

Thomas A. Knight
Curriculum Vitae

Department of Biology
Whitman College
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Faculty and research positions:

2007 – present: Assistant Professor, Department of Biology, Whitman College

2006 – 2007: Visiting Assistant Professor, Department of Biology, Whitman College

2005 – 2006: Postdoctoral Research Fellow, Institute of Pharmacology, University of Heidelberg, Heidelberg, Germany

Research interests:

I am a neuroscientist interested in describing neural mechanisms underlying motor behavior and motor learning in order to improve treatment for those with motor deficits. I examine the control of eye and head movements of mammals as a model for understanding the mechanisms of sensorimotor integration, neural control and plasticity. To study these mechanisms, I use neuroanatomical histochemistry, *in vivo* electrophysiology in rodents, and noninvasive measurements of visuomotor behavior in humans (videoculography).

Education:

2005 Ph.D., Neurobiology and Behavior

University of Washington, Seattle, WA

Dissertation: The role of the frontal eye field in coordinated eye-head gaze shifts in the rhesus monkey.

Advisor: Dr. Albert F. Fuchs

- 2000 – 2003: University of Washington, Neuroscience Training Grant, GM-07108

1997 M.S., Biology with Honors; Concentration: Physiology

Eastern Michigan University, Ypsilanti, MI

Thesis: The morphology of the urogenital region of the diandric, protogynous wrasse, Thalassoma bifasciatum.

Advisor: Dr. Douglas Y. Shapiro

- Eastern Michigan University, Circle of Excellence Award (4.0 graduate GPA), 1997
- Eastern Michigan University, Hellwig Graduate Research Fellowship, 1994 – 1995
- Eastern Michigan University Dean's Award for Research Excellence, 2nd place, 1995

1989 B.S., Biology Cum Laude

Alma College, Alma, MI

- Alma College Trustee Honors Scholarship, 1985 – 1989
- State of Michigan Competitive Scholarship, 1985 – 1989
- Alma College Outstanding Senior Leader Award, 1989
- Alma College Campus Leadership Award, 1989
- Alma College Art Performance Scholarship, 1985 – 1987
- Alma College Department of Biology Scholarship, 1985 – 1986

Teaching Experience:

- 2006 – present: Assistant Professor, Department of Biology, Whitman College:
Biol 111: Biological Principles (Spring 2007 – present);
Biol 111L: Biological Principles Laboratory (Spring 2007 – present);
Biol 228: Biostatistics (Spring 2008);
Biol 310: Physiology (Fall 2008);
Biol 310L: Physiology Laboratory (Fall 2008);
Biol 320: Neurobiology (Fall 2006);
Biol 320L: Neurobiology Laboratory (Fall 2006);
Biol 330: Pathophysiology (Spring 2010 – present);
Biol 330L: Pathophysiology Laboratory (Spring 2010 – present);
Biol 471: Physiology and behavior of animals (Fall 2006);
Biol 471L: Physiology and behavior of animals Laboratory (Fall 2006);
Biol and BBMB 489, 490, 498: Senior Thesis Research (Fall 2006 – present)
- 1998: Graduate Teaching Assistant (with Drs. K. Mulligan and T. Reh), University of Washington School of Medicine:
HUBIO 532: Nervous System
- 1993 – 1994: Graduate Teaching Assistant (with Dr. H. Booth), Eastern Michigan University:
ZOO 200: Introduction to Zoology

Research Experience:

- 2007 – present: Principal investigator/Lab co-director, Knight research laboratory at Whitman College. I investigate human motor control and movement coordination behavior with noninvasive videooculography and head measurement to determine rules of normal movement coordination and adaptation (motor learning). I also examine frontal cortex and midbrain involvement with eye and head movements in the mouse, developing this as a model for motor control studies. This involves stereotaxic injection of neuroanatomical tracers, histology, and electrophysiology (microstimulation, single neuron recording, EMG recording and whole-cell patch clamp electrophysiology).
- 2005 – 2006: Postdoctoral Research Fellow with Dr. R. Kuner, Institute of Pharmacology, University of Heidelberg. I used whole-cell patch clamp electrophysiology to examine plasticity at the primary nociceptor-spinal projection neuron synapse (in mouse spinal cord) as a possible mechanism of increased sensitivity to pain (hyperalgesia).
- 1999 – 2005: Ph.D. student/Research Assistant, dissertation research with Dr. A.F. Fuchs, University of Washington. I used extracellular single-unit recording and microstimulation of the frontal eye field (FEF) in the head-unrestrained monkey to demonstrate that FEF neurons encode gaze, eye, or head movements dependent on the position of the eyes before movement, suggesting a critical role for the FEF in eye-head movement coordination.
- 1996 – 1999: Ph.D. student/Research Assistant, dissertation research with Dr. E. Fetz, University of Washington. I used single-unit and cortical local field potential recordings (LFP) and microstimulation to investigate synchrony of neural activity within and between primary and supplementary motor regions in monkeys performing a bimanual manipulation task.
- 1993 – 1995: M.S. student/Research Assistant and Project Manager and with Dr. D.Y. Shapiro, Eastern Michigan University. I used field observation, gamete collection, histology, light microscopy and scanning electron microscopy to investigate the effect of protogynous sex change on the reproductive anatomy of a coral reef fish. I also coordinated the efforts of

the Shapiro lab in data collection and analysis, laboratory analyses, and histology.

