** (1998-1999).

5. Univ. of KY, College of Arts and Sciences (**2002-2004**). Area –A, Curriculum Committee.

6. Provided tours for public school students of my lab and short discussion on the science (**2003**) for the Science Outreach Center, UK. (SCRAMS- Science camp for rural and Appalachian middle students).

7. Chemical Safety Committee (**2004-2005; 2006-2007; 2007-2008; 2009-2010**) Campus wide oversight.

8. Fellowship Panel for Northern KY Alumni Club Fellowships (**Spring 2005**). Review fellowships.

9. Representative on Mathematical & Natural Sciences for the **University Senate (2005-2007)**.

10. Selection Committee for the 2006 Provost Outstanding Teacher Award (**2006**)

11. Board member of the Tracy Farmer Center (Scientific Advisory Board) (**2006 for a 3yr term**).

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The Tracy Farmer Center for the Environment is the University of Kentucky's focal interdisciplinary center for the comprehensive integration of research, education, and public service dedicated to: advancing our knowledge and understanding of environmental systems, the analysis and management of environmental problems and issues, the development of sustainable technologies and solutions to these environmental problems and issues, and the successful transfer and dissemination of these technologies to state, federal, and local governments, private organizations, businesses and corporations, and individuals.

12. University Studies Committee 2005-2006 (**Campus wide, 2006-2008**; Dr. Phil Kraemer, Director).
13. Graduate Council for University (representing the College of Arts and Sciences) (**Sept. 2006-May 2008**).
14. Kirwan Faculty Prize selection committee (Univ. of KY, for **2007**).
15. TriBeta (faculty representative for the Biology Honor Society local chapter of TriBeta) (**2005-present**) . Bimonthly meetings to engage undergraduates in various activities.
<http://www.as.uky.edu/Biology/TriBeta/default.htm>
16. Founder and faculty representative of UK-SHIFT. (**2006- present**)
<http://www.as.uky.edu/Biology/faculty/cooper/UKSHIFT/default.htm>
The purpose of UK SHIFT: The purposes of the organization are to 1) promote and practice the open, rational, and scientific examination of the universe and our place in it, 2) and that ethics and morality can be meaningfully based on rational and humanistic ideals and values, 3) promote skeptical inquiry, 4) provide community for atheists, agnostics, humanists, skeptics, naturalists and other freethinkers, 5) organize activities, such as forums for discussion, guest speakers, and debates that educate the University of Kentucky and surrounding community, 6) foster acceptance of freethinkers and promote a positive image of freethinkers through community service, and 7) advocate for the separation between church and state.
17. Member of the Mathematics and Science Education **Program Faculty in the College of Education** at the University of Kentucky. (2007-present). Role is to supervise graduate training in the College of Education. I serve on the Program Faculty, which is also the same as the admission board, for the MIC program for sciences. MIC is the masters with Initial Certification for high & middle school teachers.
18. Fall 2007. National Merit Students. Gave presentations to entering students. Program is run out of the UK EURKRA office.
19. Summer 2008. Served on the extensive external review of the Ag Bio Tech (UK) program. 2 months over the summer of meetings and surveys of faculty, students, mentors, and administrators. (This was not during a salaried DOE time).
20. Fall 2008. Provide a lecture for ANA710/GRN710/PGY710/PHA710
1.5 hrs on Aging of the Nervous System: "Invertebrate studies and their ongoing contributions to neuroscience". (Took a fair bit of time to prepare as this is not my area of expertise).
Course director: Dr. Greg Gerhardt (Dept. Anatomy and Neurobiology).

