

CURRICULUM VITAE- Eric C. Lai, Ph. D.

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Education

- 1999 Ph. D. in Biology, University of California at San Diego
1993 B. A., *magna cum laude* in Biochemistry, Harvard University

Research and Professional Experience

- 2005-present Assistant Member, Department of Developmental Biology
Memorial Sloan-Kettering Cancer Center, New York, NY
- 2005-present Assistant Professor, Program in Cell Biology and Genetics
Weill Cornell Medical School, New York, NY
- 1999-2005 Postdoctoral fellow, HHMI/Department of Molecular and Cell Biology
University of California at Berkeley, Berkeley, CA
1. "Regulation of the Notch pathway by ubiquitin ligases"
2. "Genomewide analysis of *Drosophila* microRNA function"
Dr. Gerald M. Rubin, postdoctoral advisor
- 1993-1999 Predoctoral fellow, Department of Biology
University of California at San Diego, La Jolla, CA
"Pattern formation during *Drosophila* sensory organ development"
Dr. James W. Posakony, graduate thesis advisor
- 1992-1993 Undergraduate thesis research, Department of Molecular Biology
Massachusetts General Hospital/Harvard Medical School, Boston, MA
"Spatial expression of *ceh-20*, a *C. elegans* PBX-class homeobox gene"
Dr. Gary Ruvkun, undergraduate thesis advisor

Selected Awards and Fellowships

- 2009 Louise and Allston Boyer Young Investigator Award for Basic Research
2008 New York Academy of Sciences-Blavatnik Award for Young Scientists, Finalist
2007 Alfred W. Bressler Scholar
2007-2009 Kimmel Scholar of the Sidney Kimmel Foundation for Cancer Research
2006-2008 V Scholar of the V Foundation for Cancer Research
2005 Career Award in the Biomedical Sciences, Burroughs Wellcome Fund
2004-2006 Special Fellow of the Leukemia and Lymphoma Society
2000-2003 Fellow of the Damon Runyon Cancer Research Foundation
2000 Fellow of the Jane Coffin Childs Memorial Fund for Medical Research (declined)
2000 Larry Sandler Memorial Award for *Drosophila* Research, Finalist
1993-1999 Fellow of the Lucille P. Markey Charitable Trust
1993 Phi Beta Kappa, Harvard College
1991 John Harvard Scholarship
1989 National Merit Scholarship

