Mia T. Levine, PhD

Department of Biology and Epigenetics Institute

University of Pennsylvania

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**Education**

PhD Molecular Population Genetics, University of California, Davis 2009

MSc Ecology and Evolution, University of Illinois, Champaign 2003

BA Biology *with honors*, University of Pennsylvania, 1999

 *magna cum laude*

**Professional Experience**

Assistant Professor of Biology, Univ. of Pennsylvania, Philadelphia, PA 2015-

Member, Penn Epigenetics Institute, Philadelphia, PA 2015-

Postdoctoral Fellow, Fred Hutchinson Cancer Research Center, Seattle, WA 2009-15

Advisor: Harmit Malik (*Evolutionary cell biology)*

*Causes and functional consequences of chromatin protein evolution*

Biocomplexity Outreach Coordinator, Smithsonian, Edgewater, MD 2000-01

*Curriculum development for Belizean teachers* *on mangrove conservation*

Science Education Intern, NSF ACCESS Science, Univ. of Pennsylvania 2000

*Curriculum development, science teaching at Lee Elementary School*

**Awards and Fellowships**

SMBE Allan Wilson Junior Award for Independent Research 2017

Forbeck Scholar Award, **William Guy Forbeck Research Foundation** 2016-20

NIH K99 Pathway to Independence Award 2013-15

NIH Ruth L. Kirschstein NRSA Postdoctoral Fellowship 2011-13

Genetics Society of America DeLill Nasser Award 2010

Dissertation Year Fellowship, University of California, Davis 2008-09

NSF Pre-doctoral Graduate Research Fellowship 2003-06

**Current External Funding**

**GM124684-01 NIH/NIGMS R35 Maximizing Individual Researchers’** 09/2017- 22

**Award for Early Stage Investigators**

“Causes and functional consequences of chromatin evolution”

Role: PI

**Completed Funding**

**1KR00GM107351 NIH/NIGMS R00**  09/15-06/18

“Evolutionary and functional diversification of chromatin proteins”

Role: PI

**DEB0806205 NSF/DEB Dissertation Improvement Grant** 07/08-06/09

“Functional consequences of adaptive variation at chromatin remodeling genes”

Role: co-PI

**Pending Funding**

**University Research Fund,** University of Pennsylvania

*Epigenetic regulation of reproductive arrest*

Role: PI (with co-PI, Paul Schmidt)

**Refereed Publications**

at Penn:

Saint-Leandre, B., Nguyen, SB., and **M.T. Levine**. (*under review*). Diversification and collapse of a telomere elongation mechanism. bioRxiv doi: 10.1101/445429.

Helleu, Q. and **M.T. Levine** (2018) Recurrent amplification of the Heterochromatin Protein 1 (HP1) gene family across Diptera. *Molecular Biology and Evolution.* 35: 2375-2389.

Lee, Y.C.G., Leek, C., and **M. T. Levine** (2017)Recurrent innovation at genes required for telomere integrity in Drosophila. *Molecular Biology and Evolution*. 34: 467-482.

pre-Penn:

**Levine, M.T**., Vander Wende, H., Hseih, E., Baker E., and H.S. Malik (2016) Recurrent gene duplication diversifies genome defense repertoire in Drosophila. *Molecular Biology and Evolution.* 33:1641-53.

**Levine, M.T.,** Vander Wende, H., and H.S. Malik (2015) Mitotic fidelity requires transgenerational action of a testis-restricted HP1. *eLife* **4**: e07378.

***Additional coverage:***

“Biparental control in remodeling sperm” *Science* 7 August 2015: Vol. 349

no. 6248 p. 599

“Transgenerational remodelling of sperm DNA” *Nature Reviews Molecular Cell Biology* 23 July 2015 Vol. 16, no. 453

“Reprogramming sperm DNA” (Interview) The Naked Scientist eLife podcast,

27 July 2015

**Levine, M.T.** and H.S. Malik (2013) A rapidly evolving genomic toolkit of Drosophila heterochromatin. *Fly* **7:** 137-141.

