# BENJAMIN CARONE, PH.D.

ROWAN UNIVERSITY - DEPARTMENT OF BIOLOGICAL SCIENCES
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## Education

**Post-doctoral Fellow** **2009-2014**
UMass Medical School
Department of Biochemistry and Molecular Pharmacology
Laboratory of Dr. Oliver Rando
*Topic: Investigation into the phenomenon and underlying mechanism of Transgenerational Inheritance in M. musculus*

**Ph.D. in Genetics & Genomics** **2004-2009**
University of Connecticut
Department of Molecular and Cell Biology
Laboratory of Dr. Michael O'Neill
*Thesis title: An X-linked imprinted cluster defies the classical mechanisms of epigenetic regulation*

**B.S. Double Major Molecular & Cell Biology and Philosophy** **2000-2004**
University of Connecticut
College of Liberal Arts and Sciences
*Thesis title: Identification of three X-linked imprinted genes Xlr3b, Xlr4b, & Xlr4c in mice*

## Research Experience

**Rowan University**
Department of Biological Sciences **2016-Present**
Assistant Professor
Role: Principle Investigator

**Research Directions:**

- Investigating the capacity of conserved protein catalytic domains to establish and maintain epigenetic modifications in *S. cerevisiae* with the ultimate goal establishing the causal role of histone packaging in regulating gene expression.

- Testing the hypothesis that mammalian spermatic chromatin is highly organized and that this patterning can function to drive Transgenerational Epigenetic Inheritance. Determining the genome-wide organization of chromatin in germ cells using genomic and bioinformatics approaches

**Williams College**
Department of Biology **2014-2016**
Visiting Assistant Professor
Role: Principle Investigator

**Research Directions:**

- Investigating the capacity of induced H3K9 trimethylation to induce gene silencing in *S. cerevisiae.*

**University of Massachusetts Medical School** **2009-2014**
Department of Biochemistry & Molecular Pharmacology
Role: Postdoctoral Fellow
*Laboratory of Oliver Rando, Ph.D., M.D*

**Research Directions:**

- Investigating the inheritance of acquired states using a mouse model of paternal dietary exposure and gene expression analysis in offspring. Work resulted in a first author Cell paper (2010) that has been cited in over 350 publications.

- Determination of fine-scale chromatin mapping in mouse embryonic stem cells & sperm. Work resulted in first author publication in Developmental Cell (2014) and is the first work to resolve the long-standing debate on the location of histone retention within the sperm nucleus.

- Investigation of the RNA expression profiles of Human iPS lines with an Xist-inactivated chromosome 21 in Down syndrome cell lines. This work resulted in a Nature paper (2013) which garnered acclaim from the scientific community and was further covered by NYT, BBC, FOX, as well as many other popular media outlets. My contribution to this work was as the primary bioinformatician/genomic scientist, and as a result, I generated several of the key figures within.

**University of Connecticut** **2000-2004**
Department of Molecular & Cellular Biology
Role: Ph.D. Candidate – Graduate Studies
*Laboratory of Michael O'Neill, Ph.D.*

**Research Directions:**

- Identification of the first X-linked imprinted locus, Xlr3b, Xlr4b, & Xlr4c in mice. Work resulted in a publication in Nature Genetics (2005). My Ph.D. followed up on this finding to look at the mechanism driving genomic imprinting. Our further unpublished findings suggest an entirely novel imprinting mechanism based on post-transcriptional mRNA processing.

- Evaluation of imprinting mechanism driving Igf2 mono-allelic expression in marsupials. Discovery that genomic imprinting in marsupials is accompanied by differential DNA methylation (contrary to previous suggestions in the field) resulted in a first-author publication in BMC Genomics.

