

DR. MATTHEW D. DEAN

Molecular and Computational Biology
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PERSONAL STATEMENT

Science rocks.

PROFESSIONAL EXPERIENCE

2009-present **Associate professor.** Molecular and Computational Biology, University of Southern California

Research topic: Evolutionary and reproductive genetics

2004-2009 **Postdoctoral fellow.** Ecology and Evolutionary Biology, University of Arizona

Mentor: Dr. Michael W. Nachman (ib.berkeley.edu/labs/nachman)

Research topic: coevolution of male and female reproductive proteins

2003-2004 **Lecturer.** Roosevelt University, Chicago IL

EDUCATION

2003 **Ph.D.** in Biological Sciences, University of Iowa at Iowa City
Advisor: Dr. J. William O. Ballard (<http://billb.babs.unsw.edu.au/>)
Research topic: coevolution of *Wolbachia* and their hosts

1996 **B.S.** in Entomology, University of Wisconsin at Madison
Advisors: Dr. Daniel K. Young and Dr. Kenneth F. Raffa
Research topic: coevolution of bark beetles and their predators

PUBLICATIONS (REVERSE CHRONOLOGICAL)

Qu, J., E. Hodges, A. Molaro, P. Gagneux, **M. D. Dean**, G. J. Hannon, A. D. Smith. In Press.
Evolutionary expansion of DNA hypomethylation in the mammalian germline genome.
Genome Research.

Lough-Stevens, M., N. G. Schultz, **M. D. Dean**. 2018. The baubellum is more developmentally and evolutionarily labile than the baculum. *Ecology and Evolution* 8:1073–1083.

(Note: Michael Lough-Stevens and Nick Schultz were graduate students in the Dean Lab during this project)

Chang, P. L., E. Kopania, S. Keeble, B. Sarver, E. Larson, A. Orth, K. Belkhir, P. Boursot, F. Bonhomme, J. M. Good, **M. D. Dean**. 2017. Whole exome sequencing of wild-derived inbred strains of mice improves power to link phenotype and genotype. *Mammalian Genome* 28: 416–425.

(Note: This study was featured on the cover of *Mammalian Genome*)

(Note: Sara Keeble and Emily Kopania were graduate students in the Dean Lab during this project)

Decato, B., J. Tello, J. M. Good, A. Sferruzzi-Perri, A. D. Smith, and **M. D. Dean**. 2017. DNA methylation divergence and tissue specialization in the developing mouse placenta. *Molecular Biology and Evolution* 34: 1702-1712.

Sarver, B., S. Keeble, T. Cosart, P. Tucker, **M. D. Dean**, and J. M. Good. 2017. Phylogenomic insights into genome evolution and speciation in mice. *Genome Biology and Evolution* 9: 726-739.

(Note: Sara Keeble was a graduate student in the Dean Lab during this project)

Schultz, N. G., E. Otárola-Castillo, and **M. D. Dean**. 2017. Dissection, microCT scanning, and morphometric analyses of the baculum. *Journal of Visualized Experiments* 55342.

(Note: Nick Schultz was a graduate student in the Dean Lab during this project)

Larson, E. L., S. Keeble, D. Vanderpool, **M. D. Dean**, J. M. Good. 2016. The composite regulatory basis of the large X-effect in mouse speciation. *Molecular Biology and Evolution* 34: 282-295.

(Note: Sara Keeble was a graduate student in the Dean Lab during this project)

Schneider, M. R., R. Mangels, and **M. D. Dean**. 2016. The molecular basis and reproductive function(s) of copulatory plugs. *Molecular Reproduction and Development* 83: 755-767.

