

## CURRICULUM VITAE

*Mark A. Segraves*

Professor

Department of Neurobiology

Northwestern University

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June 10, 2015

### **RESEARCH INTERESTS:**

Systems, Cognitive, and Computational Neuroscience; Sensorimotor Integration; Control of Eye Movements in Mice and Primates; Neural Basis of Decision-Making; Neural Substrates for Visual Search

### **EDUCATION:**

1974            B.S. Zoology, University of Maryland, College Park, MD  
                  B.A. Anthropology, University of Maryland, College Park, MD  
1981            Ph.D. Anatomy, University of Pennsylvania, Philadelphia, PA

### **PRE-DOCTORAL AWARDS, HONORS, AND FELLOWSHIPS:**

1973            Phi Sigma Society (Biology)  
1976-80        Predoctoral Fellow supported by NIH training grant to Department of Anatomy,  
                  University of Pennsylvania  
1980, 81        Grass Foundation Summer Fellowships

### **POST-DOCTORAL AWARDS, HONORS, AND FELLOWSHIPS:**

1981-82        Postdoctoral Fellowship, Swiss National Science Foundation

- 1982 Postdoctoral Fellowship, Individual National Research Service Award, EY05627- 01. Award declined following receipt of NIH Intramural Staff Fellowship
- 1989-93 Alfred P. Sloan Research Fellowship in Neuroscience
- 1989-94 National Institutes of Health F.I.R.S.T. Award

**EMPLOYMENT:**

- 1974-1976 Laboratory Technician, within the laboratory of Dr. Timothy J. Cunningham, Department of Anatomy, Medical College of Pennsylvania
- 1976-1981 Predoctoral Fellow, Department of Anatomy, University of Pennsylvania, Philadelphia, PA
- 1981-1982 Postdoctoral Fellow Institute of Anatomy, Lausanne, Switzerland
- 1982-1985 Staff Fellow, Neuro-ophthalmologic Mechanisms Section Laboratory of Sensorimotor Research, National Eye Institute, Bethesda, Maryland
- 1985-1988 Senior Staff Fellow, Neuro-ophthalmologic Mechanisms Section Laboratory of Sensorimotor Research, National Eye Institute, Bethesda, Maryland
- 1988-1994 Assistant Professor, Department of Neurobiology and Physiology, Northwestern University, Evanston, Illinois
- 1994-2015 Associate Professor, Department of Neurobiology, Northwestern University, Evanston, Illinois
- 2015-present Professor, Department of Neurobiology, Northwestern University, Evanston, Illinois

**RESEARCH SUPPORT:**

Current

- Mark A. Segraves, (PI), Konrad Kording, (PI), “Neural Mechanisms of Fixation Choice while Searching Natural Scenes”, NIH EY021579. Total direct costs: \$1,250,000, Project period: 4/1/2012-3/31/2016.
- Mark A. Segraves (PI) and Jianhua Cang (PI), “Eye Movement Maps in Mouse Superior Colliculus”, NIH EY023060, Total direct costs: \$275,000, Project period: 7/1/2013-6/30/2015.

Previous

- Alfred P. Sloan Research Fellowship in Neuroscience, BR-2907, \$25,000, 9/89 - 9/91, extended to 9/93.
- Mark A. Segraves, Principal Investigator, “Cortical contributions to the control of eye movements”, N.I.H. FIRST Award, EY 08212. Direct Costs: \$333,915, Project period: 8/1/89 - 7/31/94.

