Marina E. Crowder, PhD

University of California, Davis
Department of Molecular and Cellular Biology
156 Briggs Hall, Davis, CA 95616

email: mecrowder@ucdavis.edu
phone: (916) 425 -1343

EDUCATION

Doctor of Philosophy in Biochemistry, Molecular, Cellular & Developmental Biology **June 2012**
Department of Molecular and Cellular Biology | University of California, Davis
Dissertation: "Mechanism and cell cycle regulation of cytoplasmic dynein-dependent female meiotic spindle positioning in *Caenorhabditis elegans*"

Bachelor of Science in Genetics **June 2007**
Department of Molecular and Cellular Biology | University of California, Davis
Recipient of Department Citation

TEACHING EXPERIENCE

Instructor Positions

Lecturer PSOE | University of California Davis, Davis, CA **July 2015 - Present**
Molecular and Cellular Biology Department

Adjunct Instructor | Laney Community College, Oakland, CA **Aug 2013 - May 2015**
Biology 74: Scientific Communications

- Instructor for undergraduate biomanufacturing course composed of students representing a range of academic, cultural, and socioeconomic backgrounds.
- Facilitate student acquisition of cross-disciplinary skills in verbal, written, and oral communication of scientific data and concepts using active-learning strategies that allow students to learn by practice and experience.
- Using multiple diagnostic and formative assessments to collect data on student learning gains and identifying effective teaching strategies and course areas needing improvement.

Instructor | UC Berkeley Extension, Berkeley, CA **Mar 2014 - May 2015**
X143: Genetics

- Instructor of record for online course enrolled by a diverse student population pursuing professional degrees in allied health fields.
- Guide students through course material via online communication, covering areas of Mendelian, molecular, and population genetics relating to both prokaryotes and eukaryotes.
- Collecting data on student learning to evaluate course content, activities, and assessments.

Co-Instructor | American River College, Sacramento, CA **Jan 2011 - May 2011**
BIOL 300: Foundations of Biology

- Designed lectures and assessments for non-majors introductory biology course.
- Led class sessions on biological processes and interactions occurring at the cellular, organismal, and environmental level. Regularly incorporated active learning strategies such a think-pair-shares, case studies, and peer instruction during class sessions.

Guest Lectures

Developmental Biology Lab | University of San Francisco, San Francisco, CA Aug 2014

- Developed a three-hour introductory development lab for 3rd year Biology majors and guided students through inquiry-based experiments comparing fertilization and early embryonic divisions across animal phyla.

Scientific Communication | iGEM Program, UC San Francisco, San Francisco, CA July 2014

- Led a workshop for high school students in the UCSF iGEM program focusing on critical thinking skills and approaches to analyzing primary scientific literature.

Cell Biology | Department of Biology, San Francisco State University, San Francisco, CA Apr 2014

- Delivered lecture on cell division to 150 student enrolled upper-division cell biology course that incorporated clicker questions and peer instruction.

Biotechnology | Biology Department, American River College, Sacramento, CA Mar 2011

- Delivered lecture on 'Ethics in Biotechnology' to undergraduate biotechnology course.

Teaching Assistantships and Tutoring

Graduate Teaching Assistant | Mol. & Cell Biology Department, UC Davis, CA Winter 2008
MCB 163: Developmental Genetics

- Facilitated group discussions in an upper-level course covering topics in genetic and molecular regulation of development in vertebrate and invertebrate animals.

Graduate Teaching Assistant | Mol. & Cell Biology Department, UC Davis, CA Fall 2011
MCB 160L: Principles of Genetics Laboratory

- Guided students in upper-level genetics lab and facilitated group discussions on molecular genetic concepts and problems.
- Guided laboratory experiments where students practiced skills in classic genetic and molecular techniques such as gene mapping, PCR, and recombinant DNA techniques, using model organisms ranging from fungi to plants to animals.

Undergraduate Tutor | Mol. & Cell Biology Department, UC Davis Fall 2006
MCB 160L: Principles of Genetics Laboratory

- Guided peers in learning classic genetic laboratory techniques, facilitated laboratory set-up and execution of experiments, and tutored students in genetic and molecular biology concepts.

