Michael Strong, PhD

Assistant Professor
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FACULTY

I am an Assistant Professor in the Integrated Center for Genes, Environment, and Health, at **National Jewish Health**. Research interests include genomics, systems biology, structural informatics, and the development of computational methods to better examine the interplay among humans, human pathogens, and environmental factors. http://www.nationaljewish.org/professionals/research/programs-depts/genetics-therapeutics/labs/michael-strong/

I am also a core faculty member of the Computational Bioscience Program at the **University of Colorado, Denver**, School of Medicine. http://compbio.ucdenver.edu/pages/corefaculty.html

POSTDOCTORAL

Harvard Medical School - I conducted my postdoctoral work in George M. Church's lab in the Department of Genetics at Harvard Medical School. Research interests include genomics, biochemistry, systems biology, and synthetic biology. (Recipient of a Jane Coffin Childs Foundation Research Grant).

EDUCATION

Ph.D. in Molecular Biology, **University of California, Los Angeles**. 2005. Graduate Advisor – David Eisenberg. My research focused on identifying the modular nature of genome-wide protein networks, and developing biochemical tools to identify protein-protein interactions. Research interests include genomics, protein biochemistry, molecular biology, bioinformatics, and structural biology. (recipient of NIH Cell and Molecular Biology Training Grant)

B.S. Microbiology, concentration in Genetic Engineering. University of California, Santa Barbara. (recipient of HHMI undergraduate research grant).

PUBLICATIONS

Network and Matrix Analysis of the Respiratory Disease Interactome. Benjamin Garcia, Gargi Datta, Gregory P Cosgrove, **Michael Strong**. *BMC Systems Biology*, 8:34 (2014).

A Minimum Variance Method for Genome-wide Data-driven Normalization of qRT-PCR Expression Data. Benjamin Garcia, Nicholas D Walter, Gregory Dolganov, Marc Coram, J. Lucian Davis, Gary K. Schoolnik, **Michael Strong**. *Analytical Biochemistry*, 458:11-13 (2014).

High Relatedness among *Mycobacterium abscessus* subsp. *massiliense* Strains from Geographically Distant Outbreaks. Hervé Tettelin, Rebecca M. Davidson, Sonia Agrawal, Moira L. Aitken, Shamira Shallom, Nabeeh A. Hasan, **Michael Strong**, Vinicius Calado Nogueira de Moura, Mary Ann De Groote, Rafael S. Duarte, Erin Hine, Sushma Parankush, Qi Su, Sean C. Daugherty, Claire M. Fraser, Barbara A. Brown-Elliott, Richard J. Wallace Jr., Steven M. Holland, Elizabeth P. Sampaio, Kenneth N. Olivier, Mary Jackson, Adrian M. Zelazny. *Emerging Infectious Diseases*, 20:3 (2014).

HspX Vaccination and Role in Virulence in the Guinea Pig Model of Tuberculosis. Agatha E. Wieczorek, Jolynn L. Troudt, Phillip Knabenbauer, Jennifer Taylor, Rebecca L. Pavlicek, Russell Karls, Anne Hess, Rebecca M. Davidson, **Michael Strong**, Helle Bielefeldt-Ohmann, Angelo A. Izzo, Karen M. Dobos. *Pathogens and Disease*, Feb 24 (2014).

Phylogenomics of Brazilian epidemic isolates of *Mycobacterium abscessus* subsp. *bolletii* reveals relationships of global outbreak strains. Rebecca M. Davidson, Nabeeh A. Hasan, Vinicius Calado Nogueira de Moura, Rafael Silva Duarte, Mary Jackson, **Michael Strong.** *Infection, Genetics and Evolution*, S1567-1348(13)00353-5 (2013).

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Genome sequence of an epidemic isolate of *Mycobacterium abscessus* subsp. *bolletii* from Rio de Janeiro, Brazil.
Rebecca M. Davidson, Paul R. Reynolds, Eveline Farias-Hesson, Rafael Silva Duarte, Mary Jackson, **Michael Strong**. *Genome Announcements,* 1:e00617-13 (2013).

Galectin-9 functionally impairs natural killer (NK) cells in humans and mice.
Lucy Golden-Mason, Rachel McMahan, **Michael Strong**, Richard Reisdorph, Spencer Mahaffey, Brent Palmer, Linling Cheng, Caroline Kulesza, Mitsuomi Hirashima, Toshiro Niki, and Hugo Rosen. *Journal of Virology*, 87:4835-4845 (2013).

Translating basic science insight into public health action for MDR- and XDR-TB.
Walter, Nicholas; **Strong, Michael**; Belknap, Robert; Ordway, Diane; Daley, Charles L; Chan, Ed; *Respirology*. 17:772-791 (2012).

Research, Collaboration, and Open Science using Web 2.0.
Kevin Shee*, **Michael Strong***, Nicholas J. Guido, Robert Lue, George M. Church, Alain Viel. *Equal contribution, *Journal of Microbiology and Biology Education*, 11:2 p130-134, (2010).

