Professional Curriculum Vitae
Sean P. Mullen

Fields of Interest

Hybridization, Adaptation, Speciation, Mimicry, Evolutionary Genomics, Functional Genetics

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Current Position

Assistant Professor, Boston University, Department of Biology & Center for Ecology and Conservation Biology

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Boston, Massachusetts 02215
United States of America

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Education History

1999-2006 Ph.D., Ecology and Evolutionary Biology, Cornell University, Ithaca, NY USA

1997-1999 M.S., Biology, Villanova University, Villanova, PA, USA.

1991-1995 B.S., Biology, Dickinson College, Carlisle, PA, USA

Employment Record

2010 – 2013 Assistant Professor. Department of Biology, Boston University, Boston, Ma., USA.

2007 – 2010 Assistant Professor. Department of Biological Sciences, Lehigh University, Bethlehem, Pa., USA.

2005 – 2007 NIMH NRSA Postdoctoral Research Fellow - Department of Biology, University of Maryland, College Park, Md., USA.

RESEARCH

Honors & Awards

2006 Ruth L. Kirschstein National Research Service Award Postdoctoral Training Fellowship– NIMH
Howard Hughes Postdoctoral Fellowship in Bioinformatics and Genomics – Declined.

2005 "*Advances in Genome Technology and Bioinformatics*", Tuition Scholarship, MBL-Woods Hole, USA.
Outstanding Graduate Teaching Assistant Award, Department of Ecology and Evolutionary Biology, Cornell University, USA.

2004 Doctoral Dissertation Improvement Grant, National Science Foundation, USA

2003 "*Workshop on Molecular Evolution*", Tuition Scholarship, MBL-Woods Hole , USA.

2002 Cornell Environmental Inquiry Research Partnership (CEIRP) K-12 Teaching Fellowship, National Science Foundation, USA

Kieckhefer Adirondack Fellowship, Three Awards (2001-03)
Edna Bailey Sussman Fund, Environmental Field Research Award
2001 Theodore Roosevelt Memorial Grant, American Museum of Natural History.
2001 The Joan Mosenthal DeWind Award, The Xerces Society.
1998 Biology Department Research Fellowship, Villanova University

Grants and Fellowships Awarded

2014-2018 Dimensions: Collaborative Research: Connecting the proximate mechanisms responsible for organismal diversity to the ultimate causes of latitudinal gradients in species richness
- National Science Foundation Award #1342712 $1,988,908

2010-2013 Collaborative research: The comparative genetics of wing pattern diversity in mimetic butterflies
- National Science Foundation Award #1020136 $986,722

2010-2012 The conservation genetics of *Speyeria callippe*.
- Department of Interior, United States Fish & Wildlife Agency BU-USFWS Cooperative Agreement #81420-A-J506 $90,690

2009-2010 The developmental basis of mimetic wing pattern variation in butterflies
- Howard Hughes, Biodynamics Summer Institute Award $58,000

2007-2008 Color pattern evolution and mimicry in butterflies
- Faculty Innovation Grant, Lehigh University $25,000

2003 Hybridization, mimicry, and species boundaries in the Limenitis arthemis admiral butterfly complex.
- National Science Foundation DDIG Award #: 0407499 $11,355

2000-2005 Hybridization, mimicry, and the evolution of wing pattern diversity in North American admiral butterflies
- Grants from multiple sources $30,000

Grant proposals in review

2013 Kronfrost, M.R., **Mullen, S.P**., Kapan, D. D., Kulathinal, R., & McMillan, W.O. Collaborative Research: Examining the Genomic Consequences of Selection, Speciation, and Hybridization in a Recent Adaptive Radiation.
NSF DEB Evolutionary Processes – Full proposal, invited

Publications in print – Refereed articles

2013 **Mullen, S.P.** & Shaw, K. L. Insect speciation rules: Unifying concepts in speciation research. *Annual Review of Entomology*, *in press.* (corresponding author)

2013 **Mullen, S.P**. Hybrid zones. *Oxford Bibliographies in Evolutionary Biology, in press.*

2013 Kronforst, M. K., Kapan, D. D., Hansen, M., Crawford, N., Kulathinal, R. & **Mullen, S. P.** Hybridization reveals the genomic architecture of speciation. *Cell reports, in press.* (corresponding author).

2013 Iyengar, V. K., Castle, T. & **Mullen, S. P.** Signal divergence among *Calopteryx* damselflies correlated with increased male-male aggression. *Behavioral Ecology & Sociobiology, in press*. (Corresponding author).

