# DAVID M. ALTMAN

Assistant Professor of Physics
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## EDUCATION

**Ph.D., Physics**
Stanford University, Stanford, CA, September 2006
*Dissertation title*: "Regulation of the molecular motor myosin VI"
*Dissertation advisor*: James A. Spudich

**Bachelor of Arts, Physics, with Honors**
The University of Chicago, Chicago, IL, June 2000

## PROFESSIONAL EXPERIENCE

**Assistant professor, Department of Physics**
Willamette University, Salem, OR, August 2009–present
*Research project*: Use single molecule and cell biological techniques to understand how myosin motors are regulated through interactions with their cellular environment.

**Post-doctoral scholar, Department of Chemical Engineering**
Stanford University, Stanford, CA, April 2009-August 2009
*Research advisor:* Alex Dunn
*Research project*: Used multiple biochemical and biophysical approaches to probe the force-generating step in the kinetic cycle of the molecular motor myosin.

**Post-doctoral scholar, Department of Chemistry**
Stanford University, Stanford, CA, September 2006-May 2009
*Research advisor:* Richard Zare
*Research project*: Designed and implemented a capillary flow system to measure the impedance spectrum of individual cells in a population in suspension.

**Doctoral researcher, Department of Biochemistry and Department of Physics**
Stanford University, Stanford, CA, 2001-2006
Laboratory of Dr. James A. Spudich
*Research project*: Performed single-molecule studies probing the detailed mechanism of the myosin VI mechanochemical cycle using optical traps. Used *in vivo* fluorescence techniques to elucidate the oligomeric form of myosin VI in a cellular system. Used standard biochemical and molecular biology techniques to assist in studies of myosin II thick-filament self-assembly.

**Doctoral researcher**
National Center for Biological Sciences, Bangalore, India, 2005
Laboratory of Dr. Satyajit Mayor
*Research project*: Initiated collaborative work between the labs of Dr. James A. Spudich and Dr. Satyajit Mayor to develop an *in vivo* fluorescence experiment for measuring time-resolved fluorescence emission anisotropy.

**Undergraduate researcher, Department of Physics**
University of Chicago, Chicago, IL, 1999-2000
Laboratory of Dr. David G. Grier
*Research project*: Studied diffusional dynamics of colloidal polystyrene spheres in a thin-slit geometry using optical traps.

## TEACHING AND ADVISING EXPERIENCE

**Instructor,** Willamette University, Department of Physics, Fall 2009-present

Introductory Physics I (PHYS 221) and lab (PHYS 221Y)

Introductory Physics II (PHYS 222) and lab (PHYS 222Y)

Modern Physics (PHYS 223) and lab (PHYS 223Y)

Physical Biology of the Cell (PHYS 250)

Mechanics (PHYS 339)

Advanced Topics in Experimental Physics (PHYS 396W) and lab (PHYS 396Y)

Research Seminar (PHYS 495 & 496)

Research Exploration in Biology (BIOL 297)

Senior Research Project (CHEM 495)

College Colloquium (IDS 101), *Knitting Culture*; *Controlling Life*

**Guest Lecturer**, Willamette University, Department of Chemistry, Fall 2010, Spring 2012, Fall 2012

Biochemistry (CHEM 351), talked about the history and biochemistry of molecular motors

**Instructor,** Stanford University, Department of Bioengineering, Fall 2008

Molecular and Cellular Bioengineering, graduate level course, required for graduate students in the Department of Bioengineering; team-taught

**Instructor,** Stanford University, Department of Chemistry, Spring 2007-Spring 2008

Biochemistry I, undergraduate and graduate level course, required for undergraduates in the biological chemistry track of the Department of Chemistry

Biological Chemistry Laboratory, undergraduate level course, required for undergraduates in the biological chemistry track of the Department of Chemistry

**Mentor**, Stanford Summer Research Program (SSRP), Summer 2008

SSRP is a research program for undergraduates planning on entering a graduate program in the sciences who will bring diversity to the biomedical sciences

**Teaching assistant,** Marine Biological Laboratory, Woods Hole, MA, June 10-July 29, 2006

Physiology Course, intensive lab course for students at the graduate level or higher; labs explore concepts at the interface between cellular and computational biology