- Mark A. Segraves, Principal Investigator, “Cortical contributions to the control of eye movements”, N.I.H. EY 08212. Total Direct Costs: \$463,709, Project period: 8/1/94 - 7/31/98.
- Mark A. Segraves, Principal Investigator, “Pharmacological manipulation of cortical eye fields.” N.I.H. EY 06716, Postdoctoral NRSA for Elisa Dias. Total Direct Costs: \$82,200. Project period: 9/1/95-8/31/98.
- Roger Ratcliff , Principal Investigator, Mark A. Segraves, Co-investigator, “Integrating human information processing models with multi-electrode neural recordings from monkeys”, N.I.H. R01- MH59893. Total direct costs: \$1,246,886, Project period: 8/1/99-7/31/2004. No-cost extension to 7/31/2005
- Mark A. Segraves, Principal Investigator, “Cortical contributions to the control of eye movements”, N.I.H. R01-EY08212 competing continuation. Total Direct Costs: \$799,023, Project period: 8/1/98-7/31/2003. Funded extension to 7/31/2005. No-cost extension to 7/31/2006.
- Ronald E. Kettner, Principal Investigator, Mark A. Segraves, Co-investigator:, “Frontal lobe involvement in complex predictive pursuit”, NIH EY014606. Total direct costs: \$775,000, Project period: 8/1/03-7/31/06. No-cost extension to 7/31/2007
- Jianhua Cang and Mark A. Segraves, “Organization and Development of Motor Maps in the Mouse Superior Colliculus”, Brain Research Foundation, Total direct costs: \$40,000. Project period: 6/1/2009-5/31/2010.

## **AREAS of RESEARCH FOCUS:**

### 1) Neural Mechanisms of Fixation Choice while Searching Natural Scenes

Major collaborator: [Konrad Kording, Ph.D.](#)

In these experiments, we use the rhesus monkey as a model to address questions concerning the cognitive control of eye movement behavior. Our overall goal is to understand how the brain controls where we look. To accomplish this, it’s important to study brain activity and behavior under conditions that approximate those in the real world. The frontal eye field (FEF) is a cortical area closely involved in the control of purposive voluntary eye movements. In prior work, we have studied activity in the FEF while monkeys looked at images of natural scenes. While the monkey searched for a target hidden in the images, the activity of FEF neurons consisted of combinations of activity related to planning upcoming eye movements, as well as activity that was sensitive to salient visual features of the image. In parallel with the development of our understanding of how the brain controls eye movements, there have been substantial advances in our understanding of the features of natural images that guide both human and monkey eye movements. These behavioral studies are at the advanced level of being able to accurately predict patterns of eye movements. The goal of our current investigations is to take advantage of these advancements in predicting patterns of eye movements in natural environments to help us understand the brain events that are responsible for this behavior. In addition to the brain recording experiments, a large part of our effort is devoted to mathematical analysis and modeling of the behavioral and neuronal data we obtain. Our ultimate goal is to provide a model that predicts the brain’s search-related activity for both artificial and natural visual environments.

## 2) Development and Organization of Eye Movement Maps in Mouse Superior Colliculus

Major collaborator: [Jianhua Cang, Ph.D.](#)

For this project, we are taking advantage of the vast array of genetic tools available for the mouse model to address questions related to development and organization for eye movements that are likely to be shared across species, including primates. The mammalian superior colliculus (SC) is a subcortical structure that integrates visual and other sensory information to initiate orienting movements of the eyes and head. A fundamental feature of SC organization is that the representations of sensory inputs and motor outputs are topographically arranged and aligned. While great progress has been made in understanding the development of the visual representation in the mouse SC, how the motor maps are formed and aligned with the visual map remains unknown. The goal of this project is to reveal the topographic organization for movement control in the deep layers of the SC. In addition, we are using environmental and genetic manipulations to help us to understand the factors responsible for the development of this topography.

### **PUBLICATIONS:**

#### Papers

- Segraves, M. A., and A. C. Rosenquist (1982) The distribution of the cells of origin of callosal projections in cat visual cortex. *Journal of Neuroscience* **2**:1079-1089. [PDF](#)
- Segraves, M. A., and A. C. Rosenquist (1982) The afferent and efferent callosal connections of retinotopically defined areas in cat cortex. *Journal of Neuroscience* **2**:1090-1107. [PDF](#)
- Segraves, M. A., and G. M. Innocenti (1985) A comparison of the distributions of ipsilaterally and contralaterally projecting cortico-cortical neurons in cat visual cortex using two fluorescent tracers. *Journal of Neuroscience* **5**:2107-2118. [PDF](#)
- FitzGibbon, E. J., M. E. Goldberg, and M. A. Segraves (1986) "Short term saccadic adaptation in the monkey". In *Adaptive Processes in Visual and Oculomotor Systems*, E. L. Keller, D. S. Zee, ed., pp. 329-334, Pergamon Press, New York. [PDF](#)
- Deng, S.-Y., M. E. Goldberg, M. A. Segraves, L. G. Ungerleider, and M. Mishkin (1986) "The effect of frontal eye field lesions on oculomotor performance in the monkey". In *Adaptive Processes in Visual and Oculomotor Systems*, E. L. Keller, D. S. Zee, ed., pp. 201-208, Pergamon Press, New York. [PDF](#)
- Segraves, M. A., C. J. Bruce, S.-Y. Deng, L. Ungerleider, M. Mishkin, and M. E. Goldberg (1986) "No notion for motion: monkeys with unilateral striate lesions have permanent deficits in the utilization of stimulus velocity information by the oculomotor system". In *Adaptive Processes in Visual and Oculomotor Systems*, E. L. Keller, D. S. Zee, ed., pp. 217-222, Pergamon Press, New York. [PDF](#)