2013 The FroSpects Gregynog Workshop (incl. **Mullen S. P.).** Hybridization and speciation. Target Review. *J. Evol. Biol. 26(2):229-246.*

2012 The *Heliconius* Genome Consortium**.** Butterfly genome reveals promiscuous exchange of mimicry adaptations among species. *Nature* 487(7):94-98. (Co-principal investigator)

2012 Kronforst, M. R., Barsh, G. S., Kopp, A., Mallet, J., Monteiro, A., **Mullen, S.P**., Protas, M., Rosenblum, E. B., Schneider, C. J., & Hoesktra, H.E. Unraveling the thread of nature's tapestry: the genetics of diversity and convergence in animal pigmentation. *Pigment Cell Melanoma Res.* 25(4):411-433.

2012 **Mullen, S.P**., K. Little, M. Draud., J. Brozek, & Itzkowitz, M. Hybridization among Caribbean damselfish species correlates with habitat degradation. J. Exp. Mar. Biol. Ecol. 416-17:221-229. (corresponding author).

2011 Shaw, K.L. & **Mullen, S. P.** Genes versus phenotypes in the study of speciation. *Genetica* 139(5): 649-661. (both authors contributed equally).

2011 **Mullen, S. P**., Savage, W. K., Wahlberg, N. & Willmott, K. R.. Rapid diversification and not clade age explains high diversity in neotropical *Adelpha* butterflies. *Proc. Roy. Soc. B*. 278(1713): 1777-1785. (corresponding author).

2010 Pfennig, D.W. & **Mullen, S. P.** Mimics without models: causes and consequences of allopatry in Batesian mimicry. *Proc. R. Soc. B*. 277:2577-85.

2009 Gommans, W.M., **S. P. Mullen**, & Maas, S. RNA editing: a driving force for adaptive evolution? *Bioessays* 31(10): 1137-1145.

2009 Savage, W.K. & **Mullen, S. P.** A single origin of Batesian mimicry among hybridizing populations of admiral butterflies (Limenitis arthemis) rejects an evolutionary reversion to the ancestral phenotype. *Proc. Roy. Soc. B.* 276 (1677):2557-2565. (corresponding author).

2008 Ries, L. & **Mullen, S. P.** A rare model limits the distribution of its more common mimic: a twist on frequency-dependent Batesian mimicry. *Evolution* 62:1798-1803. (both authors contributed equally).

2008 **Mullen, S. P.**, Dopman, E. B. & Harrison, R.G. Hybrid zone origins, species boundaries, and the evolution of wing pattern diversity in a polytypic species complex of North American admiral butterflies (Nymphalidae: Limenitis). *Evolution* 62:1400-1417. (corresponding author)

2008 **Mullen, S.P.**, Millar, J. C., Schal, C., & Shaw, K. L. Identification and characterization of cuticular hydrocarbons from a rapid species radiation of Hawaiian Swordtailed Crickets (Gryllidae: Trigonidinnae: *Laupala*). *J. Chem. Ecol*. 34:198-204. (corresponding author).

2007 Danley, P. D., **Mullen, S. P.**, Lui, Quakenbush, J., & Shaw, K. L. Generation and analysis of large scale cricket expressed sequence tags (EST's) derived from a normalized, nerve chord cDNA library. *BMC Genomics* 8:109.

2007 **Mullen, S. P.** & Andrés, J. A. Rapid evolution of sexual signals in sympatric *Calopteryx* damselfies: reinforcement or "Noisy-neighbor" ecological character displacement. *J. Evol. Biol*. 20:1637-1648. (corresponding author).

2007 **Mullen, S.P.**, Mendelson, T.C., Schal, C., & Shaw, K. L. 2007. Rapid evolution of cuticular hydrocarbons in a species radiation of acoustically diverse Hawaiian crickets (Gryllidae: Trigonidiinae: *Laupala*). *Evolution* 61(1):223-231. (corresponding author).

2007 Reudink, M.W., Mech, S.G., **Mullen**, S. P., & Curry, R. L. Structure and dynamics of a chickadee hybrid zone. *The Auk* 124.463-478.

2006 **Mullen, S. P.** Wing pattern evolution and the origins of mimicry among North American admiral butterflies (Nymphalidae: *Limenitis*). *Molecular Phylogenetics and Evolution*. 39 (3):747-758.

2006 Lovejoy, N., **Mullen, S. P.**, Sword, G.A., Chapman, R.F., & Harrison, R.G. Ancient trans-Atlantic flight explains locust biogeography. *Proceedings of the Royal Society Biological Series B*. 273:767-774. (both authors contributed equally).

