

BIOL GU4305 - Seminar in Biotechnology

Lili Yamasaki, PhD
ly63@columbia.edu

Spring 2023

601 Fairchild
 In-Person

DATE	SPEAKER & TOPICS
1/18/23	YAMASAKI - Course Overview, Intro & Team Projects
1/25/23	YAMASAKI – Stem Cells, Mouse Technologies
2/1/23	HYNEK WICHTERLE, PhD - Human iPSC and Mouse Models of ALS Co-Director, Motor Neuron Center Assoc. Professor in Pathology & Cell Biology, Neurology, Rehab & Regn Med, CUMC Assoc. Director, Columbia Genome Center; Co-Director, Columbia Stem Cell Initiative
2/8/23	DAVID SABLE, MD - Entrepreneurship in Biotechnology Manager, Special Fund Life Sciences Innovation Fund
2/15/23	DIETRICH EGLI, PhD. - SCNT & iPSC Models for Diabetes, Genome Instability Assistant Professor of Developmental Cell Biology (in Pediatrics)
2/22/23	WENDY CHUNG, MD PhD - Treating Rare Pediatric Genetic Diseases Kennedy Family Professor of Pediatrics and Medicine, CUMC Chief, Division of Clinical Genetics, Department of Pediatrics, CUMC
3/1/23	SHEN-YING ZHANG, PhD. - Inborn Errors of Immunity St. Giles Laboratory of Human Genetics of Infectious Diseases, Rockefeller University Laboratory of Human Genetics of Infectious Diseases, INSERM, Necker Hospital for Sick Children -University of Paris, Imagine Institute
3/8/23	CHRISTOPH ANACKER, PhD - Optogenetic Murine Models of Chronic Stress Assistant Professor of Clinical Neurobiology, Dept of Psychiatry, CUMC
3/15/23	No Class - Spring Break
3/22/23	EMILY CORSE, PhD Immuno-Oncology Senior Vice President, Biology Larkspur Biosciences
3/29/23	Speaker TBA
4/5/23	Speaker TBA
4/12/23	NEVILLE SANJANA, PhD - Genomic Engineering & Functional Screens with CRISPR/Cas Core Faculty, New York Genome Center Assistant Professor in Biology, NYU Assistant Professor, Neuroscience & Physiology, NYUSoM
4/19/23	STUDENT TEAM PRESENTATIONS #1 - 3
4/26/23	STUDENT TEAM PRESENTATIONS #4 - 5 Last Day of GU4305 (Task C Papers Due)

GU4305 Seminar in Biotechnology - Spring 2023

Lili Yamasaki, Ph.D.

ly63@columbia.edu

Course web site: <https://courseworks2.columbia.edu/courses/170653>

Location: 601 Fairchild Building

Time: Wednesdays, 2:10 – 4:00 pm

Attendance is mandatory. P/F or R-Credit is not allowed.

Course Description

GU4305 Seminar in Biotechnology complements the existing, lecture-based Biotechnology core course offered in the Fall term (GU4300 Drugs and Disease), and is designed specifically as a **Core requirement** for students enrolled in the **MA in Biotechnology Program**. Graduate students from other programs and upper-level undergraduates are welcome to register if they have sufficient biology background (minimum of 4 college level biology courses) for this graduate level course. The course will address critical topics and advances in biotechnology with regards to human disease. Invitations to participate have been extended to a range of speakers, who are experts in their research discipline or in their specialty from the private sector. The overall focus of this course is the future of medicine and how technological advances, including genomic sequencing, stem cell development, complex mouse models and CRISPR/Cas, will change the diagnosis and/or treatment of human disease. This year, we will also be discussing how best to deploy new technologies, vaccines and drugs to combat the COVID19 Pandemic.

There will be 10 classes devoted to invited speakers, who will give 60 to 90-minute seminars on their research topic or area of expertise. Embedded in each seminar, the speaker will answer questions from the audience that are intended to provide an opportunity for rich interaction with the students. Beyond this year's scientific focus, GU4305 is designed to practice and improve on the following skills:

- 1) How to dissect primary research papers and to write cogent scientific summaries,
- 2) How to prepare for and optimize learning during a research seminar,
- 3) How to organize and conduct team-based projects,
- 4) How to interact productively and professionally with experts in academia and industry,
- 5) How to conduct science in a productive and ethically responsible manner.