**Levine, M.T.,**McCoy, C. Vermaak. D., LeeY.C.G, Hiatt, M.A., Matsen, F.A., and H.S. Malik (2012) Phylogenomic analysis reveals dynamic evolutionary history of the Drosophila Heterochromatin Protein 1 (HP1) gene family. *PLoS Genetics* **8**(6): e1002729.

Moyle, L.C., **Levine, M.T.,**Stanton, M.L. and J.W. Wright (2012) Hybrid sterility over tens of meters between ecotypes adapted to serpentine and non-serpentine soils. *Evolutionary Biology* **39:** 207-218.

**Levine, M.T.,** Eckert, M., and D.J. Begun (2011) Whole genome expression plasticity across tropical and temperate *Drosophila melanogaster* populations from eastern Australia. *Molecular Biology and Evolution* **28:** 249–256.

Levine, M.T. and D.J. Begun (2008) Evidence of spatially varying selection at four chromatin-remodeling loci in *Drosophila melanogaster*. *Genetics* 179: 455-473.

Turner, L.T., Levine, M.T., and D.J.Begun (2008) Genomic analysis of adaptive differentiation in *Drosophila melanogaster*. *Genetics* 179: 475-485.

Levine, M.T., Holloway, A.K., Arshad, U., and D.J. Begun (2007) Pervasive and largely lineage-specific adaptive protein evolution in the dosage compensation complex of *Drosophila melanogaster*. *Genetics* 177: 1959–1962.

**Levine, M.T.** and D.J. Begun (2007) Comparative population genetics of the immunity gene, relish: Is adaptive evolution iiosyncratic? *PLoS ONE* **2**(5): e442.

**Levine, M.T.,** C. D. Jones, A. D. Kern, H. A. Lindfors, and D. J. Begun (2006) Novel genes derived from noncoding DNA in *Drosophila melanogaster* are frequently X-linked and exhibit testis-biased expression. *Proceedings of the National Academy of Sciences* *USA* **103:** 9935-9939.

**Invited manuscripts**

Lee, Y.C.G.and **M.T. Levine**(2017) Germline genome protection on an evolutionary treadmill. *Developmental Cell*: **43(1):**1-3.

* Preview for: Parhard S. *et al*. (2017) Adaptive evolution leads to cross-species incompatibility in the piRNA transposon silencing machinery *Developmental* *Cell*: **43:**60-70**.**

**Levine, M.T.**and H.S. Malik (2011) Learning to protect your genome on the fly. *Cell* **147:**1440-1441.

* Preview for: Khurana, J.S. *et al*. (2011) Adaptation to transposon invasion in Drosophila melanogaster. *Cell* **147:**1551-1563.

**Invited Talks**

University of Kansas, Department of Molecular Biosciences 2019

*Intra-genomic conflict shapes Drosophila telomere evolution*

University of Chicago, Committee on Genetics, Genomics & Systems Biology 2019

*Intra-genomic conflict shapes Drosophila telomere evolution*

Institut für Populationsgenetik, Veterinärmedizinische, University of Vienna 2018