(Note: Rachel Mangels was a graduate student in the Dean Lab)

Mangels, R., K. Tsung, K. Kwan, and **M. D. Dean**. 2016. Copulatory plugs inhibit the reproductive success of rival males. *Journal of Evolutionary Biology* 29: 2289-2296

(Note: Rachel Mangels and Kelly Kwan were graduate students, and Kathleen Tsung a lab technician, in the Dean Lab during this project)

Larson, E. L., D. Vanderpool, S. Keeble, M. Zhou, B. A. J. Sarver, A. D. Smith, **M. D. Dean**, and J. M. Good. 2016. Contrasting levels of molecular evolution on the mouse X chromosome. *Genetics* 203: 1841-1857.

(Note: Sara Keeble was a graduate student in the Dean Lab during this project)

Crisci, J. L., **M. D. Dean**, P. Ralph. 2016. Adaptation in isolated populations: when does it happen and when can we detect it? *Molecular Ecology* 25: 3901-3911.

(Note: Jessica Crisci was a postdoc with the Dean Lab and Ralph Lab)

Schultz, N. G., M. Lough-Stevens, E. Abreu, T. Orr, **M. D. Dean**. 2016. The baculum was gained and lost multiple times during mammalian evolution. *Integrative and Comparative Biology* icw034.

(Note: Nick Schultz and Michael Lough-Stevens are graduate students in the Dean Lab, Eric Abreu was a high school volunteer [now full ride at Harvard])

Schultz, N. G., J. Ingels, A. Hillhouse, K. Wardwell, P. L. Chang, J. M. Cheverud, C. Lutz, L. Lu, R. W. Williams, **M. D. Dean**. 2016. The genetic basis of baculum size and shape variation in mice. *G3: Genes | Genomes | Genetics*. 6:1141-1151.

(Note: Nick Schultz is a graduate student in the Dean Lab)

- Young, B. W. and **M. D. Dean**. 2015. To be, or not to be, related; how female guppies bias sperm usage. *Molecular Ecology* 24: 4039-4041
(Note: Brent Young was our lab manager)
- Dines, J. P., S. L. Mesnick, K. Ralls, L. May Collado, I. Agnarsson, and **M. D. Dean**. 2015. A tradeoff between precopulatory and postcopulatory trait investment in male cetaceans. *Evolution* 69: 1560-1572.
(Note: Jim Dines was a graduate student in the Dean Lab)
- Mangels, R., B. Young, S. Keeble, R. Ardekani, C. Meslin, Z. Ferreira, N. L. Clark, J. M. Good, and **M. D. Dean**. 2015. Genetic and phenotypic influences on copulatory plug survival in mice. *Heredity* 115: 496–502
(Note: Rachel Mangels and Sara Keeble are graduate students in the lab; Brent Young was our lab manager. This study was featured on the Heredity podcast.)
- Dines, J. P., E. Otárola-Castillo, P. Ralph, J. Alas, T. Daley, A. Smith, **M. D. Dean**. 2014. Cetacean pelvic bones are targets of sexual selection, not vestigial structures. *Evolution* 68: 3296-3306.
(Note: Jim Dines was a graduate student in the Dean Lab; Jesse Alas was a local high school student from West Adams working in the lab. This study was featured in the popular press: Science, National Geographic, Washington Post, Smithsonian Magazine, Discovery Magazine, Time, and more)
- Kessler, M. and **M. D. Dean**. 2014. Effective population size does not predict codon usage bias in mammals. *Ecology and Evolution* 4: 3887-3900.
(Note: Michael Kessler was a USC undergraduate in the Dean Lab during this project)
- Young, B. Y., D. C. Conti, and **M. D. Dean**. 2013. Sneaker “jack” males outcompete dominant “hooknose” males under sperm competition in Chinook salmon (*Oncorhynchus tshawytscha*) *Ecology and Evolution* 3: 4987-4997.
(Note: This study was featured on cover)
(Note: Brent Young was our lab manager)
- Dean, M. D.** 2013. Genetic disruption of the copulatory plug in mice leads to severely reduced fertility. *PLoS Genetics* 9:e1003185
- Campbell, P., J. M. Good, **M. D. Dean**, P. K. Tucker, M. W. Nachman. 2012. The contribution of the Y chromosome to hybrid male sterility in house mice. *Genetics* 191:1271-1281.
- Fang, F., E. Hodges, A. Molaro, **M. D. Dean**, G. J. Hannon, A. Smith. 2012. The genomic landscape of human allele-specific DNA methylation. *Proceedings of the National Academy of Sciences* 109: 7332-7337.
- Dean, M. D.**, G. D. Findlay, M. R. Hoopmann, C. C. Wu, M. J. MacCoss, W. J. Swanson, M. W. Nachman. 2011. Identification of ejaculated proteins in the house mouse (*Mus domesticus*) via isotopic labeling. *BMC Genomics* 12: 306.
- Good, J. M., T. Giger, **M. D. Dean**, M. W. Nachman. 2010. Widespread over-expression of the X chromosome in sterile F1 hybrid mice. *PLoS Genetics* 6: e1001148.
- Dean, M. D.**, N. L. Clark, G. D. Findlay, R. C. Karn, W. J. Swanson, X. Yi, M. MacCoss, and M. W. Nachman. 2009. Proteomics and comparative genomic investigations reveal heterogeneity in evolutionary rate of male reproductive proteins in mice (*Mus domesticus*) *Molecular Biology and Evolution* 26: 1733-1743. (Also winner of the postdoctoral poster competition at SMCBE 2008)