2003 McIntyre, P.B., Dopman, E. B. & **Mullen, S. P.** *Elaphe obsoleta*. Predation. *Herpetological Review* 34: 66.

Publications in print – Book reviews & popular press (total =2)

2008 Reis, L. & **Mullen, S. P.** The biogeography of a mimicry complex: surprising discoveries in the July 4th data set. *American Butterflies* 15(3/4): 48-52.

2007 **Mullen, S. P.** Conservation and the genetics of populations. *Copeia* 2007(3):774-776.

Publications in review

2013 Gallant, J. R*. Imhoff, V. E., Martin, A. R., Chamberlain, N., Pote, B., Evans, B. R., Reed, R. D., Kronforst, M. R. & **Mullen, S.P.** Ancient homology underlies adaptive mimetic diversity in butterflies. *Nature Communications, in review.* (corresponding author).
(*Denotes postdoc in Mullen lab).

2013 Frentiu, F.D., Yuan, F., Bernard, G.D., **Mullen, S.P.,** & Briscoe, A.D. Opsin clines in butterflies indicate a non-visual role for insect photopigments. TARGET: *Mol. Biol. Evol.*

Publications in preparation

2013 Imhoff, V.E.*, Wong, A., & **Mullen, S. P.** Comparative genetic linkage mapping supports a conserved genetic and developmental basis for butterfly wing pattern formation. TARGET: *Evoluton.* (*Denotes graduate student in Mullen lab).

2013 Imhoff, V.E.*[2], Gallant, J.R., Pote, B*. Moskowitz, N.A., & **Mullen, S. P**. Connecting genotype-to-phenotype to resolve genealogical discordance between population history and character evolution. TARGET: *Proceedings of the National Academy of Sciences USA.* (*Denotes graduate student in Mullen lab)

2014 Gallant, J.R.*, Ebel, E. R. & **Mullen, S. P.** A phylogenomic analysis of wing pattern evolution and mimicry among North American admiral butterflies. TARGET: *Evolution* (*Denotes postdoc in Mullen lab).

2014 Ebel, E. R.*, Hill, R., Willmott, K.W., and **Mullen, S. P.** Mimicry, convergence, and wing pattern evolution among Neotropical *Adelpha* butterflies. TARGET: Proceedings of the Royal Society. (*Denotes graduate student in Mullen Lab).

2014 Savage, W.K.*, Hill, R., & **Mullen, S. P.** Delineating species boundaries and conservation units of the endangered Callippe Silverspot butterfly (*Speyeria callippe*). TARGET: *Conservation Genetics.* (*Denotes postdoc in Mullen Lab)

Symposium Participation

2013 Co-organizer, Symposium on "***Speciation Genomics***", Society for Molecular Biology and Evolution, Chicago, IL, USA

2013 Participant, 4th International Meeting of the *Heliconius* Genome Sequencing Consortium, Harvard Museum of Natural History, Cambridge.

2011 Participant in Frontiers in Speciation workshop entitled "***Hybridization & Speciation***", Gregynog Hall, Wales, U.K.

2010 "**Genetics and the Origin of Species: The Continuing Synthesis**", Ithaca, NY USA (July 22nd -23rd) – "Genes vs. Phenotypes in the Study of Speciation". Invited Talk.

2010 **6th International Butterfly Biology Conference**, Edmonton, Alberta (June 2010) - **"**Comparative genetic mapping reveals unexpected diversity in the genetic control of mimetic wing pattern variation across three distantly related butterfly species." Invited Talk

2010 "***The Genetics and Evolution of Animal Coloration***". Hopi Hoekstra & Marcus Kronforst, Organizers, April 22-23, 2010 - "*Melanism and mimicry in butterflies*" – Harvard University's Radcliffe Institute for Advanced Study. Invited Talk.

2010 Organizer – ***Lehigh Valley Ecology & Evolution Symposium***, Keynote by Ryan Calsbeek.

2007-09 Co-organizer and participant, ***Darwin Day Celebration*** at the Da Vinci Science Center, with Richard Kliman.

Conference Presentations

2013 **American Genetics Association**, Ithaca, NY – "The genetic basis of adaptation and speciation in butterflies".

2009 **Society for the Study of Evolution**, Moscow, ID - "*Finding a needle in a haystack: recent progress identifying the genomic region(s) housing mimicry genes in admiral butterfles*"

2008 **Society for the Study of Evolution**, Minneapolis, MN - "*The origins and maintenance of an admiral butterfly hybrid zone involving mimicry*"

2006 **Society for the Study of Evolution**, Stony Brook, NY - "*Biogeographic patterns of intra- vs. inter-island diversity in cuticular hydrocarbons in a rapid species radiation of Hawaiian crickets*"

2005 **Great Lakes Odonata Meeting**, 2005. University of Ottawa, Canada.- "Hybridization, Reinforcement, and Wing Pattern Evolution among North American Jewelwing Damselflies (*Calopteryx*)".

