Spatiotemporal dynamics of chromatin closure in regeneration

Hannah Arbach (They/Them)
University of Washington

Dynamic changes in gene expression is critical for the regulation of the complex process of regeneration, however little is known about how transient repression of genes is achieved during regeneration. During development dynamic changes in histone modifications and nuclear lamina association aid in regulating gene expression. Proper timing of changes in histone modifications and positioning with respect to the nuclear lamina of specific genomic loci, in specific tissues is required for proper development. It is known that changes in histone modifications are necessary for regeneration however, the spatiotemporal dynamics of these changes are poorly understood, and changes in nuclear lamina association are completely unknown. My work focuses on determining the role of histone methylation, deacetylation, and nuclear lamina association in transient chromatin closure during tail regeneration in *Xenopus tropicalis* tadpoles. Utilizing complementary approaches of immunofluorescence, ATAC-seq, CUT&RUN, and RT-qPCR I will gain a more mechanistic understanding of the dynamic changes in chromatin and their roles in ensuring proper regeneration.

When I am not in lab, I am probably hanging out with my cats Big Norm and Lil Penelope. I also enjoy making beer and watching Sounders (men’s soccer), Reign (women’s soccer), Seawolves (rugby), and Storm (women’s basketball) games at my neighborhood brewery. When I am able, I also enjoy hiking and camping.
Evolution and development of the stomach in carnivorous larvae of *Lepidobatrachus laevis*

Jenni Austiff
Harvard University

My dissertation aims to determine the developmental mechanisms underlying the evolution of the stomach in *Lepidobatrachus laevis*, the Budgett’s frog. During metamorphosis many frogs undergo an ontogenetic niche shift. The typical tadpole is a filter-feeding herbivore/omnivore, and at metamorphosis the gastrointestinal tract transforms as the adult frog to becomes a macrophagous carnivore. Although this complex life cycle is broadly maintained in frogs, it is evolutionarily labile in the degree to which larvae and adults of a given species diverge, providing interesting opportunities to study the mechanisms underlying metamorphic change. *L. laevis* is an interesting case in which metamorphosis is retained but ecological-morphological differences between larvae and adults are considerably reduced. In particular, *L. laevis* tadpoles are megalophagous carnivores, eliminating the dietary gap between tadpoles and adults, and tadpoles develop an adult like stomach during embryogenesis that is not remodeled at metamorphosis. My research is investigating the development at gross, histological and physiological levels to better compare the developmental trajectory of the stomach in *L. laevis* to plesiomorphic patterns in frogs. I will further investigate the genetic underpinnings of *L. laevis* stomach by comparing transcriptomes as well as exploring candidate genes. Additionally, through experimental treatments manipulating retinoic acid, the ancestral gut phenotype can be recovered, and I plan to investigate further the role of retinoic acid in mediating the evolution of *L. laevis* stomach morphology and physiology.

My other interests are also informed by my love of studying the natural world and generative processes. I love biking and hiking to get out of the lab and into nature. I also enjoy trying to make just about anything. Lately, I have primarily been working with ceramics, an exciting medium for exploring the role of form and function in a creative context. I dedicate all the rest of my free time to labor organizing.
Understanding novelty, one cell at a time

Leslie S. Babonis, PhD
Whitney Lab for Marine Bioscience, University of Florida

I study novelty. Specifically, I am interested in understanding the factors that drive the origin and diversification of novel cell types. More than just taxon-specific oddities, novel cell types can promote niche specialization and facilitate speciation events; thus, studying novelty is critical for understanding the evolution of biodiversity. One of my favorite projects focuses on understanding the mechanisms driving morphological and functional specialization of cnidocytes (stinging cells) across cnidarians. Using a combination of observational and manipulative techniques I am able to link small scale changes in gene regulatory network architecture with phenotypic outcomes in a truly bizarre lineage of cells. In parallel, I am applying a similar framework to characterize the evolutionary origin of colloblasts (sticky cells), a ctenophore-specific cell type that shares a common progenitor with neurons. By comparing the mechanisms that generate cell identity in these two lineages of animals I hope to identify overarching rules promoting the development of novel cell types that apply across taxa.