Research Articles

- (1) Leviten, M. W., **E. C. Lai**, and J. W. Posakony (1997). The *Drosophila* gene *Bearded* encodes a novel small protein and shares 3' UTR sequence motifs with multiple *Enhancer of split* Complex genes. *Development* **124**: 4039-4051.
- (2) **Lai, E. C.** and J. W. Posakony (1997). The Bearded box, a novel 3' UTR sequence motif, mediates negative post-transcriptional regulation of *Bearded* and *Enhancer of split* Complex gene expression. *Development* **124**: 4847-4856. (**January cover**).
- (3) **Lai, E. C.** and J. W. Posakony (1998). Regulation of *Drosophila* neurogenesis by RNA:RNA duplexes? *Cell* **93**: 1103-1104.
- (4) **Lai, E. C.**, C. Burks, and J. W. Posakony (1998). The K box, a conserved 3' UTR sequence motif, negatively regulates accumulation of *Enhancer of split* Complex transcripts. *Development* **125**: 4077-4088.
- (5) Nellesen, D. T., **Lai, E. C.**, and J. W. Posakony (1999). Discrete enhancer elements mediate selective responsiveness of *Enhancer of split* Complex genes to common transcriptional activators. *Developmental Biology* **213**: 33-53.
- (6) **Lai, E. C.***, R. Bodner*, J. Kavalier, G. Freschi, and J. W. Posakony (2000). Antagonism of Notch signaling activity by members of a novel protein family encoded by the *Bearded* and *Enhancer of split* gene complexes. *Development* **127**: 291-306. (**Cover**).
- (7) **Lai, E. C.**, R. Bodner and J. W. Posakony (2000). The *Enhancer of split* Complex includes four Notch-regulated members of the Bearded gene family. *Development* **127**: 3441-3455.
- (8) **Lai, E. C.** and G. M. Rubin (2001). *neuralized* functions cell-autonomously to regulate a subset of Notch-dependent processes during adult *Drosophila* development. *Developmental Biology* **231**: 217-233. (**Cover**).
- (9) **Lai, E. C.** and G. M. Rubin (2001). *neuralized* is essential for a subset of Notch pathway-dependent cell fate decisions during *Drosophila* eye development. *Proc. Natl. Acad. Sci. USA*. **98**: 5637-5642. (**Cover**).
- (10) **Lai, E. C.**, G. A. Deblandre, C. Kintner and G. M. Rubin (2001). *Drosophila* Neuralized is a ubiquitin ligase that promotes internalization and degradation of Delta. *Developmental Cell* **1**: 783-794. (**Faculty of 1000 selection**).
- (11) Deblandre, G. A., **E. C. Lai** and C. Kintner (2001). *Xenopus* Neuralized is a ubiquitin ligase that interacts with X-Delta1 and regulates Notch signaling. *Developmental Cell* **1**: 795-806. (**Faculty of 1000 selection**).
- (12) **Lai, E. C.** (2002). microRNAs are complementary to 3' UTR sequence motifs that mediate negative post-transcriptional regulation. *Nature Genetics* **30**: 363-364. (**Highlighted by the Scientist**, 3[1]).
- (13) **Lai, E. C.** (2003). *Drosophila* *Tufted* is a gain-of-function allele of the proneural gene *amos*. *Genetics* **163**: 1413-1425. (**Faculty of 1000 selection**).
- (14) **Lai, E. C.***, P. Tomancak*, R. Williams and G. M. Rubin (2003). Computational identification of *Drosophila* microRNA genes. *Genome Biology* **4**:R42.1-R42.20. (**Sept cover**) (*, equal contribution).
- (15) **Lai, E. C.**, C. Wiel and G. M. Rubin (2004). Complementary miRNA pairs suggest a regulatory role for miRNA:miRNA duplexes. *RNA* **10**:171-175. (**Faculty of 1000 selection**).
- (16) Hu, H., M. Li, J.-P. Labrador, J. McEwen, **E. C. Lai**, C. S. Goodman and G. J. Bashaw (2005). Cross GTPase-activating protein (CrossGAP)/Vilse links the Roundabout receptor to Rac to regulate midline repulsion. *Proc. Natl. Acad. Sci. USA* **102**: 4613-4618.
- (17) **Lai, E. C.**, F. Roegiers, X. Qin, Y. N. Jan and G. M. Rubin (2005). The ubiquitin ligase *Drosophila* Mind Bomb promotes Notch signaling by regulating the localization and activity of Serrate and Delta. *Development* **132**: 2319-2332 (**May cover**).