Curriculum Development

Course Developer | Laney Community College, Oakland, CA Aug 2013 - Dec 2013
Biology 74: Scientific Communications

- Employed backward design to develop student-centered curriculum, learning outcomes, and assessments for a pilot course.
- Developed experience-based learning activities for students to acquire critical thinking, written, and verbal skills pertaining to communication of science. This included covering topics from critically analyzing primary literature, preparing and analyzing data and statistical significance, delivering oral presentations, to writing protocols, proposals, and formal reports.

Course Developer | UC Berkeley Extension, Berkeley, CA **Jun 2013 - Mar 2014**
X143: Genetics

- Developed entire curriculum, learning outcomes, course content and assessments for online genetics course covering Mendelian, molecular, population, and quantitative genetics.
- Created digital multimedia presentations, assessments, and materials using a variety of formats to engage various learning styles.

Course Developer Assistant | UC Davis, Davis, CA **Dec 2011 - Jun 2012**
MCB 160L: Principles of Genetics Laboratory

- Updated the syllabus and lab manual for upper-division genetics lab to adhere to tightened constraints on class space and equipment as well as incorporated modern genetic practices.
- Designed inquiry-based experiments that incorporate current genetic techniques using several model organisms.

Pedagogical Professional Development

An Introduction to Evidence-Based Undergraduate STEM Teaching | Coursera **Fall 2014**

- Completed a seven-week NSF-funded interactive online course on evidence-based undergraduate STEM teaching developed by the Center for the Integration of Research, Teaching, and Learning at Vanderbilt University.
- Intensively studied evidence-based effective teaching practices, undergraduate education research, and how to apply best practices to course instruction, design, and assessments.

SEPAL Teaching Square | SEPAL, San Francisco State University, CA **Fall 2014**

- Engaging in monthly peer group meetings that discuss methods for promoting equity and diversity, curriculum design, and active learning.
- Collecting evidence on teaching methods and student outcomes.

Scientific Teaching Institute | SEPAL, San Francisco State University, CA **July 2014**

- Participated in a 50-hour workshop on methods and practices of scientific teaching, with a focus on how to incorporate student-centered learning activities and promote equity and diversity in undergraduate biology courses.

Postdoc Workshop on Scientific Teaching | SEPAL, San Francisco State University, CA **Feb 2014**

- Attended a one-day intensive training workshop on teaching and assessment methods in undergraduate biology education.

Faculty Diversity Internship Program | Los Rios Community College District, CA **2010- 2011**

- Participated in a year-long faculty preparation teaching program that provided training in strategies for teaching to a diverse student body, attending to various learning styles, practicing awareness of diversity, and handling difficult classroom situations.

Teaching Service & Outreach

Panelist and Discussion Leader | Synberc Expanding Potential, UC Berkeley, CA **Nov 2014**

- Invited panelist for a one-day Synthetic Biology Engineering Research Center workshop focused on promoting women in STEM. Discussed navigating graduate school and transitioning to a

postdoc position with undergraduate and graduate students in STEM. Also facilitated discussions of undergraduate teaching in STEM as a roundtable topic leader.

Bridges to Baccalaureate Speaker | City College of San Francisco, San Francisco, CA Oct 2014

- Presented my research interests to a group of underrepresented minority community college students. Also presented on various career pathways in STEM highlighting the process of graduate school and postdoctoral research.

Career Pathways Trust Faculty Representative | Peralta Colleges, Oakland, CA 2014 - 2015

- Faculty representative on action team developing career pathway programs that bridge secondary and post-secondary institutions to achieve the goals of a $15 million dollar grant to support integrated career pathway programs in the East Bay.

Undergraduate Mentoring

Wendy Ibarra | St. Mary's College Summer 2014

- Molecular cloning, PCR, and protein purification

Owen Kemp | University of California Davis 2010 - 2011

- Cell cycle regulation of cytoskeletal motor proteins

Lisa Hammon | University of California Davis 2009 - 2010

- Meiotic spindle positioning in C. elegans

Clarissa D'Souza | University of California Davis 2009 - 2010

- Mitochondria dynamics in meiosis

Rowen Hawn | University of California Davis 2006 - 2007

- Germ line DNA damage response in C. elegans

RESEARCH EXPERIENCE

Postdoctoral Fellow | Dept. of Molecular and Cellular Biology, UC Berkeley Jun 2012 - Jun 2015
Postdoctoral Advisor: Dr. Rebecca Heald

- Investigated differences between meiotic and mitotic spindle morphology and function using the frog *Xenopus laevis* extract system.
- Applied biochemical techniques and quantitative mass-spectrometry to compare complex samples for differences in protein composition and sub-complex protein assemblies.
- Optimized assays for making embryo and egg extracts, combined immunofluorescence, immunodepletion and immunoprecipitation of spindle assembly factors to determine their roles in different cellular contexts.
- Piloted a comparative study of variation in early embryonic divisions and spindle morphology across animal phyla using comparative molecular phylogenetics and advanced imaging.