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21. March 2010. I participated as a mentor in the UK project (took one full day in session and many pre/post sessions with paper work and reports. UK made \$ off this time). University of Kentucky Office of Undergraduate Research and Creativity/eUreKa! will participate in the research study, "Efficacy of Interventions to Promote Research Careers," conducted by Dr. Elise Lev, associate professor at Rutgers University and her research team. The project is funded by the National Institute of General Medical Sciences (NIGMS) at the National Institutes of Health (NIH). Participating schools that are able to refer at least 30 dyads (30 mentors and 30 students) to the study will receive a \$10,000 honorarium.
22. 2000-present, Serve as an advisor and mentor to students in UK A&S Topical Studies programs. Review proposals and advise in course work
23. Participated in the College of Arts and Sciences' Envision 2020 program. Presented and demonstrated my research to UK donors at Keenland and to Scholars night on Campus. Took two full days with setup and tear down as well as preparation time.
See- http://envision.as.uky.edu/Predictions/bench_sciences.aspx#RobinCooper
See- **Ampersand Issue Spring 2011 page 39.**
24. April 2011. Reviewed proposals for the Oswald Competition by Univ of KY undergraduates. Reading papers and ranking them for University wide awards.
25. Chair of Chemical Safety Committee (**2012-present**). Campus wide oversight. President appointed.
26. Posters Presentation Committee for NCUR 2014. (**2012-2014**). The National Conference on Undergraduate Research annual conference. 1st time held at Univ. of KY.
27. Fall **2012**. Review 10 research proposals submitted by undergraduate students in the AMSTEMM Program (Appalachian & Minority Science, Technology, Engineering & Math Majors) to determine which ones should be funded.
28. Fall 2012. Review 5 Oswald Competition fellowships for the University of Kentucky. Only Dr. Danley (biology) and I reviewed these proposals

MS Committee service:

1. Stacy Smith 1996-1997; Member (advisor- Dr. Bonner)
2. Kwani Stewart 1997-1998; Member (advisor- Dr. Bonner)
3. Vanessa Boyce 1998-1999; Member (advisor-Dr. Hartman, Duquesne Univ., Biology, Pittsburgh, PA.)
4. Joe Kramer 1998-1999; Member (advisor- Dr. Bonner)
5. Misty Crider 1996-1998; **Advisor**
6. Ping He 1997- 1998; **Advisor**
7. Johann Sohn 1998-1999; **Advisor**
8. Joseph Shearer 1999-2001 **Advisor** (Plan B)
9. Sean Griffin 2000-2002; Member (advisor- Dr. Bonner)

10. Shardan Radmanesh 2000-2002; Member (advisor- Dr. Bonner)
11. Bin Xing 2001-2003 **Advisor**
12. A. Ashleigh Long 2003-2004; **Advisor**
13. Samuel P. Carmichael 2006-2008 Member (advisor Dr. Osborn; Biology)
14. Fan Wu 2008; Member (advisor Dr. O'Hara; Biology)
15. Capt. Junyoung Lee 2007-2010 (MS student); **Advisor**
16. Nathan Klar 2010-2011 (advisor Dr. Crowley)
17. Rachel C. Holsinger 2011-present. **Advisor**

PhD Committee service:

1. Matt Turnbull 2002-2003; Member (advisor Dr. Webb; Entomology)
2. M.K. Jeoung 2000-2003; Member (advisor Dr. Ji; Chemistry)
3. Mark Lancaster 2000-2007; Member (advisor Dr. Viele; Statistics)
4. Shi-Ping Zou 2000-2003 (advisor Dr. Staben)
5. Bruce Griffis 1997-2001; Member (advisor Dr. Bonner)
6. Hao Li 1997-2001; **Advisor**
7. Brad Dickey 1998-2004; Member (advisor Dr. Crowley)
8. Changsu Hwang 1998-2001; Member (advisor Dr. MacAdams; Physics)
9. Greg Mayer 1997-2001; Member (advisor Dr. Hogstrand)
10. Bing Zhao 1997-2004; Member (advisor Dr. Debski)
11. Chris Butt 1997-2000; Member (advisor Dr. Debski)
12. Jorge Quintero 2001 Outside examiner (Physiology- Dr. McMahon)
13. Patrick Crumrine 1998-2003; Member (advisor Dr. Crowley)
14. Johann Sohn 2000-2005; Member (Chair but his advisor was Dr. Ji; Chemistry)
15. Andy Johnstone 2003-2007; **Advisor**
16. Sameera Dasari 2003-2007; **Advisor**
17. Jeremy Nadolski 2002-2004; Member (advisor Dr. Viele; Statistics)
18. Mohati Desai 2005- 2008; **Advisor**
19. Andrew Wigginton 2004-2005; member (advisor Dr. Birge; Biology)
20. Sonya Bierbower 2006-2010; **Advisor**
21. Ying Shu 2006-2007; Member (advisor Dr. Tae H. Ji; Chemistry)
22. Chris Noe 2006-2007; Member (advisor Dr. Tae H. Ji; Chemistry)
23. Rachael Self 2006 Outside examiner (advisor Dr. Prendergast; Psychology)
24. Rhonda VanDyke 2006-2008; Member (advisor Dr. Viele; Statistics)
25. Gayle L. Joseph 2006-2008; Member (advisor Dr. Andrade; Physiology)
Switched to MS after quals.
26. Deanna Morris 2006-2010; Member (advisor Dr. Rawls; Biology)
27. Tim Bradshaw 2006-2012; Member (advisor Dr. Osborn; Biology)
28. Katherine Smith 2006-2011; Member (advisor Dr. Prendergast; Psychology)
29. Ling Liu 2006-2009; Member (advisor Dr. O'Hara; Biology)
30. Prashant Karl 2005-2010 ?; Member (advisor Dr. O'Hara; Biology)
31. Lisa Thomas 2008; outside examiner (advisor- Rehabilitation Sciences Dr. Joseph Stemple)
32. Tracy Butler 2008-2011; Member (advisor Dr. Prendergast; Psychology)
33. Elizabeth A.E. Roland 2009; outside examiner (advisor- Dr. J. Truman Stevens, Dept. Instruction and Administration-Dept of Education)