In addition to being a scientist, I have served as the Mayor of the Town of Marineland, Florida, since 2013. These two jobs keep me pretty busy but when I do have free time, I like to spend it outside – kayaking, beaching, tormenting alligators - basically anything outside.
Single-molecule proteomics; Image analysis; Gene regulatory networks

Alexander Boulgakov
University of Texas at Austin

As a Ph.D. student, I help develop single-molecule proteomics technologies and image analysis tools. For my upcoming postdoc next year, I am switching topics a bit: I’ve become super interested in unraveling gene regulatory networks in the contexts of development, regeneration, and cell & tissue reprogramming. What are the factors – whether they’re proteins or chromatin conformation or otherwise – that are the gatekeepers to a successfully reprogrammed stem cell? How do regenerating tissues and organs restore their previous selves outside the context of embryonic development? Are the regulatory networks in regenerative contexts mostly recycling modules activated during embryonic development, or is something new happening? How can we develop novel experimental and computational strategies to tackle these questions?

I really enjoy talking about things like history, philosophy, and science fiction. We should really stop broadcasting our presence to the universe. Do you really think our neighbors are some “live long and prosper” hippies? No! How do we know they’re not some extremely belligerent insectoid borg?! Or worse, maybe they subscribe to the Dark Forest game theory.
The Two Body Problem: An Investigation of Development in Adult and Larval Body Plans in an Indirect Developing Deuterostome

Paul Bump

Hopkins Marine Station of Stanford University

As an PhD student in the Lowe Lab I study *Schizocardium californicum*, an indirect developing deuterostome hemichordate worm, an excellent model for investigating how fundamental cell biological processes shape the formation of two body plans. While indirect development, with distinct larval and adult body plans, is the most common developmental strategy in many animal phyla, much of what we know about development comes from direct developing species. Across metazoan diversity some indirect developing animals remodel and transform an existing larval body into the adult body plan. In an animal that transforms an existing body from larvae to adult, these transitions provide a window into tissue turnover and remodeling, an important focus of cell and developmental biology. I am generally interested in topics of cell type evolution, regeneration, and how small and squishy marine invertebrates can provide novel perspectives to advance fundamental cell biology research.

I grew up in Southern California before heading out to University of Hawaii for my undergraduate degree and miss the islands every day. If you can’t find me in lab, I’m likely out on the ultimate frisbee field, walking the crazy rescue pup that I co-parent with my dad, or out on the porch reading to try to understand the age of old question of what makes a good life. Looking forward to exploring with all this summer!
Role of Nitric Oxide during amphioxus embryonic development.

Filomena Caccavale
Stazione Zoologica Anton Dohrn of Naples, ITALY

During my PhD and post-doc in the Dr. Salvatore D’Aniello’ Lab at the Stazione Zoologica Anton Dohrn of Naples, I studied about the role that Nitric Oxide (NO) plays during embryonic and larval development in the cephalochordate Branchiostoma lanceolatum. NO is a very versatile signal molecule and studying its role in invertebrate physiology can allow to further expand the spectrum of known biological processes in which this molecule is involved. Nitric Oxide Synthase (NOS) enzymes are the most crucial factors in NO production for their exclusive role in its de novo synthesis, and thus decisive in the physiological functions of NO system. Therefore, investigating the ancestral role of animal Nos genes and their novel acquired functions during evolution is an issue of broad interest to understand the importance of NO system in the evolution of animals. For this purpose, amphioxus is a perfect model organism given its key phylogenetic position.

During my PhD, I characterized the expression pattern and profile and the regulation of the three amphioxus Nos genes. Furthermore, I quantified and localized NO during development and then I inhibited its enzymatic production by the treatment with a specific NOS inhibitor (TRIM). Thanks to such experiments I revealed the key role, during neurulation, of NO in pharynx development and patterning. During my post-doc I mainly focused on the reconstruction of the gene network downstream NO during amphioxus pharyngeal development.