Doctoral Research | Dept. of Molecular and Cellular Biology, UC Davis Sept 2007 - Jun 2012
Dissertation Advisor: Dr. Frank McNally

- Uncovered cell cycle control of cytoskeletal mechanisms during meiotic spindle positioning in the nematode *Caenorhabditis elegans*.
- Used a combination of molecular, cellular, biochemical, and live-imaging approaches to identify mechanisms of dynein-dependent control of meiotic spindle movements in female meiosis.
- Applied biochemical and cellular techniques to identify a protein domain in the dynein/dynactin complex that controls motor function via electrostatic forces with tubulin that are regulated by phosphorylation.

Undergraduate Research | Dept. of Molecular and Cellular Biology, UC Davis Jun 2005 - Sept 2007
Advisor: Dr. JoAnne Engebrecht

- Investigated sex-specific differences of meiotic prophase progression in *C. elegans*.
- Combined classic molecular biology, genetic screens, microinjection, and imaging to uncover the timing of meiotic prophase progression in the male C. *elegans* germline and how DNA repair mechanisms influence temporal progression of meiotic S phase.

PUBLICATIONS

Peer-reviewed Research Articles

M Ellefson Crowder, JR Flynn, KP McNally, DB Cortes, KL Price, PA Kuehnert, MT Panzica, A Andaya, J Leary, and FJ McNally. (2015). Dynactin-dependent cortical dynein and spherical shape correlate temporally with meiotic spindle rotation in Caenorhabditis elegans. *Molecular Biology of the Cell*. 26: 3030-46.

M Ellefson Crowder, M Strzelecka, J Wilbur, M Good, G von Dassow, G and R Heald. (2015) A comparative analysis of spindle morphometrics across metazoans. *Current Biology*. 25: 1542-50.

KL McNally, AS Fabritius, **ML Ellefson,** JR Flynn, JA Milan, and FL McNally. (2012). Kinesin-1 prevents capture of the oocyte meiotic spindle by the sperm aster. *Developmental Cell*. 22: 788-98.

ML Ellefson and FJ McNally. 2011. CDK-1 inhibits meiotic spindle shortening and dynein-dependent spindle rotation in C. elegans. *Journal of Cell Biology*. 193: 1229-44.

KL McNally, JL Martin, **ML Ellefson,** and FJ McNally. 2010. Kinesin-dependent transport results in polarized migration of the nucleus in oocytes and inward movement of yolk granules in meiotic embryos. *Developmental Biology*. 339: 126-140.

ML Ellefson and FJ McNally. 2009. Kinesin-1 and cytoplasmic dynein act sequentially to move the meiotic spindle to the oocyte cortex in Caenorhabditis elegans. *Molecular Biology of the Cell*. 20: 2722-2730.

A Jaramillo-Lambert, **ML Ellefson**, AM Villeneuve, and J Engebrecht. 2007. Differential timing of S phases, X chromosome replication, and meiotic prophase in the *C. elegans* germ line. *Developmental Biology*. 308: 206-221.

Review

AS Fabritius, **ML Ellefson,** and FJ McNally. 2010. Nuclear and spindle positioning during oocyte meiosis. *Current Opinion Cell Biology*. 23: 1-7.

FELLOWSHIPS & AWARDS

Research Fellowships

Ruth L. Kirschstein Postdoctoral Fellowship | National Institutes of Health, UC Berkeley **2013- 2016**
Grant No: 5 F32 GM105199-02
Project: Elucidating differences between meiotic and mitotic spindles
$148,518

First Year NIH Mol. and Cell Biology Fellowship | University of California, Davis **2007- 2008**
Grant No: T32 GM007377
Project: Function of cytoplasmic dynein in meiotic spindle positioning
$39,109

Presidential Undergraduate Fellowship | University of California, Davis **2006 -2007**
Project: Timing of regulation of S phase progression in the male germline of *C. elegans*
$2,500