**Teaching assistant**, Stanford University, Department of Physics, 2002

*Cosmic Horizons*, undergraduate modern astronomy class for non-physics majors
*The Nature of the Universe*, undergraduate introductory astrophysics course for non-physics majors
*Electricity and Optics*, undergraduate introductory class for biology, social science, and premedical students

**Instructor,** The Science Bus, East Palo Alto, CA, 2002 and 2005

The Science Bus is an after-school science program for grade school students in a public charter school

## UNIVERSITY SERVICE AND PROFESSIONAL DEVELOPMENT

**Attended a Workshop on Metacognition in the Classroom**, Willamette University, May 29, 2014

**Member of the Undergraduate Grants and Awards Committee**, Willamette University, Fall 2012-present

**Advisor to the Bearcat Robotics Club**, Willamette University, Fall 2011-present

**Member of the Physics Department's Visiting Professor Search Committee**, Willamette University, Spring 2014

**Keck Fellow**, Willamette University, Fall 2011-Fall 2013

**Attended the Little Red Schoolhouse Workshop**, Willamette University, May 18-20, 2011

**HHMI Leadership Team**, Willamette University, Physics department representative, Spring 2011

**Member of the Physics Department's Visiting Professor Search Committee**, Willamette University, Spring 2011

**Member of the Biology Department's Microbiology Search Committee**, Willamette University, Fall 2010

**Member of the Faculty Colloquium Committee**, Willamette University, Fall 2010-Fall 2011

**Attended the Junior Science Mentoring Program Retreat**, Willamette University, August 12-13, 2010

**Advisor to the Ping Pong Club**, Willamette University, Spring 2010

**Lab Manager**, Stanford University, Bio-X Teaching Lab, Spring 2007-2009

## PUBLICATIONS AND PRESENTATIONS

* Indicates undergraduate author

### Manuscripts

Altman, D., F.C. Minozzo, and D.E. Rassier, *Thixotropy and Rheopexy of Muscle Fibers Probed Using Sinusoidal Oscillations*, manuscript under review.

Daniel, R.*, A.T. Koll*, and D. Altman, *Force dependence of phagosome trafficking in retinal pigment epithelial cells*, manuscript under review.

Nagata, B.*, R. Daniel*, and D. Altman, *A role for myosin VI in retinal pigment epithelium phagocytosis*, manuscript in preparation.

Baer, T.* and D. Altman, *The role of intramolecular strain in a myosin VI dimer*, manuscript in preparation.

Altman, D. *Mechanism of myosin work and motility,* in: Roberts GC. Encyclopedia of Biophysics. Heidelberg, Springer; 2012.

Altman, D. *Fundamental properties and structure of myosin,* in: Roberts GC. Encyclopedia of Biophysics. Heidelberg, Springer; 2012.

Altman, D., D. Goswami, T. Hasson, J.A. Spudich, and S. Mayor, *Precise positioning of myosin VI on endocytic vesicles*. PLoS Biology, 2007. 5(8): e210.

Bryant, Z., D. Altman, J.A. Spudich, *The power stroke of myosin VI and the basis of reverse directionailty*. Proc. Natl. Acad. Sci. USA, 2007. 104, 722-777.

Altman, D., and J.A. Spudich, *Single-molecule optical trap studies and the myosin family of motors*, in *Nanoscale Technology in Biological Systems*, R.S. Greco, F.B. Prinz, and R.L. Smith, Editors. 2005, CRC Press: Boca Raton. p. 175-212.

Hostetter, D., S. Rice, S. Dean, D. Altman, P.M. McMahon, S. Sutton, A. Tripathy, and J.A. Spudich, *Dictyostelium myosin bipolar thick filament formation: importance of charge and specific domains of the myosin rod*. PLoS Biology, 2004. **2**(11): p. e356.

Altman, D., H.L. Sweeney, and J.A. Spudich, *The mechanism of myosin VI translocation and its load induced anchoring*. Cell, 2004. 116: 737-49.

Dufresne, E.R., D. Altman, and D.G. Grier, *Brownian dynamics of a sphere between parallel walls*. Europhys Lett, 2001. 53: 264-270.

### Conference Presentations

Daniel R.*, B. Nagata*, and D. Altman. "Force dependence of phagosome trafficking in retinal pigment epithelial cells," Poster presentation at the *Optical Trapping & Optical Micromanipulation Conference*, which is a part of the *SPIE Optics + Photonics Meeting*, San Diego, CA, August 17 – 21, 2014.