I live in countryside, in a small town close to Naples, with my parents and my pets (four ducks, three dogs, a cat, a hamster, a goat!). Often, I take an active part in educational events in which Stazione Zoologica participates, especially those aimed at children. I'm not a sporty person but, sometimes, I like to practice yoga. I am passionate of series, especially the sci-fi ones. Moreover, I love to traveling, cooking, drinking wine with friends and, as a good Neapolitan, I love pizza!
Role of small RNAs during arthropod segmentation

Llilians Calvo

The University of Manchester

My PhD project aims to annotate and elucidate the role of microRNAs and piRNAs during Parhyale hawaiensis embryogenesis. Using small RNA-Seq across different stages of Parhyale embryonic development we hope to create a detailed ID chart of microRNA distribution, accumulation and expression changes over embryonic development. We are using our de-novo annotation to link Parhyale small RNAs to specific biological events in the embryo such as maternal to zygotic transition, germ-band elongation, organogenesis and neurogenesis. Our main focus lies on segmentation, however, our data will be publicly available on miRbase so could be used by others. We are also interested in another class of small RNAs: piRNAs, which are known to suppress transposon elements in the germ line. piRNA-like RNAs turn out to be massively over-represented in our data set, so we are working on the hypothesis they are also abundant in Parhyale somatic cells. Hence, we will try to unveil their function by knocking out their expression using CRISPR and looking for phenotypic effects.

I am originally from Cuba, but in the past 10 years I’ve been some sort of an academic pilgrim, studying in France, Canada and now the UK. Apart from science and philosophy, I also enjoy a lot of different things: old movies, reading, and discussions about moral dilemmas. I also like sports (I play waterpolo), being outdoors and to play games, in the sea, in the sand, wrestling, whatever, if it is unorganized fun I am in!
Understanding the evolution of animal body plans by looking at annelid neural development

Allan M. Carrillo-Baltodano
Clark University

As part of my PhD in the laboratory of Dr. Néva Meyer at Clark University, USA, I have been submerged in a very exciting project trying to understand evolution of nervous systems by studying neural development in the spiralian annelid Capitella teleta. My research question focuses on signaling events and cellular processes occurring in the microscopic embryos and larvae of C. teleta that are important for early neural specification. One of my goals is to contribute to our knowledge of how brains and nerve cords are specified across animals, for instance, by demonstrating the use of both intrinsic and extrinsic signals during early neural specification. Recently, I developed a methodology to isolate and culture blastomeres from early embryos of C. teleta, followed by specific techniques such as in situ hybridization and immunohistochemistry to assess cell fate. This work led to the discovery that the anterior neural system and the trunk neural system are specified by different developmental mechanisms, as well as a working hypothesis to test neural fate specification in other spiralian. These findings suggest a more complex scenario for the development and evolution of the diverse nervous systems found in Metazoa.

I am originally from Costa Rica, therefore I am very passionate for soccer and Latin American music. Outside of lab, I would likely be watching soccer games or ridiculous anime series. I like to play guitar, and occasionally go for some fun salsa dancing.
My current research focuses on the genetics related to a range of conditions known as Disorders of Sex Development (DSD). More specifically I'm interested in how someone with male genetics (XY karyotype) can develop as anatomically female. I am focusing on how testis determining genes are regulated. Using patients with large copy number variations (duplications and deletions) upstream of a key testis gene SOX9, I identified three enhancers that when duplicated or deleted can cause sex reversal in humans. DSDs affects around 1% of all live births and currently only 50% of cases get a definitive diagnosis. This lack of diagnosis impacts the long term physical and mental health of the children and their families. My research aims to increase the diagnostic rate, allowing doctors to improve clinical management for patients with DSD.