*Intra-genomic conflict shapes Drosophila telomere evolution*

University of Nebraska, School of Biological Sciences 2018

*Intra-genomic conflict shapes Drosophila telomere evolution*

University of Utah, Department of Human Genetics 2018

*Intra-genomic conflict drives DNA packaging evolution*

\*Graduate student invited speaker

Temple University, Department of Biology 2018

*Intra-genomic conflict drives DNA packaging evolution*

Lehigh University, Department of Biology2017

*Intra-genomic conflict shapes diversification of DNA packaging proteins.*

Perelman School of Medicine, U of Pennsylvania, Department of Genetics2017

*Intra-genomic conflict drives HP1 gene family diversification*

Bryn Mawr College, Department of Biology 2016

*Causes and functional consequences of DNA packaging evolution*

William Guy Forbeck Foundation Annual Forum on Aneuploidy and

Genome Instability, Hilton Head, SC 2016

*Evolutionary and functional diversification of paternal DNA packaging*

*proteins in Drosophila*

Villanova University, Department of Biology 2016

*Evolutionary and functional diversification of the Heterochromatin*

*Protein 1 gene family*

University of Pennsylvania, Epigenetics of Cell Fate Symposium 2016

*Evolutionary and functional diversification of the Heterochromatin*

*Protein 1 gene family*

New York University, Center for Genomics and Systems Biology 2014

*Revolving door evolution of essential DNA packaging proteins*

University of Pennsylvania, Evolution Cluster 2014

*Revolving door evolution of essential DNA packaging proteins*

Fred Hutchinson Cancer Research Center, Seattle WA 2012

*Functional diversification of the Heterochromatin Protein 1 gene family*

**Conference Platform (\*) and Posters Presentations**

**\*M.T. Levine** (2018) Intra-genomic conflict shapes Drosophila telomere biology.

Company of Biologists Workshop, Evo-chromo: towards an integrative approach of chromatin dynamics across eukaryotes. Sussex, UK.

\*Saint-Leandre, B and **M.T. Levine** (2018) Intra-genomic conflict shapes Drosophila telomere biology. *Society for the Study of Evolution*. Montpellier, France.

\*Saint-Leandre, B., Lee, Y.C.G, and **M.T. Levine (**2017) Genetic conflict shapes Drosophila telomeres. *Society of Molecular Biology and Evolution Meeting.* Austin.

**\***Mauger, M., Helleu, Q., and **M.T. Levine** (2017) Intra-genomic conflict drives Heterochromatin Protein 1 (HP1) gene family diversification. *International Conference on Drosophila Heterochromatin*, Sardinia, Italy.

**Levine, M.T.,** Vander Wende, H., Hsieh, E., and H.S. Malik (2015) Recurrent gene duplication diversifies host repertoire of genome defense. *Genetics Society of America Drosophila Research Conference*, Chicago.

**\*Levine, M.T.,** Vander Wende, H., and H.S. Malik (2014). A new paternal effect lethal is required to prime paternal chromatin for embryonic mitosis. *Genetics Society of America Drosophila Research Conference*, San Diego.

**\*Levine, M.T.,** McCoy, C., Lee, G., Vermaak, D., Hiatt, M.A., Matsen, F., and H.S. Malik (2012) Phylogenomic analysis of the Heterochromatin Protein 1 gene family defines new germline-restricted functions. *Genetics Society of America Drosophila Research Conference*, Chicago.

**\*Levine, M.T**., McCoy, C., Lee, G., Vermaak, D., Hiatt, M.A., Matsen, F., and H.S. Malik (2011) Phylogenomics of the Heterochromatin Protein 1 gene family guides analysis of germline heterochromatin. *International Conference on Drosophila Heterochromatin*, Gubbio, Italy.

**Levine, M.T.,** Eckert, M., and D.J. Begun (2009) Natural variation at the chromatin remodeling factor, chameau, is shaped by spatially-varying selection and is associated with cold resistance in *Drosophila melanogaster*. *Genetics Society of America--Drosophila Research Conference*, Chicago, IL.

**Conference Platform (\*) and Posters Presentations by Trainees**

Saint-Leandre, B and **M.T. Levine** (2018). Recurrent turnover of the specialized retrotransposons that maintain Drosophila chromosome length. *Genetics Society of America Drosophila Research Conference.* Philadelphia.

Mauger, M. and **M.T. Levine** (2018). Unleashing cryptic sex chromosome conflict in Drosophila melanogaster. *Genetics Society of America Drosophila Research Conference.* Philadelphia.

**\***Helleu, Q. and **M.T. Levine** (2017) HP1 gene family diversification suggests recurrent innovation in paternal chromosome packaging across Diptera evolution. *Genetics Society of America, Drosophila Research Conference*, San Diego.

