IAP 2022

For Credit

7.102 – Introduction to Molecular Biology Techniques

January 10 – 27, daily from 12:30-5 p.m.
Building 68 Room 089
Level: U | 6 units (0-5-1)
Instructors: Prof. Adam Martin, Dr. Mandana Sassanfar
Prerequisites: None - Note that this course is not a substitute for 7.002 or 7.003

This intensive 2-week "boot-camp" style course will provide hands-on instruction in basic molecular biology and microbiology techniques including sterile techniques, isolation and quantification of nucleic acid (DNA) and protein, agarose and SDS-PAGE gel electrophoresis, PCR, Cloning, microscopy, DNA sequence analysis, and bioinformatics. In addition students will learn to classify bacteria based on their shape, membrane structure and metabolism. Emphasis will be on real-world application, experimentation and trouble shooting in preparation for a successful UROP experience. This lab course will improve students' troubleshooting and problem-solving skills. As in a real lab situation, some experiments will take longer than expected, or will need to be repeated. Priority will be given to freshmen with no prior research experience.

Students will be expected to spend every afternoon from 1-5pm in the lab. Labs may start earlier on some days.

Apply by December 10, 2021 by filling out this form and emailing it to Dr. Mandana Sassanfar. The class is limited to 16 students. No listeners. Do not preregister on WebSIS. Applicants will be informed by December 15.

Non-Credit

Science and Society

A Field Guide to Values in Science for Biologists

Thursday, January 13th, 1:30 – 3 p.m.
KI Luria Auditorium, 76-156

Dr. David Frank
Brown University

The past few decades have seen the emergence of a significant philosophical literature on values in science. In this talk I offer a field guide to ongoing debates about values in science for biologists. I first consider arguments against the ideal of value freedom, presenting the case that science is thoroughly, normatively value-laden. On this view, scientists ought to take social or contextual values into account in their work, in ways that go beyond the traditional emphases of Responsible Conduct of Research training on preventing fabrication, falsification, and plagiarism on the one hand and protecting human and non-human research participants on the other. Drawing on my own research, I illustrate by discussing roles for social values in problem selection, concept formation and operationalization, the analysis and interpretation of data, and the communication of results in the

life sciences. I close by introducing two alternative models of value-laden science: the social value management model and the social justice standpoint model. I conclude that both of these contain important insights about socially responsible science, suggesting both might be relevant to specific contexts.

Professional Cultures and Inequality in STEM

Wednesday, January 19th, 1:30 – 3pm
Hybrid 68-181

Dr. Erin Cech
University of Michigan, Depts. of Sociology and Mechanical Engineering

Can the culture of STEM help reproduce inequality? The professional cultures of STEM, which give each discipline its particular "feel" and unite discipline members under a taken-for-granted system of meanings and values, are not benign. Drawing from several NSF-funded survey and interview-based studies, I argue that these professional cultures can have built within them disadvantages for women and other under-represented groups in STEM. Specifically, I discuss the role of three particular cultural ideologies—schemas of scientific excellence, depoliticization, and the meritocratic ideology—in producing these disadvantages. I end by explaining why decisions (e.g. admissions, hiring, tenure) that partially rely on assessments of individuals' "fit" with professional cultures are particularly important to critically examine for their potential to contribute to inequality.

"But I'm Not A Feminist": Why women leave engineering, meritocratic ideologies, and professional role confidence

Thursday, January 27th, 4 – 5:30 p.m.
KI Luria Auditorium, 76-156

Dr. Susan Silbey
Leon and Anne Goldberg Professor of Sociology and Anthropology, Professor of Behavioral and Policy Sciences, Sloan School of Management, MIT

Despite direct experiences and reports of sexism, differential treatment, and marginalization, women engineering students describe the profession as meritocratic and objectively rewarding individual accomplishment. This talk will present results from a comparative study of engineering students at four institutions, locating the results within a larger context concerning gender, scientific careers, and organizational practices more generally.

Careers in Biology

Staying at the Bench: Non-PI Careers that Keep You Doing the Work You Love

Tuesday, January 4th, 12:30 – 2 p.m., Virtual

Boryana (Bory) Petrova, PhD
Instructor, Harvard Medical School
Stuart Levine, PhD
Director, BioMicro Center, MIT
Christina Steadman, PhD
Staff Scientist, Los Alamos National Laboratory

What if I want to keep doing science? Many post-PhD careers take trained scientists away from the bench, but that need not be the case. Hear about the perspectives and trajectories of three "staff scientists"—some of whom conducted postdoctoral research at MIT—and how their work overlaps and diverges from that of a PI at an academic institution.

Session organizers: Dylan McCormick and Alice Herneisen

How to Carve Your Path in the Biopharmaceutical Industry

Monday, January 10th, 3 – 5 p.m., Virtual

Tamara Reyes-Robles, PhD
Associate Principal Scientist, Chemical Biology,Exploratory Science Center, Merck
Nina Leksa, PhD
Distinguished Scientist, Lab Head, Hemophilia and Musculoskeletal Disease Research Center, Sanofi
Amaris Torres Delgado, PhD
Senior Scientist, Process Development, Amgen
Cynthia Barber, PhD
Senior Director, Program Management, Vertex

Amgen, Merck, Vertex and Sanofi are multinational biopharmaceutical companies with 20,000-100,000 employees generating numerous commercially available drugs. In this session, we will chat with scientists working in each of these companies to learn about their company culture, structure, and different career paths. Join us for an engaging discussion on what it takes to succeed in biopharma and learn about the challenges and benefits of working in such well established companies.