- Dean, M. D.** and M. W. Nachman. 2009. Faster fertilization rate in conspecific versus heterospecific matings in house mice. *Evolution* 63: 20-28.
- Good, J. M., **M. D. Dean**, and M. W. Nachman. 2008. A complex genetic basis to X-linked hybrid male sterility between two species of house mice. *Genetics* 179:2213-2228.
- Dean, M. D.**, J. M. Good, and M. W. Nachman. 2008. Adaptive evolution of proteins secreted during sperm maturation: an analysis of the mouse epididymal transcriptome. *Molecular Biology and Evolution* 25:383-392.
- Laurie, C.C, D.A. Nickerson, A. Anderson, B.S. Weir, R.J. Livingston, **M. D. Dean**, K.L. Smith, E.E. Schadt, and M.W. Nachman. 2007. Linkage disequilibrium in wild mice. *PLoS Genetics* 3: e144.
- Dean, M. D.**, K. G. Ardlie, and M. W. Nachman. 2006. The frequency of multiple paternity suggests that sperm competition is common in house mice (*Mus domesticus*). *Molecular Ecology* 15: 4141-4151.
- Dean, M. D.** 2006. A *Wolbachia*-associated fitness benefit depends on genetic background in *Drosophila simulans*. *Proceedings of the Royal Society of London series B-Biological Sciences* 273: 1415-1420.
- Dean, M. D.** and J. W. O. Ballard. 2005. High divergence among *Drosophila simulans* mitochondrial haplogroups arose in midst of long term purifying selection. *Molecular Phylogenetics and Evolution* 36: 328-337.
- Dean, M. D.** and J. W. O. Ballard. 2004. Linking phylogenetics with population genetics to reconstruct the geographic origin of a species. *Molecular Phylogenetics and Evolution* 32: 998-1009.
- Dean, M. D.**, K. J. Ballard, A. Glass, and J. W. O. Ballard. 2003. Influence of two *Wolbachia* strains on population structure of east African *Drosophila simulans*. *Genetics* 165: 1959-1969.
- James, A. C., **M. D. Dean**, M. E. McMahon, and J. W. O. Ballard. 2002. Dynamics of double and single *Wolbachia* infections in *Drosophila simulans* from New Caledonia. *Heredity* 88: 182-189.
- Ballard, J. W. O. and **M. D. Dean**. 2001. The mitochondrial genome: mutation, selection and recombination. *Current Opinion in Genetics and Development* 11: 667-672.
- Dean, M. D.** and J. W. O. Ballard. 2000. Factors affecting mitochondrial DNA quality from museum preserved *Drosophila simulans*. *Entomologia Experimentalis et Applicata* 98: 279-283.

