

**BioS421 – (O10/D10: On-Site and Distance Education)  
Molecular Cell Biology 1  
(Spring 2021)**

**Mondays 5:50 pm – 8:30 pm, Iacocca Hall, IH-E301, and via Zoom link: 984 9409 5951**

**Accompanying Course Site: BIOS-421-SP21**

**Instructor: Matthias M. Falk Iacocca Hall, D-218**  
**Contact: [mmf4@lehigh.edu](mailto:mmf4@lehigh.edu) (484-707-5676 for emergency text messages only!)**

As this class has a Zoom link, I plan to hold all classes even if the campus is closed due to adverse weather conditions.

This course is a discussion class that reviews current “hot topics” in Cell Biology and related areas **You will need to attend all classes live either by coming to Iacocca Hall or via Zoom.**

The class has the following learning outcomes:

- (1) To give you a sense on current advances in select areas of modern Molecular Cell Biology.
- (2) To search for and select research papers to a given topic.
- (3) To read and understand research and review articles that have been published preferentially in the past year in leading international journals.
- (4) To teach you how to critically comprehend and digest these research articles.
- (5) To clearly present research findings.
- (6) To discuss the research findings in class with others.

**Since this is a presentation/discussion course, lectures and exams will not be given. Your grade is entirely dependent upon your oral presentations AND lively participation in class discussions! Presence and active participation in ALL classes are required!**

Topics were selected keeping current relevance to molecular medicine and disease in mind. Each course day, 3 – 4 manuscripts will be presented and discussed. It is expected that each student will present a total of 3 papers. (= 50% of final grade). In addition, engaged participation in class discussions is equally important (= 50% of final grade).

**Each publication will be presented in a Power Point presentation by an assigned student and its content will be discussed in class. Thus, it is important that ALL students carefully read ALL papers that will be discussed on that day BEFORE class meets! To promote discussion, each student should send me one question for each paper discussed by no later than noon on Monday. If you present a paper, you do not need to send me a question for your paper.**

We will present and discuss about 42 articles (3/student). PDF-files of the manuscripts including News & Views sections, cover highlights, and other comments will be posted on the

accompanying Course Site by the Instructor. Topics and presentation order will be assigned on the first day of class. I will involve students in finding relevant papers they may want to present. I will suggest and we need to agree on topics. Potential papers you select will need to be accepted by the instructor. How to find potential manuscripts and how to evaluate their appropriateness will be discussed on the first day of classes. In addition, on the second day of classes each student will present a short summary (a few minutes each) of her/his work/field of expertise/work environment (= learn to know each other's expertise).

The learning outcomes will be assessed as follows:

- (1) The first set of manuscripts (the first one to be presented by each student) and some additional ones have been selected by the instructor. For papers two and three, the student may be assigned a topic. The student will then search the literature to this topic and send a small selection (about 3) of manuscripts he/she would like to present to the instructor. Instructor and student, in email discussions, will select the most appropriate manuscript.
- (2) The student presents the manuscript in class based on a PowerPoint presentation he/she has assembled and will lead the discussion of the paper. The instructor will provide written feedback to the student including statements on what was good, and what would need improvement. It is expected that the student uses this advice preparing the following presentation/s.
- (3) The lively participation of the student in classroom discussions related to the presentations is equally important. To help students identify areas that need further clarification, each student should send one written question to the instructor by noon on Monday. Participation in discussions will be monitored by the instructor for each class day and used together with the presentations to generate the final course grade.

**All students will have to send me their ready presentation file via email no later than Monday, 2 pm to give enough time to upload the files on the distance ed computer system.**

**When preparing your presentation, keep in mind that each student has no more than 35 minutes including presentation and discussion time (some additional time on days with only 3 presentations).** Thus, presentations should not be longer than 20 minutes (25 min max) to leave enough time for discussions. Make sure, that you give a brief, but clear introduction to the topic area of the paper. To consult additional materials such as Medline, the internet, Google Scholar, Google Images, and cell biology textbooks is advisable. Also, emphasis should be placed on the methods used. Even if a manuscript is not on the topic of one's own research, methods used by others might be very useful to advance your own work! **If the paper is too long to be presented in its entirety, you have to select and cut to be done in time.** For higher resolution images of figures, using the "full text file" on the journal website (accessible via LTS e-journals) is advisable, instead of copying figures from the posted relatively low-resolution PDF files.

