Advanced Chemical Biology (Fall 2023)

Professors:
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TA: TBD

Classroom: Department of Chemistry, NTU, Rm 121
Hours: Mon. 13:20 – 15:10, Thu. 13:20 – 15:10
Office hours: Mon. 15:20 – 16:20 (Rm A521)
Language: Lectures, exams, and student presentations will all be given in ***English***
Students must answer exam questions in ***English*** but may ask questions in ***Chinese***
Grading: Midterm exam 35%; Final exam 35%
Presentation 10%; Homework 10%; Quizzes 5%; Paper discussion 5%
Wage your bet on 2023 Chemistry / Physiology or Medicine Nobel Prizes (+2%)
Prerequisite: Everyone enrolled in this class (including undergraduate students) should have taken undergraduate level biochemistry and organic chemistry. Some background information will be provided in the lectures.

Course Syllabus (check CEIBA website for updates)

#	Date	Day	Topic	Note[1]
1	09/04	Mon.	Course overview. What is chemical biology.	
2	09/07	Thu.	Experiments relevant to understanding the origin of life	
3	09/11	Mon.	Nucleobase, nucleoside, and nucleic acid	Paper discussion 1[2]
4	09/14	Thu.	Nucleic acid synthesis and synthetic mimics 1	Quiz 1[3]
5	09/18	Mon.	Nucleic acid synthesis and synthetic mimics 2	Paper discussion 2[2]
6	09/21	Thu.	Next generation sequencing (NGS) technologies	
7	09/25	Mon.	Applications of NGS technologies	Paper discussion 3[2]
8	09/28	Thu.	RNA, aptamers, and ribozymes	
9	10/02	Mon.	Classic directed evolution experiments 1	Paper discussion 4[2]
10	10/05	Thu.	Amino acids, peptides, and proteins	Quiz 2[3]
11	10/09	Mon.	National Day (10/10)	No class
12	10/12	Thu.	Ribosome and protein translation 1	Quiz 3[3]
13	10/16	Mon.	Ribosome and protein translation 2	Paper discussion 5[2]
14	10/19	Thu.	Student presentation A[4,5]	Homework due B[4,6]
15	10/23	Mon.	Office hour (A521)	No class
16	10/26	Thu.	MID-TERM EXAM [7]	No class
17	10/30	Mon.	Discuss mid-term exam questions and answers	

18	11/02	Thu.	**CRISPR technologies**	**Kurt Mou**
19	11/06	Mon.	**Immunotherapy & bacterial therapy**	**Kurt Mou**
20	11/09	Thu.	PTM and protein conjugation methods	
21	11/13	Mon.	Noncanonical amino acid incorporation into proteins	Quiz 3[3]
22	11/16	Thu.	Classic directed evolution experiments 2	Paper discussion 6[2]
23	11/20	Mon.	Classic directed evolution experiments 3	Paper discussion 7[2]
25	11/23	Thu.	Protein degradation	
26	11/27	Mon.	Carbohydrates and lipids	Quiz 4[3]
27	11/30	Thu.	Carbohydrates and lipids / Secondary metabolites	Paper discussion 8[2]
28	12/04	Mon.	Secondary metabolites	
29	12/07	Thu.	Super-resolution fluorescence imaging	Quiz 5[3]
30	12/11	Mon.	Please attend KT Wang Lecture (TBD)[8]	Paper discussion 9[2]
32	12/14	Thu.	Student presentation B[4,5]	Homework due A[4,6]
33	12/18	Mon.	Office hour (A521).	No class
34	12/21	Thu.	FINAL EXAM[7,8]	

Notes:

[1] Slides and assigned reading materials will be uploaded to **NTU COOL** (https://cool.ntu.edu.tw/login/portal).

[2] We will talk in-depth about one (or a few) paper during the "discussion" sessions. These papers will be announced ahead of time and you should read them ***before*** coming to class. The session is meant to be interactive and you are welcome to ask questions and / or voice your opinions.

[3] There will be in-class short (≤ 5 questions) quizzes every now and then. Quiz 1 (9/15) and Quiz 3 (10/13) will ask you to draw the chemical structures of ***nucleic acids*** and ***amino acids***, respectively.

[4] The class will be split evenly into two groups (A and B). Group A do oral presentations **on 10/20** and turn in their homework **on 12/15**; the schedule is the opposite for group B.

[5] Prepare only ***ONE*** slide and a short (***≤ 4 min.***) talk for your **presentation** in the form of an infographic on a chemical biology topic. You do ***not*** have to present molecular structures (see examples uploaded to NTU COOL); be creative! I will include a few questions based on student presentations in the final exam

[6] Summarize a recent paper in the field of chemical biology using the uploaded example as a template (due 12/15).

[7] You will be allowed to write notes on a piece of A4 paper and bring it to the mid-term and final exams. Both the **mid-term** and **final exams** will be held on Thursdays; **no class** on the Monday of the same week.

[8] KT Wang Bioorganic Chemistry Lecture (王光燦生物有機化學講座) features great talks; the exact date has not been set but it is usually held on a Thursday afternoon. We will not have class on that day and you should attend the lecture instead. **Contents of the lecture will be included in the final exam**.

Examples of presentation and homework (paper summary):

http://www.compoundchem.com
https://www.foodprocessing.com/articles/2014/infographic-chemistry-of-food/
https://baranlab.org/research/seminars/
http://www.flipflopflyin.com/flipflopflyball/infographics.html