Reducing Global Health Disparities through Research, Education, and International Collaboration .
Michael Strong. *Center for Strategic and International Studies, Smart Global Health Policy Report p47-48* (2010).

Tuberculosis Drug Resistance Mutation Database .
Andreas Sandgren, **Michael Strong**, Preetika Mutukrishnan, Brian K. Weiner, George M. Church, Megan B. Murray. *PLoS Medicine* 6:2 (2009).

Gem of an idea for a unique machine.
Michael Strong and George Church. *Nature* 447:112 (2007).

The Protein Network as a Tool for Finding Novel Drug Targets.
Michael Strong and David Eisenberg. Book Chapter in Systems Biological Approaches in Infectious Diseases. Edited by H.I.M Boshoff and C.E. Barry III, Birkhauser. Verlag Publishing. *Progress in Drug Research*, 64:191, 193-215 (2007).

Functional linkages can reveal protein complexes for structure determination.
Kim SM, Bowers PM, Pal D, **Strong M**, Terwilliger TC, Kaufmann M, Eisenberg D. *Structure* 15:1079-89 (2007).

Toward the Structural Genomics of Complexes: Crystal Structure of a PE/PPE protein complex from *Mycobacterium tuberculosis*.
Michael Strong, Michael Sawaya, Shuishu Wang, Martin Philips, Duilio Cascio, and David Eisenberg. *Proc. Natl. Acad. Sci. U. S. A.* 103:8060-8065 (2006).

Structural Proteomics and Computational Analysis of a Deadly Pathogen: Combating *M. tuberculosis* from Multiple Fronts.
Michael Strong and Celia Goulding. Book Chapter (Chapter 15) in Microbial Proteomics: Functional Biology of Whole Organisms. Edited by Ian Humphrey-Smith and Michael Hecker. Wiley Publishing, Inc. *Methods of Biochemical Analysis* 49:245-69 (2006).

Unique Transcriptome Signature of *Mycobacterium tuberculosis* in Pulmonary Tuberculosis.
Helmy Rachman, **Michael Strong**, Timo Ulrichs, Leander Grode, Johannes Schuchhardt, Hans Mollenkopf, George A. Kosmiadi, David Eisenberg, S.H.E. Kaufmann. *Infection and Immunity* 74:1233-1242. (2006).

Mycobacterium tuberculosis Gene Expression Profiling within the Context of Protein Networks.
Helmy Rachman*, **Michael Strong***, Ulrich Schaible, Johannes Schuchhardt, Kristine Hagens, Hans Mollenkopf, David Eisenberg, Stefan H.E. Kaufmann. *Equal Contribution. *Microbes and Infection*. 8:747-757 (2006).

A specific secretion system mediates PPE41 transport in pathogenic mycobacteria.
Abdallah M. Abdallah, Theo Verboom, Fredericke Hannes, Mohamad Safi, **Michael Strong**, David Eisenberg, Rene Musters, Christina M.J.E. Vandenbroucke-Grauls, Ben J. Appelmelk, Joen Luirink4 and Wilbert Bitter. *Molecular Microbiology* 62:667-79 (2006).

Scientists and Societies: Community Outreach.
Michael Strong. *Nature*. 434, 418. (2005).

Protein Nanomachines.
Michael Strong. *PLoS Biology* Mar, 2:E73. (2004).

A Web-Based Comparative Genomics Tutorial for Investigating Microbial Genomes.
Michael Strong, Duilio Cascio, and David Eisenberg. *ASM Microbiology Education Journal* 5: 30-35. (2004).

Genomes, Maps, and Modules: Navigating the *M. tuberculosis* Genome.
Michael Strong. *UCLA Scientific Review* 1: 28-32. (2004).

Visualization and Interpretation of Protein Networks in *Mycobacterium tuberculosis* Based on Hierarchical Clustering of Genome-Wide Functional Linkage Maps.
Michael Strong, Thomas G. Graeber, Morgan Beeby, Matteo Pellegrini, Michael J. Thompson, Todd O. Yeates, and David Eisenberg. *Nucleic Acids Research*, 31: 7099-7109. (2003).

Inference of Protein Function and Protein Linkages in *M. tuberculosis* Based on Prokaryotic Genome Organization: A Combined Computational Approach.
Michael Strong, Parag Mallick, Matteo Pellegrini, Michael J. Thompson, and David Eisenberg. *Genome Biology* 4:R59.1-R59.16. (2003).

2'-Ribose-ferrocene oligonucleotides for electronic detection of nucleic acids.
Yu CJ, Wang H, Wan Y, Yowanto H, Kim JC, Donilon LH, Tao C, **Strong M**, Chong Y. *Journal of Organic Chemistry* 66:2937-2942. (2001).

Uridine-Conjugated Ferrocene DNA Oligonucleotides: Unexpected Cyclization Reaction of the Uridine Base.
Yu, C. J.; Yowanto, H.; Wan, Y.; Meade, T. J.; Chong, Y.; **Strong, M**.; Donilon, L. H.; Kayyem, J. F.; Gozin, M.; Blackburn, G. F. *Journal of the American Chemical Society*. 122: 6767-6768. (2000).