I grew up in Melbourne, close to the beach. For the last couple of years, I have spent my summer holidays camping at music festivals. I like to unwind after a long week in the lab with some mates exploring Melbourne’s many hidden bars (there’s even a few science themed ones), going to live music, trying to win trivia and eating dumplings. I recently started playing Australian (Aussie) rules football, it’s a violent sport, great for getting rid of thesis writing aggression.
Characterizing neural patterning in the cnidarian
*Nematostella vectensis*

Dylan Faltine-Gonzalez
Lehigh University

The phylogenetic placement of cnidarians as sister taxa to the bilaterians makes them an ideal phylum to study the evolution of bilaterian traits. It is hypothesized that the cnidarian-bilaterian ancestor likely had a nerve net-like nervous system similar to the cnidarian nerve net. Using the anthozoan cnidarian, *Nematostella vectensis*, our lab focuses on identifying how central nervous systems evolved from this ancestral nerve net. My PhD work focuses on identifying how the cnidarian nerve net is patterned. I’m currently focusing on determining whether spatial domain patterning genes also pattern tissue domain restricted neural subtypes. I am also attempting to identify new neural genes and determine whether they play a broadly neural role or are subtype specific markers.

When I’m home in San Diego, or by a beach, I like to free dive, scuba dive, and I’m a big fan of bonfires at the beach. In Pennsylvania I tend to go hiking, cook, camp, or cycle around town. An interesting fact about me is in high school I worked as a costume character at the San Diego Zoo.
The origin of the jaw is a long-standing problem in vertebrate evolution. Over a century ago, the anatomist Karl Gegenbaur proposed that the upper and lower jaw arose through modifications of the dorsal and ventral elements of the anterior-most gill arch, based on the strikingly similar anatomical organization of the jaws and gill arches of chondrichthians (cartilaginous fishes - sharks, skates and rays). However, a gap in the fossil record leaves this hypothesis both unsupported and unrefuted by paleontological evidence. In my PhD, I am revisiting Gegenbaur's hypothesis from a developmental perspective in a chondrichthyan, the little skate (*Leucoraja erinacea*). First, I am testing whether jaws and gill arches were primitively patterned by a shared transcriptional network, and secondly, whether the spiracular cartilage, which is located on the back of the jaw and supports the wall of an opening to the pharyngeal cavity in skate, might be a vestige of one or more gill-bearing branchial rays, reflecting an ancestral gill-arch like condition of the jaw.

In my free time I like to read, watch films, play table-top games, and get needlessly competitive at table football.
The Evolution of Parasitism in Platyhelminthes: Dissecting the Genetic Bases of Evolutionary Novelties in Neodermata

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Laboratory on Thymus Research
Oswaldo Cruz Institute/Oswaldo Cruz Foundation, Rio de Janeiro, Brazil

Parasitism is an ecological relationship in which a phylogenetically distinct organism – the parasite – obtains benefits to the detriment of another organism – the host. Although widespread among animals, parasitism can also be considered a monophyletic feature found in Neodermata, which brings together species of great medical and veterinary importance worldwide. All its members exhibit a specialized syncytial integument (neoderm) in addition to other class-specific associated adaptations. How these parasitism-related novelties have emerged during platyhelminth evolution remains largely unknown. Using a transdisciplinary approach encompassing Evolutionary Developmental Biology, Parasitology, Immunology, and Bioinformatics, I aim to unveil the genetic basis of the development of evolutionary novelties in Neodermata with the intention to identify new broad-spectrum vaccine or drug targets.

I am passionate about discovering and learning. That’s why I became a scientist. Nowadays I divide my time between working in the lab, giving cell biology, embryology and histology classes, and taking care of my most important embryology experiment: my 2-year-old daughter! We love playing outside, drawing, and painting. If I still have a little time, I enjoy swimming (I used to be a water polo player) and snorkeling, even though I am now out of shape. Photography and cooking are sporadic hobbies. A good book can make my day. I am a very bad singer.