INVITED RESEARCH SEMINARS

- 2017 American Association of Anatomists, invited symposium speaker
- 2017 Chicago Field Museum
- 2016 Society Integrative Biology, Portland Oregon
(featured in <http://science.sciencemag.org/content/351/6270/214.full>)
- 2015 Biology of Sperm Meetings, Sheffield England
- 2015 École Polytechnique Fédérale de Lausanne
- 2014 AAAS, Molecular Reproduction and Development
- 2014 Department of Anatomy and Neurobiology, University of Tennessee
- 2013 Department of Biology, University of California at Riverside
- 2013 Darwin Day, University of Wisconsin at Madison

2013	Biological Sciences, University of Montana
2012	Los Angeles Natural History Museum
2012	Minority Action Plan
2012	Ecology and Evolutionary Biology, UC Irvine
2011	Programs in Biomedical and Biological Sciences, USC Keck School of Medicine
2011	Reproductive Endocrinology and Infertility, USC Keck School of Medicine
2011	Molecular, Cell, and Developmental Biology. University of California at Los Angeles
2011	Genetics, University of Wisconsin at Madison
2010	Ecology, Evolution, and Marine Biology. University of California at Santa Barbara
2009	Ecology and Evolutionary Biology, University of California at Los Angeles
2009	Programs in Biomedical and Biological Sciences, USC Keck School of Medicine
2009	Reproductive Endocrinology and Infertility, USC Keck School of Medicine

CONTRIBUTED PAPERS (SELECTED ORAL/POSTER PRESENTATIONS)

- Schultz, N. G., M. Lough-Stevens, E. Abreu, T. Orr, **M. D. Dean**. 2016. Society for Integrative and Comparative Biology.
- Mangels, R. and **M. D. Dean**. 2013. Male and female genotype affects copulatory plug survival. *Biology of Sperm*, Bakewell, England.
- Dean, M. D.** 2012. Positively selected codons are enriched on alternative exons. Society for Molecular Biology and Evolution, Dublin, Ireland.
- Dean, M. D.** 2012. Genetic disruption of the copulatory plug leads to severely reduced fertility in mice. *Evolution*, Ottawa, Canada.
- Dean, M. D.** 2011. *Transglutaminase IV* is necessary for copulatory plug formation and normal male fertility in house mice. *Mouse Genetics*, Washington D. C.
- Dean, M. D.**, Good, J. M. and Nachman, M. W. 2007. Adaptive evolution of proteins secreted during sperm maturation: an analysis of the mouse epididymal transcriptome. Society for Molecular Biology and Evolution, Halifax, Nova Scotia.
- Dean, M. D.** and Nachman, M. W. 2006. Sexual selection in house mice. *Ecology and Evolutionary Biology seminar*, Tucson, AZ.
- Dean, M. D.** and Nachman, M. W. 2006. The evolution of male reproductive genes in house mice (genus *Mus*). Society for Molecular Biology and Evolution, Tempe, Arizona.
- Dean, M. D.**, Ardlie, K. G., and Nachman, M. W. 2005. Multiple mating in house mice. Society for the Study of Evolution, Fairbanks, Alaska.
- Dean, M. D.** 2004. Voice entry databasing. International Society for Biological and Environmental Repositories, New York, New York (invited speaker).