- 34. Wen Hui Wu 2008-present; **Advisor**
- 35. Hua Bai 2009; outside examiner (advisor-Dr. Subba R Palli, Dept of Entomology)
- 36. Ashlie Beals 2009-present; Member (advisor- Dr. Krall, Dept. Instruction and Administration- Dept of Education)
- 37. Dustin Lueker 2010-present; Member (advisor Dr. Viele; Statistics)
- 38. Laura Gilliam 2010; outside examiner (advisor-Dr. Reid, Dept of Physiology)
- 39. Jessica Harris 2011-present; Member (advisor-Dr. Butterfield, Dept of Chemistry)
- 40. Nathan Klar 2011-present; Member (advisor Dr. Crowley, Dept of Biology)
- 41. Zana R. Majeed 2011-present; **Advisor**
- 42. Josh Titlow 2011-present; **Advisor**
- 43. Mansi Sethi 2012-present; Member (advisor Dr. O'Hara; Biology)

General service:

- 1999 Served as an external job candidate reviewer for Dept. of Physiology, UK.
- 1999 Served as a reviewer for Freshman Scholarships. 75 applications were reviewed.
- 1999 Served as an external job candidate reviewer for Dept. of Biochemistry, UK.
- 2000 Served as a mentor for WINS (women in science). Two high school students worked in my laboratory to learn about conducting scientific methods and experimentation. UK- Outreach center program.
- 2000 Served as a mentor for minority undergraduate students. A Jr. undergraduate student from Alabama worked in my lab for 1 summer. UK- Outreach center program.
- 2001 Served as a University reviewer for Undergraduate Research and Creativity Grants. 19 Spring and 33 Summer ones reviewed.
- 2002 Served as a University reviewer for Freshman Scholarships. 75 applications were reviewed.
- 2002 Served as an external job candidate reviewer for School of Pharmacy, UK (for 2 different people)
- 2002 Served as an external job candidate reviewer for Dept. of Entomology, UK.
- 2002-2003 Served as an external job candidate reviewer for Dept. of Physiology, UK.
- 2004 - Ad hoc for job candidate in Dept. of Anatomy and Neurobiology, UK.
- 2005-2006 Northern Kentucky UK Fellowship Panel. Review fellowship applications. Dean Blackwell's committee.
- 2009-2010 Statistics dept.- member on faculty search committee for joint position Statistics/Biology

XI. DEPARTMENT OF BIOLOGY

- 1996-1997 Facilities and safety committee
- 1998-1999 Biology dept.- OIB faculty search
- 1998-1999 Graduate affairs committee
- 1998 & 1999 Served as the Biology representative for the Teaching and Learning Center in testing incoming students for TAs
- 2000 Biology dept.- seminar committee.
- 2000-2002 Biology dept.- Faculty Merit Evaluation committee.
- 2000-2008 Biology dept.- Undergraduate affairs committee.
- 2000-2001 Biology dept.- Bioinformatics faculty search
- 2001-2002 Biology dept.- Functional Genomics faculty search
- 2003-2004 Biology dept.- Functional Genomics faculty search
- 2005 Served as the Biology representative for the Teaching and Learning Center in testing TAs.