Professional workshops and training:

- 2011: *Brain, Behavior, and Mind*, Cross-Disciplinary Learning and Teaching Initiative Workshop, Whitman College
- 2005: Patch clamp methods training, Dr. H.U. Zeilhofer, Institute of Pharmacology and Toxicology, University of Zurich, Switzerland

Grant support:

- 2013: Principal Investigator, NFL/GE Head Health Challenge, Phase I: *Development of a during-game diagnosis of mild traumatic brain injury and post-injury measures of recovery by noninvasive measurement and comparison of eye-head gaze shifts*; \$300,000, two-year grant for faculty research. Submitted 7/15/13, response expected in Jan. 2014.
- 2012 – 2013: Innovations In Teaching and Learning grant, Whitman College: *Exploring Science at the Cutting Edge -- using electronic lab notebooks and innovations in technology to push biology teaching labs into the 21st century*. Two collaborators (Dr. Leena Knight, Assistant Professor of Biology, and David Sprunger, Director of Institutional Technology) and I were awarded a \$12,900 grant to introduce iPad and electronic lab notebook technology to integrate research and teaching.
- 2012: Principal Investigator, M.J. Murdock Charitable Trust Murdock College Research Program for Life Sciences: *Human eye-head coordination during gaze shifts in healthy subjects and those at risk for mild head injury and neurodegenerative movement disorders*; \$39,872 two-year renewal of 2010 – 2013 grant (below) for faculty research; this application was not funded.
- 2010 – 2013: Principal Investigator, M.J. Murdock Charitable Trust Murdock College Research Program for Life Sciences: *Human eye-head coordination during gaze shifts in the natural environment: effects of eye position, eye movement range, and behavioral context*; \$66,000 two-year award for faculty research; funded for two years (with one-year extension).
- 2012 – 2013: Abshire Research Scholar Award, Whitman College: *Eye-head coordination during gaze shifts in subjects at risk for mild head injury and neurodegenerative movement disorders*. \$2000 award for faculty research employing student researcher.
- 2012: Perry Summer Research Scholarship: *Human eye-head coordination during gaze shifts in the natural environment: effects of eye position and eye movement range*; \$8000 Whitman College award for student-faculty research.
- 2009: Perry Summer Research Scholarship: *Neural control of eye and head movements in the mouse: functional connections between eye and head premotor regions*; \$8000 Whitman College award for student-faculty research.
- 2008: Perry Summer Research Scholarship: *Control of orienting head movements in the mouse: projections from the motor cortex to brainstem neck premotor regions*; \$8000 Whitman College award for student-faculty research.
- 2000 – 2003: University of Washington, Neuroscience Training Grant, GM-07108.

Publications:

Knight, T.A. and Shapiro, D.Y. *submitted*. The morphology of the urogenital region of the Bluehead wrasse, *Thalassoma bifasciatum*: female egg release via epidermal rupture. *Copeia*.

Knight, T.A. 2012. Contribution Of The Frontal Eye Field To Gaze Shifts In The Head-Unrestrained Rhesus Monkey: Neuronal Activity, *Neuroscience*, 225: 213 - 36.

Knight, T.A. and Fuchs, A.F. 2007. Contribution of the frontal eye field to gaze shifts in the head-unrestrained monkey: effects of microstimulation. *J. Neurophysiol.*, 97: 618 - 634.

Knight, T.A. 2005. The role of the frontal eye field in coordinated eye-head gaze shifts in the rhesus monkey. Ph.D. Thesis. University Microfilms. Ann Arbor, MI.

Knight, T.A. 1997. The morphology of the urogenital region of the diandric, protogynous wrasse, *Thalassoma bifasciatum*. M.S. Thesis. University Microfilms. Ann Arbor, MI.

Manuscripts in preparation (* indicates Whitman student author):

Aegerter, E.R.*, Stoehr, K.R.*, Bhatt, E. M.*, Helberg, K.*, Knight, L.S. and **Knight, T.A.** *in preparation*. Microstimulation and anterograde tracer determination of cortical and collicular projections to the oculomotor brainstem of the mouse. *Neuroscience*.

