Curriculum Vitae

Robert A. Drewell, Ph.D.

Clark University
Department of Biology
Worcester, MA 01610

Tel: (508) 793 7625
E-mail: rdrewell@clarku.edu
Lab Webpage: http://wordpress.clarku.edu/drewelllab/

Faculty Positions

Clark University
Biology Department
Chair — **June 2018 – present**
Professor — **Aug 2017 – present**
Associate Professor — **Aug 2014 – July 2017**

Biochemistry and Molecular Biology Program — **Aug 2014 – present**
Mathematical Biology and Bioinformatics Concentration — **Aug 2014 – present**
Director — **June 2016 – present**

University of Colorado, Boulder — **Aug 2017 – Dec 2017**
Inaugural Sabbatical Professor, BioFrontiers Institute

Amherst College, Department of Biology
Mount Holyoke College, Department of Biological Sciences
Five College Visiting Professor — **July 2013 – July 2014**

Harvey Mudd College
Biology Department
Associate Professor — **July 2010 – July 2014**
Assistant Professor — **July 2006 – June 2010**

University of Sydney, Australia — **Jan –May 2011**
Visiting Professor, School of Biological Sciences

University of Manchester, UK — **Oct – Dec 2010**
Visiting Scholar, Faculty of Life Sciences

Harvard University Medical School — **July – Sep 2010**
Visiting Fellow, Department of Biological Chemistry and Molecular Pharmacology

Deep Springs College — **May – June 2010**
Visiting Professor of Natural Science

University of Nevada, Reno — **June 2004 – June 2006**
Assistant Professor, Biology Department

Research Interests

Investigating the molecular mechanisms of developmental gene regulation in *Drosophila* and social insects, using experimental molecular genomic, mathematical and computational approaches. Currently analyzing the epigenetic and transcriptional regulatory networks that control gene expression during embryogenesis, including the evolution of *cis*-regulatory modules and the role of DNA methylation.

Education

King's College, University of Cambridge, UK **Sep 1999**
Wellcome Trust Prize Studentship
Ph.D. Molecular & Developmental Biology Advisor: Prof. Azim Surani
Thesis: Functional analysis of a *cis*-acting imprinting control element

King's College, University of London, UK **June 1996**
Wilkins Outstanding Undergraduate Prize
B.Sc. (Hons.) Molecular Genetics – First Class Advisor: Prof. Roger Patient
Honors research project: Analysis of regulatory sequences in the promoter of the *GATA-1* genes in the zebrafish *Danio rerio* and *Xenopus laevis*

Laboratory Research Positions

Postdoctoral Research
California Institute of Technology **June 2002 – May 2004**
Division of Biology
Elizabeth Ross Biology Divisional Fellowship P.I.: Prof. Ed Lewis
Regulation of gene expression during embryogenesis in *Drosophila*.

University of California Berkeley **Feb 2001 – May 2002**
Department of Molecular & Cell Biology
Wellcome Trust Prize Travelling Fellowship P.I.: Prof. Mike Levine
Functional analysis of *cis* regulatory elements at the *Hox* gene clusters in *Drosophila melanogaster*.

University of Cambridge **Oct 1999 – Jan 2001**
Wellcome/CR-UK Institute
Wellcome Trust Prize Fellowship P.I.: Prof. Azim Surani
Developed projects which arose from my Ph.D. thesis work.

Graduate Research
University of Cambridge **Oct 1996 – Sep 1999**
Wellcome/CR-UK Institute
Wellcome Trust Prize Studentship
Ph.D. thesis in the laboratory of Prof. Azim Surani, studied the mechanism of genomic imprinting in mice.

Undergraduate Research
University of London **July - Aug 1995**
Department of Immunology, King's College School of Medicine
Wellcome Trust Vacation Scholarship P.I.: Dr. Mark Peakman
Characterized the Coxsackie viral genome, a causative agent in insulin dependent diabetes mellitus in humans.

University of London **May - June 1995**
Developmental Biology Research Centre, King's College
KCL Biomedical Sciences Division Summer Studentship P.I.: Prof. Roger Patient
Investigated proteins which regulate *GATA-2* gene expression during *Xenopus laevis* development.

Rice University **June - Aug 1994**
Department of Biochemistry & Cell Biology, Houston, Texas
Nuffield Foundation Undergraduate Research Bursary P.I.: Prof. Kate Beckingham
Examined phenotypes in *Drosophila melanogaster* carrying mutations in the *Calmodulin* gene.

Teaching

Philosophy

My primary teaching goals are embodied in three central concepts: to foster critical thinking from my students, develop the acquisition of life-long learning and to generate problem-solving skills. These goals are reflected in my approach to teaching Biology and have helped to shape my instructional methods in class. I believe that education is the single most important asset that defines a person. Only members of the human species devote more than a quarter of their lives to formal education in an effort to gain an understanding of concepts that are evolving over time. As an educator, I respect this fact and value the role I can play in influencing the intellectual development of my students.

Courses taught

Molecular Genetics, Clark University **Spring 2018**
Biochemistry and Molecular Biology Program
Course director and instructor for seminar-based upper level Undergraduate/Graduate class. Course explores recent discoveries in the molecular genetics of prokaryotes and eukaryotes. Topics include: Transcription, gene regulation, RNA splicing, protein synthesis, non-coding RNAs and the origins of living systems.

Mathematical Modeling of Biological Systems, Clark University **Spring 2017, 2019**
Mathematical Biology and Bioinformatics Concentration
Co-course director and instructor for introductory course in Mathematical Biology for Undergraduates. Course focuses on molecular, organismal and population-level topics that utilize modeling approaches at the interface of mathematics and the life sciences. This class is taken by up to 24 First Year and Sophomore students.

Introduction to Biology II, Clark University **Spring 2016**
Biology Department
Course director and instructor for lecture-based class focused on the central themes of Biochemistry, Cell Biology and Evolutionary diversity as a framework to introduce the field of biology. This class is taken by approximately 155 First Year students.