2011-present Biology dept.- Faculty Merit Evaluation committee.
2011-present Biology dept.- Undergraduate affairs committee.
2010-2012 Biology dept.- Graduate affairs committee.

XII. LOCAL COMMUNITY SERVICE (State of KY)

1. 2002-2003: Served as **Secretary** for the **Blue Grass Grotto** (BGG). This is a local caving club as a branch of the National Speleological Society. The BGG is mostly composed of academic types and is concerned with conservation and education of the public about caves within KY.

2004-2007: Serving a three year appointed term as a **Director** for the **Blue Grass Grotto**.

2. Sloan's Valley Conservation Task Force, National Speleological Society (NSS) (1997-present). As a member of this task force I work to protect the ecology and educate the public concerning the 23.5 miles of the Sloan Valley Cave system in Kentucky. We monitor the water quality and status of the biota throughout the cave system. We also have implemented an experimental research station to observe the behavioural interactions of various species of blind cave-adapted crayfish. There are a number of recent concerns that the task force is working on related to agricultural pollutants and run off from county landfills that affect the cave biology and cave dynamics.

3. 2006-2007 Vice president in the executive board for the Kentucky Academy of Sciences (KAS). This then leads by default to President Elect for 2007-2008 and then **President of the KAS for 2008-2009**. This is a state wide organization to promote science education in the state of KY.

4. 2008-2012. I am a board member of the KY-SEF (KY STATE SCIENCE AND ENGINEERING FAIR). This is to help organize and fundraise for the state science fair held annually at Eastern KY Univ. We meet 3 times a year in Frankfort at the Dept of Education (KY) to help plan state wide science activities for high school and middle school students.

2012-present, President of the board for KY-SEF (Kentucky & Science Engineering Fair). This is the STATE Science fair. All the regional fairs work their way to the highest state fair. We are really two fairs (Life sciences and Physical Sciences). Our winners go directly to the International INTEL competition.

5. 2009. KY Girls STEM Collaborative Conference. Present at conference about science activities for science majors. Hayett (Lexington, KY) June 15, 2009. Entire day event.

6. 2010 , 2011 2012. Jr. Kentucky Academy of Sciences. Serve as a judge of presentations. April 23, 2011. Annual meeting

Community Service in Lexington, KY & local areas

1. For National Brain Awareness Week (1997, 1998, 1999, 2000, 2001, 2002) neuroscientists across America were asked to speak at local elementary and high schools on the subject of neurobiology For example, I volunteered to speak at the Cassidy school throughout the week. The presentations reached every 4th and 5th grader at Cassidy elementary school during that week. We worked with the Cassidy

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science teacher Ms. Hesseldenz so that we could use the students Science hour in order to have 15 to 20 students in each of the 12 sessions. I brought human brains, a snake brain and a fish brain to the school for the students to hold (with gloves) and compare. We also played some games that the students enjoyed doing while learning about sensory and motor neurophysiology.

2. Science Fair 2000-2012 Glendover Elementary School. **Coordinated the judging** of the science fair projects. Every 4th and 5th grader (~200) is required to present at the Science Fair. In the year 2002, I had to coordinate all the science fun day activities and organize 30 judges for the event. I also judged at the local school level and at the county level.

3. The local elementary schools (Cassidy & Glendover) have a yearly science day. In **1998, 1999, 2000, 2001** I presented neurophysiology and neuroanatomy experiments for Glendover (February-contact Ms. Dove-Science teacher at Glendover) and crayfish interactions, cave ecology and heart rates of crayfish for Cassidy (April-contact Ms. C. Hesseldenz, Cassidy).

4. The local middle school (Morton). Since **2003** I have been presenting hands on demonstrations neurophysiology experiments for students. (contact Ms. Jacobs-Science teacher). I also organize the Science fair at the middle school to secure judges for the event and the determine the over winners for the competitions. These events involve 3-5 days each year.

