C. Chase Bolt, Ph.D.

orcid.org/0000-0002-3544-3552
christopher.bolt@epfl.ch
http://chasebolt.com

EPFL SV ISREC UPDUB
SV 2843 (Bâtiment SV)
Station 19
Lausanne CH 1015
+41 (0)21 693 06 06 (work)
+41 (0)79 139 45 17 (mobile)

Post-Doctoral Work

École Polytechnique Fédérale de Lausanne - Laboratory of Denis Duboule — April 2015 - Present
- Department: Swiss Institute for Experimental Cancer Research
- Research –
  - Regulation of the *HoxD* cluster during mouse digit and reproductive development

Education

Doctorate of Philosophy – Laboratory of Lisa Stubbs — Aug 2008 - May 2015
- Department: University of Illinois - Cell and Developmental Biology
- Research –
  - Regulatory dynamics of the *Tbx18* locus in mouse urogenital development
    - available at http://hdl.handle.net/2142/78608
- Teaching –
  - Teaching Assistant: MCB 410 – Developmental Biology (Discussions) — Spring 2014
  - Teaching Assistant: MCB 250 – Molecular Genetics (Discussions and Special Tutoring)
    - Ranked “Excellent” on TA reviews by students — Fall 2012
  - Teaching Assistant: CDB 495 – Genetics and Genomics (unofficial) — Spring 2010

Bachelor of Science, Cum Laude – Laboratory of Nicholas Stover — Jan 2005 - May 2008
- Major: Bradley University - Cellular and Molecular Biology
- Research –
  - Characterization of a novel non-receptor tyrosine kinase in the cnidarian, *Hydra magnipapillata*
- Teaching –
  - Teaching Assistant: General Biology I and II — 2007 - 2008
  - Teaching Assistant: General Chemistry I — Fall 2007

Publications

Bolt CC, Negi S, Guimarães-Camboa N, Zhang H, Troy JM, Lu X, et al. *Tbx18* Regulates the Differentiation of Periductal Smooth Muscle Stroma and the Maintenance of Epithelial Integrity in the Prostate. PLoS ONE. 2016;11: e0154413–20. PMID 27120339.

Bolt CC, Elso CM, Lu X, Pan F, Kispert A, Stubbs L. A distant downstream enhancer directs essential expression of *Tbx18* in urogenital tissues. Developmental Biology. Elsevier; 2014 Aug 15;392(2):483–93. PMID 24854998.

Conferences & Symposia

Society for Developmental Biology 75th Annual Meeting – Boston, MA — Aug 2016
Regulation of the HoxD cluster in the urogenital system

Institute for Genomic Biology Fellows Symposium – Urbana, IL — May 2013
Dissecting the *Tbx18* locus regulatory structure and its role in mouse prostate development

Cellular & Molecular Biology Training Grant Symposium – Urbana, IL — Nov. 2012
Developmental dynamics of the *Tbx18* locus and its downstream transcriptional targets

GSA Mouse Molecular Genetics Conference – Pacific Grove, CA — Oct. 2012
Developmental dynamics of the *Tbx18* locus and its downstream transcriptional targets

Scholarships & Awards

NIH Ruth L. Kirchstein NRSA Predoctoral Training Fellowship — 2010 - 2012

Bradley Biology Scholarship
awarded for academic excellence — 2005 - 2008

Bradley University Dean's List
awarded for academic excellence — 2005 - 2008

Mentoring

John Elue — 2014 - 2015
Advised his senior thesis research.
Currently at Rush Medical College

Andrew Park — 2009 - 2012
Advised his undergraduate research project and senior thesis
Currently at University of Illinois College of Medicine

Professional Development & Service

MCB Graduate Student Advisory Panel — Dec. 2013
Provide advice to first year graduate students in the program

Career Professionalization Seminar Committee — Aug. 2012 – Mar. 2013
Nominate, invite, and host guest speakers

Cellular & Developmental Biology Department Seminar Student Committee — 2011-2013
Invite and host guest speakers working in a field of personal or professional interest, with relevance to the department.
Blanche Capel, Ph.D., Duke University (Oct. 2012)
Janet Rossant, Ph.D., University of Toronto (April 2014)

MCB Graduate Student Advisory Panel — Oct. 2011
Provide advice to first year graduate students in the program

UIUC CMBTG Symposium Chair — May – Oct. 2011
Managed weekly meetings, organized and delegated tasks, introduced speakers during speaking sessions

Animal Work and Training

Module 1 Certified by Réseau des Animaleries Lémaniques (RESAL) — June 2015

20 hours theoretical and 20 hours practical training on animal research models. Program accredited by the Federation of European Laboratory Animal Science Associations (FELASA) and recommended by the Swiss Federation of Cantonal Veterinary Surgeons (ASCV).