I am eager to meeting all of you in Woods Hole!
Mechanism of cell specification and renewal in *Nematostella vectensis*

Ahmet Karabulut

Stowers Institute for Medical Research

My research focuses on the specification and renewal of stinging cells in *Nematostella vectensis*. Anyone who has been stung by a jellyfish is probably familiar with the cnidarian stinging cells known as cnidocytes. Cnidocytes are considered to be one of the most unique and beautifully bizarre cell types found in nature. They harbor a “harpoon grenade” in their cytoplasm. Cnidocytes are excellent models to study the formation of complex cell types: they are highly specialized and require continuous renewal. My goal is to understand the genetic and cellular mechanisms that build this cell type. In my studies, I utilize reverse genetics to interrogate the genes involved in the cnidocyte specification process. I am also interested in understanding how cnidocytes are renewed in the animal body and what kind of interactions they have within the surrounding tissue. To address this, I utilize transgenic animals and advanced microscopy techniques to investigate cnidocyte behavior in their tissue niche. To my advantage, *Nematostella* has a transparent body plan and many available experimental tools that allow detailed analysis of cellular and developmental processes. Understanding the genetic basis of cnidocyte specification in *Nematostella* could reveal similar mechanisms in other complex cell types.

My background is in chemical biology and molecular genetics. Upon joining the Stowers Institute graduate program, I shifted my focus to developmental biology. This has been an exciting challenge and a wonderful experience. I grew up at a marine biology institute on the eastern Mediterranean coast of Turkey and I had my fair share of marine animal stings or bites. I am passionate about night snorkeling. Fortunately, by living in Kansas City, I am equally close to two oceans.
Understanding tissue specific factors responsible for multiciliated cell ciliogenesis

Mia Konjikusic
University of Texas at Austin
Gray and Wallingford Labs

Cilia are microtubule based projections of the cell. Specialized epithelia have dozens to hundreds of motile cilia located on their apical surface. These motile cilia beat in a synchronous fashion to produce fluid flow across an epithelia. These multiciliated (MCCs) cells exist in three well-defined places in the mammalian body: the brain, where ependymal cell cilia beat to produce laminar cerebrospinal fluid flow (CSF), the trachea, where MCCs work to remove mucus from the airways, and finally the oviduct in the female reproductive tract where MCCs are through to produce movement of the ovum from the oviduct down into the uterus. Although the universal development of MCCs is well-defined, the underlying tissue-specific ciliogenesis factors remain to be defined. Specifically, I have been working to define how a specific kinesin, Kif6, is working as a tissue-specific kinesin that is required for ependymal cell ciliogenesis.

I love the outdoors and music, specifically love mixing the two together. Anything from running, swimming and hiking to music festivals and outdoor music venues. If it is nice out and I’m not in lab, count me in!
Non-canonical Wnt16-Fzl1/2/7 signaling in early patterning of the sea urchin anterior-posterior axis

Marina Martínez-Bartolomé

Auburn University
Department of Biological Sciences

I am a PhD student in Ryan Range’s lab. I am interested in the patterning of the different body axis in deuterostomes. Specifically, I am working on elucidating the mechanism by which Wnt16-Fzl1/2/7 signaling antagonizes Fzl5/8-JNK signaling during early anterior-posterior axis patterning in sea urchin embryos. In early development of the sea urchin embryo, anterior-posterior patterning depends on integrated information from the Wnt/β-catenin, Wnt/JNK, and Wnt/PKC pathways, forming an interconnected Wnt signaling network. In our lab, we have previously shown that a non-canonical signaling pathway involving the Wnt receptor Fzl1/2/7 antagonizes the progressive posterior-to-anterior downregulation of the anterior neuroectoderm (ANE) gene regulatory network (GRN) by canonical Wnt/β-catenin and non-canonical Wnt1/Wnt8-Fzl5/8-JNK signaling. This interaction is critical to establish the spatial expression of the early GRNs along the AP axis. Yet, the exact mechanism by which Fzl1/2/7-PKC signaling antagonizes Fzl5/8-JNK signaling during this process is still unclear. Hence, my research aims to better characterize the Fzl1/2/7 signaling pathway and the gene regulatory network (GRN) it activates to identify possible interactions between these different Wnt signaling branches during this fundamental developmental process.