Also outside FY county I help out in science outreaching. For example, I visit (Ms. Pam Long, Biology Teacher) West Jessamine High School, Nicholasville, KY for demonstrations is sensory neurophysiology to sciences classes. In **2004** I visited (Ms. Leona Blackburn, science teacher) Berea Community School and presented hands-on science activities for her 3 classes.

5. Science Fair Judging:

2002-2006 Judged at Fayette **County Science fair** and at the **science fair for SCAPA**, Lexington.

2003-present Judged at Fayette **County Science fair**, **District Science fair** at Northern KY Univ., **State Science fair** at Eastern KY Univ. and at the **Jr. Kentucky Academy of Sciences** annual meeting Campbellsville Univ. served as a mentor.

6. 2003-present. Serve as a **mentor** for the **Jr. Kentucky Academy of Sciences**. This is to help High School Students with Science projects so that they will be able to learn the investigative principles of science. I also help the students prepare to present their findings at the Jr. Kentucky Academy of Sciences annual meeting. **In 2004, 2005 and 2006** - I couch students from Morton Middle school on their skills to present their science projects and helped them prepare their research lab notebooks so that they could compete at the **Jr. Kentucky Academy of Sciences**. Four of the 5 placed 1st in their divisions.

7. 2000-present. Serve as a resource for MAD SCIENCE network. I serve as a resource for questions from students around the world related to neuroscience questions. This service is coordinated by graduate students from Washington University, School of Medicine.

8. 2003-2008. Developer and Founder of the **Central KY Regional Science and Engineering Fair, Inc.** This was a new entity brought to the University of KY. This provides an opportunity for 33 counties in

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KY to send their K4-12 students to compete in the **DISCOVERY CHANNEL CHALLENGE** or **INTEL-ISEF** recognized science fairs. This also provided UK with some credibility for PR into the community. **THIS TOOK A CONSIDERABLE AMOUNT OF TIME AND EFFORT.** (I would estimate 3 to 4 weeks of total time each year.). I passed directorship over to Dr. Ed DeMoll in 2008.

9. Sept. 18, 2007. Visited Wolf County High School biology classes to help with demonstration of invertebrate life cycles and sensory biology- focus on cave animals. Outreaching with the Tracy Farmer center for the Environment. 40 kids.

10. Oct. 24, 2007. Took Woodford County high school Biology classes to KY state Fish and Wildlife aquaculture facilities to examine the economics and biology of prawn farming. Outreaching with the Tracy Farmer center for the Environment. 50 kids

11. Nov. 8, 2007. Visited Woodford County High School biology classes to help with Crayfish dissections. Provided animals and dissecting tools and knowledge on dissections. Outreaching with the Tracy Farmer center for the Environment. 50 kids.

12. Provided physiological demos of synaptic transmission and dissection techniques to a class (Anatomy and Physiology students) at Kentucky State University. Spent all day at KY State to work with this class. Host: Bruce Griffs (Faculty member in Natural Sciences). January 30, 2008

13. Provided an entire day (March 16, 2009) to teaching all the 8th graders (4 classes) at Beaumont Middle School (Lexington, KY) differences in innate and learned behaviors. This was done with lecture and hands on activities. (Contact person: Mr. Patrick Goff, Science teacher at Beaumont Middle School).

14. The local middle school (Morton). Presenting hands on demonstrations of sensory physiology on the students and on invertebrate animals. (contact Ms. Jacobs-Science teacher). The event took a day to prepare and a ½ day to execute in the classroom. May 27, 2009.

15. The local middle school (Jessie Clark). Presenting hands on demonstrations of math concept is biology for advanced geometry and algebra students. (contact Craig Schroeder, Ph.D.; Math and Science Teacher, Jessie Clark Middle School). The event took two days to prepare and a full day 4 classes to execute. May 29, 2009. This was an event to Beta test of exercises that I wish to publish for teachers in Math/Biology for middle and high schools.