- Goldberg, M. E., and M. A. Segraves (1987) Visuospatial and motor attention in the monkey. *Neuropsychologia* **25(1A)**:107-118. [PDF](#)
- Segraves, M. A., M. E. Goldberg, S.-Y. Deng, C. J. Bruce, L. G. Ungerleider, and M. Mishkin (1987) The role of striate cortex in the guidance of eye movements in the monkey. *Journal of Neuroscience* **7(10)**:3040-3058. [PDF](#)
- Segraves, M. A. and M. E. Goldberg (1987) Functional properties of corticotectal neurons in the monkey's frontal eye field. *Journal of Neurophysiology* **58(6)**:1387-1419. [PDF](#)
- Goldberg, M. E., and M. A. Segraves (1989) "The role of the visual and frontal cortices in the generation of saccadic eye movements". In, R. H. Wurtz and M. E. Goldberg, editors, *The Neurobiology of Saccadic Eye Movements*, D. A. Robinson, and H. Collewijn, series editors, Reviews of Oculomotor Research, Vol. III, pp. 283-313, Elsevier, Amsterdam. [PDF](#)
- Goldberg, M. E. and M. A. Segraves (1990) "The role of the frontal eye field and its corticotectal projection in the generation of eye movements". In *Vision and the Brain*, B. Cohen, and I. Bodis-Wollner, editors, pp. 195-209, Raven Press, New York. [PDF](#)
- Segraves, M. A., and M. E. Goldberg (1992) Properties of eye and head movements evoked by electrical stimulation of the monkey superior colliculus. In, A. Berthoz, W. Graf, and P. P. Vidal, editors, *The Head-Neck Sensory-Motor System*, pp. 292-295, Oxford University Press, New York. [PDF](#)
- Segraves, M. A. (1992) Activity of monkey frontal eye field neurons projecting to oculomotor regions of the pons. *Journal of Neurophysiology* **68**: 1967-1985. [PDF](#)
- Segraves, M. A., and K. Park (1993) The relationship of monkey frontal eye field activity to saccade dynamics. *Journal of Neurophysiology* **69**: 1880-1889. [PDF](#)
- Burman, D. D., and M. A. Segraves (1994) Primate frontal eye field activity during natural scanning eye movements. *Journal of Neurophysiology* **71**: 1266-1271. [PDF](#)
- Burman, D. D., and M. A. Segraves (1994) Frontal eye field signals involved in the control of saccadic eye movements. In, A. Fuchs, U. Büttner, and D. Zee, editors, *Contemporary ocular motor and vestibular research: A tribute to David A. Robinson*, Verlag, Berlin. [PDF](#)
- Segraves, M. A., and M. E. Goldberg (1994) Effect of stimulus position and velocity upon the maintenance of smooth pursuit eye velocity. *Vision Research* **34**: 2477-2482. [PDF](#)
- Dias, E. C., M. Kiesau, and M. A. Segraves (1995) Acute activation and inactivation of macaque frontal eye field with GABA-related drugs. *Journal of Neurophysiology* **74**: 2744-2748. [PDF](#)
- Dias, E. C., and M. A. Segraves (1996) The primate frontal eye field and the generation of saccadic eye movements: comparison of lesion and acute inactivation/activation studies. *Rev. Brasil. Biol.*, **56 (Suppl. 1)**: 239-255. [PDF](#)

