

BMB634 Cryo-EM course (1 credit)

This is an introductory and practical course on cryo-electron microscopy methods and applications. The purpose of this course is to help students jump start their research using cryo-electron microscopy or to obtain critical knowledge to design their research with cryo-electron microscopy methods. The course will include the following components: 1) lectures on the principles of cryo-electron microscopy, single particle analysis (SPA), and cryo-electron tomography (cryo-ET), 2) a sample freezing workshop, 3) hands-on SPA and cryo-ET data analysis activities, 4) student presentations of cryo-EM related research articles.

Co-Directors

Kenji Murakami, Ph.D.

Assistant Professor

Department of Biochemistry and Biophysics Perelman School of Medicine

University of Pennsylvania

Clinical Research Building 364

415 Curie Blvd.

Philadelphia, PA 19104-6059

TEL. 215-573-1125

E-mail: kenjim@pennmedicine.upenn.edu

Yi-Wei Chang, Ph.D.

Assistant Professor

Department of Biochemistry and Biophysics Perelman School of Medicine

University of Pennsylvania

913B Stellar-Chance Labs

422 Curie Blvd.

Philadelphia, PA 19104-6059

TEL. 215-898-7789

E-mail: ywc@pennmedicine.upenn.edu

Sudheer Kumar Molugu, Ph.D

Director, Electron Microscopy Resource Lab

Department of Biochemistry and Biophysics Perelman School of Medicine

The University of Pennsylvania (SOM)

3620 Hamilton Walk, Philadelphia, PA 19104-6059

TEL: 215-898-6730

E-mail: Sudheer.Molugu@pennmedicine.upenn.edu

SUPPORT (Don't hesitate to ask questions!!)

support@pennemclass.freshdesk.com

TAs

Hee-Jong Kim

Department of Biochemistry and Biophysics Perelman School of Medicine

University of Pennsylvania

Clinical Research Building 364

415 Curie Blvd.

Philadelphia, PA 19104-6059

TEL. 215-573-1128

heejong@heejong.com

Leon Palao III

Department of Biochemistry and Biophysics Perelman School of Medicine

University of Pennsylvania

915 Stellar-Chance Labs

422 Curie Blvd.

Philadelphia, PA 19104-6059

TEL: 215-898-1191

palaoiii@pennmedicine.upenn.edu

Matthew Martinez

Department of Biochemistry and Biophysics Perelman School of Medicine

University of Pennsylvania

915 Stellar-Chance Labs

422 Curie Blvd.

Philadelphia, PA 19104-6059

TEL: 215-898-1191

mpm896@pennmedicine.upenn.edu

Time and place

Lectures will be on Wednesday 1:45 PM – 3:15 PM from January 10 – May 8 (except March 6 in spring break) in BRB 253 (Unless otherwise indicated).

Required Text

<http://cryo-em-course.caltech.edu/>

Course Outline

- (1) Principles of cryo-electron microscopy
- (2) Principles and practical workshop of cryo-electron microscopy single particle analysis
- (3) Principles and practical workshop of cryo-electron tomography
- (3) Student presentations

Grading will be based on the written report of single particle analysis and cryo-ET data analysis hand-on activities (75%) and research article presentation (25%).

Class schedule:

Jan 10

Coordinators: Yi-Wei Chang

- (1) Principles of cryo-electron microscopy

Jan 17, 24, 31 Feb 7, 14

Coordinators: Kenji Murakami, Hee Jong Kim

- (1) Principles of single particle analysis (Jan 17)
- (2) Hands-on activates of SPA data analysis (Jan 24, 31, Feb 7, 14)
- (3) Report should be turned in by Feb 28

Feb 21

Coordinators: Sudheer Molugu

- (1) EMRL sample freezing and imaging workshop

Feb 28, Mar 13, 20, 27

Coordinators: Yi-Wei Chang, Leon Palao III, Matthew Martinez

- (1) Principles of cryo-electron tomography (Feb 28)
- (2) Hands-on activates of cryo-ET tomogram reconstruction and subtomogram averaging (Mar 13, 20, 27)
- (3) Report should be turned in by Apr 10

Apr 3, 10, 17, 24, May 1, 8

Each student conducts a 15-min presentation of cryo-EM-related research article.