Daniel R.*, B. Nagata*, and D. Altman. "The role of myosin VI in retinal pigment epithelium phagocytosis," Poster presentation at the *Physics Research & Education Gordon Research*

*Conference, The Complex Intersection of Biology and Physics*, South Hadley, MA. June 8-13, 2014.

Daniel, R.*, B. Nagata*, and D. Altman. "A role for myosin VI in retinal pigment epithelium phagocytosis," Poster presentation at *Biophysical Society 58th Annual Meeting*, San Francisco, CA, February 15-19, 2014.

Altman, D., F. Minnozo, and D.E. Rassier. "Thixotropy of muscle fibers probed with sinusoidal oscillations," Poster presentation at *Biophysical Society 58th Annual Meeting*, San Francisco, CA, February 15-19, 2014.

Howard J.*, and D. Altman, "Exploring the force-sensitivity of *Acanthamoeba* myosin 1c function," Poster presentation at *Biophysical Society 57th Annual Meeting*, Philadelphia, PA, February 2-6, 2013.

Green J.*, J., Sant*, I. McGahan*, and D. Altman, "Studies of the force-dependent motor activity of myosin I," Poster presentation at *Biophysical Society 55th Annual Meeting*, Baltimore, MD, March 5-9, 2011.

Altman, D. and R.N. Zare, "An undergraduate biological chemistry lab course," Oral presentation at the *California Innovative Life Science Education Symposium*, UCLA, Nov 30-Dec 1, 2007.

Altman, D. and R.N. Zare, "Designing an undergraduate biological chemistry lab course," Oral presentation at the *HHMI Society of Professors Meeting*, Chevy Chase, MD, March 2-4, 2007.

Altman, D., D. Goswami, B.J. Spink, T. Hasson, J.A. Spudich, and S. Mayor, "Myosin VI is an oligomer on endocytic vesicles," Oral presentation at the *Biophysical Society 50th Annual Meeting*, Salt Lake City, UT, Feb 18-22, 2006.

Altman, D., T.J. Purcell, and J.A. Spudich, "Coordination of myosin VI heads studied with optical traps," Poster presentation at the *Single Molecule Biophysics Workshop at the Aspen Center for Physics*, Aspen, CO, Jan 2-8, 2005.

Altman, D., H.L. Sweeney, and J.A. Spudich, "The mechanism of myosin VI translocation and its load induced anchoring," Poster presentation at the *Biophysical Society 48th Annual Meeting*, Baltimore, MD, Feb 14-18, 2004.

Sweeney, H.L., S. Rosenfeld, P. Coureux, J Ménétrey, A. El-Amraoui, D. Altman, C. Morris, C. Yengo, T.J. Purcell, R.S. Rock, A.L. Wells, J.A. Spudich, and A. Houdusse, "Unusual aspects of myosin design and function: mechanisms of myosin V and VI," Poster presentation at *The American Society for Cell Biology 43rd Annual Meeting*, San Francisco, CA, Dec 13-17, 2003.

Altman, D. and J.A. Spudich, "Role of myosin VI as a transporter and a linker: a single molecule analysis," Oral presentation at *The Protein Society 17th Annual Symposium*, Boston, MA, July 16-30, 2003.

Hostetter, D., D. Altman, and J.A. Spudich, "The molecular mechanism by which heavy chain phosphorylation regulates myosin II thick filament assembly in *Dicytostelium discoideum*," Poster presentation at *The American Society for Cell Biology 42nd Annual Meeting*, San Francisco, CA, Dec 14-18, 2002.

**Invited Talks**

*Regulation of the motor protein myosin in the cell*. SSO seminar, Oregon State University, March 12, 2014.

*What do aliens look like?* Science Night at the Campus, The Gilgamesh Campus, Nov 21, 2013.

*Regulation of the motor protein myosin in the cell*. Faculty Colloquium, Willamette University, March 8, 2013.

*Studies of the regulated activity of the motor protein myosin*. Department of Physics, Reed College, March 7, 2012.

*Studies of the regulated activity of the motor protein myosin*. Department of Physics, Oregon State University, November 30, 2011.

*Physics of the nano-realm*. Institute for Continued Learning, Willamette University, October 11, 2011.

*Nanotech and the physics of the nano-realm*. Salem Science Pub, February 8, 2011.

*Understanding the regulated activity of the motor protein myosin*. Department of Physics, Lewis and Clark College, October 25, 2010.