16. Judged for “The FFA Agriscience Fair” Science fair. High school students. June 9, 2010; Lexington KY. ½ day event.

17. Provided an entire day (March 6, 2012) to teaching all the 8th graders (4 classes) at Beaumont Middle School (Lexington, KY) differences in innate and learned behaviors. This was done with lecture and hands on activities. (Contact person: Mr. Patrick Goff, Science teacher at Beaumont Middle School).

Health Related Community Service in Lexington, KY & local areas

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1. Presentation and activity on the importance of good respiration with pH balance for elderly and people with COPD: Concerns with oxygen therapy. Presentation to students in High School Biology classes (2 different classes). FCPS, Southside Technical Center, Lexington, KY. Feb. 1, 2012. Contact: Ms. Shannon Raymer, RN, MSN, CCRN
2. Volunteer multiple times in evenings as a RN for Mission Clinic at the Baptist Church, Frankfort, KY. (~50hrs within 2012).
3. Presentation and activity on the importance of good respiration with pH balance for elderly and people with COPD: Concerns with oxygen therapy. The Lexington Senior Center. February 7, 2012. Contact: Mr. Wright.
4. Presentation and activity on the circulatory system: Concerns with obesity and arthroscleroses. The Lexington Senior Center. "Did you know presentations" April 2, 2012. Contact: Mr. Wright.
5. Presentation and activity on the importance of good respiration with pH balance for elderly and people with COPD: Concerns with oxygen therapy. Presentation to students in High School Biology classes (3 different classes). Sayre high school, Lexington, KY. April 2012. Contact: Ms. Maggi O'Neill.

XIII. TEACHING

Teaching Awards:

1. Recipient of the University of Kentucky Provost Award for Outstanding Teaching April, 2005 (5K cash award and a plaque).

2. Recipient of KAS (Kentucky Academy of Science) Outstanding College/University Teacher of 2012-2013. The qualifications: The recipient shall have made some significant contribution primarily to science teaching but also to research at the college/university level in Kentucky. Contributions should be interpreted broadly to mean contribution directly to the Commonwealth, or the intellectual growth in the Commonwealth. The recipient must be a member of the Kentucky Academy of Science.

Teaching:

1. Univ. of Kentucky

Details related to teaching and course content are provided in the TEACHING PORTFOLIO.

Teaching general physiology to undergraduates, allied health and medical students is a matter in which I am proficient. During postdoctoral years (Dept. Physiology, Univ. Toronto) I taught physiology in the general areas of human physiology and experimental neurophysiology. I have continued to teach comparative physiology and advanced neurophysiology courses at the University of Kentucky. I also taught undergraduate and graduate seminars at the Univ. of Kentucky on the topics of neuromodulation and neurophysiology. I also developed **3 new courses** (Bio550, Bio621, and Bio650) on these subjects within my first 3 years at Univ. of KY.

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In 2010 summer I developed a series of wet labs for the Bio350 core course (animal physiology). This took a lot of effort and time but it paid off in having a series of wet labs now established for the course that could be tweaked over the years. A number of the labs I published in JoVE which showed how advanced our course was with advanced physiological teaching. Students at Cornell (NY) and other locations use the on line material for their courses.

Published labs that were originally developed for the Bio350 course:

Wu, W.H. and **Cooper, R.L. (2010)** Physiological recordings of high and low output NMJs on the Crayfish leg extensor muscle. *Journal of Visualized Experiments (JoVE)*. *Jove*. 45: <http://www.jove.com/index/details.stp?id=2319> doi:10.3791/2319.

Robinson, M.M., Martin, J.M., Atwood, H.L. and **Cooper, R.L. (2010)** Modeling biological membranes with circuit boards and measuring conduction velocity in axons: Student laboratory exercises. *Journal of Visualized Experiments (JoVE)*. *Jove*. 47: <http://jove.com/details.php?id=2325> doi: 10.3791/2325

Leksrisawat, B., Cooper, A.S., Gilberts, A.B. and **Cooper, R.L. (2010)** Response properties of muscle receptor organs in the crayfish abdomen: A student laboratory exercise in proprioception. *Journal of Visualized Experiments (JoVE)*. *Jove*. 45: (for manuscript) <http://www.jove.com/index/details.stp?id=2323> doi:10.3791/2323

Cooper, A.S., Leksrisawat, B., Gilberts, A.B., Mercier, A.J. and **Cooper, R.L. (2011)** Physiological experimentations with the crayfish hindgut. *Journal of Visualized Experiments (JoVE)*. *Jove* 47: <http://www.jove.com/details.php?id=2324> doi: 10.3791/2324.