- (18) **Lai, E. C.**, B. Tam and G. M. Rubin (2005). Pervasive regulation of *Drosophila* Notch target genes by GY box-, Brd box- and K box-class microRNAs. *Genes and Development* **19**: 1067-1080. (Highlighted in *Nature Reviews Genetics* **6**: 519).
- (19) Aboobaker, A., P. Tomancak, N. Patel, G. M. Rubin and **E. C. Lai** (2005). *Drosophila* microRNAs exhibit diverse spatial expression patterns during embryonic development. *Proc. Natl. Acad. Sci. USA* **102**: 18017-18022.
- (20) Ronshaugen, M, F. Biemar, J. Piel, M. Levine and **E. C. Lai** (2005). The *Drosophila* microRNA iab-4 causes a dominant transformation of halteres into wings. *Genes and Development* **19**: 2947-2952. (Highlighted in *Bioessays*, **28**: 445-448).
- (21) Okamura K., J. W. Hagen, H. Duan, D. Tyler and **E. C. Lai** (2007). The mirtron pathway generates microRNA-like regulatory RNAs in *Drosophila*. *Cell* **130**: 89-100. (Highlighted in *Nature Reviews Molecular Cell Biology* **8**: 597).
- (22) Berezikov, E. W.-J. Chung, J. A. Willis, E. Cuppen and **E. C. Lai** (2007). Mammalian mirtron genes. *Molecular Cell* **28**:328-336. (Highlighted in *Developmental Cell* **13**: 605-607).
- (23) Ruby G.J., A. Stark, W. Johnston, M. Kellis, D. P. Bartel and **E. C. Lai** (2007). Evolution, biogenesis, expression, and target predictions of a substantially expanded set of *Drosophila* microRNAs. *Genome Research* **17**: 1850-1864.
- (24) Silver, S., J. W. Hagen, K. Okamura, N. Perrimon and **E. C. Lai** (2007). Functional screening identifies miR-315 as a potent activator of Wingless signaling. *Proc. Natl. Acad. Sci. USA* **104**: 18151-18156. (Faculty of 1000 selection).
- (25) Stark, A., M. F. Lin, P. Kheradpour, J. S. Pedersen, L. Parts, J. W. Carlson, M. A. Crosby, M. D. Rasmussen, S. Roy, A. N. Deoras, J. G. Ruby, J. Brennecke, Harvard FlyBase curators, Berkeley *Drosophila* Genome Project, E. Hodges, A. S. Hinrichs, A. Caspi, B. Paten, S.-W. Park, M. V. Han, M. L. Maeder, B. J. Polansky, B. E. Robson, S. Aerts, J. van Helden, B. Hassan, D. G. Gilbert, D. A. Eastman, M. Rice, M. Weir, M. W. Hahn, Y. Park, C. N. Dewey, L. Pachter, W. J. Kent, D. Haussler, **E. C. Lai**, D. P. Bartel, G. J. Hannon, T. C. Kaufman, M. B. Eisen, A. G. Clark, D. Smith, S. E. Celniker, W. M. Gelbart and M. Kellis (2007). Discovery of functional elements in 12 *Drosophila* genomes using evolutionary signatures. *Nature*, 450: 219-232. (Highlighted in *Nature* **450**: 184-185).
- (26) Chou, Y.-T., B. Tam, F. Linay and **E. C. Lai**. (2007) Transgenic inhibitors of RNA interference in *Drosophila*. *Fly* **1**: 311-316.
- (27) Tyler, D. M., K. Okamura, W.-J. Chung, J. W. Hagen, E. Berezikov, G. J. Hannon and **E. C. Lai** (2008). Functionally distinct regulatory RNAs generated by bidirectional transcription and processing of microRNA loci. *Genes and Development* **22**: 26-36. (Highlighted in *Nature Reviews Genetics* **9**: 84 and *BioEssays* **30**:1058-1061).
- (28) Cayirlioglu, P., I. G. Kadow, X. Zhan, K. Okamura, G. Suh, D. Gunning, **E. C. Lai**, and S. L. Zipursky (2008). Hybrid neurons in a microRNA mutant are putative evolutionary intermediates in insect CO₂ sensory systems. *Science*, **319**: 1256-1260. (Highlighted in *Bioessays* **30**: 621-623).
- (29) Okamura, K., M. D. Phillips, D. Tyler, H. Duan, Y.-T. Chou and **E. C. Lai** (2008). microRNA* species have substantial influence on regulatory networks. *Nature Structural and Molecular Biology* **15**: 354-363. (Selected as *NSMB Article of the month*).
- (30) Okamura, K., W.-J. Chung, J. G. Ruby, H. Guo, D. P. Bartel and **E. C. Lai** (2008). The *Drosophila* hairpin RNA pathway generates endogenous siRNAs. *Nature*, **453**: 803-806. (Highlighted in *Science* **320**: 1023-1024, *Nature Reviews Molecular Cell Biology* **9**: 426, *Nature Structural and Molecular Biology* **15**: 546-547, *Cell* **133**: 747-748 and *Nature* **453**: 729-731).
- (31) Chung, W.-J., K. Okamura, R. Martin and **E. C. Lai** (2008). Endogenous RNA interference provides a somatic defense against *Drosophila* transposons. *Current Biology* **18**: 795-802. (Full Article and Featured Article of its issue). (Highlighted in *Nature Reviews Molecular Cell Biology* **9**: 426 and *Current Biology* **18**: R561-R563).
- (32) Okamura, K., S. Balla, R. Martin, N. Liu and **E. C. Lai** (2008). Two distinct mechanisms generate endogenous siRNAs from bidirectional transcription in *Drosophila*. *Nature Structural and*

Molecular Biology **15**: 581-590. (Highlighted in *Nature Structural and Molecular Biology* **15**: 546-547 and *Nature* **453**: 729-731).

(33) Martin, R., P. Smibert, A. Yalcin, D. M. Tyler, U. Schaefer, T. Tuschl and **E. C. Lai** (2009). A *Drosophila pasha* mutant distinguishes the canonical miRNA and mirtron pathways. *Molecular and Cellular Biology* **29**: 861-870.

(34) Flynt, A. S., N. Liu, R. Martin and **E. C. Lai** (2009). Dicing of viral replication intermediates during silencing of latent *Drosophila* viruses. *Proc. Natl. Acad. Sci. USA*, in press.