- Dias, E. C., and M. A. Segraves (1997) A pressure system for the microinjection of substances into the brain of awake monkeys. *Journal of Neuroscience Methods* **72**: 43-47. [PDF](#)
- Dias, E. C., and M. A. Segraves (1999) Muscimol-induced inactivation of monkey frontal eye field: effects on visually and memory-guided saccades. *Journal of Neurophysiology*, **81**: 2191-2214. [PDF](#)
- Segraves M. A. (2002) Cerebral control of saccadic and smooth pursuit eye movements. In: *Virtual lesions: understanding perception and behavior with reversible deactivation techniques* (Lomber S, Galuske R, eds), pp 215-238. Oxford, United Kingdom: Oxford University Press. [PDF](#)
- Helminski, J. O., and M. A. Segraves (2003). Macaque frontal eye field input to saccade-related neurons in the superior colliculus. *Journal of Neurophysiology*, **90**: 1046-62. [PDF](#)
- Ratcliff R., A. Cherian, and M. A. Segraves (2003) A comparison of macaque behavior and superior colliculus neuronal activity to predictions from models of two-choice decisions. *Journal of Neurophysiology* **90**:1392-1407. [PDF](#)
- Campos, M., A. Cherian, and M. A. Segraves. (2006) Effects of eye position upon activity of neurons in macaque superior colliculus. *Journal of Neurophysiology* **95**: 505-526. [PDF](#)
- Farrell S, Ratcliff R, Cherian A, Segraves M (2006) Modeling unidimensional categorization in monkeys. *Learning and Behavior* **34**:86-101. [PDF](#)
- Hasegawa RP, Hasegawa YT, Segraves MA (2006) Single trial-based prediction of a go/no-go decision in monkey superior colliculus. *Neural Networks* **19**:1223-1232. [PDF](#)
- Ratcliff R, Hasegawa YT, Hasegawa RP, Smith P, Segraves MA (2007) Dual diffusion model for single-cell recording data from the superior colliculus in a brightness-discrimination task. *Journal of Neurophysiology* **97**:1756-1774. [PDF](#)
- Hasegawa RP, Hasegawa YT, Segraves MA (2008) Prediction of a go/no-go decision from single-trial activity of multiple neurons in monkey superior colliculus. In: *Neural information processing* (Ishikawa M, Doya K, Miyamoto H, Yamakawa T, eds), pp 997-1006: Springer. [PDF](#)
- Hasegawa RP, Hasegawa YT, Segraves MA (2008) Neural prediction of multidimensional decisions in monkey superior colliculus. *IEICE Transactions on Communication Special Issue on Brain Communication*. [PDF](#)
- Segraves MA (2009) Microstimulation. In: *The SAGE Encyclopedia of Perception* (Goldstein EB, ed). Thousand Oaks, CA: SAGE Publications, Inc. [PDF](#)
- Hasegawa RP, Hasegawa YT, Segraves MA (2009) Neural mind reading of multi-dimensional decisions by monkey mid-brain activity. *Neural Netw* **22**:1247-1256. [PDF](#)

- Phillips AN, Segraves MA (2010) Predictive activity in macaque frontal eye field neurons during natural scene searching. *J Neurophysiol* 103:1238-1252. [Cover PDF](#)
- Ratcliff R, Hasegawa YT, Hasegawa RP, Childers R, Smith PL, Segraves MA (2011) Inhibition in superior colliculus neurons in a brightness discrimination task. *Neural Comput* 23:1790-1820. [PDF](#)
- Campos M, Segraves MA (2011) Signal multiplexing in neural circuits - the superior colliculus deserves a new look. *Front Integr Neurosci* 5:5. [PDF](#)
- Fernandes HL, Stevenson IH, Phillips AN, Segraves MA, Kording KP (2014) Saliency and Saccade Encoding in the Frontal Eye Field During Natural Scene Search. *Cerebral Cortex* 24:3232-3245. [PDF](#)
- Ramkumar P, Fernandes H, Kording K, and Segraves MA (2015) Modeling peripheral visual acuity enables discovery of gaze strategies at multiple time scales during natural scene search. *Journal of Vision* 15. [PDF](#)

### Manuscripts

- Wang L, Liu M, Segraves MA, Cang J. Visual experience is required for the development of eye movement maps in the mouse superior colliculus. Submitted, *J. Neuroscience*, under revision.
- Ramkumar P, Lawlor PN, Glaser J, Wood D, Segraves MA, Kording KP. Task-relevant features predict gaze behavior but not neural activity in frontal eye field during natural scene search. Submitted, *Cerebral Cortex*.
- Glaser JI, Wood DK, Lawlor PN, Ramkumar P, Phillips AN, Kording KP, Segraves MA. Neural differences between exploratory and exploitive saccades. Submitted, *Current Biology*.
- Segraves, MA, Kuo R-S, Caddigan S., and Kording K, Predicting rhesus monkey eye movements during natural image search. In preparation.