Bioethics: stem cells, embryos and reproduction, Clark University **Fall 2015**
Biology Department
Course director and instructor for discussion-based *First Year Intensive* and *Values Perspective* class, taken by 12 First Year Undergraduate students. Course develops a deeper understanding of the science surrounding recent technological advances in stem cell Biology and embryological sciences and addresses some of the key associated societal and ethical concerns.

Epigenetics, Clark University **Spring 2015, 2018**
Biology Department
Course director and instructor for seminar-based upper level Undergraduate/Graduate class. Course focuses on a critical investigation of key topics in the primary literature from the fields of epigenetics, chromosome structure, chromatin and gene expression.

Genetics, Clark University **Fall 2014, 2015**
Biology Department **Spring 2017**
Course director and instructor for lecture based, Undergraduate class of 64 students. Course aimed at introducing the central concepts of Mendelian and molecular genetics from a genomic perspective.

Frontiers in Biomathematics, Smith College **Spring 2014, Fall 2014**
Biology Department
Co-instructor for gateway course in Mathematical Biology for Undergraduates. Course focuses on interdisciplinary topics spanning mathematics and the life sciences. This class is typically taken by 30 First Year and Sophomore students.

Molecular Genetics, Mount Holyoke College **Spring 2014**
Biology Department
Course director and instructor for seminar-based upper level Undergraduate class. Course focuses on a detailed analysis of topics in the primary literature from the field of modern molecular genetics and human disease.

Epigenetics, Amherst College **Spring 2014**
Biology Department
Course director and instructor for seminar-based upper level Undergraduate class. Course focuses on a critical investigation of key topics in the primary literature from the fields of epigenetics, chromatin and gene regulation.

Integrated Introduction to Biology and Chemistry, Mount Holyoke College **Fall 2013**
Chemistry and Biology Departments
Course director and instructor for lecture-based class focused on the core concepts, language and frameworks for both biology and chemistry. This class is taken by approximately 48 First Year students.

Topics in Biochemistry and Molecular Biology, Harvey Mudd College **Fall 2012**
Chemistry and Biology Department
Course director and instructor for seminar-based upper level Undergraduate class. Course focuses on a detailed analysis of topics in the primary literature from the fields of molecular biology and nucleic acid biochemistry with a focus on cancer.

Molecular and Cellular Biology Laboratory, Harvey Mudd College **Fall 2012**
Biology Department
Course director and instructor for laboratory-based modules in genetics, molecular and cell biology in human and *C. elegans* model organism. This class is typically taken by 24 Sophomore and Junior students.

The Human Genome, Deep Springs College **Summer 2010**
Course director and instructor for lecture and recitation-based introductory level Undergraduate class of 14 students. The human genome is used as a reference point from which to teach the central concepts of genetics, molecular biology and evolution through an integrated, problem-solving approach.

Epigenetics, Harvey Mudd College **Spring 2009**
Biology Department
Course director and instructor for seminar-based upper level Undergraduate class. Course focuses on a critical investigation of key topics in the primary literature from the field of epigenetics, chromatin and gene regulation.

Introductory Biology, Harvey Mudd College **Fall, Spring 2008 - 2010**
Biology Department **Spring 2012 and 2013**
Course director and instructor for lecture-based class focused on the central themes of genetics, molecular biology and evolution as a framework to introduce the field of biology. This class is taken by approximately 180 Freshman students each semester.

Introductory Biology Laboratory, Harvey Mudd College **Spring 2008**
Biology Department
Course director and instructor for laboratory-based experimental module utilizing *Drosophila* fruit flies as a model organism to investigate Mendelian genetics. This class is typically taken by 24 Sophomore students.

Cell and Developmental Biology, Harvey Mudd College **Spring 2007, 2010, 2012**
Biology Department
Course director and instructor for seminar-based upper level Undergraduate class. Course focuses on a critical evaluation of key topics in the current primary literature from the fields of developmental biology and evolution.

Bioethics and Embryology, Harvey Mudd College **Spring 2007, 2008, Fall 2011**
Biology Department
Course director and instructor for seminar and discussion-based Undergraduate class.
Course develops a deeper understanding of the ways in which modern science can influence human development and an appreciation for the complexity and current issues in the field of embryological bioethics.

Interdisciplinary Laboratory, Harvey Mudd College **Fall 2006 and 2007**
Chemistry Department
Course director and instructor for laboratory-based experimental plasmid mapping module taken by Freshman class of 170 students.

Molecular Biology, Harvey Mudd College **Fall 2006 - 2009**
Biology Department
Course director and instructor for lecture based, upper level Undergraduate class of 25 students. Course focused on examining the details of the central dogma of Molecular Biology through critical thinking exercises.

Principles of Genetics, University of Nevada, Reno **Fall 2005**
Biology Department
Course director and instructor for lecture based, upper level Undergraduate class of 100 students. Course aimed at introducing the central concepts of Mendelian, molecular and population genetics through a problem-solving approach.

Developmental Biology, University of Nevada, Reno **Spring 2005 and 2006**
Biology Department
Course director and instructor for lecture based, upper level Undergraduate class of 50 students. Course concentrates on fundamental events during embryonic development. A particularly important question is how genes direct the behavior and differentiation of cells in different kinds of embryos.

Cell Biology, University of Nevada, Reno **Spring 2005 and 2006**
Cell and Molecular Biology Graduate Program
Instructor for lecture and seminar-based, graduate class of 30 students. Lectured on the specific research interests of my own lab, including the role of chromatin and *cis*-regulatory elements in directing gene expression during embryonic development.

Regulation of Developmental Gene Expression, Caltech **Spring 2003**
Division of Biology
Course director and instructor for seminar and tutorial-based Undergraduate class.

Molecular Genetics, University of Cambridge **Fall 1999**
King's College
Teaching assistant for tutorial-based Undergraduate class.

Cell and Molecular Biology, University of Cambridge **Spring 1997**
King's College
Teaching assistant for tutorial-based Undergraduate class.

