| **Module 1: Microscopy, Arthropods (June 2- June 7)** | | |
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| 6/01/25 (Sun1) | Reception & Dinner, 7pm 2nd Floor Loeb 256 | **Tatjana Piotrowski, (**Stowers); **Athula Wikramanayake**, (Univ. Miami), *Welcome and course overview.* ***Bring your posters*** |
| 6/02/25 (Mon) | Morning lecture (9-11am) Speck Auditorium | **Athula Wikramanayake**, (Univ. Miami). Evolution of metazoan body plans.<br>**Nipam Patel** (MBL) Key concepts in development as seen through Drosophila embryogenesis |
| | Afternoon lecture and lab (1pm)<br>Speck Auditorium | Lecture**: Lisa Cameron**, (Duke U.), **Michelle Itano**, (UNC), **Paula Montero Llopis** (Harvard), *Light and confocal microscopy*<br>Lab: Looking at fly embryos |
| | Evening lab (7:30pm) | Imaging Unknown Fly Stains; **Lisa Cameron**, (Duke U.), **Michelle Itano**, (UNC), **Paula Montero Llopis** (Harvard |
| 6/03/25 (Tue) | Morning lecture (9-11am) Speck Auditorium | **Nipam Patel** (MBL) Establishment of the Drosophila body plan<br>**Melanie Worley** (UVA) Growth and patterning during post-embryonic development of *Drosophila* |
| | Afternoon lab (1pm) | Drosophila larval analysis**;** Dissection of additional arthropods, and continued analysis of Drosophila unknown stains. Students begin their own antibody and in situ stains to familiarize themselves with handling samples and these techniques |
| | Evening lab (7:30pm) microscopy lab | Continue working on larvae and other arthropods and visualization and analysis using unknown stains<br>Introduction of small group projects |
| 6/04/25 (Wed) | Morning lecture (9-11am) Speck Auditorium | **Melanie Worley (**UVA) Regeneration in Drosophila<br>**Heather Bruce** (UBC-Vancouver) Arthropod appendages: homology and novelty over half a billion years |
| | Afternoon (1:30pm) & evening labs (7:30pm) | *Arthropod Lab continued*<br>Students complete their own initial stains; and begin small group projects<br>Student presentations of Drosophila unknowns |
| 6/05/25 (Thu) | Morning lecture (9-11am) Speck Auditorium | **Guilherme Gainett** (Boston Children's Hospital and Harvard Medical School), Visual system diversification in arachnids: eye loss and major transitions in eye types<br>**Prashant Sharma** (University of Wisconsin, Madison) Analyses of genome architecture and comparative development break impasses in the evolutionary biology of "Arachnida" |
| | Afternoon (1:30pm) & evening labs (7:30) | *Arthropod Lab continued; continue group projects*<br>Evening Lecture: Butterfly wing coloration and tour of butterfly collection |
| 6/06/25 (Fri) | Morning lecture (9-11am) Speck Auditorium | **Anyi Mazo-Vargas** (Duke U.), *Diving into butterfly wing patterning: Understanding genomic organization and signals driving diversity*<br>**Lesley Weaver** (Indiana University)*, Drosophila as a model to understand inter-organ communication* |
| | Afternoon (1:30pm) & evening labs (7:30pm) | *Arthropod Lab continued; continue group projects* |
| 6/07/25 (Sat) | Morning lecture (9-11am) Speck Auditorium | **Michalis Averof (**Lyon) *Perfect regeneration of a complex organ; does regeneration mirror development?* (Rose lecture) |
| | Afternoon (1:30pm) & evening labs (7:30pm) | *Arthropod Lab continued; complete group projects* |
| 6/08/25 (Sun) | 7:00pm | *Scavenger hunt and course dinner* |
| *Things to do this week: T-shirt design for class, softball t-shirt, parade committee* | | |

| **Module 2: Nematodes, Annelids, Acoels (June 9- June 14)** | | |
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| 6/09/25 (Mon) | Morning lecture (9-11am) Speck Auditorium | **Dave Sherwood,** (Duke), *Introduction to C. elegans, and The ins and outs of oocyte to zygote transition* |
| | Afternoon & evening labs | *C. elegans* |
| 6/10/25 (Tue) | Morning lectures (9-11am) Speck Auditorium | **Geraldine Seydoux,** (Johns Hopkins/ HHMI), *Assembly and function of germ granules*<br>**Dan Dickinson** (UT Austin), *Establishing and regulating cell polarity in the early C. elegans embryo* |
| | Afternoon lab | *C. elegans.* |
| 6/11/25 (Wed) | Morning lecture (9-11am) Speck Auditorium | Student symposium (5min talk, 2 min questions). 104/105 Candle House |
| | Afternoon & evening labs | *C. elegans. Library/MRC tour.* |
| 6/12/25 (Thu) | Morning lecture (9-11am) Speck Auditorium | **Duygu Özpolat** (Wash U, St. Louis. Zoom lecture), *Cellular mechanisms of regeneration in annelids*<br>**Elaine Seaver,** (Whitney Laboratory for Marine Bioscience), *Embryology and regeneration: an annelid perspective* |
| | Afternoon & evening lab | *Annelids (C. elegans)* |
| 6/13/25 (Fri) | Morning lecture (9-11am) Speck Auditorium | **Mansi Srivastava,** (Harvard), *The evolution of regeneration and stem cells: the acoelomorph perspective*; and, *Plasticity across development and evolution* |
| | Afternoon & evening labs, | *Acoels (C. elegans, annelids)* |
| | 10am | *Tour marine invertebrate culture center* |

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| 6/14/25 (Sat) | Afternoon & evening labs | *C. elegans, acoels, annelids,* |
| | Class presentations (9pm) | *Show 'n Tell 1; lab clean up* |
| 6/15/25 (Sun) | *Free time* | |
| **Module 3: Basal deuterostomes and spiralians (June 16- June 21)** | | |
| 6/16/25 (Mon) | Morning lecture (9-11am) Speck Auditorium | **Athula Wikramanayake,** (Univ. Miami), *Introduction to echinoderms and early patterning*<br>**Zak Swartz,** (MBL), *A (sea) star is born: oogenesis and early development in a changing ocean* |
| | Afternoon & evening labs | *Marine Resource Center tour and tour of Loeb.* (1-3PM) schedule!<br>**Jon Henry**, (MBL), **Zak Swartz** (MBL), **Margherita Perillo** (MBL), **Athula Wikramanayake** (UMiami), *Tool making & microinjection (use echinoderms to practice microinjections)* (3-6PM) |
| 6/17/25 (Tue) | Morning lecture (9-11am) Speck Auditorium | **Laurinda Jaffe** (University of Connecticut)(Lillie lecture) *Fertilization and the activation of development*<br>**Margherita Perillo,** (MBL)*, Sea stars and sea cucumbers as models for organogenesis.* |
| | Afternoon & evening labs | *Echinoderms. Sea stars* |
| 6/18/25 (Wed) | Morning lecture (9-11am) Speck Auditorium | **Bob Zeller,** (San Diego State Univ.), *Introduction to ascidian development - sea squirts made easy.*<br>**Ed Munro**, (Univ. Chicago), *Coupling cell fate and morphogenesis in Ascidians* |
| | Afternoon & evening labs<br>Evening discussion | *Echinoderms, ascidians.* **Athula Wikramanayake,** (Univ. Miami) and **Tatjana Piotrowski,** (Stowers Institute), Ethics Discussion- authorship and navigating mentor/mentee relationships |

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| 6/19/25 (Thu) | Morning lecture (9-11am) Speck Auditorium | **Ed Munro**, (Univ. Chicago), *Dynamics of neural tube closure in ascidians*<br>**Alberto Stofi** (Georgia Tech), *A conserved RNA switch for acetylcholine receptor clustering at neuromuscular junctions in chordates* |
| | Afternoon & evening labs | *Ascidians (echinoderms)* |
| | evening lecture (fish bowl) | **Jon Henry** (MBL). *Twists and turns of spiralian developmental biology* |
| 6/20/25 (Fri) | Morning lecture (9-11am) Speck Auditorium | **Dede Lyons** (Scripps Institute of Oceanography)(Kessel Lecture), *Developmental origins of molluscan novelties* |
| | Afternoon & evening labs | *Spiralians (echinoderms, tunicates)* |
| 6/21/25 (Sat) | Morning lecture (9-11am) Speck Auditorium | **Elia Benito- Gutierrez** (Univ. of Cambridge, UK). Cephalochordates, Amphioxus. |
| | Afternoon & evening labs | *spiralians, tunicates, echinoderms* |
| 6/22/25 (Sun) | Morning and Afternoon | *Free time* |
| | Evening lecture (8pm) | **Elke Ober** (FAU Erlangen, Germany). *Introduction to ZF development* |
| **Module 4: Fish and Frogs (June 23- June 28) (Please note that there will be morning and evening labs, and afternoon lectures this week)** | | |
| 6/23/25 (Mon) | Morning lab (9am) | *Zebrafish* |
| | Afternoon lecture (1-3pm) Speck Auditorium | **Tatjana Piotrowski,** (Stowers Institute), *Zebrafish intro; sensory lateral line development/regeneration* |
| | Evening lab (7:30-8:30pm) | *Zebrafish/ frog lab intro* |
| 6/24/25 (Tue) | Morning lab | *Zebrafish, Frogs* |
| | Afternoon lecture (1-3pm) Speck Auditorium | **John Wallingford** (Univ. of Texas, Austin), *What 25 years of vertebrate Planar Cell Polarity hasn't taught us* |
| | Evening lab | *Zebrafish, Frogs* |
| 6/25/25 (Wed) | Morning lab | *Zebrafish, Frogs* |
| | Afternoon Lecture (1-3pm) Speck Auditorium | **Elke Ober, (**FAU Erlangen, Germany), *Building an organ - liver development and regeneration* |
| | Evening lab | *Frogs, Zebrafish* |
| 6/26/25 (Thu) | Morning lab | *Frogs, Zebrafish* |
| | Afternoon lecture (1-3pm) Speck Auditorium | **Andrea Wills,** (Univ. Washington), *Decoding the transcriptional and metabolic requirements for vertebrate regeneration*<br>**Shinuo Weng** (Johns Hopkins University), *Decoding multiscale biomechanics in convergent extension* |
| | Evening lab | *Frogs, Zebrafish* |
| 6/27/25 (Fri) | Morning lab 10:30am | *Zebrafish, Frogs* |
| | Afternoon lecture (1-3pm) Speck Auditorium | **Marina Venero-Galanternik** (University of Utah), *Anatomical and molecular characterization of the zebrafish meninges*<br>**Andrew Gillis,** (MBL) *Skate development and evolution of the vertebrate skeleton* |
| | Evening lab | *Zebrafish, Frogs, Skates* |
| 06/28/25 | Morning lab | *Zebrafish, Frogs* |
| | 11am | *Fish room tour* with Elke Ober |

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| (Sat) | Afternoon lecture 1:30pm Speck Auditorium | **Dan Rokhsar** (UC Berkeley)(Rafferty lecture), *The past has left its traces on the world: deeply conserved synteny and the evolution of animals* |
| | Evening lab | *Zebrafish, Frogs* |
| | Class presentations 8pm | *Show 'n Tell 2; lab clean up* |
| 06/29/25 (Sun) | | *Whale watching trip to Hyannis* |
| **Module 5: Chicks and Mouse (June 30- July 5)** | | |
| 6/30/25 (Mon) | Morning lecture (9-11am) Speck Auditorium | **Peter Lwigale** (Rice University), *Introduction to avian development*<br>**Tatjana Sauka-Spengler,** (Stowers Institute), *Gene Regulatory Networks.* |
| | Afternoon & evening labs | *Chick* |
| 7/1/25 (Tue) | Morning lecture (9-11am) Speck Auditorium | **Richard Behringer** (MD Anderson). *Introduction to mouse development/sex development* |
| | Afternoon & evening labs | *Mouse (chick)* |
| 7/2/25 (Wed) | Morning lecture (9-11am) Speck Auditorium | **Ondine Cleaver** (UTSW)**,** *Introduction to mouse development and development of the vascular system* |
| | Afternoon & evening labs | *Chick and mouse* |
| 7/3/25 (Thu) | Morning lecture (9-11am) Speck Auditorium<br>Afternoon & evening labs | **Stephan Grill** (Max-Planck-Institute Dresden, Germany; Katsuma and Jean Dan lecture hosted by Physiology). *Physics of Structure Formation in Living Systems.*<br>*Chick and mouse* |
| 7/4/25 (Fri) | July 4th Parade | *Free time, parade. Course BBQ next to white tent at 6pm and watch fireworks on beach.* |
| 7/5/25 (Sat) | Morning lecture (9-11am) Speck Auditorium | **Peter Lwigale** (Rice University), *Partnering of Periocular Neural Crest Cells during Ocular Development*<br>**Marcos Simoes-Costa** (Harvard University), *The avian embryo as a model for developmental genomics* |
| | Afternoon/evening labs | *Chick and mouse, softball game, After game BBQ* |
| 7/6/25 (Sun) | *Free time* | |
| **Module 6: Cephalopods, Cnidarians, Ctenophores (July 7- July 12)** | | |
| 7/7/25 (Mon) | Morning lecture (9-11am) Speck Auditorium | **Carrie Albertin** (MBL) *Evolution and development of cephalopod brains and body plans* |
| | Afternoon | *Cephalopods* |
| | evening lab | *Cephalopods,* squid injections. |
| 7/8/25 (Tue) | Morning lecture (9-11am) Speck Auditorium | **Celina Juliano (**UC Davis), *Mechanisms of development and regeneration in Hydra.* |
| | Afternoon & evening labs | *Cnidarians, Nematostella* |
| 7/9/25 (Wed) | Morning lectures (9-11am) Speck Auditorium | **Matt Gibson,** (Stowers Institute), *Anthozoan overview: The biology of sea anemones and reef building corals*, and. *Your inner anemone: segments, somites, and the evolution of animal metamerism* |
| | Afternoon & evening labs | *Cnidarians, Nematostella* |
| 7/10/25 (Thu) | Morning lecture (9-11am) Speck Auditorium | **Bill Browne (**Univ. Miami), *Using Mnemiopsis as a model to investigate ctenophore innate immunity*<br>**Athula Wikramanayake** (Univ. Miami), *The evolution of signaling pathways: insights from Wnt/beta-catenin signaling in non-bilaterians* |
| | Afternoon labs (1:30PM) | *Ctenophores* (*cnidarians, cephalopods)* |
| | Evening labs | *Ctenophores* (*cnidarians, cephalopods)* |
| 7/11/25 (Fri) | Morning lecture (9-11am) Speck Auditorium | **Olivier Pourquie** (Harvard) (Saunders lecture). *Laying down the body plan: lessons from the embryo*, and *Deconstructing and reconstructing the human musculo-skeletal system in vitro with pluripotent stem cells.* |
| | Afternoon & evening labs | *Cnidarians (ctenophores, cephalopods)* |
| 7/12/25 (Sat) | Morning lecture (9-11am) Speck Auditorium | **Ehab Abouheif (McGill),** *What ants—nature's ultimate superorganisms—teach us about development and evolution* |
| | Afternoon labs | *cnidarians, ctenophores, cephalopods* |
| | Class presentations, (8pm) | *Show 'n Tell 3* |
| 7/13/25 (Sun) | Morning discussion (11am) | **Athula Wikramanayake,** (Univ. Miami) and **Tatjana Piotrowski** (Stowers Institute) |
| | Afternoon lab | *Lab clean-up* |
| | Evening (7:30pm) | *Course banquet and award ceremony* |