Session organizer: Fiona Aguilar

Impact of AI in Drug Discovery

Wednesday, January 12th, 1:30 – 3 p.m., 68-181

Dr. Pat Walters
Senior VP of Computation, Relay Therapeutics
Dr. Gevorg Grigoryan
Co-founder and Chief Technology Officer, Generate Biomedicines
Dr. Eric Ma
Principal Data Scientist, Moderna

The impact of artificial intelligence in drug discovery is becoming more apparent as more and more biopharmaceutical companies are investing heavily in it as well as news of its significant roles in new drugs abound. The flexibility of AI has made it applicable in all areas of pharmaceutical research including small molecules, protein and RNA-based therapeutics. This session will explore this impact with three of the fastest growing biotech companies that are pushing the boundaries of AI in Biology. Our speakers are leading scientific leaders from Relay Therapeutics—a leading company in AI-based small molecule drug design, Generate Biomedicines—a company invested in using AI to design protein-based drugs, and Moderna—a nearly household name that has been at the forefront of revolutionizing vaccine research with the help of AI.

Join us for a session where we learn how these three industry leaders are integrating AI and biology for faster and more effective drug discovery. They will each give a 15-minute talk about their specific research areas and

the talks will be followed by an engaging panel discussion. Come learn about how you can position yourself to be part of the AI revolution!

Session organizer: Israel Desta

New Positions, New Perspectives

***postponed, date TBD**

Professors
Olivia Corradin, Yadira Soto-Feliciano
Sinisa Hrvatin, Kristin Knouse
Hernandez Moura Silva, Sara Prescott
Francisco J. Sánchez-Rivera, Alison Ringel
***and* Harikesh Wong**

New faculty members joining the Biology Department this year bring with them fresh perspectives on their scientific journeys, strategies for pursuing an academic career, and visions for the scientific community. Join us for a discussion of their bold ideas and followed by a facilitated reception to get to know them individually.

Session organizers: Eliezer Calo, Aditi Shukla, Alice Herneisen

Arcadia Science: A New Institutional Model for the Research and Translation of Biological Discovery

Thursday, January 20th, 12 –1:30 p.m.

Dr. Prachee Avasthi, PhD
Arcadia Science, Co-founder, Chief Scientific Officer, and Director of Cell Biology, Geisel School of Medicine at Dartmouth, Associate Professor of Biochemistry and Cell Biology

Arcadia Science is a new for-profit research institute distinct from traditional academic and biotech environments. Their mission is to uncover novel biology of non-model organisms and to directly commercialize impactful discoveries. Composed of scientists, engineers, and entrepreneurs, Arcadia Science is creating a unique environment to empower curiosity-driven discoveries that are also financially self-sustaining. Join us for this moderated Q&A with their Co-Founder and Chief Scientific Officer, Dr. Prachee Avasthi, to learn more about Arcadia Science.

Session organizers: Chris Giuliano and Alex Chan

Using Your PhD to Combat Climate Change

Wednesday, January 26th, 2 – 3:30 p.m.

Dr. Rachel Fraser, PhD
Impossible Foods, Vice President of Downstream Process Development
Dr. Hélène Berges, PhD
Inari Agriculture, Vice President of Research and Development

The climate crisis has galvanized scientists to pursue bold ideas to both reduce carbon emissions, as well as adapt to a changing environment. Join us for a moderated Q&A to discover how we, as biologists, can leverage the skills that we have acquired to pursue industry research positions that are focused on sustainability. We will

be speaking to Dr. Rachel Fraser, the Vice President of Downstream Process Development at Impossible Foods, a company focused on developing plant-based meat substitutes, and Dr. Hélène Berges, Vice President of Research and Development at Inari Agriculture, a company harnessing AI and multiplexed gene editing to produce robust seeds for food production.

Session organizers: Alex Chan and Aditi Shukla

How to Navigate the Biotech Startup Network

Friday, January 28th, 3 –5 p.m.

Ohad Yosefson, PhD
Associate Director of Protein Sciences, Repertoire Immune Medicines
Nathan Young, PhD
Associate Director of Molecular and Cellular Oncology, Ikena Oncology
Megan Warner, PhD
Senior Scientist, Protein Sciences, CRISPR Therapeutics

The Boston biotech sector is booming with scientific innovation, investments, and company creation. In this session, we will chat with scientists from three different biotech companies to learn how to navigate a career in a constantly evolving company while managing expectations and responsibilities. Learn about their previous experiences and job roles and inquire about their thoughts on the biotech landscape.

Repertoire Immune Medicines is a series B funded Flagship Pioneering company seeking to rationally engineer T cell receptor (TCR)-antigen interactions. Ikena Oncology is a public company focusing on genetically defined or biomarker-driven cancer targets. CRISPR Therapeutics is a public gene editing company developing treatments for hemoglobinopathies, cancer, and diabetes. All three are clinical-stage companies at the frontline of innovation.

Session organizer: Fiona Aguilar

Gene Regulation and Expression

Fundamental Principles During the Egg-to-embyro Transition

Tuesday, January 11th, 12-1 p.m.

Dr. Andrea Pauli
Group Leader at the Research Institute for Molecular Pathology (IMP), Vienna

Single-cell Epigenomics: Gene Regulation at Unprecedented Resolution

canceled due to Covid

Dr. Jason Buenrostro
Assistant Professor at Harvard University

Structural Basis of Chromatin Transcription

Tuesday, February 1st, 12 – 1 p.m.

KI Luria Auditorium, 76-156

Dr. Lucas Farnung
Assistant Professor at Harvard University

Python IAP Bootcamp

Tuesdays & Wednesdays, January 4 – 19, biweekly from 3 – 5 p.m.
Instructor: Dr. Duan Ma

This 6-session IAP Python programming bootcamp introduces the basics of Python. All levels of experience are welcome, but the material is targeted at those with little or no programming experience.