

ELIZABETH H. KELLOGG

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Positions

2019 – present Cornell University, Ithaca, NY
Molecular Biology and Genetics
Assistant Professor

Education

2013-2018 University of California, Berkeley
Molecular Biophysics and Integrated Bio-imaging
Advisor: Dr. Eva Nogales

2012 University of Washington Ph.D.
Biochemistry
Thesis Title: “Assessing and Improving Computational Models of Protein
Thermodynamics and Kinetics using Rosetta”
Advisor: Dr. David Baker

2006 University of California, Berkeley B.S., *summa cum laude*
Bioengineering

Funding

01/2019 R00 Pathway to Independence Award
10/2017 K99 Pathway to Independence Award
06/2016-12/2017 Burroughs Wellcome Fund Collaborative Research Travel Grant

Selected Awards and Honors

2020 Biophysical Society Cryo-EM subgroup Program Co-Chair
2019 Sumner Lecture Organizing Committee
2014 Session Chair “Rosetta and Structural Biology”, Rosetta-Conference
2006 UC Berkeley Bioengineering Department Award Winner
Significance: Top honor bestowed on one Bioengineering graduate per year

Publications

Citations (since 2014): 1361

1. Ghanim G. *, **Kellogg EH.***,# , Nogales E., and Rio DC. # “Cryo-EM structure of the P element transposase strand transfer complex” *Under review*
* equal contribution
co-corresponding authors
Significance: Cryo-EM structure of the historically important P element transposase reveals the structural basis underlying its unique transposition mechanism.
2. **Kellogg EH.***, Hejab N*, Poepsel S., Downing KH, Dimaio F., and Nogales E. “Near-atomic cryo-EM reconstruction of microtubule-tau interactions” *Science* 360(6394):1242-46, June 2018

Significance: First high-resolution (3.5 Å) cryo-EM structure of tau reveals details of MT-tau interactions and explains discrepancies in biochemical data as well as reveals structural mechanism of tau-mediated tubulin stabilization.

3. Nogales E., and **Kellogg EH**. “Challenges and opportunities in the high-resolution cryo-EM visualization of microtubules and their binding partners” *Curr. Op. Struct. Biol.* 46:65-70, October 2017
4. Howes SC., Geyer E., LaFrance BJ., Zhang R., **Kellogg EH**., Westermann S., Rice L., and Nogales E., “Structural and functional differences between yeast and mammalian microtubules revealed by cryo-EM” *Journal of Cell Biology* DOI: 10.1083/jcb.201612195, June 2017
5. **Kellogg EH***, Hejab N.* , Howes S., Northcote P., Miller JH., Diaz FJ., Downing KH. and Nogales E. “Insights into the distinct mechanisms of action of taxane and non-taxane microtubule stabilizers from cryo-EM structures” *Journal of Molecular Biology* 429 (5):633-646, March 2017

Significance: Multiple stabilizing chemotherapeutic drugs are studied in the context of the microtubule lattice and are found to have distinct structural effects, therefore, distinct mechanisms of action.

Impact:

- a. Selected for March 2017 JMB cover volume 429 issue 5.
6. **Kellogg EH***, Howes S.* , Ti SH., Kapoor T., Chacon P., and Nogales E. “Near-atomic cryo-EM structure of PRC1 bound to the microtubule” *PNAS* 113(34):9430-9, August 2016

Significance: Atomic structure of PRC1 on the microtubule elucidates how PRC1 selectively cross-links antiparallel microtubules and identifies novel function of PRC1 in microtubule stabilization.

Impact:

- a. Research highlight in FEBs letter, September 2016. *doi: 10.1111/febs.13838*
7. Alushin GM.* , Lander GC.* , **Kellogg EH***, Zhang R., Baker D., Nogales E. “High-resolution microtubule structures reveal the structural transitions in $\alpha\beta$ -tubulin upon GTP hydrolysis” *Cell* 157(5):1117-29, May 2014

Significance: The first high-resolution cryo-EM reconstruction of microtubules in different nucleotide states enable atomic flexible-fitting of tubulin to describe, at a detailed level, how nucleotide-hydrolysis induces strain in the microtubule lattice and how chemotherapy drug Taxol relieves this strain.

Impact:

- a. Highlighted by LBNL newscenter, May 2014. <http://bit.ly/2pv1pR2>
- b. Highlighted by Berkeley newscenter, May 2014. <http://bit.ly/2puPRNI>
- c. Highlighted in Cell, May 2014. *doi: 10.1016/j.cell.2014.05.001*
8. Leaver-Fay A., O’Meara M., Tyka M., Jacak R., Song Y., **Kellogg EH**, Thompson J., Davis I., Pache R., Kortemme T., Lyskov S., Gray J., Snoeyink J., Baker D., Kuhlman B. “Scientific Benchmarks for Updating the Rosetta Energy Function” *Methods Enzymol.* 523:109-43, July 2013