Review Articles and Book Chapters

(1) **Lai, E. C.** (2002). Protein degradation: Four E3s for the Notch pathway. *Current Biology* **12**: R74-78.

(2) **Lai, E. C.** (2002). Notch cleavage: Nicastrin helps Presenilin make the final cut. *Current Biology* **12**: R200-202.

(3) **Lai, E. C.** (2002). Keeping a good pathway down: Transcriptional repression of Notch pathway target genes by CSL proteins. *EMBO Reports* **3**: 840-845. (**Cover**).

(4) **Lai, E. C.** (2002). Developmental signaling: shrimp and strawberries help flies make cones. *Current Biology* **12**: R722-R724.

(5) **Lai, E. C.** (2003). RNA sensors and riboswitches: self-regulating messages. *Current Biology* **13**: R285-291.

(6) **Lai, E. C.** (2003). Lipid rafts make for slippery platforms. *Journal of Cell Biology* **162**: 365-370.

(7) **Lai, E. C.** (2003) MicroRNAs: Runts of the genome assert themselves. *Current Biology* **13**: R925-R936.

(8) **Lai, E. C.** (2004). Notch signaling: control of cell communication and cell fate. *Development* **131**: 965-973.

(9) **Lai, E. C.** and V. Orgogozo (2004). A hidden program in *Drosophila* peripheral neurogenesis revealed: fundamental principles underlying sensory organ diversity. *Developmental Biology* **269**: 1-17.

(10) **Lai, E. C.** (2004). Predicting and validating microRNA targets. *Genome Biology* **5**: 115-121.

(11) Lau, N. and **E. C. Lai** (2005). Diverse roles for RNA in gene regulation. *Genome Biology* **6**: 315-319.

(12) **Lai, E. C.** (2005). miRNAs: Whys and wherefores of miRNA-mediated regulation. *Current Biology* **15**: R458-R460.

(13) Hagen, J. W. and **E. C. Lai** (2008). Seeing is believing: strategies for studying microRNA expression. In "microRNAs: From Basic Science to Disease Biology", ed. K. Drappasani. Cambridge University Press, Cambridge, UK.

(14) Hagen, J. W. and **E. C. Lai** (2008). microRNA control of cell-cell signaling during development and disease. *Cell Cycle* **7**: 2327-2332.

(15) Smibert, P. and **E. C. Lai** (2008). Lessons from microRNA mutants in worms, flies and mice. *Cell Cycle* **7**: 2500-2508.

(16) Okamura, K. and **E. C. Lai** (2008). Endogenous small interfering RNAs in animals. *Nature Reviews Molecular Cell Biology* **9**: 673-678.

(17) Okamura, K. and **E. C. Lai** (2008). The long and short of inverted repeat genes in animals: microRNAs, mirtrons and hairpin RNAs. *Cell Cycle*, **7**: 1-6.

(18) Liu, N., K. Okamura, D. M. Tyler, M. D. Phillips, W.-J. Chung and **E. C. Lai** (2008). The evolution and functional diversification of animal microRNA genes. *Cell Research* **10**: 985-996. (**Featured Article**).

(19) Flynt, A. S. and **E. C. Lai** (2008). Principles of microRNA-mediated regulation: shared themes amid diversity. *Nature Reviews Genetics* **9**: 831-842. (**Featured Article** of its issue).

Oral Presentations at Major Symposia (since 2005)