### Recent Abstracts

- Clark ZJ, Smith GD, Phillips AN, Segraves MA. Behavioral evidence for planning sequences of multiple saccades in rhesus monkey. Program No. 71.7. 2009 Neuroscience Meeting Planner. Chicago, IL: Society for Neuroscience, 2009. Online. [PDF](#)
- Wang L, Segraves MA, Cang J. A normal retinotopic map is required for the development of an eye movement map in mouse superior colliculus. Program No 71.10. 2011 Neuroscience Meeting Planner. Washington, DC: Society for Neuroscience, 2011. Online. [PDF](#)

- Kuo R-S, Kording K, Segraves MA. Predicting rhesus monkey eye movements during natural image search. Program No. 373.19. 2012 Neuroscience Meeting Planner. New Orleans, LA: Society for Neuroscience, 2012. Online. [PDF](#)
- Ramkumar P., Fernandes H, Segraves MA, Kording K. Target relevance modulates primate gaze behavior during natural scene search. Vision Sciences Society Meeting, Naples, FL, 5/2013. [PDF](#)
- Segraves MA, Caddigan S., Kuo R-S, Kording K. Predicting eye movements of rhesus monkeys searching for pedestrians in natural images. Vision Sciences Society Meeting, St. Petersburg, FL, 5/2014. [PDF](#)
- Glaser JI, Lawlor PN, Wood DK, Ramkumar P, Caddigan S, Drapekin J, Frick B, Qin B, Kording KP, Segraves MA. The frontal eye field reflects task demands in natural scenes. Society for Neuroscience, 2014, Washington, D.C.
- Wood DK, Ramkumar P, Lawlor, Glaser JI, Kording KP, Segraves MA. How do frontal eye field neurons ignore distractors while selecting target-relevant features in natural scenes?. Society for Neuroscience, 2014, Washington, D.C.
- Joshua I. Glaser, Daniel K. Wood, Patrick N. Lawlor, Pavan Ramkumar, Sara Caddigan, Adam N. Phillips, Konrad P. Kording, Mark A. Segraves. Enhanced Activity for Search Targets in Frontal Eye Field depends on Target Awareness. Chicago Chapter Society for Neuroscience, 3/2015.

## PROFESSIONAL TALKS:

### Seminars

- 1992 Department of Anatomy, Univ. of Lausanne, Switzerland: How cerebral cortex participates in the generation of saccadic eye movements.
- 1992 Institute of Physiology, Univ. of Verona, Italy: How cerebral cortex participates in the generation of saccadic eye movements
- 1992 Dept. of Anatomy, Univ. of Wisconsin, Madison, WI: How cerebral cortex participates in the generation of saccadic eye movements.
- 1992 Department of Physiology, Northwestern University School of Medicine
- 1993 Committee on Neurobiology, University of Chicago
- 1993 Department of Physiology, McGill University
- 1995 Laboratory of Sensorimotor Research, National Eye Institute
- 2000 Laboratory of Sensorimotor Research, National Eye Institute
- 2003 Institute of Neurobiology, University of Puerto Rico

- 2007 Dept. of Structural and Cellular Biology, Tulane University School of Medicine
- 2007 Department of Physiology, Northwestern University School of Medicine
- 2014 Sensory Motor Performance Program, Rehabilitation Institute of Chicago
- 2014 Department of Neurobiology, Northwestern University
- 2015 Brain Research Institute, University of California, Los Angeles