## **SELECTED TOPICS IN CELL BIOLOGY (Spring 2021 selection):**

(see Course Site for manuscript details and pdf files)

- (1) Viruses, Coronaviruses, SARS-CoV-2 (3 presentations)
- (2) Cell Biology of SARS-CoV-2 (4 presentations)
- (3) SARS-CoV-2 vaccines and other related topics (4 presentations)
- (4) Other Pandemics: Spanish Flu, Polio, Hepatitis C, Black Death (4 presentations)
- (5) Antibiotics (3 presentations)
- (6) CRISPR gene editing, a tool to fight human disease (4 presentations)
- (7) The gut microbiomes impact on health (3 presentations)
- (8) Cellular Topics 1 (3-4 presentations)
- (9) Cellular Topics 2 (3-4 presentations)
- (10) Cancer, a few unexpected links (4 presentations)
- (11) Depression and neurodegenerative diseases (3 presentations)
- (12) High resolution imaging techniques: Single particle cryo EM, AFM, Super-resolution light microscopy (3 presentations)

### DETAILED CLASS SCHEDULE:

#### **Class 1, February 1:**

##### **Introduction and Logistics Meeting**

- What is Cell Biology and why is it important?
- How to search for manuscripts (NCBI's PubMed, [pubmed.ncbi.nlm.nih.gov](http://pubmed.ncbi.nlm.nih.gov); search engines; Google Scholar; etc.)
- Criteria for selecting manuscripts (topic, how comprehensive, ease to understand and present, journal, age, etc.)
- **Assign papers and presentations**

#### **Class 2, February 8:**

##### **Learn to know each other's expertise**

All students will give a short summary (up to 10 minutes each including discussion) about themselves, their career, work, work environment, and interests. If you work in a company, please do not present protected or confidential material.

Presenters (not necessarily in order):

- (1) Angela Beechan (distance ed., Collegeville, PA)
- (2) Arpana Upadhyay (on-site, LU Bio, Zappulla Lab)
- (3) Claire Naman (distance ed., New York City)
- (4) Elisa Mayerberger (on-site, LU Civil & Environmental Engineering, Jellison/Jedlicka Labs)
- (5) Emma Walen (distance ed., Sommerville, Massachusetts)
- (6) Han Zhang (on-site, LU Bio, Im Lab)
- (7) Jeremy Zambelli (distance ed., Allentown, PA, Orasure)

Break

- (8) Joanne Bautista (distance ed., Reno, Nevada)
- (9) John Fitzgerald (distance ed., Gladstone, New Jersey)
- (10) Madison Weston (distance ed., Drexel Hill, Pennsylvania)
- (11) Matthew Jepson (distance ed., Sandwich, Massachusetts)
- (12) Ryan Tarto (distance ed., Erie, PA)
- (13) Simran Dayal (on-site, LU BioE, Graduate Research Assistant, Ramamurthi lab)
- (14) Talulla Palumbo (on site, LU Bio, Miwa Lab)

### **Class 3, February 15:**

#### **Topic 1: Viruses, Coronaviruses, SARS-CoV-2**

1 Paper 1A: Viruses, an overview (not provided)  
(Presenter: Angela Beechan 1)

2 Paper 1B: Coronaviruses (not provided)  
(Presenter: Arpana Upadhyay 1)

3 Paper 1C: SARS-CoV-2 (not provided)  
(Presenter: Matthew Jepson 1)

### **Class 4, February 22:**

#### **Topic 2: Cell Biology of SARS-CoV-2**

4 Paper 2A: Virus docking and uptake (provided)  
(Presenter: Madison Weston 1)

5 Paper 2B: Virus replication (provided)  
(Presenter: Emma Walen 1)

6 Paper 2C: Virus release (provided)  
(Presenter: Elisa Mayerberger 1)

7 Paper 2D: How to identify critical cellular proteins (provided)  
(Presenter: Claire Naman 1)

### **Class 5, March 1:**

#### **Topic 3: SARS-CoV-2 vaccines and other related topics**

8 Paper 3A: Vaccines and vaccine development (provided)  
(Presenter: Simran Dayal 1)

9 Paper 3B: Virus infection and immunity (provided)

(Presenter: John Fitzgerald 1)

10 Paper 3C: SARS-CoV-2 neuro-invasion (provided)

(Presenter: Ryan Tarto 1)

11 Paper 3D: SARS-CoV-2 infection and cell lipids (provided)

(Presenter: Joanne Bautista 1)

**Class 6, March 8:**

**Topic 4: Other Pandemics**

12 Paper 4A: Spanish Flu (not provided)

(Presenter: Talulla Palumbo 1)

13 Paper 4B: Polio (not provided)

(Presenter: Jeremy Zambelli 1)

14 Paper 4C: Hepatitis C, The Nobel Prize in Med/Phys 2020 (not provided)

(Presenter: Han Zhang 1)

15 Paper 4D: Black Death (provided)

(Presenter: Elisa Mayerberger 2)

**Class 7, March 15:**

**Topic 5: Antibiotics**

16 Paper 5A: Antibiotics, an overview (not provided)

(Presenter: John Fitzgerald 2)

17 Paper 5B: Novel antibiotics (provided)

(Presenter: Matthew Jepson 2)