Baierlein, B., Thurow, A.L., Atwood, H.L. and **Cooper, R.L. (2011)** Membrane potentials, synaptic responses, neuronal circuitry, neuromodulation and muscle histology using the crayfish: Student laboratory exercises. *Journal of Visualized Experiments (JoVE)*. *Jove* 47: <http://www.jove.com/Details.php?ID=2322> doi: 10.3791/2325.

Semester	Course number/title	# of Students	Student Evaluation	Jan. 2013 School Average
Fall 96	BIO 350 Animal Physiology	75	3.9 out of 4.0	3.1
Fall 97	BIO 550 Adv. Comparative Physiology	8	3.7 out of 4.0	3.4
Fall 97	BIO 350 Animal Physiology	75	3.6 out of 4.0	3.0
Fall 98	BIO 550 Adv. Comparative Physiology	14	3.7 out of 4.0	3.3
*Fall 98	BIO 650 Neurophysiology Lab cross listing PGY650	6	3.6 out of 4.0	3.5
	*A in-depth laboratory manual was assembled for this course			
Spring 99	BIO 425 Undergraduate seminar	12	3.9 out of 4.0	3.5
	BIO 425 Undergraduate seminar	14	3.8 out of 4.0	3.5
Fall 99	BIO 621 Membrane Biophysics registered	6	3.7 out of 4.0	3.5
	Sit ins	5		
Fall 99	BIO 770 Graduate seminar	6	3.8 out of 4.0	3.4
Spring 00	BIO 350 Animal Physiology (sec1-6)150	3.5 out of 4.0	3	
	BIO 550 Adv. Comparative Physiology	12	3.5 out of 4.0	2.9
Fall 01	BIO 350 Animal Physiology (sec1-6)72	2.9 out of 4.0	2.9	
Spring 01	BIO 350 Animal Physiology (sec1-6)65	2.9 out of 4.0	3	
	BIO 550 Adv. Comparative Physiology	12	3.5 out of 4.0	3.3
Spring 02	BIO 425 Undergraduate seminar	12	3.8 out of 4.0	3.4
Summer 02	BIO 350 Animal Physiology	8	3.9 out of 4.0	
Fall 02	BIO 350 Animal Physiology (sec1-5)120	3.34 out of 4.0		
	BIO 425 Undergraduate seminar	14	4.0 out of 4.0	
Spring 03	BIO 425 Undergraduate seminar	12	3.9 out of 4.0	
Fall 03	BIO 350 Animal Physiology-avg all 6 sec	120	3.3 out of 4.0	
Fall 03	BIO 152 Introductory Biology	280	3.4 out of 4.0	
Spring 04	BIO 650 Neurophysiology	6	4.0 out of 4.0	
Summer 04	BIO 350 Animal Physiology	20	no evaluation (Summer -NA)	
	BIO 425 Undergraduate seminar	15	no evaluation (Summer -NA)	
Fall 04	BIO 350 Animal Physiology-avg all 5 sec	120	?	
	BIO 425 Undergraduate seminar	15	?	
Spring 05	BIO 350 Animal Physiology-avg all 5 sec	120	3.6 out of 4.0	
	BIO 425 Undergraduate seminar	13	4.0 out of 4.0	
Summer 05	BIO 350 Animal Physiology	16	no evaluation (Summer -NA)	
	BIO 425 Undergraduate seminar	10	no evaluation (Summer -NA)	
	BIO 425 Undergraduate seminar	6	no evaluation (Summer -NA)	
	A&S 500 (to be Bio401G-Teachers in science) 20		no evaluation (Summer -NA)	
Fall 05	BIO 152 Introductory Biology	320	3.2 out of 4.0	
	BIO 350 Animal Physiology-avg all 5 sec	120	3.4 out of 4.0	
Spring 06	BIO 350 Animal Physiology-avg all 6 sec	120	3.5 out of 4.0	
	BIO 550 Adv. Comparative Physiology	12	4.0 out of 4.0	
	BIO 621 Membrane biophysics	8	3.8 out of 4.0	
Summer 06	BIO 350 Animal Physiology	15	no evaluation (Summer -NA)	
	BIO 425 Undergraduate seminar	12	no evaluation (Summer -NA)	
	BIO 425 Undergraduate seminar	8	no evaluation (Summer -NA)	