Publications

Undergraduate student authors are underlined
H-index score: 18 i10-index score: 21

44. Hierarchical clustering reveals distinct binding site sub-groups for many *Drosophila* transcription factors
N. Al Hossain, **R. A. Drewell** and J. M. Dresch. **In preparation**.

43. Honey bee worker sub-castes display extensive DNA methylation differences.
E. Wainblat, S. Parker, J. M. Dresch and **R. A. Drewell**. **In preparation**.

42. A novel hybrid parameter estimation approach outperforms traditional local or global evolutionary algorithms.
M. Gaiewski, **R. A. Drewell** and J. M. Dresch. **In preparation**.

41. Core promoter element sequence interdependencies are conserved from fly to human.
J. M. Dresch, R. Conrad, D. Larkin and **R. A. Drewell**. **In preparation**.

40. Analyzing the stability of gene expression.
G. D. McCarthy, **R. A. Drewell** and J. M. Dresch. **Submitted**. *SIAM Journal on Applied Mathematics*

39. Whole genome bisulfite sequencing reveals a sparse, but robust pattern of DNA methylation in the *Dictyostelium discoideum* genome.
J. L. Steenwyk, J. St. Denis, J. M. Dresch, D. A. Larochelle and **R. A. Drewell**. **Submitted**. *BIORXIV/2017/166033*

38. The GEP: Crowd-Sourcing Big Data Analysis with Undergraduates.
S. C. R. Elgin, C. Hauser, T. M. Holzen, C. Jones, A. Kleinschmit, J. Leatherman, Genomics Education Partnership (incl. **R. A. Drewell**). **2017**. *Trends in Genetics* 33: 81-85.

37. Spatial distribution of predicted transcription factor binding sites in *Drosophila* ChIP peaks.
K. Pettie, J. M. Dresch and **R. A. Drewell**. **2016**. *Mechanisms of Development* 141: 51-61.

36. Nucleotide interdependency in transcription factor binding sites in the *Drosophila* genome.
J. M. Dresch, R. G. Zellers, D. K. Bork and **R. A. Drewell**. **2016**. *Gene Regulation and Systems Biology* 10: 21-33.

35. Parent-of-origin effects on genome-wide DNA methylation in the Cape honey bee (*Apis mellifera capensis*) may be confounded by allele-specific methylation.
E. J. Remnant, A. Ashe, P. Young, G. Buchmann, M. Beekman, M. H. Allsopp, C. M. Suter, **R. A. Drewell** and B. P. Oldroyd. **2016**. *BMC Genomics* 17: 226.

34. Global sensitivity analysis of a dynamic model for gene expression in *Drosophila* embryos.
G. D. McCarthy, **R. A. Drewell** and J. M. Dresch. **2015**. *PeerJ* 3: e1022.

33. MARZ: an algorithm to combinatorially analyze gapped *n*-mer models of transcription factor binding.
R. G. Zellers, **R. A. Drewell** and J. M. Dresch. **2015**. *BMC Bioinformatics* 16: 30.

32. The dynamic DNA methylation cycle from egg to sperm in the honey bee *Apis mellifera*.
R. A. Drewell, E. C. Bush, E. J. Remnant, G. T. Wong, S. M. Beeler, J. L. Stringham, J. Lim and B. P. Oldroyd. **2014**. *Development* 141: 2702-2711.

31. Whole genome DNA methylation profile of the jewel wasp (*Nasonia vitripennis*).
S. M. Beeler, G. T. Wong, J. M. Zheng, E. C. Bush, E. J. Remnant, B. P. Oldroyd and **R. A. Drewell**. **2014**. *G3: Genes, Genomes, Genetics* 4: 383-388.

30. Deciphering the combinatorial architecture of a *Drosophila* homeotic gene enhancer.
R. A. Drewell, M. J. Nevarez, J. S. Kurata, L. N. Winkler, L. Li and J. M. Dresch. **2014**. *Mechanisms of Development* 131: 68-77.

29. A parent-of-origin effect on honeybee worker ovary size.
B. P. Oldroyd, M. H. Allsopp, K. M. Roth, E. J. Remnant, **R. A. Drewell** and M. Beekman. **2013**. *Proceedings of the Royal Society B* 281: 20132388.

28. Flanking sequence context-dependent transcription factor binding in early *Drosophila* development.
J. L. Stringham, A. S. Brown, **R. A. Drewell** and J. M. Dresch. **2013**. *BMC Bioinformatics* 14: 298.

27. Decoding the *cis*-regulatory grammar behind enhancer architecture.
J. M. Dresch and **R. A. Drewell**. **2012**. *Genomics III: Methods, Techniques and Applications* (iConcepts Press, book chapter) ISBN: 978-1-922227-096.

26. Kin conflict in insect societies: a new epigenetic perspective.
R. A. Drewell, N. Lo, P. R. Oxley and B. P. Oldroyd. **2012**. *Trends in Ecology and Evolution* 27: 367-373.

25. Transcription factor binding site redundancy in embryonic enhancers of the *Drosophila* bithorax complex.
R. A. Drewell. **2011**. *G3: Genes, Genomes, Genetics* 1: 603-606.

24. Molecular dissection of *cis*-regulatory modules at the *Drosophila* bithorax complex reveals critical transcription factor signature motifs.
M. O. Starr, M. C. W. Ho, E. J. M. Gunther, Y. K. Tu, A. S. Shur, S. E. Goetz, M. J. Borok, V. Kang and **R. A. Drewell**. **2011**. *Developmental Biology* 359: 290-302.

23. Transcriptional repression by the proximal exonic region at the human *TERT* gene.
T. C. Wong, E. S. Sokol, A. N. Schep, M. Punjiya, D. A. Tran, D. Allen and **R. A. Drewell**. **2011**. *Gene* 486: 65-73.

