

MARCOS SOTOMAYOR

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PERSONAL

Date of Birth: September 6, 1978 (Caracas, Venezuela)
Nationality: Chilean
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EDUCATION & TRAINING

- Postdoctoral Fellow, February 2008 – present.
Department of Neurobiology,
Harvard Medical School, USA.
Helen Hay Whitney – Howard Hughes Medical Institute.
Advisors: Dr. David P. Corey, Dr. Rachelle Gaudet.
- Ph.D., Physics, December 2007.
M.S., Physics, May 2004.
Physics Department,
University of Illinois at Urbana-Champaign, USA.
Advisor: Dr. Klaus Schulten.
- M.S., Physics, August 2002.
B.S., Physics, November 2001.
DFI, FCFM, Universidad de Chile, Chile.
Advisor: Dr. Fernando Lund.

RESEARCH INTERESTS

- Mechanotransduction; Mechanosensitive Ion Channels; Elasticity of Modular Proteins; Adhesion Molecules and Cancer; Theoretical Modeling; Molecular Dynamics Simulations; Structural Biology.

PUBLICATIONS

- (15) E. H. Lee, J. Hsin, G. Comellas, **M. Sotomayor**, and K. Schulten. “Discovery through the computational microscope” *Structure, in press*, 2009 (ISI 0)¹.

¹Number of citations until September 2009.

- (14) F. Khalili-Araghi, J. Gumbart, P. Wen, **M. Sotomayor**, E. Tajkhorshid, and K. Schulten. “Molecular dynamics simulations of membrane channels and transporters” *Current Opinion in Structural Biology*, **19**:128-37, 2009 (ISI 1) ¹.
- (13) V. Vasquez, **M. Sotomayor**, J. Cordero-Morales, K. Schulten, and E. Perozo. “A structural mechanism for MscS gating in lipid bilayers” *Science*, **321**:1210-1214, 2008 (ISI 13) ¹.
- (12) **M. Sotomayor** and K. Schulten. “The Allosteric Role of the Ca²⁺ Switch in Adhesion and Elasticity of C-Cadherin” *Biophysical Journal*, **94**:4621-4633, 2008 (ISI 7) ¹.
- (11) B. Lim, E. H. Lee, **M. Sotomayor**, and K. Schulten. “Molecular basis of fibrin clot elasticity” *Structure*, **16**:449-459, 2008 (ISI 12) ¹.
- (10) V. Vasquez, **M. Sotomayor**, D. Marien Cortes, B. Roux, K. Schulten, and E. Perozo. “Three dimensional architecture of membrane-embedded MscS in the closed conformation” *Journal of Molecular Biology*, **378**:55-70, 2008 (ISI 5) ¹.
- (9) **M. Sotomayor** and K. Schulten. “Single-Molecule Experiments *in Vitro* and *in Silico*” *Science*, **316**:1144-1148, 2007 (ISI 89) ¹.
- (8) **M. Sotomayor**, V. Vasquez, E. Perozo, and K. Schulten. “Ion Conduction through MscS as Determined by Electrophysiology and Simulation” *Biophysical Journal*, **92**:886-902, 2007 (ISI 25) ¹.
- (7) M. Gao, **M. Sotomayor**, E. Villa, E. Lee, and K. Schulten. “Molecular Mechanisms of Cellular Mechanics” *Physical Chemistry - Chemical Physics*, **8**:3692-3706, 2006 (ISI 18) ¹.
- (6) **M. Sotomayor**, T. A. van der Straaten, U. Ravaioli, and K. Schulten. “Electrostatic Properties of the Mechanosensitive Channel of Small Conductance MscS” *Biophysical Journal*, **90**:3496-3510, 2006 (ISI 16) ¹.
- (5) **M. Sotomayor**, D. P. Corey, and K. Schulten. “In Search of the Hair-Cell Gating Spring: Elastic Properties of Ankyrin and Cadherin Repeats” *Structure* **13**:669-682, 2005 (ISI 65) ¹.
- (4) E. Tajkhorshid, J. Cohen, A. Aksimentiev, **M. Sotomayor**, and K. Schulten. “Towards understanding membrane channels” in *Bacterial ion channels and their eukaryotic homologues*, Boris Martinac and Andrzej Kubalski, editors, pp. 153–190. ASM Press, Washington, DC, 2005.
- (3) **M. Sotomayor** and K. Schulten. “Molecular Dynamics Study of Gating in the Mechanosensitive Channel of Small Conductance MscS” *Biophysical Journal* **87**:3050-3065, 2004 (ISI 58) ¹.
- (2) D.P. Corey and **M. Sotomayor**. “Tightrope act” *Nature* **428**:901-902, 2004 (ISI 26) ¹.

- (1) C.J. Clarke, A. Gendrin, **M. Sotomayor**. “The dispersal of circumstellar discs: the role of the ultraviolet switch” *Monthly Notices of the Royal Astronomical Society* **328**:485-491, 2001 (ISI 99) ¹.