Fall 06 Sabbatical (for 1 semester)

Gap---Have not updated 2006 to 2010

Spring 2010 A&S 300 Special topics to develop laboratory experiments
for Bio350. Beta test wet labs. 6

Summer 2010

BIO 402G For MIC students at UK. Teacher's workshop on Science education.
BIO 350 Animal Physiology 20 no evaluation (Summer -NA)
BIO 425 Undergraduate seminar 8 no evaluation (Summer -NA)
BIO 425 Undergraduate seminar 3 no evaluation (Summer -NA)

Fall 2010

BIO 350 Animal Physiology with wet labs 125 Avg ~3.0
21 hours per week of contact time. This was the 1st semester to introduce wet labs into Bio350.
6 sections of 3 hrs each plus 3 hrs/wk of lecture.

Spring 2011

BIO 499 Undergraduate seminar for
students that conducted research 6 ?

BIO (A&S300)/ B650 - Physiology laboratory techniques 6 ?
(overload without salary increment. Taught in my research lab)

Summer 2011

BIO 350 Animal Physiology 16

Fall 2011

BIO 350 Animal Physiology with wet labs 125 Avg ~3.4

Spring 2012

Bio 621- Membrane Biophysics (3 hrs) 6 3.8

Fall 2012

BIO 350 Animal Physiology with wet labs 125 TBA
A&S 300 - On line International Seminar course (new adventure) (1 hr)
**NEW ADVENTURE; PR for dept gained. 6 TBA
<http://theworldreportuky.com/2012/09/28/uk-seminar-course-promotes-international-dialogue/>

2. BCTC (BLUEGRASS COMMUNITY AND TECHNICAL COLLEGE) Lexington, KY.

Summer II 2011

BIO 137 Human Anatomy & Physiology I (lecture) 75 students

INTERNATIONAL TEACHING & ORGANIZATION

1. Course organizer and director: 1993 summer
Dept. of Physiology, Korea University, Seoul, South Korea

Topic: Neuroscience hands-on workshop: "**6th Intensive IBRO Workshop on Basic Neuroscience**"
For: International neuroscience graduate and medical students
I had initiated and succeeded in obtaining an international neuroscience hands-on workshop in Seoul, South Korea. Obtained funding (\$25,000 USD) for this workshop from International Brain Research Organization (IBRO) and Brain Research Foundation, Tokyo. I was the main instructor and laboratory overseer for this workshop. The title of this workshop was, "**6th INTENSIVE IBRO WORKSHOP ON BASIC NEUROSCIENCE**" and was held from **July 16 to August 1, 1993** at Korea University, Seoul, South Korea. Dr. Joseph Chang of Sogang Univ., Seoul, Korea was the organizer within Korea. Dr. Masao Ito of Japan (President of the IBRO Commission on Pan-Asian Oceanic Neuroscience) was the international Co-organizer. See: (1) Abst. Soc. Neurosci. (1993) 19:116.3; (2) IBRO News Letter (1993) vol. 21 #2; and (3) Neuroscience Research (1993) 16:237.
2. Adjudicator for PhD thesis (**2006**). Ms. M. Komali (Sri Venkateswara University, Tirupati, **India**). "*Elucidation of the role of biogenic amines in the metabolism and reproduction of freshwater prawn, *Macrobrachium malcolmsonii**"
3. Adjudicator for PhD thesis (**2008**). Mr. L. Imayavaramban (Ph.D. Research scholar, Unit of Biochemistry, Department of Zoology, University of Madras, Guindy Campus, Chennai-600 025, **India**)
4. Created a new on line international seminar course (A&S 300, at the University of KY). This brought international PR for our Biology Department and University.
See local PR <http://theworldreportuky.com/2012/09/28/uk-seminar-course-promotes-international-dialogue/> Also a write up in the UK Undergraduate Research newspaper.