I am originally from Madrid, Spain. Outside of the lab, I like cooking, hiking, running, and traveling the world. I have lived in several countries (Brazil, Ecuador, Sweden, US…) in the last years and I really enjoy learning more about other cultures and meeting new people. I am vegetarian and love animals: my cat and my dog get most of my attention whenever I am not in the lab.
Enhanced innate immune response in the olfactory sensory system of developing zebrafish

M. Fernanda Palominos

Centro Interdisciplinario de Neurociencia de Valparaiso (CINV).

Universidad de Valparaiso, Chile.

Olfactory sensory neurons (OSNs) are the only class of neurons in the nervous system where dendrites of the peripherally located cell bodies are in contact with the external environment and their axons make first synaptic contact within the central nervous system (CNS), thus making the olfactory sensory system (OS) a potential gateway for the entry of damaging or infectious agents to the CNS. Therefore, my PhD thesis has been focused in unraveling the interaction between olfactory-associated innate immune cells and OSNs within the peripheral olfactory epithelium (OE) during zebrafish larval development. We have identified for the first time that innate immune cells are associated with OSNs, and that blood and lymphatic vasculature enclose the developing OE. When the system is challenged by the exposure to a neurotoxic heavy metal local and non-local immune cells are recruited to the OE, just allowed by long-lasting Ca\(^{2+}\) changes in dying OS neurons. Moreover, I'm interested in investigating the evolutionary conservation of the constant interaction between immune cells and olfactory neurons in this peripheral sensory interface among vertebrata.

I am a tiny Chilean, born and raised in Santiago, but moved to Valparaiso (at the coast) to pursue a PhD in Neuroscience. I also enjoy participating in Ciencia al tiro (which means Science right now), an outreach program run by my advisor and people from the graduate program, to children of all ages. When not in the lab I’m probably cycling (for sure!), doing Pilates, reading mystery/fiction books, knitting or painting. I’m extremely enthusiastic and super grateful for this opportunity! I’m looking forward to meet you all.
Formation and function of higher-order septin structures in C. elegans

Jenna Perry

University of North Carolina at Chapel Hill

In my postdoctoral training in the Maddox Laboratory, I am interested in understanding how the cytoskeleton dictates cell shape and tissue organization during development. A poorly understood component of the cytoskeleton is a family of proteins known as septins. Septins are GTP-binding proteins that form non-polar hetero-oligomeric complexes and higher order structures, including filaments and rings. Higher-order septin structures localize to curved boundaries between cell compartments, often acting as a scaffold to recruit septin-interacting proteins. In this way, septins facilitate the regulation of cell processes such as cell division or ciliogenesis. How septin assemblies form and how they function to mediate changes in cell shape and rigidity is currently unknown. Therefore, I am focused on two main questions: How do posttranslational modifications facilitate the formation of a higher order septin structure? How do common disease-causing septin mutations affect the function of septins in facilitating cell shape and tissue organization.

I grew up about an hour from Woods Hole, which probably resulted in my love for being near the ocean and being outdoors. When I’m not in lab, I love finding new recipes to bake (and eat!). I am pretty active and I recently got into weightlifting (to eat more food). I love going to concerts and discovering new types of music. A fun fact about me is that I have a pet axolotl named Reptar!
Organismal behavior results from emergent properties of a large number of physical and biological processes occurring across multiple scales. My focus is on understanding how physics shapes biology. During my postdoc, I have investigated fluid and cellular flows in three different animal systems – *Trichoplax*, Starfish larvae, and Chick embryos. In the simple, early divergent animal *Trichoplax adhaerens*, we have discovered motility-induced physiological tissue fractures and healing. We have demonstrated how tissue fracture mechanics govern extreme plastic changes and asexual reproduction in these animals. In early chick embryo development, I have studied the fascinating bilateral cellular flows during gastrulation and revealed their key role in establishing the embryonic symmetry axis. We have also elucidated how a beautiful array of vortex structures around starfish larvae creates a physical tradeoff between feeding and swimming. My research exemplifies the promise of leveraging physics to unearth the general organizing principles underlying fundamental form-function relationships in organismal biology.