Assignments and Descriptions:

Task A In-Class Seminar Speaker Assignments (35%)

Task B Team Project (35%)

Task C Future-of-Medicine Paper (30%)

Task A In-Class Seminar Speaker Assignments (35%)
--

One of the most important skills to develop in biotechnology is the ability to acquire information from the scientist directly in a professional research environment. To develop and practice this skill, students will be attending research seminars and interacting with scientists and industry professionals one-on-one. There will be ~10 invited speakers addressing the students of GU4305 on various subjects this term. Many of the invited speakers will be research scientists, whose work is focused on understanding normal development and rare disease using patient genomic information, stem cell development, complex mouse models and/or CRISPR/Cas technology. Additionally, we are fortunate this year to have a biotech investor and physician, who normally teaches Entrepreneurship (BIOT GU4180) and who has agreed to share his special insights and experiences into the ever-changing landscape of biotechnology.

To prepare for an in-depth interaction with the scientific speakers, **all** students must **read in advance** of the speaker's visit at least one recent research paper by the speaker and one scientific review of the speaker's discipline. There will be suggested readings to be completed before the visits of non-scientific speakers on the topic to be addressed. Each student should **formulate at least two** thoughtful questions ahead of the seminar.

Students are expected to listen to each speaker's seminar and **ask** pertinent questions about the featured work or other questions of interest at an appropriate time (e.g., previous published work, opinions on technological advances, career path and preparation, future directions). If another student asks that intended question, then a **new question** must be posed to the speaker.

Note the following for these invited seminar speakers, who have agreed to spend their time with us:

- 1) Asking questions of the speakers via email afterwards (rather than during class) is **NOT** allowed. The speakers have agreed to share this class time with GU4305, and they are not available after class to complete student work that should occur during their visit.
- 2) Readings for a speaker's visit should be completed by all students whether or not a Task A assignment will be submitted. The speakers represent unique learning opportunities for GU4305 and preparing for their talks will benefit students immensely.
- 3) The best questions posed will be those that arise organically from the talk presented. So, an engaged audience will always learn more. Do not just wait for the end of the talk to pose your question - you may lose your chance.
- 4) Recording the speaker's seminar by the audience is **NOT** permitted. Slide decks will not be provided by the speaker. Be an active audience member – take notes – listen – ask questions.

For **SEVEN** of the ten In-Class Speakers, students must submit one file to the speaker's assignment folder in

CourseWorks that includes:

- 1) An original synopsis (≥ 500 words) of the speaker's talk, which highlights salient features of particular interest to the student from the talk – more than just a summary of what was covered, insight about how that speaker connected with the student's interest should be shared.
- 2) A list of the research paper(s) and review read in advance for the speaker's visit,
- 3) The two questions that the student prepared for the speaker, including the one unique question asked of the speaker and the answer received.

Each submission must occur **within one week** of the speaker's visit and counts toward **5% of the final grade**. At least 5 of the submissions should be from the 7-8 scientific research seminars scheduled. Assignment folders in CourseWorks will be opened for each week's speaker and should be used for all student submissions. Late submissions will receive **deductions for tardiness**. Do not submit Task A assignments via email to the instructor. Seven Task A submissions (5% each) account for 35 % of the final grade for GU4305.

Task B	Team Project (35%)
---------------	---------------------------

Progress in science requires collaboration, personal interactions and professional communication, ranging from global networking between interested colleagues and/or competitors to local interactions between labs, lab members and/or mentors. Along with developing formal presentation skills, it is critical to learn how to work together productively and to communicate effectively (informally and formally). In the spirit of collaboration, students will conduct a Student Team Project to hone organizational (leadership, collaborative work and time management) and presentational skills, which will help prepare students for future professional and scientific interactions in the research community and with the biotechnology industry. The scope of the team project will be ambitious enough to account for **35% of the final grade**. Students must gain approval prior to the initiation of their team project.