22. Disruption of the *Abdominal-B* promoter tethering element results in a loss of long-range enhancer-directed Hox gene expression in *Drosophila.*
M. C. W. Ho, B. J. Schiller, O. S. Akbari, E. Bae and **R. A. Drewell**. **2011.** *PLoS One* 6: e16283.

21. Characterization of an ultra-conserved putative *cis*-regulatory module at the mammalian telomerase reverse transcriptase gene.
D. A. Tran, T. C. Wong, A. N. Schep and **R. A. Drewell**. **2010**. *DNA and Cell Biology* 29: 499-508.

20. Dissecting the regulatory switches of development: Lessons from enhancer evolution in *Drosophila*.
M. J. Borok, D. A. Tran, M. C. W. Ho and **R. A. Drewell**. **2010**. *Development* 137*:* 5-13.

19. Functional evolution of *cis*-regulatory modules at a homeotic gene in *Drosophila*.
M. C. W. Ho, H. Johnsen, S. E. Goetz, B. J. Schiller, E. Bae, D. A. Tran, A. S. Shur, J. M. Allen, C. Rau, W. Bender, W. W. Fisher, S. E. Celniker and **R. A. Drewell**. **2009**. *PLoS Genetics* 5: e1000709.

18. Non-genic transcription at the *Drosophila* bithorax complex – functional activity of the dark matter of the genome.
M. C. W. Ho, B. J. Schiller, S. E. Goetz and **R. A. Drewell**. **2009**. *International Journal of Developmental Biology* 53: 459-468.

17. A concise *Drosophila* laboratory module to introduce the central concepts of genetics.
M. C. W. Ho, D. R. Venema and **R. A. Drewell**. **2008**. *Drosophila Information Service* 91: 164-168.

16. Between transcription and translation: re-defining RNA and regulation.
M. C. W. Ho, B. J. Schiller, S. E. Goetz, J. M. Allen and **R. A. Drewell**. **2008**. *Fly* 2: 152-155.

15. A novel promoter tethering element regulates enhancer-driven gene expression at the bithorax complex in the *Drosophila* embryo.
O. S. Akbari, E. Bae, H. Johnsen, A. Villaluz, D. Wong and **R. A. Drewell**. **2008**. *Development* 135: 123-131.

14. The *Abdominal-B* promoter tethering element mediates promoter-enhancer specificity at the *Drosophila* bithorax complex.
O. S. Akbari, B. J. Schiller, S. E. Goetz, M. C. W. Ho, E. Bae and **R. A. Drewell**. **2007**. *Fly* 1: 337-339

13. Chromatin looping mediates boundary element promoter interactions.
S. Celniker and **R. A. Drewell**. **2007**. *Bioessays* 29: 7-10.

12. The human and mouse *H19* imprinting control regions harbor an evolutionarily conserved silencer element that functions on transgenes in *Drosophila*.
K. L. Arney, E. Bae, C. E. Olsen and **R. A. Drewell**. **2006**. *Development, Genes and Evolution* 216: 811-819.

11. Unraveling *cis*-regulatory mechanisms at the *abdominal-A* and *Abdominal-B* genes in the Drosophila bithorax complex.
O. S. Akbari, A. Bousum, E. Bae and **R. A. Drewell**. **2006**. *Developmental Biology* 293: 294-304.

10. The 3' portion of the mouse *H19* Imprinting-Control Region is required for proper tissue-specific expression of the *Igf2* gene.
H. Hagège, R. Nasser, M. Weber, L. Milligan, N. Aptel, C. Jacquet, **R.A. Drewell**, L. Dandolo, M.A. Surani, G. Cathala, T. Forné. **2006**. *Cytogenetic & Genome Research* 113: 230-237.

9. Transcription defines the embryonic domains of *cis*-regulatory activity at the *Drosophila* bithorax complex.
R. A. Drewell, E. Bae, J. Burr and E. B. Lewis. **2002**. *Proceedings of the National Academy of Sciences USA* 99: 16853-16858.

8. Characterization of the intergenic RNA profile at *abdominal-A* and *Abdominal-B* in the *Drosophila* bithorax complex.
E. Bae, V. C. Calhoun, M. Levine, E. B. Lewis and **R. A. Drewell**. **2002**. *Proceedings of the National Academy of Sciences USA* 99: 16847-16852.

7. Novel conserved elements upstream of the *H19* gene are transcribed and act as mesoderm enhancers.
R. A. Drewell, K. L. Arney, T. Arima, S. C. Barton, J. D. Brenton and M. A. Surani. **2002**. *Development* 129: 1205-1213

6. Methylation-dependent silencing at the *H19* imprinting control region by MeCP2.
R. A. Drewell, C. J. Goddard, J. O. Thomas and M. A. Surani. **2002**. *Nucleic Acids Research* 30: 1139-1144

5. A conserved imprinting control region at the *HYMAI/ZAC* domain is implicated in transient neonatal diabetes mellitus.
T. Arima, **R. A. Drewell**, K. L. Arney, J. Inoue, Y. Makita, A. Hata, M. Oshimura, N. Wake, and M. A. Surani. **2001**. *Human Molecular Genetics* 10: 1475-1483

4. Epigenetic reprogramming of the genome - from the germ line to the embryo and back again.
K. L. Arney, S. Erhardt, **R. A. Drewell** and M. A. Surani. **2001**. *International Journal of Developmental Biology* 45: 533-540

3. Deletion of a silencer element disrupts *H19* imprinting independently of a DNA methylation epigenetic switch.
R. A. Drewell, J. D. Brenton, J. F-X Ainscough, S. C. Barton, K. J. Hilton, K. L. Arney, L. Dandolo and M. A. Surani. **2000**. *Development* 127: 3419-3428.

2. A novel imprinted gene, *HYMAI* is located within an imprinted domain on human chromosome 6 containing *ZAC*.
T. Arima, **R. A. Drewell**, M. Oshimura, N. Wake and M. A. Surani. **2000**. *Genomics* 67: 248-255.