**GRANTS**

INTER-POGIL: A POGIL Approach to Interdisciplinary STEM Education, collaborative with Brian Gilbert (Linfield College), Anne Kruchten (Linfield College), Elizabeth Atkinson (Linfield College), Joelle Murray (Linfield College), Tricia Sheppard (Westminster College), and Kimberly D. Tanner (San Francisco State University), *Improving Undergraduate STEM Education (IUSE) program*, National Science Foundation, submitted 2014, not funded.

The role of force in regulating the function of myosin motors, *College Research Program for Life Sciences Grant*, M.J. Murdock Charitable Trust, 2014, funded.

Request for a temporary lab technician to identify, test, and organize lab equipment in our introductory and intermediate labs, with Michaela Kleinert and Richard Watkins, *Hewlett Grant*, Willamette University, 2013, funded.

Interdisciplinary Research Using Imaging Science (IRIS), collaborative with Jason Duncan, Emma Coddington, Gary Tallman, Alison Fisher, and Barbara Stebbins-Boaz, *Research Experiences for Undergraduates*, National Science Foundation, submitted 2012, not funded.

INTER-POGIL: A POGIL Approach to Interdisciplinary STEM Education, collaborative with Brian Gilbert (Linfield College), Anne Kruchten (Linfield College), Elizabeth Atkinson (Linfield College), Joelle Murray (Linfield College), Tricia Sheppard (Westminster College), and Kimberly D. Tanner (San Francisco State University), *Transforming Undergraduate Education in Science, Technology, Engineering, and Mathematics (TUES) Award*, National Science Foundation, submitted 2012, not funded.

A collaboration to develop measurements of the biodynamic response of muscle fibers exposed to vibrations, *Collaborative Research Travel Grant*, Burroughs Wellcome Fund, 2012, funded.

STEM Colloquium Series: Promoting Interdisciplinary Communication & Collaboration, collaborative with Inga Johnson, David Craig, Haiyan Cheng, Erin McNicholas, Alison Fisher, *Hewlett Grant*, Willamette University, 2012, funded.

Development of a new course for science majors: Advanced Data Analysis and Simulation, ADAS, collaborative with Michaela Kleinert and Richard Watkins, *Hewlett Grant*, Willamette University, 2012, funded.

MRI: Acquisition of a laser-scanning confocal system to advance research and training in biology, chemistry, and physics at Willamette University, collaborative with Emma Coddington, Jason Duncan, Gary Tallman, Alison Fisher, and Barbara Stebbins-Boaz, National Science Foundation, 2011, funded.

Studying the regulated mechanical activity of the motor protein myosin, *College Research Program for the Life Sciences Grant*, M.J. Murdock Charitable Trust, 2010, funded.

Elucidating the role mechanical forces play in the regulation of myosin function, *Single Investigator Cottrell College Science Award*, Research Corporation for Science Advancement, 2010, funded.

## RESEARCH WITH UNDERGRADUATES

*Students who have conducted research in my lab (arranged by date of graduation):*

Hyakub Herring (Willamette University, undeclared, 2017)

Rosaline Kim (Willamette University, undeclared, 2016)

Elisa Ahern (Willamette University, Physics Department, 2015)
- This research will be conducted through PHYS 495 & 496

Forrest Betton (Willamette University, Physics Department, 2015)
- This research will be conducted through PHYS 495 & 496

Max Vellequette (Willamette University, Physics Department, 2015)
- This research will be conducted through PHYS 495 & 496

Avery Pike (South Salem High School, 2014)

Anders Koll (Willamette University, Physics Department, Fall 2014)
- This research was conducted through PHYS 495 & 496
- *Thesis title*: Detecting *Acanthamoeba* Myosin 1c *In Vitro* with Shifting Optical Trap Assays

Cat Carragee (Willamette University, Chemistry Department, 2014)
- This research was conducted through CHEM 495W & 496W
- *Thesis title*: Kinetic Rates in Molecular Motors Linked to Hypertrophic Cardiomyopathy: Mutated M531R in β-Cardiac Myosin and H246R Myosin VI

Bianca Nagata (Willamette University, Biology Department, 2014)
- Received the Arthur A. Wilson Research Scholarship Award to conduct this research in the summer of 2013
- Some of this research was conducted through BIOL 297 & 497
- *Thesis title*: Investigating the Role of Myosin VI in Retinal Pigment Epithelial Cell Phagocytosis