#### Symposia and Workshops

- 1990 Chicago Chapter Society for Neuroscience Symposium: How Movement is represented in the brain. Invited speaker presenting: "Cortical contributions to the generation of eye movements."
- 1991 First annual *Neural Control of Movement Meeting*, Marco Island, Florida. Organizer and participant for session entitled: "The involvement of primate cerebral cortex in the preparation for movement: A comparison of eye and hand control systems."
- 1993 *Neural Control of Movement Meeting*, Marco Island, Florida. Invited participant in symposium entitled: "Evidence for a fixation system that suppresses saccadic eye movements."
- 1993 Symposium to honor David A. Robinson, Eibsee, Germany. Invited participant. Presentation entitled "Frontal eye field signals involved in the control of saccadic eye movements."
- 1994 *Neurovision Symposium*, February 22-24, 1994, Ruhr-Universität, Bochum, Germany. Invited presentation entitled: "Prefrontal cortex and the generation of eye movements during visual scanning."
- 1994 *Neural Control of Movement Meeting*, April 13-18, 1994, Maui, Hawaii. Invited participant in symposium entitled: "From thought to action: Recent advances in oculomotor control."
- 1994 *Society for Neuroscience Meeting*, November 13-18, 1994, Miami Beach, FL. Invited chair for slide session entitled "Oculomotor: saccades."
- 1995 "*Looking ahead in sensorimotor control: Big questions for 2001.*" Queen's University, Kingston, Ontario. Sponsored by the Human Frontiers Science Program and the Canadian Medical Research Council. Invited participant for session entitled "Higher brain centers in motor control."
- 1996 *Neural Control of Movement Meeting*, April 16-21, 1996, Marco Island, Florida. Invited participant in symposium entitled: "Saccade Target Selection."
- 2000 *Eye movements and vision in the natural world*. September, 2000. Erasmus University, The Netherlands. Invited presentation entitled: "Natural scanning eye movements reveal head- as well as eye-centered movement fields in monkey superior colliculus neurons."

- 2003 *Symposium for The Laboratory of Sensorimotor Research. - 25th Reunion*, September 2003, National Eye Institute, Bethesda, MD. Presentation entitled: "Lessons from visual scanning and search."
- 2007 *Gordon Conference – Oculomotor System Biology*, July 8-13, 2007, Bates College, Lewiston, Maine. Presentation entitled: "The frontal eye field plans sequences of eye movements."
- 2013 *Gordon Conference – Eye Movements*, July 7-12, 2013, Stonehill College, Easton, MA. Invited presentation entitled: "The organization and development of the deep layers of the mouse superior colliculus."

#### Presentations of Collaborative Work

- 1999 Dias, E. C., M. A. Segraves, C. E. Schroeder, and D. C. Javitt. "Disruption of performance in working memory tasks by pharmacological manipulation in the prefrontal cortex of monkeys." Presented by Elisa Dias at the Annual Meeting of the American College of Neuropsychopharmacology.
- 2000 Ratcliff, Segraves, and Cherian (2000) "Neural recording and simple two-choice decisions." Presentation by Roger Ratcliff made at Mathematical Psychology meeting for Midwestern universities. October 2000.
- 2001 Ratcliff, Segraves, and Cherian (2001) "Neural recording and simple two-choice decisions." Presentation by Roger Ratcliff made at the Annual Interdisciplinary Conference (Computational Neuroscience and Psychology), Jackson Hole. January 2001.
- 2006 Hasegawa RP, Hasegawa YT, Segraves MA "Neural mechanisms of decision-making for saccadic eye movements. The 45th Annual Conference of Japanese Society for Medical and Biological Engineering. Fukuoka, Japan.
- 2014 Lawlor P, Glaser JI, Ramkumar P, Wood DK, Kording KP, Segraves MA. On the role of FEF in planning eye movements in natural scenes. Dept. of Neurobiology, Northwestern University, Data Lunch.
- 2015 Wood DK, "Properties of the visual orienting reflex in human upper limb muscles." Advanced Topics in Vision Seminar, Northwestern University.
- 2015 Glaser JL, "Frontal eye field contributions to search in natural scenes." Northwestern Interdepartmental Neuroscience PhD Program (NUIN) presentation for visiting NUIN applicants.
- 2015 Ramkumar P, "The brain basis of rapid scene categorization and visual search in natural scenes." Psychological Sciences Colloquium Series, Kansas State University.
- 2015 Wood, DK, "'Do Frontal Eye Field Cells Encode the Task Relevance of Visual Features During Natural Scene Search?'" Invited presentation: *Gordon Conference – Eye Movements*, July 26-31, 2015, Bentley University, Waltham, MA