1. A silencer element identified in *Drosophila* is required for imprinting of *H19* reporter transgenes in mice.
J. D. Brenton, **R. A. Drewell**, S. Viville, K. J. Hilton, S. C. Barton, J. F.-X. Ainscough, and M. A. Surani. **1999**. *Proceedings of the National Academy of Sciences USA* 96: 9242-9247.

Student Mentoring

Clark University **Aug 2014 – present**

Undergraduate research projects with 28 students including Biology, Mathematical Biology & Bioinformatics, Physics, Mathematics, Psychology and Biochemistry & Molecular Biology majors.
Two Ph.D. students and seven Masters students in Biology and Biochemistry & Molecular Biology programs.
Six Biology Masters thesis committees.
Three Biology PhD thesis committees.

Amherst College **July 2013 – July 2014**

Undergraduate research projects with 14 students from Amherst and Mount Holyoke Colleges, including Biology, Mathematics, and Biochemistry majors.

Harvey Mudd College **July 2006 – June 2013**

Undergraduate research projects with 54 students, including Biology, Mathematical Biology, Physics, Chemistry, Engineering, Computer Science and Neuroscience majors.

University of Nevada, Reno **June 2004 – June 2006**

Undergraduate research projects with 9 students including Biology and Biochemistry majors.
Two Ph.D. students in Cellular & Molecular Biology and one Masters student in Biotechnology.
Two Cellular & Molecular Biology PhD thesis committees.

Grants Awarded

Research program grants

Decoding gene regulatory networks using integrative systems-level approaches
Clark University Faculty Development Funds ($5,000) **Mar 2018 – Dec 2018**

Decoding *cis*-regulatory grammar at Hox genes
NIH R15 Grant ($450,900) **Apr 2016 – Mar 2019**

Evolution of DNA methylation: genomic imprinting in social insects
Beavers Research Grant ($4,200) **Mar 2015 – Aug 2016**

A synthetic biology approach to investigate *cis*-regulatory logic in *Drosophila*
HHMI Exploratory Pilot Grant ($4,533) **May 2013 – July 2013**

Honey bee epigenomics: investigating differential DNA methylation in gametes
HHMI Collaborative Grant ($25,350) **June 2012 – May 2013**

Genes in conflict in the social insects
Australian Research Council Grant (A$212,000) **Dec 2011 – Nov 2014**
Collaborative P.I.

Molecular dissection of *Drosophila* Hox gene *cis*-regulatory modules
NIH R15 Grant ($210,000) **June 2010 – May 2015**

Molecular evolution of conserved *cis*-regulatory modules in *Drosophila*
HHMI Collaborative Grant ($15,000) **June 2009 – May 2010**

Identification of novel *cis*-regulatory modules at the *Drosophila* Hox genes
Rose Hills / Beckman Research Grant ($10,000) **June 2009 – May 2010**

Investigating the evolution of gene regulation at *Drosophila* Hox genes
NSF CAREER Award ($600,000) **Feb 2009 – Jan 2017**

Molecular investigation of an ultra-conserved region in the human telomerase promoter
Beckman Research Grant ($10,000) **June 2008 – May 2009**

Epigenetic regulation of *Drosophila* Hox gene expression
HHMI Collaborative Grant ($23,000) **June 2008 – May 2009**

Promoter-enhancer interactions at the *Drosophila* bithorax complex
NIH R03 Grant ($145,000) **June 2007 – May 2010**

Regulation of enhancer-directed gene expression at *Drosophila* homeotic genes
Beckman Research Grant ($10,000) **June 2007 – May 2008**

Molecular characterization of conserved regulatory regions in the telomerase promoter
Sierra Sciences Research Grant ($120,000) **Jan 2006 – Dec 2008**

Regulation of tissue-specific gene expression at the imprinted *H19* and *Igf2* genes
University of Nevada Junior Faculty Research Grant ($15,000) **Sep 2005 – Aug 2006**

Career development grants

Project in Innovative Curriculum and Teaching Program Award ($5,000) **Nov 2013 – Dec 2014**

Mellon Foundation Curricular Development Award ($5,000) **May 2011 – Aug 2011**

HHMI Distinguished Mentor Award ($10,000) **Jan 2009 – Dec 2010**

Postdoctoral research grants

Functional analysis of *cis*-regulatory elements at the Hox gene clusters in *Drosophila*
Wellcome Trust, UK ($116,000) **May 2001 – Apr 2004**

Investigation of novel mechanisms of imprinting at the *H19*/*Igf2* locus
Wellcome Trust, UK ($126,000) **Oct 1999 – Apr 2001**

Graduate research grant

Functional characterization of a *cis*-acting imprinting control element
Wellcome Trust, UK ($84,000) **Oct 1996 – Sep 1999**

Departmental Program Grants Awarded

Defining the Quantitative and Computational Skills of Incoming First Year College Students
HHMI Undergraduate Science Education Program ($200,000) **2013 – 2016**
Collaborative Pilot Grant

Enhancing Quantitative and Computational Skills in a New Generation of Leaders in the Sciences: a Collaborative Approach
HHMI Undergraduate Science Education Program ($3,600,000) **2012 – 2016**
Program Director

Interdisciplinary Molecular Science
Beckman Foundation Scholars Program ($77,200) **2010 – 2013**

The Molecular Logic of Biological Systems
MERCK-AAAS Undergraduate Science Research Program ($60,000) **2009 – 2012**

Access at the interface of Biology and Computer Science
HHMI Undergraduate Science Education Program ($1,400,000) **2008 – 2012**
Program Director

