

**BIOGRAPHICAL SKETCH**

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NAME Donald H. Edwards		POSITION TITLE Regents' Professor of Neuroscience	
eRA COMMONS USER NAME (credential, e.g., agency login) dhedwards			
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	MM/YY	FIELD OF STUDY
MIT Cambridge, MA	B.S.	06/70	Electrical Engineering
Yale University, New Haven, CT	Ph.D.	12/76	Neurobiology
Stanford University, Stanford, CA	Postdoc	06/79	Neurobiology
Univ. California at Davis, Davis, CA	Postdoc	08/81	Neurobiology

**A. Personal Statement**

My primary research focus is on sensorimotor integration in the crayfish, using it as a model for addressing general questions concerning the role of feedback in motor control, neuronal integration, electrical coupling, network function, coincidence detection, serotonergic neuromodulation, and network and synaptic modification by social status. While he was a Ph.D. student with me, Dr. David Cofer and I developed AnimatLab, a unique neuromechanical simulator ([www.AnimatLab.com](http://www.AnimatLab.com)) that permits the body and relevant neural circuits of any skeletal animal to be reconstructed in a virtual physical world. We used it to study the dynamic control of the grasshopper jump, where the biomechanics and neural circuitry is particularly well defined. In 2011, I began a collaboration with Dr. Daniel Cattaert, the leading authority on posture and locomotion in crayfish, to study the role of proprioceptive feedback in posture and locomotion, using AnimatLab. Drs. Cattaert, Cofer and I developed the hybrid neuromechanical preparation, in which a neuromechanical leg and body model provides a virtual periphery for the crayfish nervous system. This preparation enabled us to study the effect of real-time closed-loop feedback on motor output of *in vitro* nervous system. In 2012, I began a collaboration with Dr. William Heitler, author of DataView, a spike sorting and spike train analysis software tool, to define the functional circuitry of the system. This current project will bring all three collaborations together to study the effects of four sensory feedback pathways as they work simultaneously and in parallel to modulate motor control of the crayfish leg.

**B. Positions and Honors**

1976      USPHS National Research Service Award  
1978      Grass Foundation Fellowship  
1981 -     Assistant Professor, Associate Professor, and Professor of Biology, Georgia State University  
1992 - 93   Director, Program in Computational Neuroscience, National Science Foundation  
1995 - 04   Director, Center for Neural Communication and Computation, Georgia State University.  
1995      Outstanding Faculty Scholarship Award of the College of Arts and Sciences, Georgia State University  
2000      Professor of Physics, Georgia State University  
2001 - 02   Chair, Neurobiology Division, Society for Integrative and Comparative Biology  
2003 - 05   Membership Chair, International Society for Neuroethology  
2004 - 08   Director, Brains & Behavior Program, Georgia State University  
2005      Regents' Professor  
2008      Professor of Neuroscience  
2010 - 14   Director of Undergraduate Studies, Neuroscience Institute