FUNDING HISTORY

COMPLETED

- 2004-2007 Evolutionary genetics of male reproductive traits in *Mus*. National Institutes of Health, NRSA postdoctoral fellowship #F32GM070246-02
Role: PI
- 2012-2015 The influence of effective population size on the strength of selection imposed by mate choice. National Science Foundation #1146525, \$325,000 (\$126,876 indirects).
Role: PI

CURRENT

- 2012-2017 Evolutionary and functional genetics of male reproduction using wild mice as a model system. National Institutes of Health #1R01GM098536-01A1, \$1,856,969 (\$465,598 indirects).
Role: PI

2012-2017 CAREER: Understanding the function of the copulatory plug. National Science Foundation #1150259, \$990,675 (\$387,929 indirects)
Role: PI

TEACHING (AMOUNT TAUGHT)

2017 S	BISC313	Evolution and Population Genetics (50%)
2017 F	BISC542	Seminar in Molecular Biology (100%) (<u>Co-chair of course</u>)
2016 F	BISC325	Genetics (33%)
2016 S	BISC542	Seminar in Molecular Biology (50%) (<u>Co-chair of course</u>)
2016 S	BISC544	Advanced Reading in Molecular Biology (<u>Chair of course</u>)
2016 S	BISC313	Evolution and Population Genetics (50%)
2015 F	BISC325	Genetics (33%)
2014 S	BISC313	Evolution and Population Genetics (50%)
2013 F	BISC499	Hands-on Research at the Natural History Museum (50%) (<u>new course</u>)
2013 F	BISC325	Genetics (33%)
2013 S	BISC313	Evolution and Population Genetics (50%)
2013 S	BISC542	Seminar in Molecular Biology (100%) (<u>Co-chair of course</u>)
2013 S	BISC544	Advanced Reading in Molecular Biology (<u>Chair of course</u>)
2012 F	BISC542	Seminar in Molecular Biology (100%) (<u>Co-chair of course</u>)
2012 S	BISC544	Advanced Reading in Molecular Biology (<u>Chair of course</u>)
2012 S	BISC313	Evolution and Population Genetics (50%)
2012 S	BISC502B	Molecular Genetics and Biochemistry (~10 hours of lectures)
2012 S	BISC542	Seminar in Molecular Biology (100%) (<u>Co-chair of course</u>)
2011 S	BISC544	Advanced Reading in Molecular Biology
2011 S	BISC313	Evolution and Population Genetics (50%) (<u>new course developed</u>)
2011 S	BISC 502B	Molecular Genetics and Biochemistry (~10 hours of lectures)
2011 F	BISC325	Genetics (33%)
2011 F	BISC499	Introductory Bioinformatics (100%) (<u>new course developed</u>)
2010 F	BISC325	Genetics (33%)

SOCIETY MEMBERSHIPS

Society for Molecular Biology and Evolution
Society for the Study of Evolution
Genetics Society of America

TRAINEES

POSTDOCTORAL FELLOWS SUPERVISED

2013-2015 Jessica Crisci (co-supervised with Peter Ralph)

GRADUATE STUDENTS SUPERVISED

2016-	Michael Lough-Stevens
2014-	Sara Keeble
2014-	Nicholas Schultz
2014-2016	Emily Kopania (Masters)
2014-2015	Christine Stafford (Masters)
2014-2016	Yiding Jia
2011-2014	Jim Dines
2011-2013	Kelly Kwan
2010-2016	Rachel Mangels

2010-2016 Lorraine Provencio*

ROTATION STUDENTS SUPERVISED

2017	Caleb Ghione
2016	Calista Allen
2015	Michael Lough-Stevens
2014	Nick Schultz
2013	Nathan Churches
2013	Yiding Jia
2013	Anh Nguyet Vu
2012	Percy Genyk
2012	Kelly Kwan
2011	Jacqueline Lo
2010	Rachel Mangels
2010	Lorraine Provencio*
2009	Amanda Jensen

GRADUATE STUDENT QUALIFYING EXAM & DISSERTATION COMMITTEE (PRIMARY ADVISOR)