I am from Bangalore, India, and studied there until I finished my master’s degree. Following this, I spent five years in the Netherlands working on my doctoral degree and also had the opportunity to travel all around Europe. After this, I moved to sunny California for my postdoc at Stanford. I really enjoy being in nature – hiking in the mountains, beaches, and travel photography. I am a car enthusiast and love driving good cars. I also like binge watching TV series such as GoT, and movies such as Star Wars.
The neural crest is a vertebrate-specific cell type that gives rise to a diverse cell lineage in the developing embryo. Though all neural crest cells are multipotent, there are significant differences in the developmental potential of populations arising from different levels along the anterior-posterior body axis. Interestingly, neural crest cells specified at the cranial axial level possess the ability to differentiate into cartilage and bone of the craniofacial skeleton, a characteristic unique to this subpopulation. However, the gene regulatory mechanisms governing the expanded differentiation potential of the cranial neural crest are not well-understood. A transcriptomic comparison of the cranial and trunk neural crest has revealed vast gene expression differences between these two subpopulations. Using this transcriptome, our lab has identified a subset of factors enriched in the cranial neural crest which participate in a cranial-specific gene regulatory sub-circuit. To further explore the regulatory mechanisms controlling this program, I am conducting a comparative genomic analysis of the cranial and trunk neural crest cis-regulatory landscape to identify key regulatory interactions which allow for the expanded potential of the cranial neural crest. Moving forward, I hope to combine cut-and-paste embryology and genomic analysis within the developing chick embryo to gain a mechanistic understanding of early morphogenesis and patterning.

When I’m not in the lab, I love spending time outside, whether that be hiking, camping, running, fishing, or just relaxing. I am so excited to be a part of MBL Embryology and I can’t wait to spend my summer in beautiful Woodshole, MA.
Hox Genes and Body Plan Evolution in a Bivalve Mollusk

David Salamanca

Department of Integrative Zoology, University of Vienna

I am analyzing the putative roles of Hox genes in molluscan body plan diversification. Hox and ParaHox genes are commonly recognized as key players in establishing the anterior-posterior body axis of bilaterians. For the case of molluscs, there is only a clade which demonstrates an organized way of expression (Polyplacophora), while others have modified collinearity and evolved lineage-specific novel functions. Nevertheless, a full broad comparison throughout the whole molluscan clade is yet hampered by the lack of gene expression databases on crucial representative clades like Monoplacophora and Bivalvia. For this reason, I am currently analysing Hox gene expression in the bivalve *Dreissena rostriformis*. Primarily, I conduct *in-situ* hybridizations on specific developmental stages to determine the gene expression pattern of each individual gene from the cluster. Bivalves like the quagga mussel have striking unique morphological body plan modifications. Therefore, understanding the nature and mechanisms of these transformations is crucial in the study of morphological novelties evolution. Results incoming from my project will elucidate how the co-option and collinearity breakage of the Hox cluster can cause innovations on the body plan.

On my free time, I like to draw, go bouldering and scuba dive. I am currently learning (not particularly good at) American Sign Language. I am a fan of every kind of food as long as it’s good and tasty. And of course, a good beer is always appreciated.
Cell adhesion molecules as regulators of epithelial growth in *Drosophila* epithelia

Danielle Spitzer

University of California, Berkeley

For as long as I have been a biologist, I have been interested in how cells interact with one another to build complex tissues and organs. I first explored this intersection of cell and developmental biology when researching a family of cell adhesion molecules called Nectins as an undergraduate in Scott Williams’ lab at UNC-Chapel Hill. I enjoyed it so much that I continued working on adhesion in graduate school! Now, for my Ph.D. research in Iswar Hariharan’s lab, I am investigating the involvement of cell adhesion molecules in regulating epithelial growth in the fruit fly *Drosophila melanogaster*. These molecules connect cells within tissues, and many transmit information about neighbor cells, modulate cell-cell affinity, or alter the cytoskeleton. These characteristics make them attractive candidates for regulating processes that turn cell-scale properties into the tissue- and organ-scale behaviors such as cell competition and growth control. My project is in the early stages now, but I look forward to identifying and characterizing new regulators of epithelial growth over the next couple of years. I’m very excited to apply what I learn in the Embryology course to my thesis research.