Rebekah Daniel (Willamette University, Physics Department, 2014)
- Some of this research was conducted through Willamette's Science Collaborative Research Program (SCRP)
- Some of this research was conducted through PHYS 495 & 496
- *Thesis title*: Elucidating the Role of Myosin VI in Retinal Pigment Epithelium Cell Phagocytosis

Jay Howard (Willamette University, Physics Department, 2014)
- Some of this research was conducted through Willamette's Science Collaborative Research Program (SCRP)
- Received a Carson Grant to conduct this research during the summer of 2013
- Some of this research was conducted through PHYS 495 & 496
- *Thesis title*: Investigating the Force-Dependent Function of *Acanthamoeba* Myosin 1c Activity

Travis Baer (Willamette University, Physics Department, 2013)
- This research was conducted through PHYS 495 & 496
- *Thesis title*: Investigating Molecular Strain within a Myosin VI Dimer

Ian McGahan (Willamette University, Math Department, 2013)

Darrin Ginoza (Willamette University, Physics Department, 2013)
- This research was conducted through PHYS 495 & 496
- *Thesis title*: *In vivo* optical trap studies of RPE phagocytosis

Jenna Hermann (Willamette University, Physics Department, 2012)
- Some of this research was conducted through Willamette's Science Collaborative Research Program (SCRP)
- Some of this research was conducted through PHYS 396, 495, & 496
- *Thesis title*: The Role of the Molecular Motor Myosin VIIa in Phagocytosis in Retinal Pigment Epithelium Cells

Ben Donovan (Willamette University, Physics Department, 2012)
- This research was conducted through PHYS 495 & 496
- *Thesis title*: Linking Myosin VI to RPE Phagocytosis

Jesse Sant (Willamette University, Physics Department, 2012)
- Some of this research was conducted through Willamette's Science Collaborative Research Program (SCRP)
- Some of this research was conducted through PHYS 396, 495 & 496
- *Thesis title*: Construction of Optical Tweezers for Single Molecule Studies

Jared Green (Willamette University, Physics Department, 2011)
- Some of this research was conducted through Willamette's Science Collaborative Research Program (SCRP)
- Some of this research was conducted through PHYS 396, 495 & 496
- *Thesis title*: Single Molecule Studies of the Molecular Motor Myosin 1c

Andrea Weiss (Willamette University, Physics Department, 2011)
- This research was conducted through PHYS 396

## VOLUNTEER WORK

**Lecturer**, Mini University Session, Family Weekend, Willamette University, October 11, 2014

**Guest Lecturer**, Awesome Academic Adventures Camp, Willamette University, July 8, 2014

**Sat on a GMO discussion panel**, Willamette University, March 13, 2014

**Moderator**, Willamette University Student Scholarship Recognition Day, April 16, 2014

Volunteered to give a Theater Talk on citizen science before Willamette's production of Proof, February 27, 2014

**Guest Lecturer**, Awesome Academic Adventures Camp, Willamette University, July 9, 2013

**Instructor**, Salem-Keizer Indian Education Program, Willamette University, June 28, 2013

**Moderator**, Willamette University Student Scholarship Recognition Day, April 17, 2013

**Judge**, Oregon Junior Academy of Science presentations at the 2013 Oregon Academy of Science Annual meeting, Willamette University, March 2, 2013.

**Guest lecturer**, Young Writers Camp (Science-Fiction), Oregon Writing Project, Willamette University, August 14, 2012

**Referee**, First Lego League Robotics tournament, Adam Stevens Middle School, Salem, OR, December 3, 2011

As part of my College Colloquium course (IDS 101), my students and I knit hats for newborns at Salem Hospital, Fall 2011

**Instructor**, Willamette Academy, Summer 2010
- Along with other faculty members and students from the Physics Department, we taught students how to build air rockets and understand their motion

**Volunteer Scientist**, Leslie Middle School's Research Day, November 12, 2009

## HONORS AND FELLOWSHIPS

Harold M. Weintraub Graduate Student Award, 2006
American Heart Association Pre-doctoral Fellow, June 2004–June 2006
Phi Beta Kappa, University of Chicago, 1999
Hugo Sonnenschein Presidential Scholar, 1998

## PROFESSIONAL MEMBERSHIPS

Biophysical Society