Osseward, P.* Griggs, W.*, Schneider, E., and **Knight, T.A.** *in preparation*. Kinematics of coordinated eye-head movements in humans during large-amplitude, visually guided and memory tasks. *Experimental Brain Research*.

Knight, L.S., K.L. Mittelsteadt*, M.S. Zekan*, S. White, M.A. Raskind, V.G. Olson, P. Szot and T.A. Knight. *In preparation*. Altered Substance P signaling in a rodent model for Post-Traumatic Stress Disorder. *Neuroscience Letters*.

Knight, T.A. and Shapiro, D.Y. *in preparation*. The morphology of the urogenital region of the Bluehead wrasse, *Thalassoma bifasciatum*: differences in primary and secondary males. *Copeia*.

Presentations/Abstracts (* indicates Whitman student author):

Osseward, P.* Griggs, W.* and **Knight, T.A.** 2011. Kinematics of coordinated eye-head movements in humans during large-amplitude, visually guided and memory tasks. *Murdock College Science Research Program Conference, Nov. 11, 2011*.

Aegerter, E.R.*, Stoehr, K.R.*, Bhatt, E. M.*, Knight, L.S. and **Knight, T.A.** 2010. Microstimulation and anterograde tracer determination of cortical and collicular projections to the oculomotor brainstem of the mouse. *Society for Neuroscience abstract* 676.6.

Mittelsteadt, K.L.*, Olson, V., Szot, P., **Knight, T.A.**, Raskind, M. and Knight, L.S. 2010. Altered substance P signaling in an animal model of post-traumatic stress disorder. *Society for Neuroscience abstract* 162.15.

Aegerter, E.* Stoehr, K.* and **Knight, T.A.** 2009. Neural control of eye and head movements in the mouse: functional connections between eye and head premotor regions. *Murdock College Science Research Program Conference, Oct. 30, 2009*.

Bhatt, E.M.*, Moulton, S.*, Knight, L.S. and **Knight, T.A.** 2008. Student Investigations of anatomical and physiological bases of neuroplasticity in epilepsy and the neural control of movement. *Washington NASA Space Grant Consortium at the University of Washington, Sept. 2008.*

Knight, T.A. and Fuchs, A.F. 2008. Contributions of the frontal eye field to movement coordination: activity of neurons during combined eye-head gaze shifts in the rhesus monkey. *2008 Experimental Biology meeting abstracts, Abstract L100.*

Bomalaski, M.N.*, **Knight, T.A.** and Simon, R.D. 2007. Effectiveness of Long-Term Compliance with Continuous Positive Airway Pressure in Treating Obstructive Sleep Apnea: severity, compliance, and quality of life. *21st National Conference on Undergraduate Research at Dominican University of California, April 12 - 14, 2007.*

Knight, T.A. and Fuchs, A.F. 2001. Single-unit discharge and microstimulation of frontal eye field neurons in the head-unrestrained monkey. *Society for Neuroscience abstract 405.9.*

Knight, T.A. and Fuchs, A.F. 2001. Activity of frontal eye field neurons during gaze shifts in the head-unrestrained monkey. *Society for Neural Control of Movement abstract.*

Kawashima, T., **Knight, T.A.**, and Fetz, E.E. 1998. Interhemispheric synchronization of neuronal and field potential activity during bimanual movements of monkeys. *Society for Neuroscience abstract 158.6.*

Invited lectures:

Knight, T.A. 2012. Neural mechanisms of movement coordination in monkey and man. *Denison University Neuroscience seminar, December 3, 2012.*

Knight, T.A. 2011. Cortical coordination of eye-head gaze movements in monkey, mouse and man. *University of Puget Sound Neuroscience seminar, February 28, 2011.*

Knight, T.A. 2010. Cortical control of gaze movements from mouse to monkey to man. *Walla Walla University Biology Colloquium, May 18, 2010.*

Knight, T.A. 2007. The coordination of movement: contribution of the frontal eye field to gaze shifts. *Seattle University Biology Seminar, February 27, 2007.*

Knight, T.A. 2007. The coordination of movement: contribution of the frontal eye field to gaze shifts. *Whitman College Biology Seminar, March 1, 2007.*

Supervised senior-research theses:

- Griggs, W. 2013. (Honors thesis) The Effect of Reduced Visual Field Upon Intersubject Variability of Large Amplitude Gaze-shift Metrics.
- Haffner, T. 2013. New strategies for evaluating electronic data management systems for use in biorepositories.
- Helberg, K. 2013. Gaze-related cortical projections in the mouse using anterograde tract tracing.
- Peterson, L. 2013. Reducing Impact and Tibial-stress fractures in Female Distance Runners.
- Osseward, P. 2012. Kinematics of coordinated eye-head movements in humans during large-amplitude, visually guided and memory tasks.
- Sampson, H. 2011. Defining the borders of the mouse M2 using microstimulation and

anterograde tract tracing.