18 Paper 5C: Cannabidiols antibiotic potential (provided)

(Presenter: Arpana Upadhyay 2)

**Class 8 (Traditionally Spring Break week), March 22:**

**Topic 6: CRISPR gene editing, a tool to fight human disease**

19 Paper 6A: CRISPR, The Noble Prize in Chem 2020 (provided in part)

(Presenter: Jeremy Zambelli 2)

20 Paper 6B: CRISPR, sickle cell anemia and beta thalassemia (provided)  
(Presenter: Madison Weston 2)

21 Paper 6C: CRISPR and Huntington's disease (provided)  
(Presenter: Simran Dayal 2)

22 Paper 6D: CRISPR and HIV (provided)  
(Presenter: Joanne Bautista 2)

**Class 9, March 29:**

**Topic 7: The gut microbiomes impact on health**

23 Paper 7A: Diet, microbiota, and metabolic health (provided)  
(Presenter: Tallula Palumbo 2)

24 Paper 7B: Gut microbiota and depression (provided)  
(Presenter: Emma Walen 2)

25 Paper 7C: Gut microbiota and neurodegenerative diseases (provided)  
(Presenter: Angela Beechan 2)

**Class 10, April 5:**

**Topic 8: Cellular Topics 1**

26 Paper 8A: Phase separation (provided)  
(Presenter: Han Zhang 2)

27 Paper 8B: Chromosome segregation (provided)  
(Presenter: Ryan Tarto 2)

28 Paper 8C: Force transduction (provided)  
(Presenter: Claire Naman 2)

29 Paper 8D: Molecular Modeling, Golgi dynamics (provided)  
(Presenter: Han Zhang 3)

**Class 11, April 12:**

**Topic 9: Cellular Topics 2**

30 Paper 9A: Global analysis of cell behavior and neuronal tube closure (provided)  
(Presenter: Claire Naman 3)

31 Paper 9B: Rac1 activity and cytoskeletal architecture (provided)  
(Presenter: Matthew Jepson 3)

32 Paper 9C: Autophagy and cytosol degradation (provided)  
(Presenter: Arpana Upadhyay 3)

**Class 12, April 19:**

**Topic 10: Cancer, a few unexpected links**

33 Paper 10A: Mitochondria overactivity and glioblastoma (provided)  
(Presenter: Angela Beechan 3)

34 Paper 10B: Toxoplasma gondii and glioma (provided)  
(Presenter: Simran Dayal 3)

35 Paper 10C: Circadian clock and cancer: Prostate cancer (provided)  
(Presenter: Madison Weston 3)

36 Paper 10D: Aneuploidy of cancer cells: a potential treatment (provided)  
(Presenter: Joanne Bautista 3)

**Class 13, April 26:**

**Topic 11: Depression and neurodegenerative diseases**

37 Paper 11A: How ketamine works as an antidepressant (provided)  
(Presenter: Elisa Meyerberger 3)

38 Paper 11B: Vulnerable neurons in Alzheimer's disease and single cell sequencing (provided)  
(Presenter: Tallula Palumbo 3)

39 Paper 11C: Parkinson's disease and lysosomal activity (provided)  
(Presenter: Jeremy Zambelli 3)

**Class 14 (Last Class), May 3:**

**Topic 12: High resolution imaging techniques**

40 Paper 12A: Single particle cryo EM, the 2017 Chem Noble Prize; Adenovirus 41 structure or bacterial type IV secretion system and phage entry (provided)  
(Presenter: John Fitzgerald 3)

41 Paper 12B: Atomic Force Microscopy (AFM) Heteromeric gap junction channel stoichiometry (provided)  
(Presenter: Emma Walen 3)

42 Paper 12C: Super-resolution light microscopy, the 2014 Chem Noble Prize (not provided)  
(Presenter: Ryan Tarto 3)

Time to fill out course evaluations

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#### Accommodations for Students with Disabilities:

Lehigh University is committed to maintaining an equitable and inclusive community and welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact Disability Support Services (DSS), provide documentation, and participate in an interactive review process. If the documentation supports a request for reasonable accommodations, DSS will provide students with a Letter of Accommodations. Students who are approved for accommodations at Lehigh should share this letter and discuss their accommodations and learning needs with instructors as early in the semester as possible. For more information or to request services, please contact Disability Support Services in person in Williams Hall, Suite 301, via phone at 610-758-4152, via email at [indss@lehigh.edu](mailto:indss@lehigh.edu), or online at <https://studentaffairs.lehigh.edu/disabilities>.

#### The Principles of Our Equitable Community:

Lehigh University endorses The Principles of Our Equitable Community [[http://www.lehigh.edu/~inprv/initiatives/PrinciplesEquity\\_Sheet\\_v2\\_032212.pdf](http://www.lehigh.edu/~inprv/initiatives/PrinciplesEquity_Sheet_v2_032212.pdf)]. We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom.