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2018-2019

September 7, 2018 – Norm Bell, Safety talk for all students working in labs. This is mandatory!!

September 14, 2018 – “Strategies for designing and delivering a scientific presentation” (by Matt Carter, Assistant Professor of Biology)

It takes time, effort and skill to design and deliver an engaging scientific talk that audiences understand and remember. In this one-hour presentation, we will discuss three aspects of designing an outstanding scientific talk: (1) organizing complex scientific information into a clear narrative; (2) using PowerPoint or Keynote software to visually communicate scientific concepts; and (3) improving verbal and nonverbal delivery during a presentation. This seminar is open to anyone and is especially applicable to senior thesis students.

September 21, 2018 – [Tarjinder Singh '12](#), Harvard Medical School

“The promise of human genetics in uncovering the biological mechanisms underlying neurodevelopmental disorders and mental illnesses”

In the past two decades, notable technological and methodological advances in human genetics has enabled the analysis of the genetic code of many tens of thousands of individuals, and for first time, a comprehensive look into the genetic factors underlying human traits and diseases. This has been particularly revealing in the study of mental illnesses, where our understanding of the genetic and environmental causes are still limited. Here, I will discuss the emergence of next-generation sequencing as a tool in identifying large-effect protein-coding variants that are associated with higher risk of mental illnesses, with a focus on schizophrenia. I will first review earlier results from the UK10K project, in which the analysis of over 5,000 case exomes revealed a schizophrenia risk gene and shared connections with broader neurodevelopmental disorders. I will then present preliminary results from the Schizophrenia Exome Sequencing Meta-analysis Consortium, a global collaborative effort to further accelerate genetic discoveries in schizophrenia through the analysis of over 75,000 individuals. These analyses are identifying genes and biological processes that underlie mental illnesses, and provide one avenue in acquiring clues on possible drug targets that may lead to more effective treatments.

September 28, 2018 (BIMO Class of 1960 Scholar) – [Tannishtha Reva '91](#), UC San Diego
“Stem Cell Signals in Cancer Heterogeneity and Therapy Resistance”

Our research focuses on the signals that control stem cell self-renewal and how these signals are hijacked in cancer. Using a series of genetic models, we have studied how classic developmental signaling pathways such as Wnt, Hedgehog and Notch play key roles in hematopoietic stem cell

growth and regeneration and are dysregulated during leukemia development. In addition, using real-time imaging strategies we have found that hematopoietic stem cells have the capacity to undergo both symmetric and asymmetric division, and that shifts in the balance between these modes of division are subverted by oncogenes. Further, regulators of this process, including the cell fate determinant Musashi, are critical players in driving progression of solid and liquid cancers and could serve as targets for diagnostics and therapy. Ongoing work is focused on understanding the mechanisms that drive therapy resistance after drug delivery, as well as developing high resolution *in vivo* imaging approaches to map normal stem cell behavior and interactions within living animals, and to define how these change during cancer formation.

October 12, 19, 26, 2018 – Thesis Talks

November 2, 2018 – (BIOL Class of 1960 Scholar) [Dan Bolnick '96](#), University of Connecticut

“Why genetic variation persists within populations, and why we should care”

Natural selection tends to remove less-fit genotypes from populations, because they survive or reproduce at a lower rate. Consequently, we expect that selection will gradually eliminate variation within populations, leading to a monoculture of genetically identical individuals. But this does not actually happen: variation persists within most natural populations. Is this variation neutral, persisting only because it is functionally irrelevant and does not affect fitness? Or, might natural selection actually promote diversity? I argue that natural selection often favors diversity for its own sake: there can be benefits to being different from everyone else in a population. Drawing on ecology, immunology, animal behavior, and evolutionary genetics, I will present a set of studies illustrating some of the reasons why genetic variation persists, and why this variation has practical consequences that we should care about.

February 8, 2019 – [Sara Wasserman](#), Wellesley College

“State-dependent decision making in flying fruit flies”

Dr. Sara Wasserman is the Kresa Family Assistant Professor in Neuroscience at Wellesley College. In her talk she will discuss how internal and external environment are integrated to drive contextually appropriate decision making in fruit flies. She uses a combination of virtual-reality flight simulators, optogenetics, and two-photon calcium imaging to identify and characterize the neuronal circuits that underlie state-dependent tuning of visual and olfactory behaviors.

February 22, 2019 – (BIOL Class of 1960 Scholar Event) **Alumni Reunion** – The purpose of the reunion is to provide our students a window on the process of finding and gaining admission to graduate Ph.D or MD/Ph.D programs. The reunion has two parts. First, a panel discussion will be led by our visiting alumni who are now in Ph.D, MD/Ph.D or post-doctoral programs (in Wege @ 2pm). Second, the panel will be followed by a poster session where students can talk individually with the panelists about their current research and about other topics related to moving forward towards a career in basic or medical research (in TBL 211 @ 3pm). This year’s returning alum are Clint Robins ’11, Dan Nachun ’12, Molly McEntee ’14 and Kathleen Higgins ’14.