Scholarships & Awards

Graduate Studies Graduate Student Travel Award | University of California, Davis **2011**
Departmental Citation in Genetics | University of California, Davis **2007**
First Year Scholar Award | University of California, Davis **2006 -2007**
Northern California Scholarship | University of California, Davis **2006 -2007**
Scwab-Rosenhouse Scholarship | University of California, Davis **2006 -2007**
Maltese-American Scholarship | University of California, Davis **2006 -2007**

PRESENTATIONS

Invited Talks

Ellefson, M.L. "The Spindle Zoo: A comparative analysis of spindle features across metazoa." Department of Biology Seminar, University of San Francisco, San Francisco, CA, August 2014.

Ellefson, M.L. "The Spindle Zoo: Analyzing spindle features across species." Department of Biology Colloquium, Sonoma State University, Rohnert Park, CA, February 2014.

Ellefson, M.L.“Kinesin-1 and Cytoplasmic dynein act sequentially to move the meiotic spindle to the oocyte cortex in C. elegans." Bay Area Worm Meeting, Buck Institute for Age Research, Novato, CA, March 2009.

Conferences

M. L. Ellefson, M. Strzelecka, M. Good, J. Wilbur, G. von Dassow, R. Heald. " The Spindle Zoo: A comparative analysis variation and conservation of spindle features across metazoa." Abstract for poster presentation, UC Berkeley Annual Cell and Developmental Biology Colloquium, Granlibakken, Tahoe City, CA, September 2014.

M. L. Ellefson, J. Wilbur, R. Heald. "The Spindle Zoo: Analyzing spindle features across species." Abstract for poster presentation, American Society for Cell Biology Annual Meeting, New Orleans, LA, December 2013.

M. L. Ellefson, J. Wilbur, R. Heald. "The Spindle Zoo: Analyzing spindle features across species." Abstract for poster presentation, UC Berkeley Annual Cell and Developmental Biology Colloquium, Granlibakken, Tahoe City, CA, September 2013.

M. L. Ellefson and R. Heald. "Elucidating differences between meiotic and mitotic spindles." Abstract for poster presentation, American Society for Cell Biology Annual Meeting, San Francisco, CA, December 2012.

M.L. Ellefson, F. J. McNally. "Cell cycle regulation of dynein-dependent meiotic spindle positioning in C. elegans" Abstract for poster presentation, Gordon Research Conference: Motile and Contractile Systems, Colby-Sawyer College, New London, NH, July 2011.

M.L. Ellefson, F. J. McNally. "Cell cycle regulation of dynein-dependent meiotic spindle positioning in C. elegans." Abstract for symposium talk, Annual Biochemistry and Molecular Biology Colloquium, UC Davis, Davis, CA, September 2010.

M.L. Ellefson, F. J. McNally. "Kinesin-1 and Cytoplasmic dynein act sequentially to move the meiotic spindle to the oocyte cortex in *C. elegans."* Abstract for poster presentation, Gordon Research Conference: Motile and Contractile Systems, Colby-Sawyer College, New London, NH, July 2009.

M. L. Ellefson, F. J. McNally. "Kinesin-1 and Cytoplasmic dynein act sequentially to move the meiotic spindle to the oocyte cortex in *C. elegans*." Abstract for poster presentation, Annual Biochemistry and Molecular Biology Colloquium, UC Davis, Davis, CA, September 2009.

M. L. Ellefson, F. J. McNally. "Cytoplasmic dynein is required for proper positioning of the meiotic spindle in *C. elegans*." Abstract for poster presentation, American Society for Cell Biology Annual Meeting, San Francisco, CA, December 2008.

M. L. Ellefson, F. J. McNally. "Cytoplasmic dynein is required for proper positioning of the meiotic spindle. *C. elegans."* Abstract for poster presentation, Development and Evolution Meeting, University of Wisconsin-Madison, Madison, WI, June 2008.

M. L. Ellefson, J. Engebrecht. "Analysis of meiotic progression and DNA replication in the germline of *C. elegans."* Abstract for symposium talk, 18th Annual Undergraduate Research Conference, UC Davis, Davis, CA, April 2007.

PROFESSIONAL MEMBERSHIPS

Society for the Advancement of Biology Education Research, **2007 - present**
National Science Teachers Association, **2012 - present**
Golden Key International Honor Society, **2008 - present**
American Society for Cell Biology, **2007 - present**