### C. Selected Peer-reviewed Publications (out of 83)

1. Yeh, S.-R., Fricke, R.A. and **Edwards, D.H.** (1996) The effect of social experience on serotonergic modulation of the escape circuit of crayfish. *Science* **271**: 366-369. PMID: 8553075
2. Herberholz, J., Issa, F.A., and **Edwards, D.H.** (2001) Patterns of neural circuit activation during dominance hierarchy formation in freely behaving crayfish. *J. Neurosci.* 21: 2759-2767. PMID: 11306628
3. Herberholz, J., Antonsen, B.L. and **Edwards, D.H.** (2002) A lateral excitatory network in the escape circuit of crayfish. *J. Neurosci.* 22: 9078-9085. PMID: 12388615
4. Antonsen, B. and **Edwards, D.H.** (2003) Differential dye-coupling reveals the lateral giant escape circuit in crayfish. *J. Comp. Neurol.* 466: 1-13. PMID: 14515237
5. Herberholz, J., Sen, M.M. and **Edwards, D.H.** (2004) Escape behavior and escape circuit activation in juvenile crayfish during prey-predator interactions. *J. Exp. Biol.* 207 (11): 1855-1863. PMID: 15107440
6. Spitzer, N., Antonsen, B.L., **Edwards, D.H.** (2005) Immunocytochemical mapping and quantification of expression of a putative type 1 serotonin receptor in the crayfish nervous system. *J Comp Neurol* 484: 261-282. PMID: 15739232
7. Antonsen, B.L., Herberholz, J., **Edwards, D.H.** (2005) The retrograde spread of synaptic potentials and recruitment of presynaptic inputs. *J. Neurosci.* 25: 3086-3094. PMID: 15788765
8. Antonsen, B.L. and **Edwards, D.H.** (2007) Mechanisms of serotonergic facilitation of a command neuron. *J. Neurophysiol.* 98:3494-3504. PMID: 17898136
9. Cofer, D., Cymbalyuk, G., Heitler, W.J., and **Edwards, D.H.** (2010) Neuromechanical simulation of the locust jump. *J. Exp. Biol.* 213: 160-168. PMID: 20228342
10. Cofer, D., Cymbalyuk, G., Reid, J. Zhu, Y., Heitler, W.J., and **Edwards, D.H.** (2010) AnimatLab: A 3-D graphics environment for neuromechanical simulations. *Journal of Neuroscience Methods.* 187(2): 280-288. PMID 20074588
11. **Edwards, D.H.** (2010) Neuromechanical simulation. *Front. Behav. Neurosci.* 4: pii: 40. PMID: 20700384
12. Cofer, D., Heitler, W.J., and **Edwards, D.H.** (2010) Control of tumbling during the locust jump. *J. Exp. Biol.* 213: 3378-3387. PMID: 20833932
13. Cattaert, D., Delbecque, J.P., **Edwards, D.H.**, Issa, F.A. (2010) Social interactions determine postural network sensitivity to 5-HT. *J Neurosci* 30:5603-5616. PMID: 20410113
14. Issa, F.A., Drummond, J., Cattaert, D., and **Edwards, D.H.** (2012) Neural circuit reconfiguration by social status. *J. Neurosci.* 30: 5638-5645. PMID:22514325
15. Bacque-Cazenave J, Issa FA, **Edwards DH**, Cattaert D (2013) Spatial segregation of excitatory and inhibitory effects of 5-HT on crayfish motoneurons. *J. Neurophysiol.* 109(11):2793-802. PMID: 23486199
16. Chung, B., Bacqué-Cazenave, J., Cofer, D.W., Cattaert, D. and **Edwards, D.H.** (2015) The effect of sensory feedback on crayfish posture and locomotion: I. Experimental analysis of closing the loop. *J. Neurophysiol.* Mar 15;113(6):1763-71. doi: 10.1152/jn.00248.2014. Epub 2014 Dec 24.
17. Bacqué-Cazenave, J., Chung, B., Cofer, D.W., Cattaert, D. and **Edwards, D.H.** (2015) The effect of sensory feedback on crayfish posture and locomotion. II. Neuromechanical simulation of closing the loop. *J. Neurophysiol.* Mar. 15, 113(6): 1763-71. doi: 10.1152/jn.00870.2014. Epub 2014 Dec 30.

When citing articles that fall under the Public Access Policy, were authored or co-authored by the applicant and arose from NIH support, provide the NIH Manuscript Submission reference number (e.g., NIHMS97531) or the PubMed Central (PMC) reference number (e.g., PMCID234567) for each article. If the PMCID is not yet available because the Journal submits articles directly to PMC on behalf of their authors, indicate "PMC Journal - In Process." A list of these Journals is posted at:

[http://publicaccess.nih.gov/submit\\_process\\_journals.htm](http://publicaccess.nih.gov/submit_process_journals.htm). Citations that are not covered by the Public Access Policy, but are publicly available in a free, online format may include URLs or PMCID numbers along with the full reference (note that copies of publicly available publications are not accepted as appendix material.)

#### **D. Current Research Support**

NSF Research Grant (1120291) "Control of Reafference in Posture and Locomotion" 8/1/11 - 7/31/15

- Goals: To determine the role of proprioceptive feedback from one stretch-sensitive crayfish proprioceptor (the CBCO) on the motor output that controls leg movement around the joint that the proprioceptor spans. This project developed the hybrid neuromechanical system for one joint that will be expanded to include three joints and ground contact in the current proposal. Edwards was the sole PI, but worked in close collaboration with Drs. Cattaert and Cofer to develop the hybrid neuromechanical preparation.