Competitive Awards and Honors

UC Boulder BioFrontiers Institute Inaugural Sabbatical Professorship	**2017**
Project in Innovative Curriculum and Teaching Program Award	**2013 – 2014**
Mellon Foundation Curricular Development Award	**2011**
National Science Foundation CAREER Award	**2009 – 2017**
Howard Hughes Medical Institute Distinguished Mentor Award	**2009 – 2010**
Society for Developmental Biology Travel Award	**2009**
Keystone Symposium Scholarship Award	**2004**
California Institute of Technology Elizabeth Ross Biology Divisional Fellowship	**2003 – 2004**
Keystone Symposium Scholarship Award	**2003**
Wellcome Trust Prize Travelling Fellowship	**2001 – 2003**
Wellcome Trust Prize Fellowship	**1999 – 2001**
Keystone Symposium Scholarship Award	**2000**
Wellcome Trust Prize Studentship	**1996 – 1999**
Wilkins Outstanding Undergraduate Prize	**1996**
Wellcome Trust Vacation Scholarship	**1995**
KCL Biomedical Sciences Division Summer Studentship	**1995**
Nuffield Foundation Undergraduate Research Bursary	**1994**

Major Scientific Meetings & Invited Presentations

59th Annual Drosophila Research Conference **Apr 2018**
Philadelphia, Pennsylvania
Presentation – Investigating sequence interdependencies in *Drosophila* and human core promoter elements

Keystone Symposium – Gene Control in Development and Disease **Mar 2018**
Whistler, Canada
Presentation – Sequence interdependencies in core promoter elements

BioFrontiers Seminar – University of Colorado, Boulder **Nov 2017**
Boulder, Colorado
Presentation – Interdisciplinary approaches to decipher the regulatory logic of enhancers in *Drosophila* development

Gordon Research Conference – Developmental Biology **June 2017**
South Hadley, Massachusetts
Presentation – Using mathematical modeling to decipher the regulatory logic behind CRM architecture in the *Drosophila* bithorax complex

Keystone Symposium – Enhancer Malfunction in Cancer **Feb 2016**
Santa Fe, New Mexico
Presentation – Decoding the regulatory logic of *Drosophila* Hox gene enhancers

Joint Mathematics Meetings **Jan 2016**
Seattle, Washington
Presentation – Integrating research and teaching in mathematical biology: thermodynamic modeling of gene regulation

3rd International Conference on Integrative Biology **Aug 2015**
Valencia, Spain
Moderator and Session Chair – Systems Biology
Presentation – Decoding the regulatory architecture of *Drosophila* Hox gene enhancers

Society for Integrative and Comparative Biology Annual Meeting **Jan 2015**
West Palm Beach, Florida
Presentation – Integrating research and teaching in quantitative biology: mathematical modeling of gene regulation

Biology Department Seminar – Mount Holyoke College **Sep 2014**
South Hadley, Massachusetts
Presentation – Investigating genomic imprinting in the honeybee methylome using next generation sequencing

XVII International Union for the Study of Social Insects International Congress **July 2014**
Cairns, Australia
Presentation – Investigating genomic imprinting: an epigenetic cycle in the honey bee methylome

Systems Biology: Global Regulation of Gene Expression **Mar 2014**
Cold Spring Harbor Laboratory, New York
Presentations –
1. Understanding nucleotide-dependence in transcription factor binding sites in early *Drosophila* development
2. Decoding the combinatorial architecture of *Drosophila* Hox gene enhancers

Keystone Symposium – Transcriptional Regulation **Feb 2014**
Santa Fe, New Mexico
Presentations –
1. Regulatory architecture at homeotic gene enhancers
2. Investigating transcription factor binding sites in early *Drosophila* development

17th International Congress of Developmental Biology **June 2013**
Cancun, Mexico
Presentations –
1. Investigating genomic imprinting in the honeybee methylome
2. Deciphering the *cis*-regulatory grammar behind enhancer architecture using a dynamic mathematical model

54th Annual Drosophila Research Conference **Apr 2013**
Washington, D. C.
Presentations –
1. A synthetic biology approach to investigate conserved regulatory motifs in *Drosophila melanogaster*
2. Regulatory architecture of the *Drosophila* IAB7b enhancer
3. Investigating context-dependent transcription factor binding in early *Drosophila* development
4. Thermodynamic models predict quantitative expression levels driven by synthetic *cis*-regulatory modules in the *Drosophila* embryo

Biology Department Seminar – Amherst College **Mar 2013**
Amherst, Massachusetts
Presentation – Investigating genomic imprinting in the honeybee methylome using next generation sequencing

Society of Developmental Biology Southwest Regional Meeting **Feb 2013**
Salt Lake City, Utah
Presentation – Genomic imprinting in the honey bee methylome

High Throughput Biology – Genomics and Epigenomics **Oct 2012**
Cold Spring Harbor Asia, Suzhou, China
Presentation – Genomic imprinting in the honey bee methylome

10th European Molecular Biology Laboratory Transcription and Chromatin Meeting **Aug 2012**
Heidelberg, Germany
Presentation – Molecular evolution of *cis*-regulatory modules at the *Drosophila* bithorax complex

Genetics Seminar – University of Geneva **Aug 2012**
Geneva, Switzerland
Presentation – Parental conflict: epigenetics, imprinting and the methylome

High Throughput Sequencing (HiTSeq) Methods and Applications Conference **July 2012**
Long Beach, California
Presentation – Genomic imprinting in the honey bee methylome

53rd Annual Drosophila Research Conference **Mar 2012**
Chicago, Illinois
Presentation – Decoding transcriptional control at the IAB7b *cis*-regulatory module in the bithorax complex

Biological Sciences Seminar - University of Sydney **Apr 2011**
Sydney, Australia
Presentation – Molecular evolution of *cis*-regulatory modules at the *Drosophila* bithorax complex

Molecular Genetics Seminar – Harvard University Medical School **Sep 2010**
Presentation – Molecular dissection of *cis*-regulatory modules at the *Drosophila* BX-C

3rd European Society for Evolutionary Developmental Biology Meeting **July 2010**
Paris, France
Presentation – Decoding embryonic c*is*-regulatory modules at *Drosophila* Hox genes

Keystone Symposium – Regulatory Mechanisms in Eukaryotic Transcription **Apr 2010**
Keystone, Colorado
Presentation – Molecular dissection of enhancer CRMs at the *Drosophila* BX-C