March 1, 2019 – [Patricia Brennan](#), Mt. Holyoke College

“Genital coevolution in vertebrates: Sexual conflict as a driver?”

Dr. Brennan’s lab has been using an integrative approach to investigate how the diverse genitalia

of vertebrates function, and which evolutionary processes influence their complex morphology. Evidence from birds, snakes, dolphins and sharks highlights the importance of examining male and female genitalia together, and indicates that sexual conflict underlies the evolution of multiple genital features in these groups.

April 5, 2019 – [Jose Noguera](#), University of Vigo (Spain)

“Environmental Effects That Shape Individual Life Histories from Conception to Death”

It is now well recognised that the environment is not simply permissive of development, but can also shape the phenotype in ways that can be adaptive. These environmental effects can come about through both direct and indirect routes, and can span generations. In this talk I will discuss how pre- and early post-natal conditions can influence subsequent life history traits and trajectories, focusing particularly on reproduction and ageing. I will also discuss effects that can operate at different time scales, including the social environment, effects on early growth, nutrition and parental age. I will present illustrative data from natural and captive populations, and from a range of bird species and other taxa such as fish and insects. I will also examine some potential mechanisms that might mediate effects that occur over relatively long time scales and that can drive important changes in physiology, morphology and behaviour, including oxidative stress, stress responses, telomere dynamics and epigenetic marks. I hope this seminar helps all attendees to have a broader overview of the importance of early life conditions on the development of individual differences from conception to death.

April 12, 2019 – [Joseph Bergen](#), UMass Amherst
“Dynamic neural representations of social behavior”

April 19, 2019 (BIMO Class of 1960 Scholar) – [Lila M. Gierasch](#), UMass Amherst

“Dissecting a Multifunctional Allosteric Molecular Machine: the Hsp70 Chaperone”

The Hsp70 family of chaperones works with its co-chaperones, the nucleotide exchange factors (NEFs) and J-proteins, to facilitate a multitude of cellular functions. Central players in protein homeostasis, these jacks-of-many-trades are utilized in a variety of ways because of their ability to bind with selective promiscuity to regions of their client proteins that are only exposed when the client is unfolded, either fully or partially, or visits a conformational state that exposes the binding region in a regulated manner. The key to Hsp70 functions is that their substrate binding is transient and allosterically cycles in a nucleotide-dependent fashion between high and low affinity states. In the past few years, structural insights into the molecular mechanism of this allosterically regulated binding have emerged and provided deep insight into the deceptively simple Hsp70 molecular machine that is so widely harnessed by Nature for diverse cellular functions. The ability of each of the two domains of these molecular machines—the N-terminal nucleotide-binding domain and the C-terminal substrate-binding domain—to switch between two conformational states in a ligand-gated manner, and the built-in mechanism of interdomain allosteric communication to trigger these conformational switches, are key to Hsp70 action. Because of their importance in maintaining cellular homeostasis, Hsp70s there is great interest in modulating Hsp70s with small molecules to address diseases arising from loss of homeostasis. Structural insights into their molecular mechanism provide essential understanding for any rational design of modulators.

April 26, 2019 – [Byron Weckworth](#), Panthera, Director Snow Leopard Program
“Conservation in practice: from academics to grass roots”

The guiding principles in conservation dictate the importance of preserving biodiversity, maintaining ecological complexity and upholding evolutionary potential, as well as identifying that biodiversity has intrinsic value and that untimely extinctions should be prevented. Conservationists play many roles across various fields within the basic sciences and resource management. Conservation in practice requires successfully navigating the feedback loop between the new ideas and approaches provided by science and the field experience and research needs of resource managers, and then implementing the results into management and policy directives. Yet, in some cases, successful conservation dispenses with the formalities of this exchange in favor of local, grass roots interventions. Drawing from my own professional experiences in wildlife research and conservation, we will review results from studies of phylogeography, population genetics and ecology, predator-prey dynamics and social surveys, and examine the success and failure of their application to endangered species listing efforts for the Alexander Archipelago wolf, management of threatened woodland caribou in western Canada, and human-snow leopard conflict in Qinghai, China.

May 3, 2019 – Thesis Poster Presentations from 1:00-2:30pm

Thesis students will present a poster on their research project, starting with a short, one-minute presentation about their work to a general audience in **Wege Auditorium at 1:00pm**. The purpose of this presentation is to succinctly summarize their thesis projects so that they can be understood by all faculty, students and friends in attendance. This will be followed immediately by a poster session on the 2nd floor of the south science building students will talk about their research and findings.