In addition to research, I also love to teach and I’m a strong proponent of making science education more equitable, inclusive, and evidence-based. When I’m not in the lab or a classroom, you can probably find me biking around Berkeley, relaxing at home, cooking, volunteering at the local animal shelter, or socializing with friends.
I am interested in how functional organs are built from a small population of progenitor cells. In my PhD project I am addressing this question in the liver, the largest internal organ in vertebrates with an essential role in body homeostasis. The potential of individual progenitors in the embryo to contribute to the adult liver remains a mystery. It is unknown whether all hepatic progenitor cells are bipotential and contribute equally to the different functional cell types, or whether some are unipotent producing progeny of one fate. Moreover, on the level of the whole organ, it is unknown whether all hepatoblasts produce the same number of progeny or whether some progenitors proliferate more and thus contribute more to the adult organ by clonal dominance. In my project, I address these questions in zebrafish by developing a next-generation four-color cell labeling system, live-imaging of early fate-decisions and by collaborating with physicists to employ mathematical modeling to decipher the potential of individual progenitors.

In my spare time, I really enjoy to be in the nature. I like biking and climbing and I am always eager to try something new. Since I moved to Denmark for my PhD I discovered my passion for winter swimming in the cold sea.
Mechanisms that regulate the transition between different pluripotent states in mouse embryonic stem cells

Ariel Waisman

FLENI Hospital – Buenos Aires, Argentina

I am very interested in studying the mechanisms by which cells change from one developmental identity to another. Currently I am doing my postdoc in a lab that studies mammalian pluripotent stem cell differentiation. Continuing on my PhD studies, I am trying to decipher mechanisms by which mouse embryonic stem cells (mESCs) transit between different pluripotent states.

mESCs can be cultured in the naïve ground state of pluripotency, a culture condition where they resemble cells of the pre-implantation epiblast. They can be induced to form epiblast-like cells (EpiLCs), which are similar to cells of the early post-implantation epiblast. In turn, EpiLCs are germ-cell competent, and after BMP4 treatment they can be induced to form primordial germ cell like cells (PGCLCs), which are the origin of gametes. With this experimental setup, I am studying the role of different genes and signaling pathways during these cellular transitions. Apart from this, I just finished a project where we trained deep convolutional neural networks to classify light microscopy images of mESCs and early differentiating EpiLCs, only minutes after the differentiation stimulus.

I was born and raised in Buenos Aires. Apart from my research, I love hanging out with friends and family. Going out for a drink, to the cinema or theatre, listen to a band or just go out dancing. I also love landscape time lapse photography and have recently started diving into the world of astrophotography, which gives me the perfect excuse to go out camping.
Developmental Drivers of Craniofacial Evolution in Archosaurs

Aki Watanabe

New York Institute of Technology

As a morphologist, my research seeks to answer one of the most enduring questions in biology—what drives phenotypic evolution? Towards this end, my work focuses on three areas: (1) the tempo and mode of morphological evolution; (2) the complex interplay between anatomical changes along developmental and evolutionary time scales; and (3) the creation of new computational tools to investigate practical and theoretical issues in the collection and analysis of phenotypic data. My projects use a combination of techniques, including CT and surface imaging, statistical shape analysis (geometric morphometrics), and programming. Recent studies have looked into the developmental and evolutionary dynamics of skull and brain evolution in archosaurs and squamates. So far, my projects have largely been collection-based, so I am eager to incorporate more experimental approaches to my research program. I am very much looking forward to learning an entirely new set of techniques this summer and meeting bright scientists.

Personal Information: Outside of research, my interests include playing the violin, running, and playing tennis.