2017	Chia-An Yen (Curran)
2017	Sami Ali (Nuzhdin)
2017	Erik Lundgren (Ralph)
2016	Ben Decato (Smith)
2016	Sara Keeble (Dean)
2016	Martin Mullis (Ehrenreich)
2016	Nick Schultz (Dean)
2016	Asif Zubair (Nuzhdin)
2015	Hossein Asgharian (Nuzhdin)
2015	Nicole Ratib (Finkel)
2015	Matt Taylor (Ehrenreich)
2015	Xiaoshen Yin (Hedgecock)
2015	Junsong Zhao (Marjoram)
2014	Rob Linder (Ehrenreich)
2013	Dana Lynn (Curran)
2013	Emad Bahrami Samani (Smith)
2011	Jordan Eboreime* (Arnheim)
2011	Joshua Purves (Hedgecock)
2011	Wendy Vu (Nuzhdin)
2011	Barrett Phillips (Edmands)
2009	Peter Chang (Nuzhdin)
2009	Reza Dehestaniardekani (Tavaré)
2009	James P. Dines (McNitt-Gray)
2009	Fang Fang (Smith)
2009	Bradley Jay Main (Nuzhdin)
2009	Austin Michael Paul (Hedgecock)
2009	Qiang Song (Smith)

UNDERGRADUATE STUDENTS SUPERVISED (SCHOLARSHIPS AWARDED)

2018-	Colleen Sweeney
2017-	Adie Hobbs
2017-	Matt Urness

2016- Nathalye Lopez*
 2016- Naina Chipalkatti
 2016- Jamie Clarke
 2015-2016 Celine Kiner
 2014-2015 Anna Burger
 2014-2015 Max Cabaj
 2014-2015 Christine Stafford
 2013-2014 Emily Kopania (Rose Hills Foundation)
 2013-2014 Nick Schultz
 2013-2017 Kathleen Tsung (Rose Hills Foundation)
 2012-2014 Dominick Anderson-Parham* (USC Center for Genomic Excellence)
 2012-2013 Karen Lu
 2012-2013 Chelsea Milne
 2012-2013 Zena Salim
 2012-2013 Varun Sambhariya
 2012-2013 Eric Wu
 2012-2013 Francine Lang
 2011-2013 Ryan McGee (USC Provost)
 2010-2012 Michael Kessler
 2010-2012 Veronica Winget
 2011-2012 Lita Mallet* (USC Center for Genomic Excellence)
 2011-2012 Joseph Jin
 2010-2012 Armando Martinez*
 2010-2012 Jeanney Kang (Rose Hills Foundation)
 2009-2012 Amanda Johnston (Rose Hills Foundation, USC SOAR, USC SURF)
 2009-2010 Traci Aoki (USC SURF)
 2009-2010 Courtney Clayton* (USC Center for Genomic Excellence)
 2009-2010 Robert Fragoza* (USC Center for Genomic Excellence)

HIGH SCHOOL STUDENTS SUPERVISED

2017 Stephanie Duran
 2016 Justin Chang (Troy Tech)
 2016 Ebony Francisco* (Zoo Magnet)
 2016 Emila Peters (Zoo Magnet)
 2016 Tiger Schenkman (Zoo Magnet)
 2016 Jennifer Yi (Troy Tech)
 2014 Trevor Jackson* (San Dimas High)
 2014 Anthony Martinez* (San Dimas High)
 2014 Summer Smith* (Oaks Christian High)
 2014 Winnie Umazor* (San Dimas High)
 2014-2016 Alanna Wolf (Marlborough)
 2013-2014 Eric Abreu* (West Adams High)
 2013-2014 Natalie Watson (Marlborough)
 2013-2014 Martha Henriquez* (West Adams High)
 2013-2014 Maria Munoz* (West Adams High)
 2013-2014 Jhavet Wences* (West Adams High)
 2009-2012 Jesse Alas* (West Adams High)
 2012-2013 Kevin Li (San Ramon)
 2011-2013 Charlie Sanchez* (West Adams High)
 2011-2013 Neal Shah (Troy Tech High)

2011-2013 Jose Jaime* (West Adams High)
2011-2012 Jander Cruz* (West Adams High)
2011-2012 Vincent Hsu
2009-2011 Iris Salamanca* (West Adams High)

*Minority students