Snow Leopard Genomics Initiative Workshop **Jan 2010**
San Diego, California
Presentation – Genetic variation and its impact on gene expression

Southern California Fly Meeting **Sep 2009**
University of California Irvine, California
Presentation - Promoter-enhancer interactions in the bithorax complex of *Drosophila*

Beckman Scholars Symposium – Irvine, California **July 2009**
Presentation – Characterization of CTCF binding sites in the proximal exonic region of human *TERT* gene

68th Society of Developmental Biology Annual Meeting **July 2009**
San Francisco, California
Presentations –
1. Decoding embryonic c*is*-regulatory modules at *Drosophila* Hox genes
2. Characterization of a conserved element at the Telomerase promoter
3. Promoter-enhancer tethering is critical for long-range regulatory interactions in the bithorax complex of *Drosophila*

Developmental Biology Seminar – Institute of Molecular and Cell Biology **June 2009**
Singapore
Presentation – Decoding the evolution of *cis*-regulatory modules at *Drosophila* Hox genes

74th Cold Spring Harbor Symposium – Evolution: The Molecular Landscape **May 2009**
Cold Spring Harbor Laboratory, New York
Presentations –
1. Decoding the evolution of *cis*-regulatory logic at *Drosophila* Hox genes
2. Dissecting the regulatory landscape at the *Tert* gene
3. Functional evolution of *cis*-regulatory modules at a homeotic gene in *Drosophila*

Biochemistry Seminar – King's College, University of London, UK **Mar 2009**
Presentation – Decoding the evolution of *cis*-regulatory modules at *Drosophila* Hox genes

Keystone Symposium – Chromatin Dynamics and Higher Order Organization **Feb 2009**
Coeur D'Alene, Idaho
Presentation - Promoter-enhancer tethering regulates long-range regulatory interactions in the bithorax complex of *Drosophila*

Molecular Biology Seminar - City of Hope Hospital, Duarte, California **Oct 2008**
Presentation – Regulation of *Drosophila* Hox genes - functions in the dark matter of the genome

Biology Seminar – Reed College, Portland, Oregon **Sep 2008**
Presentation – Regulation of *Drosophila* Hox genes - functions in the dark matter of the genome

Molecular Biology Meeting - Epigenetics **Sep 2008**
Queenstown, New Zealand
Presentation – Non-genic RNAs within the *Drosophila* bithorax complex

Biochemistry Seminar – University of Otago, Dunedin, New Zealand **Aug 2008**
Presentation – Regulation of *Drosophila* Hox genes - functions in the dark matter of the genome

Beckman Scholars Symposium – Irvine, California **July 2008**
Presentation - Functional characterization of an ultra-conserved module at the Telomerase gene

Developmental Biology Seminar – University of Manchester, UK **June 2008**
Presentation – Regulation of *Drosophila* Hox genes - functions in the dark matter of the genome

Integrating Evolution, Development & Genomics Symposium **May 2008**
University of California Berkeley, California
Presentation - Functional evolution of *cis*-regulatory modules at a homeotic gene in *Drosophila*

49th Annual Drosophila Research Conference **Apr 2008**
San Diego, California
Presentations –
1. Functional analysis of promoter-enhancer interactions at the *Drosophila* bithorax complex
2. Molecular dissection of the IAB5 *cis*-regulatory module in *Drosophila*
3. Functional activity of rapidly evolving *cis* regulatory modules in the *Drosophila* bithorax *complex*

Sackler Colloquium of the National Academy of Sciences – Gene Networks in Animal **Feb 2008**
Development and Evolution. Irvine, California
Presentation - Functional activity of rapidly evolving *cis* regulatory modules in the *Drosophila* bithorax complex

Keystone Symposium – Regulatory Mechanisms in Eukaryotic Transcription **Feb 2008**
Keystone, Colorado
Presentation - Functional activity of rapidly evolving *cis* regulatory modules in the *Drosophila* bithorax *complex*

Northwest Regional Developmental Biology Conference **Mar 2007**
Friday Harbor, Washington
Presentation - Rapid evolution of regulatory elements at a homeotic gene complex in *Drosophila*

***Drosophila* Species Workshop VI** **Oct 2006**
Tucson, Arizona

47th Annual Drosophila Research Conference **Mar 2006**
Houston, Texas
Presentation - A promoter tethering element regulates enhancer-promoter interactions at the *Drosophila* bithorax Complex

EMBO Workshop – Upstream and Downstream of Hox Genes **Dec 2005**
Hyderabad, India
Presentation - Functional analysis of promoter-enhancer interactions at the *Drosophila* bithorax complex

Keystone Symposium – Emerging Mechanisms of Epigenetic Regulation **Jan 2004**
Tahoe City, California
Keystone Symposium Scholarship Award
Presentation - Functional analysis of an epigenetic and *cis*-regulatory network which controls gene expression at the *Drosophila* bithorax complex

Gordon Research Conference – Epigenetics **Aug 2003**
Holderness, New Hampshire
Presentation - Intergenic RNAs within the *Drosophila* bithorax complex define the embryonic domains of activity for *cis*-regulatory elements

22nd Annual Summer Symposium in Molecular Biology – Chromatin Structure and Function **July 2003**
Penn State University, Pennsylvania
Presentation - Non-coding RNAs within the *Drosophila* bithorax complex define the embryonic domains of activity for *cis*-regulatory elements

Molecular Biology Seminar - City of Hope Hospital **Feb 2003**
Duarte, California
Presentation **–** *Cis*-regulation at the imprinted *H19* gene

Keystone Symposium – Chromatin: Organizing the Genome for Patterns of Gene **Jan 2003**
Expression in Health and Disease. Big Sky, Montana
Keystone Symposium Scholarship Award
Presentation - Transcription defines the embryonic domains of *cis*-regulatory activity at the *Drosophila* bithorax complex