**Professional Development**

Penn Faculty Pathways Program Participant 2017-18

SAS Search Committee Members Orientation Diversity Training 2017

**University Teaching**

Course (Co-)Instructor, University of Pennsylvania, BIOL 221 2018

 *Molecular Biology and Genetics*

Course Instructor, University of Pennsylvania, BIOL 433 2017

 *Genetics of Adaptation: How sex, pathogens, and the environment*

 *shape modern genomes*

Guest Lecturer, University of Pennsylvania, BIOL 483 2017,18

*Evolutionary and functional diversification of the HP1 gene family*

Guest Lecturer, University of Pennsylvania, BIOL 410 2017

*Intra-genomic conflict drives diversification of DNA packaging proteins*

Guest Lecturer, University of Pennsylvania, BIOL 540

*Introduction to Drosophila as a model organism* 2016

**Independent Study Students**

Co-sponsor BIOL 499, James Nassur 2018

Co-sponsor BIOL 399, Sanjana Adurty 2018

Sponsor BIOL 399, MacKenzie Mauger 2017

Co-sponsor BIOL 399, Ying Xiong 2016-17

Co-sponsor BIOL 399, 499 Molly Brothers 2016-17

**Academic Service**

**Biology Department**

Biology Seminar Series, Committee Chair 2017-

Animal Behavior Search Committee Member 2017

Biology majors information session speaker 2017

Graduate Group Recruitment Planning Committee Chair 2016-

Biology Graduate Group Recruitment Visit Seminar Speaker 2016-

Computational Biology Curriculum Committee 2016-

Biology Retreat Poster Judge 2016

Biology Graduate Group Orientation Seminar Speaker 2016

Center for Teaching and Learning, Panel Member 2015

**Graduate Student Committees**

(BGG = “Biology Graduate Group”, G&E = Genetics and Epigenetics)

Dissertation Committee Member, Ozan Kiratli, BGG 2017-

Dissertation Committee Member, Jennifer Aleman, G&E 2017-

Dissertation Committee Member, Tomohiro Kumon, BGG 2017-

Dissertation Committee Member, Riley Graham, BGG 2017

Dissertation Committee Member, Rohini Singh, BGG 2016-

Dissertation Committee Member, Alexandra Brown, BGG 2016-

Dissertation Committee Member, Un-Sa Lee, BGG 2016-

Dissertation Committee Member, Run Jin, BGG 2016-

Dissertation Committee Member, Michael Warner, BGG 2016-

General exam committee member, Tomohiro Kumon, BGG 2017

General exam committee member, Michael Warner, BGG 2016

**School of Arts and Sciences**

Time Management Workshop Speaker, “The First Two Years” Program 2018

Velay Fellowship Selection Committee 2016

Judge, “Pop Talks” (Penn Graduate Women in Science and Engineering) 2015

**Community**

Walter Fitch Award/Student Travel Award Committee Member, Society for 2018

Molecular Biology and Evolution

Drosophila Image Award Committee Member, Genetics Society of America 2017-

Epigenetics and Chromatin Session Chair, Drosophila Research Conference 2017

National Science Foundation Grant Review Panelist, ad hoc Reviewer 2014-

Reviewer— PLoS Genetics, Nucleic Acids Research, Molecular Ecology,

 Genetics, Molecular Biology and Evolution, Heredity, Proc. Roy. Soc,

 BMC Genomics, Genome Biology and Evolution

**Outreach**

“This Week in Evolution” (TWiEVO) Podcast Guest 2018

Take your professor to lunch program 2018

Philadelphia High School Teacher Professional Development Course 2017 “How chromosomes travel from one generation to the next”

**Students Mentored at Penn**

**Regina Fairbanks,** undergraduate work-study student 2018-

**Will Gaines,** PURM student 2018

**Abigail DiVito**, Graduate Student 2018-

**Alexander Gottfried**, PURM student 2018-

**Samira Mehta,** Vagelos Scholar2018-

**Kevin Yang,** PURM Summer Student 2017-

**Juan Botero,** PURM Summer Student 2017-

**Christopher Pai,** BGS rotation student 2017

**MacKenzie Mauger**, undergraduate work-study student 2016-

**Jennifer Aleman**, BGS rotation student 2016

**Current Levine Lab Personnel**

*(in order of arrival)*

**Courtney Leek, BA,** *Lab Manager/Research Specialist* 09/2015-

**Bastien Saint-Leandre,** **PhD**, *Postdoctoral Scientist*  04/2016-

**Abigail DiVito,** *Graduate Student*  03/2018-

**MacKenzie Mauger,** *Undergraduate Researcher* 05/2016-

**Samira Mehta,** *Vagelos Scholar* 03/2018-

**Alexander Gottfried,** *Undergraduate Researcher*  03/2018-

**Regina Fairbanks,** *Undergraduate Researcher* 09/2018-

**Cara Brand**, **PhD**, *Postdoctoral Scientist*  09/2018-