2003 **Society for the Study of Evolution**, Champaign-Urbana, IL. - "Mitochondrial DNA variation across a butterfly hybrid zone in eastern North America". *Poster Presentation*

1999 **American Ornithologist's Union**, Ithaca, New York - "Genetic and morphometric variation across a chickadee hybrid zone in southeastern Pennsylvania". *Poster Presentation*

1994 **American Society of Mammologists**, Washington, D.C. - "The Raccoon roundworm (*Baylisascaris procyonis*) as a cause for decline of Allegheny woodrat (*Neotoma magister*) populations in central Pennsylvania". *Poster Presentation*

Invited Seminars:

2013 University of Hawaii, Manoa, host: Mark Wright
Tulane University, host: Cori Richards-Zawacki
U.C. Irvine, host: Adriana Briscoe
2012 Massachusetts Butterfly Club
2011 Stonehill College, host. Magdelena Peterson
2010 Cambridge Entomological Society, host:. Naomi Pierce
FAS Systems Biology Center, Harvard University, host: Marcus Kronforst
Moravian College, host: Diane Husic
Boston University, host: Michael Sorenson
2009 FMNH, University of Florida, host: Keith Willmott
Cedar Crest College, host: Erika Iyengar
2008 Franklin & Marshall College, host: Dan Ardia
Villanova University, host: Robert L. Curry
2007 Fairfield University, host: Glenn Sauer
Willamette University, host: Barbara Stebbins-Boaz

Dickinson College, host: Carol Loeffler
Lehigh University, host: Murray Itzkowitz
North Carolina State University, host: Coby Schal

Popular press coverage - selected

2012	*Science Daily* - "Genome research reveals key behind one butterfly's ability to mimic another."
2011	*This week in Evolution*, "Rapid diversification and not clade age explains high diversity in neotropical butterflies"
2011	*Bostonia Magazine, "*The secrets of butterfly wings"
2009	*Lehigh Alumni Bulletin*, "Darwin party earns national recognition for Lehigh's Sigma Xi chapter"
2008	*Lehigh Alumni Bulletin*, "Celebrating Darwin's birthday and legacy"
2006	*National Geographic Daily News*, "Ancient locust swarm crossed Atlantic, study says"

TEACHING

Assistant Professor

Boston University

Evolution, Fall 2011-2013 – Undergraduate Course
Progress in Ecology, Behavior, Evolution & Marine Science, Fall 2013 – Graduate course
Advanced Evolutionary Analysis, Spring 2013 – Graduate course
Species & Speciation, Fall 2012– Graduate course
Population Genetics, Spring 2011– Undergraduate course

Lehigh University

Integrative & Comparative Biology w/Lab, Spring 2009, 2010 – Undergraduate Course
Evolution, Fall 2007-2009 – Undergraduate Course
Species & Speciation, Spring 2008 – Graduate course

Instructor

University of Maryland, College Park
Principles of Evolution, Winter 2006 – Undergraduate Course

NSF K-12 Teaching Fellow – Cornell University

Environmental Science, The Alternative Community School, Ithaca, NY USA. - Spring 2004
Ecology, The Alternative Community School, Ithaca, NY USA - Fall 2003

Teaching Assistant – Undergraduate Courses

Introductory Biology, 1999-2001; 2004-2005
Evolution for non-majors, 2002-2003
Environmental Science, 1998; 1999
Animal Behavior, 1997

DEPARTMENTAL SERVICE

Boston University

2013 Department of Biology, undergraduate advising (n=26)
2012 Ecology, Behavior, Evolution, and Marine Biology Seminar Organizer
Department of Biology, undergraduate advising (n=24)
2011 Ecology, Behavior, Evolution, and Marine Biology Seminar Organizer
Department of Biology, undergraduate advising (n~18)
2011 Biobugs x 2
2010 Freshmen Friday x 3
Biomixer

Lehigh University

2010 Department of Biological Sciences, undergraduate advising (n=19)
Pool Scholars Pre-Medical Faculty Advisor
Graduate Admissions Committee
2009 Biology Seminar Series Coordinator
Pool Scholars Pre-Medical Faculty Advisor
Microbial Ecology Search Committee
Graduate Admissions Committee
Department of Biological Sciences, undergraduate advising (n=14)
2008 Graduate Admissions Committee
Department of Biological Sciences, undergraduate advising (n=11)
Undergraduate Curriculum Committee
2007 Undergraduate Curriculum Committee

Postdoctoral advisor

2011 – 2013 Jason R. Gallant, Boston University, USA
2009 - 2012 Wesley K. Savage, Boston University, USA

Graduate advisor/ co-advisor

2013 - 2018 Benjamin Pote, Ph.D. Boston University, USA
2012 - 2014 Emily R. Ebel, Master's, Boston University, USA
2007 - 2013 Vance E. Imhoff, Ph.D, Lehigh University, USA.