Task B Option 1: A number of Team Projects (#1-4) will require screening & selection of team membership (5-6 students/team) by the hosting entity. These Team Projects will be introduced during the first class. After considering the Team Project Proposals, students must select the one project for which they wish to apply. **Only one submission at a time for Option 1 per student is allowed and should be submitted as quickly as possible to reflect interest.**

By **January 25th**, all students must **submit one** pdf file to the Assignment folder in Courseworks that contains a **cover letter** to the hosting entity (page 1) explaining why they should be considered for that **specific proposal** and an up-to-date **resume** (page 2) with relevant coursework and work experience. Entitle the submission as “*Student’s Name – Host Institution*”. Be sure to declare any competing interests that might exist, for instance, if the student is or will be working with or has previously worked with a similar organization. **As soon as** five students have applied for a specific proposal, the outside hosting entity will receive their letter and resumes for consideration, and this may occur **before** January 25th.

Students will be informed as soon as possible if they match with their desired proposal, so that they can begin to coordinate that team project with their team members and the outside organization by **February 1st**. Those students, who are **not** matched, may then apply for another team proposal (Option 1, space allowing) or may choose to find or form another team (Option 2).

Task B Option 2: Students can group themselves into teams of 4-5 individuals and select their own GU4305 topic for a team project. Teams must notify the Instructor of their team membership. There is substantial flexibility in the team project and the approach, but it must involve some aspect of how technology is transforming medicine – the theme of GU4305. Identifying an organization with which to partner can be key to the success of the team project. Examples will be given of past projects, but these are not meant to limit this learning opportunity. **Be creative!** By January 25th, each team should identify two potential projects to discuss with LY for initial discussion and possible approval. By **February 1st**, a pre-approved Team Project Proposal must be submitted with specific goals for a Team Project.

Task B Options 1 and 2: After discussion with the instructor and outside organizations when appropriate, each Team must construct a **timeline for completion** of the Team Project utilizing the skills and strengths of all team members. A **single progress report** (1-2 pages, double-spaced) on the team project will be due on **March 1st** through CourseWorks - **one submission per team**. By mid-April, projects should reflect at least **35 total hours** per student of documented team work after the Proposal has been approved by the instructor, not including rehearsals for the class presentation to GU4305.

Task B Class Presentation: All Team Projects must be completed in time for a 25- to 30-min presentation to the class on either **Wed April 19th** or **Wed April 26th**. Presentation days will be given out first-come, first-served once the Project is approved by LY. Teams will be evaluated for the novelty and the execution of the Project (organization and productivity), the cohesion of the Team as judged by demonstrated interactions throughout the term and the quality of the final presentation. The Task B class presentation represents only a portion of Task B. **All team members must participate** in the execution of the project **and** the presentation to the class.

A **single** pdf copy of the compiled final presentation must be submitted to CourseWorks by one team member **by noon** on the day that the team's project is scheduled for presentation. All submissions for the Team Project will occur through specific Task B assignment folders in CourseWorks. Late submissions will receive deductions for tardiness. Do not submit Task B assignments via email to the instructor. **Feedback from the outside organization** supervising the team project is a critical part of the evaluation process for Task B, and it is encouraged to invite the supervisor of the team project from the outside organization to attend the presentation of the team project remotely during one of the last two weeks of class.

Task C	Future-of-Medicine Paper (30%)
---------------	---------------------------------------

This year, we will explore how sequencing of patient genomes, stem cell technologies, complex mouse models and CRISPR/Cas technologies are beginning to transform the treatment of human disease. Students should choose one rare genetic disease to explore thoroughly **after gaining instructor approval**. Reserving disease topics will be on a first-come, first-served basis. For MA in Biotechnology students, choose a disease that you are not planning to cover in your MA thesis and that was not covered in lectures for GU4300.

Students must write an original 10-page paper with primary scientific references describing how the future treatment of this genetic disease will be impacted by new technologies. Students should use this assignment to expand their knowledge base rather than just repeating what was presented during the in-class seminars for GU4305 or in lectures for GU4300. Information as to the format and layout for this assignment will follow in a couple weeks, but it will be a combination of the organization for the Disease-of-Choice/Drug-of-Choice assignments for GU4300. An electronic copy of the term paper (pdf only) must be submitted to the Task C Assignment folder on CourseWorks by the last day of class (**Wed April 26th, 2023**). Late submissions will receive increasing deductions for tardiness. Do not submit Task C assignments via email to the instructor. As always, all student work **must be original**. Evidence of plagiarism and heavy paraphrasing will result in **NO CREDIT** for the assignment, resulting in loss of 30% of the final grade. Comments on the Task C paper will be made and students will be able to use this feedback for those eventually writing their MA thesis.