- Stauffer, P. 2011. Quantifying and further characterizing the neural mechanisms of gaze shift head movement using microstimulation analysis and electromyography in C57BL6 mice.
- Montminy, T. 2011. Neural activity within in anterior cingulate cortex: encoding of recent outcome/reward ratios, and learning the correct behavior decision.
- Zimbelman, E. 2011. Biodegradable nanoparticle formulations: applications to ocular drug delivery and immunizations.
- Aegerter, E.R. 2010. Mapping gaze-related cortical projections in the mouse using microstimulation and anterograde tract tracing.
- Stoehr, K.R. 2010. Neuronal control of head and eye movements in the mouse: functional connections between superior colliculus and eye and head pre-motor regions.
- Kron, B. 2010. Strategies for Detecting False Positive Results in Echocardiography to Prevent Invasive Heart Procedures.
- Bhatt, E.M. 2009. Control of orienting head movements in the mouse: projections from the motor cortex to brainstem neck premotor regions.
- Kiefel, G. 2009. Effect of sleep extension on visuomotor performance and motor learning.
- Nabelek, M. 2009. Developing the resazurin-resorufin system as a “smart” tracer to measure microbial respiration and sediment-water interactions.
- Cahn, L. 2008. Kinematic, kinetic and electromyographic (EMG) analysis comparing unsupported versus supported movements in the “*on pointe*” position.
- Lindley, C. 2008. Associations between the effectiveness of cPAP treatment for obstructive sleep apnea and quality of life and pre-treatment depression.
- Schairer, D. 2008. (Honors thesis) Noninvasive measurements of neural tract connectivity using current source coherence.
- Bomalaski, N. 2007. (Honors thesis) Effectiveness of long-term compliance with continuous positive airway pressure in treating obstructive sleep apnea.

Collaborations:

Dr. Leena Knight, Ph.D., Whitman College Department of Biology — laboratory co-director and collaborator on rodent neuroanatomical, electrophysiological, behavioral and neurological disorder (Post-traumatic stress disorder, PTSD; Parkinson’s disease) studies.

Dr. James Phillips, Ph.D., Director of the University of Washington Medical Center Dizziness and Balance Center, and Seattle Children’s Hospital — collaborator on human gaze project, with laboratory and equipment sharing, analyses, programming support, and clinical patient investigations.

Dr. Patricia Szot, Ph.D., UW Dept. of Psychiatry and Behavioral Science and the Veterans Administration Puget Sound Health Care System — collaborator on rodent neuroanatomical, electrophysiological, and disorder studies.

Dr. Erich Schneider, Ph.D., Ludwigs-Maximilian University’s Institute of Clinical Neuroscience in Munich, Germany — team leader developing EyeSeeCam, portable videooculography equipment and software for human visuomotor research.

Dr. Chris Kaneko, Ph.D., University of Washington Dept. of Physiology and Biophysics and Washington Regional Primate Research Center — resource for new method for measuring movements of the eyes in mice.

Dr. Ken Isaacs, M.D., Neurologist, St. Mary Hospital, Walla Walla, WA — resource for patient

recruiting, testing, and consultation/support.

Memberships in professional/academic societies:

- 2010 – present: Faculty for Undergraduate Neuroscience (FUN), member
- 2008 – present: Sigma Xi, member
- 2004 – present: American Physiological Society, member
- 1998 – present: Society for Neuroscience, member
- 1997 – 1998: American Society of Ichthyologists and Herpetologists, member
- 1989 – present: Omicron Delta Kappa, member

Service commitments:

- 2008 – present: Member, Whitman College Premedical Advisory Committee.
- 2008 – present: Supervisor, Whitman College Biology Department's Virtual Pig Dissection website — I coordinated the effort to complete the first revision of Whitman's enormously popular website, completed in 2011.
- 2009 – present: Biology Department overseer of Physiology and Introductory Biology laboratory teaching spaces renovation.
- 2008 – present: Faculty Advisor, Sigma Chi Fraternity, Whitman College chapter.
- 2010 – 2011: Chair, Whitman College General Studies Committee — oversight of general studies (First year course, Cultural Pluralism requirement, distributions) programming (learning objectives, requirements, assessments, coordination).
- 2011: Participant, the Mellon NW5C Roundtable on Best Pedagogical Practices, hosted by Reed College, January 21-22, 2011.
- 2007 – 2011: Member, Whitman College General Studies Committee.
- 2008 – 2010: Co-director, Murdock Trust's College Science Research Program, Whitman College.