**PEER-REVIEW AND RELATED ACTIVITIES:**

Reviewer for:

*Brain Research*

*Cerebral Cortex*

*Encyclopedia of the Human Brain*

*European Journal of Neuroscience*

*Experimental Brain Research*

*Frontiers in Integrative Neuroscience*

*Journal of Neurophysiology*

*Journal of Neuroscience*

National Eye Institute

National Eye Institute Review Panel, November 2008

NIH/CSR Special Emphasis Panel, October 2010

NIH/CSR Special Emphasis Panel, July 2011

NIH/CSR Special Emphasis Panel, February 2012

NIH/CSR Special Emphasis Panel, July 2012

NIH/CSR Special Emphasis Panel, August 2013

NIH/CSR Special Emphasis Panel, June 2014

NIH/CSR Special Emphasis Panel, February 2015

NIH/CSR Special Emphasis Panel, June 2015

National Science Foundation

Netherlands Organization for Scientific Research

*Neuron*

Oxford University Press – Neurobiology textbook

PLOS Computational Biology (Guest Associate Editor)

*Proceedings of the National Academy of Science*

*Progress in Neurobiology*

Sinauer – Neurobiology textbook

*Somatosensory and Motor Research*

*Vision Research*

*Visual Neuroscience*

Wellcome Trust

Wisconsin National Primate Research Center

**PROFESSIONAL AFFILIATIONS AND SERVICE:**

Membership:

Society for the Neural Control of Movement

Society for Neuroscience

Society for Neuroscience Program Committee 1995-1998

Vision Sciences Society

**TEACHING AND ADVISING:**

Areas of undergraduate and graduate teaching

Neurobiology

Specific courses taught

“Fundamentals of Neurobiology II” - Lecture with one lab (sheep brain dissection), group presentations, and required term paper, 2015 enrollment: 91 junior and senior undergraduate students. Taught 1990 - present.

“Fundamentals of Neuroscience” - Lecture. Enrollment of 20-30 first year graduate students. Co-director and lecturer, 2000 – 2011; lecturer, 2014, 2015.

“Neurobiology Laboratory” - One-hour lecture/discussion period and 4-5 hour laboratory period. Taught with 2 separate laboratory sections of 12 junior and senior undergraduate students each. Taught 1991 - 2001.

“Reaction time, simple decision making, neural processes” - Pro-seminar format course for graduate students and upper-level undergraduates. Co-taught with Roger Ratcliff in Dept. of Psychology and offered for the first time in Fall 2001.

“Advanced Neurobiology and Physiology”. Pro-seminar format course taught to departmental masters students. First offered Winter 2007, 4 students

“Great Experiments in Systems & Cognitive Neuroscience”. Required course for neuroscience graduate students first offered in Spring 2008. I led the class for 2 of its weekly sessions, and joined course director Konrad Kording to administer an oral exam to the students and determine grades at the end of the quarter. Guest lecturer 2009-present.

“Introduction to Neurobiology”. New course developed Fall Quarter 2011. Purpose was to develop an introductory neurobiology course that was tailored to our

Master's students. The core of this class is Dave McLean's Fundamentals of Neurobiology I (BIOL SCI 302). To this, Garth Fowler and I added a 2 hour Friday discussion class for only the Master's students where we assign and discuss original research papers related to special topics in neurobiology. Taught 2011-present.

### Curriculum development

"Neurobiology Laboratory". Offered for first time during Spring Quarter 90/91. Format: one hour discussion period and 4-5 hour laboratory period each week. This course was developed during 1989/90. It was designed for upper-level undergraduates, and is a requirement for Northwestern Biological Sciences majors with concentrations in Physiology and Neurobiology. The course gives students hands-on experience in the performance of classical experiments in neurophysiology.

As chair of the curriculum committee for NUIN (2008-2010), I've been involved with overseeing extensive changes in the first year curriculum for NUIN graduate students. In addition, I've helped to improve the Great Experiments courses that are offered to 2nd year NUIN students.