## Publications & Manuscripts

Sharma FNU, Conine CC, Shea JM, **Carone BR,** Belleannee C, Li X, Bing XY, Fauquier L, Chen Po-shen, Gu Weifeng, Fazzio TG, Sullivan R, Mello CC, Garber M, Rando OJ
*Paternal diet alters tRNA fragment levels throughout the male reproductive tract in mammals*
Science. 2015 Dec 31.
PMID: 26721685

Shea JM*, Serra RW*, **Carone BR***, Shulha HP, Ziller M, Kucukural A, Ziller MJ, Vallaster M, Gu H, Tapper AR, Gardner PD, Meissner A, Garber M, Rando OJ
*Genetic and Epigenetic Variation, but not Diet, Shape the Sperm Methylome*
Dev Cell. 2015 Dec 21;35(6):750-8
PMID: 26702833

Hainer SJ, Weifeng Gu, **Carone BR**, Landry BD, Rando OJ, Mello CC, Fazzio, TG
*esBAF suppresses spurious transcription through targeted enhancement of nucleosome occupancy*
Genes Dev. 2015 Feb 15:29(4):362-78
PMID: 25691467

**Carone BR**, Hung JH, Hainer SJ, Min-Te Chou, Carone DM, Weng Z, Fazzio TG, Rando OJ
*High Resolution Mapping of Chromatin Packaging in mouse ES cells and sperm*
Dev Cell. 2014 Jul 14;30(1):11-22
PMID: 24998598

**Carone BR**, Tao Xu, Kenan Murphy and Marinus MG
*High Frequency Mutation to Antibiotic Resistance in Enterohemorrhagic Escherichia coli O157:H7*
Mutation Research - Fundamental & Molecular Mechanisms of Mutagenesis. 2014 Jan;759:1-8.
PMID: 24361397

Jiang J, Jing Y, Cost GC, Kolpa H, Cotton AM, Chiang J, Carone D, **Carone BR**, Shivak DA, Guschin DY, Pearl JR, Rebar EJ, Byron M, Gregory PD, Brown CJ, Urnov FD, Hall LL, Lawrence JB
*Translating Dosage Compensation to Trisomy 21*
Nature. 2013 Aug 15;500(7462):296-300
PMID: 23863942

Carone DM**,** Zhang, C**,** Hall LE, Obergfell C, **Carone BR**, O'Neill MJ, O'Neill RJ.
*Hypermorphic expression of centromeric retroelement-encoded small RNAs impairs Cenp-A loading*
Chromosome Res. 2013 Mar;21(1):49-62
PMID: 23392618

**Carone BR**, Rando OJ
*Rewriting the Epigenome*
Cell. 2012 Jun 22;149(7):1422-3
PMID: 22726428

**Carone BR***, Fauquier L*, Habib N*, Shea JM*, Hart CE, Li R, Bock C, Li C, Gu H, Zamore PD, Meissner A, Weng Z, Hofmann HA, Friedman N, Rando OJ
*Paternally induced transgenerational environmental reprogramming of metabolic gene expression in mammals.*
Cell. 2010 Dec 23;143(7):1084-96.
PMID: 21183072

Carone DM, Longo MS, Ferreri GC, Hall L, Harris M, Shook N, Bulazel KV, **Carone BR**, O'Neill MJ, O'Neill RJ.
*A new class of retroviral and satellite encoded small RNAs emanate from mammalian centromeres.*
Chromosoma. 2009 Feb;118(1):113-25
PMID: 18839199

**Carone BR***, Lawton BR*, Oberfell CJ, Ferreri GC, Gondolfi CM, VandeBerg JL, Immunorin I, O'Neill RJ, O'Neill MJ.
*Genomic imprinting of IGF2 in marsupials is methylation dependent.*
BMC Genomics 2008 May 2;9:205.
PMID: 18454865

Raefski AS**, Carone BR**, Kaur A, Krueger W, O'Neill MJ
*Wnt pathway anomalies in developing amygdalae of Turner syndrome-like mice.*
J Mol Neurosci. 2007;32(2):111-9
PMID: 17873295

## Teaching Experience

**Visiting Assistant Professor**, *Williams College*, Undergraduate level **2014-2016**

Biol 416 Senior Seminar: Epigenetics

- Senior capstone course for Biology majors focusing completely on primary literature and taught in small 12 student discussion format 2x per week 75 min. Responsible for all aspects of class including design, implementation, and grading. **93rd Percentile Ranking for Quality of Instruction across campus**

Biol 322 Biochemistry II: Metabolism *(lab instructor)*

- Laboratory component of Biochem II. 3 hour laboratory section using biochemical techniques such as gas chromatography, TLC, spectrophotometry, etc to interrogate the biochemical properties of lipids, proteins, and carbohydrates. Responsible for lab lecture, executing lab, and preparation of lab materials, grading.

