Biochem 9001       Summer Semester 2015

Special Topics:  
Protein Structure Determination by 3-Dimensional Electron Microscopy

Instructors:  
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Recommended Texts:  
Three-Dimensional Electron Microscopy of Macromolecular Assemblies, J.Frank, 2nd edition  
Electron Tomography: Methods for Three-Dimensional Visualization of Structures in the Cell, J. Frank, 2nd Edition  

Lectures:  
Veterinary Medicine E108, M 10:30am – noon

Demos/Labs:  
Electron Microscopy Core, W125-W137 Veterinary Medicine Bldg (basement)

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<td>6/8</td>
<td>Lecture 1</td>
<td>Course Outline, Lab Schedules, <em>What is 3DEM; Intro to TEM &amp; EMC Tour</em></td>
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<td>6/9-6/12</td>
<td>Lab 1 (EMC)</td>
<td>TEM: Basic Operations</td>
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<td><em>TEM Basics</em>: Electron Optics, Resolution, Signal and Image Formation, Negative Staining Introduction</td>
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<td>6/16-6/19</td>
<td>Lab 2 (EMC)</td>
<td>Negative Staining on Keyhole Limpet Hemocyanin (KLH)</td>
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<td>Lecture 3</td>
<td><em>Negative Staining</em> Continued – Single particle Analysis: Particle Picking, Classification and Averaging (<em>Guest: Hari Akkaladevi</em>)</td>
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<td>6/23-26</td>
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<td>Image Processing on Negatively Stained KLH</td>
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<td><em>Cryo-electron Microscopy</em>: Vitrification, Radiation Damage, Contrast Transfer Function &amp; Focusing</td>
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<td>Vitrification of Proteins</td>
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<td>Lecture 5</td>
<td><em>Advanced Topics in 3DEM</em>: Direct Detection, Tomography, Serial Block Face Imaging</td>
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<td>7/13</td>
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<td>Final Project Report Due</td>
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Class Policy

1. 6 students maximum.

2. Lectures will be in E108 Veterinary Medicine from 10:30am-noon on Monday (blue).

3. Lab Session will be individual, scheduled for 2 hours and occur Monday afternoon through Thursday.

4. Grades:
   - Lab reports 60% (5 lab reports)
   - Individual Projects 40% (25% abstract presentation, 25% final presentation, 50% final report)

Penalty for late homework: 10% off each day being late. Exceptions apply depending on circumstances.

5. Each student has 1 hour consulting time prior to individual projects (please schedule before 7/13/15). Each student can schedule up to 10 hours of microscope time to image specimens for individual projects.

6. Microscope time is non-transferrable.

7. Abstract Presentations will be given to the class in a 3-slide format within 5 minutes.
   i. Slide 1 – Introduction
   ii. Slide 2 – Methods
   iii. Slide 3 – Anticipated Results and Potential Caveats/Pitfalls

8. Final Presentations will be a summary of results obtained and future directions (10 minutes)

9. Final Reports will be prepared in the Microscopy and Microanalysis abstract submission format.

10. Cancellations or rescheduling on scope have to be at least 24 hours prior to appointments. This policy applies to labs, consulting time and individual projects time. Last minute notice will be subject to loss of your individual project time on the microscopes.
Helpful Links

1. http://emcore1.col_missouri.edu – to schedule time on scopes with FOM
2. http://emc.missouri.edu – EMC’s main page
3. Grant Jensen’s YouTube “Introduction to cryo-EM”
5. http://umbc.rnet.missouri.edu/resources/Lewis_access.html - Lewis Cluster
7. http://www.ebi.ac.uk/pdbe/emdb/empiar/ - EM Data Deposition