9. **Kellogg EH**, Lange OF., Baker D., “Evaluation and optimization of discrete state models of protein folding” *Journal of Physical Chemistry B*. 116(37):11405-13, September 2012
 10. Liu Y., **Kellogg EH**, Liang H. “Canonical and Micro-canonical Analysis of Folding of Trpzip2: An All-atom Replica Exchange Monte-carlo Simulation Study” *Journal of Chemical Physics*. 137(4):045103, July 2012
 11. **Kellogg EH**, Leaver-Fay A., Baker D., “Role of conformational sampling in computing mutation-induced changes in protein structure and stability” *Proteins: Structure, Function, Bioinformatics*. 29(3):830-8, March 2011
- Significance:** The first computational method in Rosetta to incorporate backbone refinement in order to improve thermodynamic predictions of protein stability with respect to sequence changes.
12. Fowler DM., Araya CL., Fleishman SJ., **Kellogg EH.**, Stephany JJ., Baker D., Fields S. “High-Resolution Mapping of Protein Sequence-Function Relationships” *Nature Methods*. 7(9):741-6, September 2010
 13. Jung HS, Okegawa Y., Shih PM., **Kellogg EH**, Abdel-Ghany SE., Pilon M., Sjolander D., Shikanai T., Niyogi K., “Aradopsis Thaliana PGR7 Encodes a Conserved Chloroplast Protein that is Necessary for Efficient Photosynthetic Electron Transport” *PloS One* 5(7):e11688, July 2010
 14. Leung CC., **Kellogg EH.**, Kuhnert A., Hanel D., Baker D., Glover JN., “Insights from the Crystal Structure of the Sixth BRCT Domain of Topoisomerase IIBeta Binding Protein 1” *Proteins: Structure, Function, Bioinformatics*. 19(1):162-7, Jan 2010
 15. Raman S., Vernon R., Thompson J., Tyka M., Sadreyev R., Pei J., Kim D., **Kellogg EH.**, DiMaio F., Lange O., Kinch L., Sheffler W., Kim B, Das R., Grishin N., Baker D. “Structure Prediction for CASP8 with All-Atom Refinement using Rosetta” *Proteins: Structure, Function, Bioinformatics*. 77(S9):89-99, Jul 2009

* indicates co-first author

Talks, Workshops, and Conferences

2019 Invited Speaker “Cryo-EM structure of the P-element transposase strand transfer complex” Microscopy and Microanalysis, Portland OR, August 4-8

Invited Speaker “Cryo-EM structure of the P-element transposase strand transfer complex” 3DEM GRC, Hong Kong, June 9-14

Invited Speaker “When life gives you lemons: Cryo-EM of difficult and heterogeneous samples” Cornell University, April 11th

Invited Speaker “When life gives you lemons: Cryo-EM of difficult and heterogeneous samples” Columbia University, April 10th

Invited Speaker “Cryo-EM structure of the P-element transposase strand transfer complex” ASBMB, Orlando FL, April 7-10

2018 Invited speaker “Near-atomic model of microtubule-tau interactions” ASCB, San Diego, CA, December 8-12

Poster Presenter “Cryo-EM structure of the P element transposase” CSHL Meeting on Transposable Elements, November 1-4

Poster Presenter “Near-atomic model of microtubule-tau interactions” 3DEM GRC, Newport RI, June 3-8

Invited speaker “Towards a high-resolution structure of the P element transposase” Keystone Symposia on Mobile Genetic Elements and Genome Plasticity, Santa Fe, NM February 11-15

2017 Poster Presenter “Cryo-EM Structure of Microtubule-bound Tau”, Understanding Biology Through Structure Symposium, Santa Fe, NM May 13-17

2016 Poster Presenter “Near-atomic cryo-EM structural studies of microtubules, microtubule-stabilizers, and microtubule-associated proteins” ASCB, San Francisco CA, December 2-6

2015 Invited Speaker “Near-atomic cryo-EM structural studies of microtubule stabilizers and microtubule-associated proteins” Bay area cryo-EM meeting, UC Berkeley, December 4

Poster Presenter “Microtubule-associated proteins and Microtubule-stabilizing drugs: how they recognize and affect microtubule structure” HHMI conference, Bethesda Maryland, November 1-3

Invited Speaker “Insights into the stabilizing mechanism of microtubule-targeting agents at near-atomic resolution using cryo-EM” Gordon Research Conference 3D EM, New London NH, June 21-26

Student invited Speaker “High-resolution cryo-EM studies of microtubule-stabilizing agents”, Louisiana state university, Baton Rouge LA, May 13

2014 Invited Speaker, “Combining High-Resolution Cryo-EM Rosetta to Study the Effect of Taxol on the Microtubule Lattice”, Rosetta Conference, Leavenworth Washington, August 1

Invited Speaker “Studying the Structural Origins of Microtubule Dynamic Instability through Combining Computational Modeling and CryoEM” MCB retreat, Asilomar CA, Jan 12-14

2013 Invited Speaker, “Studying the Structural Origins of Microtubule Dynamic Instability through Combining Computational Modeling and CryoEM”, Theoretical and Computational Biophysics Group, University of Illinois, Urbana-Champaign Illinois, August 22

Poster Presenter “Studying the structural origins of microtubule dynamic instability through computational modeling and cryoEM”, GRC 3D EM, New London NH, June 23-28

2012 Poster Presenter “Evaluation and optimization of discrete state models of protein folding” Protein Society Meeting, San Diego CA, August 5 – 8

2009 Invited Speaker, “Predicting $\Delta\Delta G$ ”, Rosetta Conference, Leavenworth WA, August 1

Teaching and Other Activities

2013-current Biophysical Society, member

2016-2017

American Society of Cell Biology, member