Biol 101 The Cell *(lab instructor – 4 sections)*

- Laboratory component of Biology 101. 3 hour laboratory section using an inquiry-based approach to learning that focuses on teaching students experimental design, execution, and interpretation in an environment that promotes curiosity and exploration. Responsible for lab lecture, executing lab, and grading.

**Instructor,** *University of Connecticut*, Graduate level **2007- 2008**

MCB 327 (1) Laboratory Techniques in Functional Genomics, (2) Real Time PCR Techniques, (3) Gene Chip Techniques, and (4) Introduction to Molecular Biology Techniques

- Graduate level course focusing on teaching students cutting-edge techniques in short 16-20 intensive laboratory boot-camp style classes. Responsible for all aspects of all four listed classes including design, implementation, and grading. **9.6 out of 10 average for 13 total classes**

**Instructor,** *University of Connecticut*, Graduate and Undergraduate level **2004-2006**
MCB327 Introduction to Molecular Techniques

**Teaching Assistant,** *University of Connecticut*, Undergraduate level **2005-2006**
MCB 214 Experiments in DNA Identification

**Teaching Assistant,** *University of Connecticut*, Undergraduate level **2005**
Biol 107 Introduction to Biology for Majors

## Academic and Professional Honors

**NIH Ruth L. Kirschstein Institutional Training Grant Fellowship** **2011-2013**
University of Massachusetts Medical School
**Doctoral Dissertation Fellowship,** University of Connecticut **2008**
**Keystone Symposia Scholarship Award**, Epigenetics: Regulation of Chromatin Structure in Development and Disease **2007**
**Pre-doctoral Dissertation Fellowship,** University of Connecticut **2005**
**National Merit Scholar**, Northwestern Regional 7 **2000**
**National Honor Society**, Northwestern Regional **1998-2000**

## Academic Service

**UMMS Epigenetics Club Coordinator** **2013 - 2014**
Founded and developed an in-house seminar series to bring together researchers focused on epigenetics and chromatin bridging campus departments, which is externally sponsored, well-attended, and highly successful at UMMS.

**Co-advisor for University of Connecticut IGEM team** **2012 - 2013**
Co-advised a team of undergraduate students in developing a competitive project for submission into MIT International Genetically Engineered Machine competition

## Selected Research Presentations

**Invited speaker, "**Preferential retention of nucleosomes in gene-poor regions in Murine sperm" Gordon Epigenetics Conference, August 2015

**Invited speaker**, "Transgenerational Inheritance: You are what your Grandparent(s) ate" Greylock talk, June 2015

**Seminar**, "Transgenerational Inheritance: You are what your Grandparent(s) ate" Williams College Summer Science Research Seminar Series, June 2015

**Poster presentation,** "High resolution mapping of chromatin packaging in mouse ES cells and sperm" Gordon Epigenetics, August 2013

**Poster presentation,** "Paternally induced transgenerational environmental reprogramming of metabolic gene expression in mammals" Keystone Symposium, Epigenomics, January 2012

**Poster presentation,** "An X-linked Imprinted Cluster Defies the Classical Mechanisms of Epigenetic Regulation" Genetics Society of America, Model Organisms to Human Biology, January 2008

**Poster presentation,** "An X-linked Imprinted Cluster Defies the Classical Mechanisms of Epigenetic Regulation" Keystone Symposium, Epigenetics, February 2007

**Seminar,** "Xisting in Silence: Methylation Analysis of an X-linked Imprinted Locus" MCB Departmental Seminar, October 2005

## Research Support

5T32HD007439-18 (Witman, George B)
CELL AND MOLECULAR BIOLOGY OF REPRODUCTION **2011-2013**
Institutional Training Grant in Reproduction
*Role: Research Fellow*

Sherman Fairchild Foundation
Awarded to support Summer Science Research Stipends and Materials **2015**
*Role: Principle Investigator*

## Professional Affiliations

Genetics Society of America **2007-2015**

American Society for Biochemistry and Molecular Biology **2015-Pres**

Sigma Xi **2016-Pres**