PRESENTATIONS

TALKS

- “Conformational transitions underlying tension-dependent gating in prokaryotic mechanosensitive channels”. Gordon Research Conference on Cellular Osmoregulation and Mechanotransduction, 2009, Biddeford, Maine, USA.
- “Cadherin Dynamics and Molecular Mechanisms of Hereditary Deafness”. 32nd Midwinter Research Meeting, Association for Research in Otolaryngology 2009, Baltimore, Maryland, USA.
- “Cadherin Dynamics and Molecular Mechanisms of Hereditary Deafness”. Force-Gated Ion Channels: From Structure to Sensation, 2008, HHMI Janelia Farm Research Campus, USA.
- “The Allosteric Role of the Ca²⁺ Switch in Adhesion and Elasticity of C-Cadherin”. 20th CMB–MB Annual Research Symposium, 2007, Urbana, USA.
- “Ion conduction through the Mechanosensitive Channel of Small Conductance MscS”. CECAM meeting Ionic Transport: from Nanopores to Biological Channels, 2007, Lyon, France.
- “Life under Tension: Molecular Mechanisms of Mechanosensitive Channels and Mechanical Sensors”. MCTP/ICAM Workshop Mechanics of Life: From Biomolecules to Molecular Machines, 2007, Ann Arbor, Michigan, USA.
- “Tertiary and Secondary Structure Elasticity of Repeat Proteins”. 87th International Bunsen Discussion Meeting on Mechanically Induced Chemistry —Theory and Experiment— 2005, Tutzing, Germany.
- “Mechanisms of Mechanosensitive Channels and Mechanical Sensors Studied by Molecular Dynamics Simulations”. Gordon Research Conference on Mechanotransduction and Gravity Signaling in Biological Systems, 2005, Biddeford, Maine, USA.
- “The Molecular Basis of Hearing”. 4D Nanostructure Lecture Series, 2005, Beckman Institute, Urbana, Illinois, USA.

POSTERS

- “Structure, Dynamics, and Elasticity of Cadherin 23 Repeats Involved in Hereditary Deafness”. **M. Sotomayor**, W. Weihofen, R. Gaudet, D. P. Corey. 7th Molecular Biology of Hearing and Deafness Meeting, 2009, Boston, Massachusetts, USA.

- “Mechanical Strength of Cadherin Binding Interfaces Suggested by Crystallography”. **M. Sotomayor**, W. Weihofen, R. Gaudet, D. P. Corey. Biophysical Society, 53rd Annual Meeting 2009, Boston, Massachusetts, USA.
- “Ca²⁺ Dependent Dynamics and Forced Unbinding of Classical Cadherins”. **M. Sotomayor**, K. Schulten, D. P. Corey. Gordon Research Conference on Signaling by Adhesion Receptors, 2008, Mount Holyoke College, Massachusetts, USA.
- “The Allosteric Role of the Ca²⁺ Switch in Adhesion and Elasticity of C-Cadherin”. **M. Sotomayor**, K. Schulten. Biophysical Society, 52th Annual Meeting 2008, Long Beach, California, USA.
- “Three Dimensional Architecture of MscS N-terminus and TM Segments in the Closed State”. V. Vásquez, **M. Sotomayor**, D. M. Cortes, B. Roux, K. Schulten, E. Perozo. Biophysical Society, 51th Annual Meeting 2007, Baltimore, Maryland, USA.
- “Tertiary and Secondary Structure Elasticity of Repeat Proteins”. **M. Sotomayor**, K. Schulten. Biophysical Society, 51th Annual Meeting 2007, Baltimore, Maryland, USA.
- “Ion Conduction through MscS as Determined by Electrophysiology and Simulation”. **M. Sotomayor**, V. Vásquez, E. Perozo, K. Schulten. Biophysical Society, 51th Annual Meeting 2007, Baltimore, Maryland, USA.
- “Tertiary and Secondary Structure Elasticity of Ankyrin Repeats”. **M. Sotomayor**, K. Schulten. Biophysical Society, 50th Annual Meeting 2006, Salt Lake City, Utah, USA.
- “Tertiary and Secondary Structure Elasticity of Repeat Proteins”. **M. Sotomayor**, K. Schulten. IUPAB/EBSA International Biophysics Congress, 2005, Montpellier, France.
- “Is TRPA1 the Transduction Channel? Mechanics of the Ankyrin-Repeat Domain”. **M. Sotomayor**, E. Cheung, K. Schulten, D. P. Corey. 28th Midwinter Research Meeting, Association for Research in Otolaryngology 2005, New Orleans, Louisiana, USA.
- “Molecular Dynamics Study of Mechanosensation Proteins Ankyrin and Cadherin”. **M. Sotomayor**, D. P. Corey, K. Schulten. Biophysical Society 49th Annual Meeting 2005, Long Beach, California, USA.
- “Multiscale Modeling of Gating and Ion Conduction in the Mechanosensitive Channel of Small Conductance MscS”. **M. Sotomayor**, T. A. van der Straaten, U. Ravaioli, K. Schulten. Biophysical Society 49th Annual Meeting 2005, Long Beach, California, USA.
- “Molecular Dynamics Study of Gating in the Mechanosensitive Channel of Small Conductance MscS”. **M. Sotomayor**, K. Schulten. Biophysical Society 48th Annual Meeting 2004, Baltimore, Maryland, USA.

- “Mechanical Properties of Ubiquitin Chains”. F. Khalili-Araghi, T. Isgro, **M. Sotomayor**, E. Villa, K. Schulten. Biophysical Society 48th Annual Meeting 2004, Baltimore, Maryland, USA.
- “Numerical Studies of Melting in Infinite Crystalline Solids”. **M. Sotomayor**, R. Soto, F. Lund. American Physical Society 2003 Annual March Meeting, Austin, Texas, USA.
- “The dispersal of circumstellar discs: the role of the ultraviolet switch”. **M. Sotomayor**, A. Gendrine, C.J. Clarke. 2002 International Astronomical Observatories in Chile Workshop, La Serena, Chile.

SUMMER SCHOOLS

- **2009** Rapid Data Collection & Structure Solving at the NSLS: A Practical Course in Macromolecular X-Ray Diffraction Measurement (April 19 - 24) Brookhaven National Laboratory, NY, USA.
- **2007** Biology of the Inner Ear: Experimental and Analytical Approaches (August 19 - September 1) Marine Biology Lab, Woods Hole, MA, USA.
- **2000** Particle Physics and Astronomy International Undergraduate Summer School (IUSS, 24 June to 4 August) University of Cambridge & PPARC, UK. Supervised by Dr. C. J. Clarke.
- **1998** Astronomy Summer School, Las Campanas Observatory. Fundación Andes - Carnegie Institution of Washington.

HONORS AND AWARDS

- **2009** Helen Hay Whitney Foundation Fellowship (accepted).
- **2009** Damon Runyon Cancer Research Foundation Fellowship (declined).
- **2007** Best Talk Prize, UIUC Cell and Molecular Biology – Molecular Biophysics Symposium.
- **2007** MCC/UIUC travel award to attend the CECAM meeting Ionic Transport: from Nanopores to Biological Channels, Lyon, France.
- **2005** BPS/IUPAB travel fellowship award to attend and participate in the International Biophysics Congress in Montpellier, France.
- **2004** Member of The Honor Society Phi Kappa Phi.
- **2002** Graduated with “Distinción Máxima” (Maximum Distinction), Master in Science, Physics, Universidad de Chile, Chile.

- **2002** Graduate Research Fellowship, CONICYT-Chile (National Commission for Scientific and Technological Research).
- **1997 – 2000** “Beca Presidente de la República” Chilean Government Scholarship.
- **1997 – 2000** “Outstanding Student” (Alumno Destacado). Top 5% of the Mathematical and Physical Sciences College (FCFM) undergraduate students at Universidad de Chile are selected in this category each year.

TEACHING

- Co-author of NAMD, VMD, Membrane Proteins, and Ion Conduction Tutorials.
<http://www.ks.uiuc.edu/Training/TutorialsOverview/index.html>
- Co-author of Water Case Study.
<http://www.ks.uiuc.edu/Training/CaseStudies/index.html>
- **2003 - 2007** Instructor. Theoretical and Computational Biophysics School (Urbana, 2003; Boston, 2004; Chicago, 2005; Talca–Chile, 2006; Bethesda, 2007).
<http://www.ks.uiuc.edu/Training/>
- **Fall 2002** Teaching Assistant. Undergraduate Course “Quantum Physics I” UIUC.
- **Spring 2001** Teaching Assistant. Undergraduate Course “Quantum Mechanics” University of Chile.
- **Fall 2000** Teaching Assistant. Undergraduate Course “Electromagnetism” University of Chile.
- **Fall 1999 - Spring 2000** Teaching Assistant. Undergraduate Course “Modern Physics” University of Chile.
- **Spring 1999** Teaching Assistant. Undergraduate Course “Dynamical Systems” (Mechanics II), University of Chile.

REVIEWER

- Biophysical Journal.
- The European Physical Journal E - Soft Matter.
- Journal of Molecular Graphics and Modelling.

GRANT PROPOSAL WRITING

Co-principal investigator:

- Molecular Mechanisms of Hereditary Deafness and Pain Sensation, 2008-2009 (NSF TRAC MCB080015 for Supercomputer time with David P. Corey and Rachelle Gaudet).

Contributed to grants:

- Mechanisms of Membrane Proteins Through *in situ* Modeling (NIH 1 R01 GM067887).
- Molecular Mechanisms of Cellular Mechanics (NIH 1 R01 GM073655).
- Simulations of Supramolecular Biological Systems, 2004-2007 (NSF LRAC MCA93S028).
- Renewal of NIH Resource for Macromolecular Modeling and Bioinformatics (NIH P41-RR05969).

SOFTWARE

- VMD Autoionize GUI.
- VMD Mutator plugin.
- VMD DataImport plugin.
- Assistance in NAMD implementation and validation of CMAP.

LANGUAGES

- Spanish (native) & English.