WORK EXPERIENCE

California Institute of Technology. I worked at Caltech with Suzanna Horvath on projects involving DNA and RNA synthesis applying phosphoramidite chemistry 1997-1998.

Clinical Microsensors (Motorola Biosciences). I worked with C.J. Yu on projects relating to the electronic detection of nucleic acids, for use in medical diagnostics. 1998-1999

TEACHING AND MENTORING EXPERIENCE

University of California, Los Angeles.

*Teaching Assistant, Microbiology 101L, Microbiology Laboratory Course. (2002 and 2003)
*I created a web-based genomics tutorial for the UCLA Macromolecular Structure class M253 (Fall 2003)
*I taught a database and web design tutorial for the UCLA Molecular Biology Institute (Fall 2003)
*I mentored middle school and high school students once a week at UCLA for about two years (2005-2006)

Harvard University

*Teaching Fellow. I was a teaching fellow for the 2007 Harvard iGEM team (Summer 2007)

National Jewish Health

Volunteered to teach basic Genetics concepts to students at the Kunsberg School (Summer 2010).

Volunteer Guest Scientist at East High School, Denver, CO (2012 - 2014).

Volunteer Guest Lecturer at Colorado Academy, CO (2014).

Michael Strong, Ph.D.

University of Colorado, Denver

Faculty – Computational Bioscience 7711 (2 lectures each semester) –Fall 2010, 2011, 2013

Faculty– Biological Science Program Journal Club - Fall 2010

Faculty - Computational Bioscience 7712 (2 lectures each semester) – Spring 2011, 2012, 2014

AWARDS, Grants, and Fellowships

Eppley Foundation Research Grant, PI Strong (2013)
Boettcher Webb-Waring Biomedical Research Grant, PI Strong (2013)
Colorado Bioscience Discovery Grant , PI Strong (2013)
National Jewish, Translational Research Initiative, PI Strong (2012)
CSIS Smart Global Health Essay Contest, 1st Place Essay (2010)
Jane Coffin Childs Memorial Fund For Medical Research, Postdoctoral Fellowship (2006 – 2009)
NIH National Research Service Award GM07185. (Cell and Molecular Biology Training Grant) (2003-2005)
Paul D. Boyer Outstanding Teaching Award (2003)
Amgen-MBI Dissertation Year Award (2004)
UCLA Dissertation Year Fellowship (2004)
Role Model Award (2004)
Glen T. Seaborg Poster Award (2004)
Howard Hughes Medical Institute Undergraduate Research Grant (1996)
UCSB College of Letters and Science Award for Outstanding Research (1997)
HHMI Award for Outstanding Undergraduate Research (1997)

TALKS

American Society for Microbiology Biodefense Conference (2003)
10th International Conference on Microbial Genomes (2002)
Lake Arrowhead Biological Chemistry Retreat (2002)
UCLA Bioinformatics Seminar Series (2004)
UCLA Molecular Biology Interdepartmental Retreat (2003,2004)
West Coast Protein Crystallography Conference (2005)
MIT iGEM T3 (2007)
National Jewish Health (2009)
Harvard Medical School, Dept. of Genetics (2009)
University of Colorado, Denver, Computational Bioscience Program Seminar (2010)
Colorado State University, Front Range TB meeting (2010)
Tuberculosis Trials Consortium meeting TBTC (2011)
University of Colorado, Infectious Diseases Department Grand Rounds (2012)
Front Range Mycobacteria Conference (2013)
University of Colorado, Denver, Biology Seminar Series (2013)

POSTER PRESENTATIONS

Mycobacterium tuberculosis Keystone conference (2003,2005)
TB Structural Genomics Consortium Retreat (2001, 2002, 2003)
UCLA Bioinformatics Recruitment Program (2002).
24th Annual MBI Lake Arrowhead Conference (2001)
NIH Protein Structure Initiative Workshop (2004)
12th International Conference on Microbial Genomes (2004)
1st Annual Duke Systems Biology Symposium (2006)
Harvard Medical School Genetics Retreat (2007)
New England TB Retreat at the Broad Institute (2007)
Jane Coffin Childs Annual Symposium (2007, 2008)
Pacific Symposium on Biocomputing (2011 - 2013)

COMMITTEES/ORGANIZER

UCLA Faculty Executive Committee (2003-2004 school year) Graduate Student Representative
Molecular Biology Interdepartmental Program (2003-2005) Graduate Student Representative
Biological Sciences Council (2004-2005 school year) MBI Graduate Student Representative
National Jewish Health, Integrated Center for Genes, Environment, and Health, Genetics Group Meeting Co-organizer (2010,2011)
University of Colorado, Denver, Computational Bioscience Program, Admissions Committee (2010-present)
University of Colorado, Denver, Computational Bioscience Program, Preliminary Exam Chair (2011)

MEMBERSHIPS

American Society for Microbiology
University of Colorado, Center for Global Health, Affiliate
International Society for Computational Biology