NEUROBIO 401 Introduction to Neurobiology. This is a new course developed for Fall Quarter 2011 by Garth Fowler and myself. Purpose was to develop an introductory neurobiology course that was tailored to our Master's students. The core of this class is Dave McLean's Fundamentals of Neurobiology I (BIOL SCI 302). To this, Garth and I added a 2 hour Friday discussion class for only the Master's students where we assign and discuss original research papers related to special topics in neurobiology.

NEUROSCI 306 Systems and Behavioral Neuroscience. This a new course that will comprise one of two required core courses for the proposed Interdisciplinary Neuroscience Major. Current plans are to first offer this course in Spring 2016. NEUROSCI 306 will provide an understanding of key topics in systems and behavioral neuroscience.

### Tutorial and Advising Activity

Postdoctoral Fellows:

Douglas Burman, Fall 1991-1995.

Elisa Dias, 1994-1998.

Ryohei P. Hasegawa, 2002-2004

Pavan Ramkumar, 2012-present

Daniel Wood, 2013-present

Doctoral Thesis advisor for:

Janet Helminski, Neuroscience Institute/Neurobiology and Physiology graduate program. 1995-1998.

Adam Phillips, Neuroscience Institute/Neurobiology and Physiology graduate program. 2001-2008.

Master's Thesis advisor for:

Chi Du. 1992/93, Department of Neurobiology and Physiology Master Degree Program.

Marin Kiesau. 1993/94, Department of Neurobiology and Physiology Master Degree Program.

Zachary Clark. 2008/09, Department of Neurobiology and Physiology Master Degree Program.

Gregory Smith. 2008/09, Master of Biotechnology Program.

Emory Kuo. 2010/11, Department of Neurobiology and Physiology Master Degree Program

Sara Caddigan. 2011/12, Department of Neurobiology Master Degree Program

Inga Salija. 2013/14, Department of Neurobiology Master Degree Program

Emily Berthiaume. 2014/15, Department of Neurobiology Master Degree Program

Karim Farrag. 2014/15, Department of Neurobiology Master Degree Program

Undergraduate Advising:

Advisor for Undergraduate Program in Biological Sciences

1989/90 – present, currently, I advise 18 students.

Independent Study:

Each academic quarter, 2-3 students from the biology and/or integrated sciences program pursue independent study in my laboratory

## **UNIVERSITY SERVICE:**

### Northwestern University Department of Neurobiology Committees

Weekly Departmental Seminars & Monthly Chalk Talks, **Chair**

Graduate Admissions, Recruitment, and Financial Aid

Curriculum

Undergraduate Studies

Departmental Master's Program, **Director**

Faculty Search Committee

Northwestern College of Arts and Sciences Committees

Undergraduate Biology Program Board

Undergraduate Program in Biological Sciences Advisory Board, Subcommittee for design of new undergraduate laboratories

Graduate Affairs Committee, Doctoral Program in Biological Sciences

Committee on Grade Changes and Appeals, **Chair**

Undergraduate Program in Biological Sciences committee to hire lecturer to teach Neurobiology Laboratory Course

*Ad Hoc* Committee for Lecturer Promotions

*Ad Hoc* Tenure review committees, **Chair**

General Studies Committee, **Chair**

Undergraduate Research Grants Committee

Northwestern University-Wide Committees

Institutional Animal Care and Use

Animal Rights Activism Subcommittee, Institutional Animal Care and Use Committee

Neuroscience Institute Graduate Admissions, **Chair**

Neuroscience Institute Special Events

*Ad hoc* search committee for animal resources veterinarian

*Ad Hoc* Tenure review committees

Neuroscience Institute Curriculum

Committee on Animal Resources

General Faculty Committee

Systems and Cognitive Neuroscience Concentration for Northwestern's Interdepartmental Neuroscience Graduate Program, **Director**

Interdepartmental Neuroscience Graduate Program Advisory Board

Interdepartmental Neuroscience Graduate Program Curriculum Committee, **Chair**

Faculty Senate

Faculty Senate Research Committee

Medical Scientist Training Program Admissions

Other (recent)

Judge – undergraduate research poster session – Spring 2006, 2007, 2008, 2009

Department of Physiology, Feinberg School of Medicine Faculty Search Committee –  
2009-2010.