Mouse colony maintenance — Aug. 2008 - April 2015

During my time in the Stubbs lab I maintained my own mouse colony of approximately 300 mice. My duties included strain preservation, genotyping, earmarking, and weaning.

Professional Memberships

Society for Developmental Biology — 2015 - Present

Genetics Society of America — 2012 - 2014

Graduate Coursework

RNA-Seq Data Analysis Workshop — June 2013

Pipeline construction for the analysis of RNA-Seq data analysis.

MCB 529 – Genomics and Gene Networks — Spring 2010

Tools for the analysis of genomics data.

MCB 571 — Bioinformatics — Fall 2009

Overview of the tools available for manipulation of bioinformatics data.

MCB 529LS – Genome Annotation — Spring 2009

Using Apollo to build gene models from sequencing data.

MCB 529AB – Advanced Cell Biology — Spring 2009

In depth study of cell biology and experimental techniques

MCB 502 – Advanced Molecular Genetics — Fall 2008

Study of The Central Dogma and associated experimental techniques.

MCB 501 – Advanced Biochemistry — Fall 2008

Advanced study of biochemical pathways and associated chemistry.

Skills & Techniques

Mouse colony management, RT-qPCR, Cloning, 5' and 3' RACE, Transcription Factor and Histone ChIP-Seq, RNA-Seq, Immunohistochemistry, *In situ* hybridization (whole mount, paraffin embedded, and frozen), Tissue culture, Histopathology, Western blot, siRNA knockdown, FACS, X-Gal staining, Whole genomic amplification, Histopathology, 4C-Seq, CRISPR Transgenesis.

Summary of Research

The expression of developmental genes is carefully controlled because they affect dramatic cellular changes such as lineage commitment and cellular differentiation. The developmental genes that facilitate these important biological transitions are frequently associated with an array of *cis*-acting regulatory elements which provide a platform for transcription factors proteins to control the expression of the target gene. The cell controls the accessibility of these elements using an assortment of epigenetic modifications. Together with chromatin architectural proteins, such as CTCF, these elements and transcription factors form a local compartment of chromatin loops that maximise enhancer-promoter contacts resulting in expression changes. The properties of regulatory elements located within and around developmental genes are frequently difficult to disambiguate because they can have redundant or additive functions.

Particular types of DNA structural mutations, such as chromosome translocations and inversions allow for a simple two-part dissection of regulatory elements from their target gene. In the Duboule Lab, we utilise a collection of structural mutations in the *HoxD* locus to study how the local chromatin architecture influences the transcription of these genes *in vivo*. The *HoxD* cluster contains nine *Hoxd* genes that are expressed in multiple domains of the embryo during a coordinated wave of transcription from one end of the cluster to the other. This remarkable property, termed collinearity, is controlled by regulatory elements disbursed around the cluster of genes. By disrupting the *cis*-regulation of these genes, dramatic morphological changes emerge in the embryo. This effect has been observed in species as ancient as the fruitfly, and is a unique property of the *Hox* genes, demonstrating their powerful influence on the formation of body patterns.

In pursuit of this knowledge, the primary goal of my research is to understand how long-range genetic regulation modulates expression of genes during embryonic development. Specifically, my current work in the Duboule Lab is focused on two projects. The first is an analysis of *Hox* gene function during the formation of the urogenital system. The formation of these tissues begins around embryonic day E10.5, which is concurrent with the establishment of *Hox* gene expression domains along the mesoderm, from which these organs arise. Interestingly, the anterior boundaries of *Hoxd* and *Hoxa* genes delineate the boundaries of nearly every portion of the urinary and reproductive systems. Loss-of-function mutations in the *HoxA* or *HoxD* clusters cause homeotic transformations in these tissues, several of which are similar to human congenital

malformations. I am working to understand how the *HoxD* genes are regulated during the formation and maintenance of these structures.

My second project is focused on the gene *Hoxd13* during formation of the handplate (autopod). The expression of this gene is very tightly controlled during limb formation because premature activation of *Hoxd13* abruptly terminates the collinearity program resulting in abbreviated arms and legs. Our previous work has shown that a chromatin structure sequesters *Hoxd13* from the activating mechanism that works on the adjacent genes in the cluster. The same work has shown that *Hoxd13* is in constitutive contact with many positions in the adjacent gene desert but when the gene is activated, a few additional elements gain chromatin contact with *Hoxd13*. To parse the regulatory structure controlling *Hoxd13*, we are utilising the CRISPR system to precisely modify elements that control *Hoxd13 in vivo*. A main goal for this work is to determine how enhancers act on specific target genes in a complex chromatin landscape and how enhancer elements control the properties of the adjacent chromatin.