- Keystone Symposium: RNA in Gene Regulation** (January 2005), Breckenridge, CO: "Pervasive regulation of *Drosophila* Notch target genes by multiple families of microRNAs"
- 46th Annual *Drosophila* Research Conference** (March-April 2005), San Diego, CA: "The ubiquitin ligase Mind Bomb promotes Notch signaling by regulating the localization and activity of Serrate and Delta".
- Small but powerful: The regulatory roles of non-coding RNAs** (September 2005), Villars, Switzerland. "Discovery and functional characterization of *Drosophila* microRNAs".
- Keystone Symposium: RNAi and Related Pathways** (January 2006) Vancouver, Canada: "The *Drosophila* microRNA iab-4-5p has homeotic activity and directly represses Ultrabithorax."
- The Genome Conference** (February 2006), Lorne, Australia. "Diverse roles for microRNAs during *Drosophila* development".
- 47th Annual *Drosophila* Research Conference** (March-April 2006), Houston, TX: "The *Drosophila* microRNA iab-4-5p has homeotic activity and directly represses Ultrabithorax."
- 15th International Workshop on the Molecular and Developmental Biology of *Drosophila*** (June 2006), Crete, Greece: "Drosophila microRNAs: from genes to functions."
- 11th Annual SCBA International Symposium** (July 2006), San Francisco, CA: "MicroRNAs in *Drosophila* development."
- Keystone Symposium: MicroRNAs and siRNAs: Biological Functions and Mechanisms** (January 2007), Keystone, CO. "Regulation of Wingless signaling by *Drosophila* miR-315".
- 48th Annual *Drosophila* Research Conference** (March 2007), Philadelphia, PA, *ibid.*
- Society of Developmental Biology, Northeast Regional Meeting** (April 2007), Woods Hole, MA. "MicroRNAs in flies".
- 2nd MicroSymposium on Small RNAs** (May 2007), Vienna, Austria, *ibid.*
- Small RNAs in Development, Immunology and Cancer** (October 2007) New York, NY. "Small RNA pathways in *Drosophila*."
- Expanding the Genetic toolkit for *Drosophila*** (October 2007) Janelia Farm, VA, *ibid.*
- RNAi, MicroRNA, and Non-Coding RNA, Keystone Symposium** (March 2008), Whistler Resort, British Columbia, Canada. "The *Drosophila* hairpin RNA pathway generates endogenous siRNAs."
- 49th Annual *Drosophila* Research Conference** (April 2008), San Diego, CA. modENCODE workshop.
- Small RNAs: Biology and Technology** (June 2008) IRIC Montreal, QC, Canada. Plenary speaker.
- Computational Systems Biology 2008** (August 2008) Stanford, CA. Plenary speaker.
- 9th International Congress on Cell Biology** (October 2008) Seoul, Korea. Plenary speaker.
- International Symposium on Molecular Biology: RNA & Diseases** (October 2008) Dankook University, Yongin, Korea. Plenary speaker.
- Keystone Symposium: The Biology of RNA Silencing** (April 2009) Victoria, Canada. "Sorting of *Drosophila* microRNA* strands to Argonaute2".
- 50th Annual *Drosophila* Research Conference** (April 2009) Chicago, IL. modENCODE workshop.
- Keystone Symposium: MicroRNA and Cancer** (June 2009), Keystone, CO. Plenary speaker.
- 42nd Meeting of the Society for the Study of Reproduction** (July 2009), Pittsburgh, PA. Plenary speaker.

Invited Lectures (since 2005)

2005 European Molecular Biological Laboratories, Heidelberg Germany
2005 Baylor College of Medicine, Houston TX
2006 Fox Chase Cancer Center, Philadelphia PA
2006 New York Academy of Sciences, New York City NY
2006 Skirball Institute, New York City NY
2006 University of Vermont, Burlington VA
2007 University of Maryland Biotechnology Institute, College Park MD
2007 Johns Hopkins University, Baltimore MD
2007 Yale University, New Haven CT
2007 Oregon State University, Corvallis OR
2007 University of Oregon, Eugene OR
2008 University of Texas at Southwestern Medical School, Dallas TX
2008 Emory University, Atlanta GA
2008 Mount Sinai School of Medicine, New York City NY
2008 New York University, New York City NY
2008 University of Washington, Seattle WA
2008 Seoul National University, Seoul Korea
2008 Korea Advanced Institute of Science and Technology, Daejeon Korea
2008 Duke University, Durham NC
2009 Purdue University, West Lafayette IN
2009 Indiana University, Bloomington IN
2009 University of California, Berkeley CA
2009 Columbia University Medical Center, New York City, NY
2010 Colorado University, Boulder CO

Academic Service

ad hoc reviewer for *Developmental Cell*, *Molecular Cell*, *Current Biology*, *Science*, *Nature*, *Nature Genetics*, *Nature Protocols*, *Nature Structural Molecular Biology*, *Nature Reviews Molecular Biology*, *Development*, *Developmental Biology*, *Molecular and Cellular Biology*, *RNA*, *PLoS Biology*, *PLoS Genetics*, *PLoS Computational Biology*, *Proceedings of the National Academy of Sciences*, *Genome Biology*, *BMC Bioinformatics*, *FEBS Letters*, *BBA Gene Regulatory Mechanisms*, etc.

October 2006 NIMH study section, *ad hoc* member
"Implicating noncoding RNAs in the Genetics of Mental Disorders"

February 2007 NIH study section, *ad hoc* member
GCAT - Genomics, Computational Biology and Technology

New York Academy of Sciences, RNAi Discussion Group, Committee co-chair. (2005-present)