12th IMP Spring Conference – Epigenetics **May 2002**
Vienna, Austria
Presentation - Epigenetic regulation of enhancer-promoter interactions at the *H19*/*Igf2* locus by an imprinting control region

FASEB Research Conference – Chromatin and Transcription **July 2001**
Snowmass, Colorado
Presentation - Novel conserved elements upstream of the *H19* gene are transcribed and act as mesodermal enhancers

4th European Molecular Biology Laboratory Transcription Meeting **Aug 2000**
Heidelberg, Germany
Presentation - Function of a silencer element in a complex *cis*-regulatory region upstream of the imprinted *H19* gene

Keystone Symposium - Chromatin Structure and Function **Feb 2000**
Durango, Colorado
Keystone Symposium Scholarship Award
Presentation - Functional analysis of a *cis*-acting imprinting control element at the *H19* locus

Genetical Society's 10th Mammalian Genetics and Development Workshop **Nov 1999**
University College London, UK
Presentation – Epigenetic control of the imprinted *H19* gene

BSDB Symposium - Genomic Imprinting, its role in development and disease. **Sept 1997**
University of Cambridge, UK

Academic Service

Clark University

Mathematical Biology and Bioinformatics Program Committee	**Aug 2014 – present**
Biology Department - Curriculum Committee	**Sep 2015 – present**
Director, Mathematical Biology and Bioinformatics Concentration	**June 2016 – present**

Mount Holyoke College

Biochemistry Program Committee	**Aug 2013 – July 2014**
Biology Department – Curriculum Committee	**Sep 2013 – July 2014**

Harvey Mudd College

Biology Department – Computational Biologist Search Committee	**Oct 2006 – Mar 2007**
Biology Department – Self Study and Program Review Committee	**July 2006 – May 2007**
Biology Department – Junior Faculty Mentoring Program Committee	**Mar 2007 – May 2007**
HHMI Summer Seminar Series Co-ordinator	**May 2007 – Jan 2010**
Teaching and Learning Committee	**Sep 2007 – May 2010**
Biology Department – Colloquium Co-ordinator	**Sep 2007 – May 2010**
Presentation Days Committee	**Mar 2008 – Jan 2010**
Pre-Medical School Advisor	**May 2008 – May 2010**
Summer Institute Instructor	**Aug 2008 – May 2010**
Biology Department Technician Search Committee	**Mar 2009 – May 2009**
HHMI Postdoctoral Teaching Fellow Search Committee	**Oct 2008 – May 2009**
Summer research celebration Committee	**June 2009 – May 2010**
Chair, Teaching and Learning Committee	**Sep 2009 – May 2010**
Biology Department – Chair, Molecular Biologist Search Committee	**Sep 2009 – May 2010**
UK Fellowships Advisor	**Aug 2011 – June 2013**
Academic Affairs Committee	**Jan 2012 – June 2013**
Biology Department – Quantitative Biologist Search Committee	**May 2012 – Jan 2012**
Biology Department – Chair, Introductory Biology Revision Committee	**Sep 2012 – June 2013**

University of Nevada, Reno

CMB Graduate Program - In-House Seminar Committee	**June 2004 – May 2005**
Chair, In-House Seminar Committee	**June 2005 – June 2006**
Biology Department – Assessment Committee	**Sep 2004 – June 2006**
CMB Graduate Program - Admissions Committee	**Oct 2004 – June 2006**
Biology Department – Cell Biologist/Geneticist Search Committee	**Oct 2004 – June 2005**
CMB Graduate Program – Thesis Committee, Gracie Andrews	**Dec 2004 – June 2006**
CMB Graduate Program – Thesis Committee, Todd Farmer	**Mar 2005 – June 2006**

Professional Activities

***Ad hoc* review of manuscripts**
Reviewer for papers submitted to the journals; *PLoS Genetics, Mechanisms of Development, BMC Evolutionary Biology*, *Genome Biology*, *PLoS Biology*, *Gene*, *Developmental Biology*, *G3: Genes, Genomes, Genetics, The International Journal of Developmental Biology*, *BMC Molecular Biology*, *FEBS Letters*, *BMC Evolutionary Biology, Computational and Structural Biotechnology Journal*, *Journal of Molecular Biology*, *Journal of Experimental Zoology*, *Epigenetics, DNA and Cell Biology*, *Molecular Biology and Evolution, PLoS One*, *Molecular Ecology*, *Biology Letters* and *Development.*

Review of grant proposals
Reviewed grant proposals for French National Institute of Cancer, University of Idaho NIH BRIN Postdoctoral Fellowships, K.U. Leuven Research Council, Netherlands, MRC UK Career Developmental Awards, Beckman Scholars Program, Deutsche Forschungsgemeinschaft, Germany, and NSF Molecular and Cell Biology and Integrative Organismal Systems divisions.

Served on proposal review panel in Fall 2009 for the NSF Molecular and Cell Biology division.
Served on proposal review panels in Fall 2009 and Spring 2014 for NSF Integrative Organismal Systems division.
Served on NIH Developmental Biology proposal review panel in Fall 2010 and Spring 2014.
Served on NIH Molecular Genetics proposal review panel in Spring 2016.

***Ad hoc* review of book chapters**
Consultant reviewer for book chapters submitted to Science and Health, Oxford University Press
Consultant reviewer for book chapters submitted to Biological Sciences, Sinauer Associates

Organizations serving Underrepresented groups in STEMs
Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS)
Claremont Colleges student chapter, Faculty Mentor **2011 – 2013**
Clark University student chapter, Faculty Mentor **2016 – present**

Professional Organizations
Society for Developmental Biology
Genetics Society of America
Society for Integrative & Comparative Biology
American Mathematical Society

Outreach to the community
Faculty Advisor, Beekeepers of Clark Club **2017 – present**

Scientific consultant and Associate Producer for movie **2017 – present**
Snowflake

Annual presentation at College Club, Palmdale High School **2006 – 2009**
What to expect at College

Scientific consultant for Discovery channel show **2007 – 2009**
Epigenetics