Ph.D. committee member

Boston University

2011 – 2017 Julie Nicol, Ph.D. candidate
2010 – 2016 Cassidy D'Aloia , Ph.D. candidate
2010 – 2016 Kristina Cohen, Ph.D. candidate
2010 – 2016 Elizabeth Burmester , Ph.D. candidate
2009 – 2015 Nathan Rycroft, Ph.D. candidate

2009 – 2015 Tristan Lubinski, Ph.D. candidate
2009 – 2015 Aryn Wilder, Ph.D. candidate
2009 – 2015 Lauren Friedman, Ph.D. candidate
2009 – 2015 Derek Stefanik, Ph.D. candidate
2008 – 2014 Katie Faust-Stryjewski, Ph.D. candidate
2006 – 2014 Jeff DaCosta, Ph.D. candidate
2007 – 2013 Nicholas Crawford, Ph.D

Lehigh University

2009 – 2015 Sonia Weimann, Ph.D candidate
2008 – 2014 Jeremy Brozek, Ph.D candidate
2008 – 2014 Kimberly Little, Ph.D candidate
2006 – 2011 Joseph Lease, Ph.D
2006 – 2010 Jennifer Gumm, Ph.D
2005 – 2010 Jennifer Snekser, Ph.D.

Undergraduate research advisor

Boston University

2012-13 Nora A. Moskowitz (Credit x 2; UROP x 1)
2012 Annie Wong (Volunteer x 1, Credit x 1).
Lita Tornaritis (Volunteer x 1; Credit x 2),
2010-11 Chelsea Peterson (Volunteer x1; UROP x 2; Credit x 2)

Lehigh University

2010 Emily Becker (HHMI Summer Institute)
David Goldberg (HHMI Summer Institute)
Kathleen Petryna (HHMI Summer Institute, Credit x 2),
Erica Smith (HHMI Summer Institute),
2009-10 Elizabeth Phyfe 2009 (Volunteer x 1, Credit x 2)
2008-10 Benjamin Evans (HHMI Summer Institute, Credit x 4)
2008-10 Inneke Carmola (Volunteer x 1, Credit x 3)
2007-10 Jennifer Cochran (Volunteer x 1, Credit x 4)

Hosted Seminars

2012 Lauren O'Connell, FAS Center, Harvard University
Jonathan Pruitt, University of Pittsburgh
Jason Gallant, Boston University
Patrick Danley, Baylor University
Richard Harrison, Cornell University
2011 David Pfennig, University of North Carolina, Chapel Hill
Karin Pfennig, University of North Carolina, Chapel Hill
2010 Ryan Calsbeek, Dartmouth University
2009 Daven Presgraves, University of Rochester.
2008 David Pfennig, University of North Carolina, Chapel Hill
2007 Marcus Kronforst, FAS Systems Center, Harvard University

EXTERNAL PROFESSIONAL SERVICE

Associate Editor – Journal of Heredity

Professional Reviews – Guest Editor

2013 Journal of Heredity
2013 Pysche, Journal of Zoology

Professional Reviews – Scientific Manuscripts (2006-13)

Nature	PNAS
PLoS Genetics	Evolution
Journal of Evolutionary Biology	Molecular Phylogenetics and Evolution
Animal Behavior	Proceedings of the Royal Society, Series B
Molecular Ecology	Genetics
Ethology	BMC Evolutionary Biology
BMC Genomics	Genetica
PLoS One	Journal of the Lepidopterist Society

Professional Reviews - Proposals

2009-2013	National Science Foundation Evolutionary Processes -External Reviewer
2010, 2012	National Science Foundation Evolutionary Process DDIG Panel
2010	BBSRC External Review, UK.
2009	National Science Foundation, Graduate Research Fellowship Panel
2009	Dutch Research Council (NWO) External Reviewer

Professional Memberships

American Genetics Association
Society for the Study of Evolution
Society for Molecular Biology and Evolution
Lepidopterist's Society
Sigma Xi Scientific Research Society