Hydrodynamic Methods BIOC5083

Course Contents:

This course will focus on experimental design and analysis of analytical ultracentrifugation (AUC) experiments.

The goal of this coursep is to provide students with a solid background in hydrodynamics, and to provide hands-on training with the UltraScan software. The emphasis will be on problem-solving approaches for studying molecules in the solution phase, and for the student to gain confidence in designing experiments and using UltraScan to interpret the results. The course will address analytical ultracentrifugation (AUC), small angle X-ray and neutron scattering, laser light scattering, and bead modeling approaches for predicting hydrodynamic properties from crystallographic or NMR atomic-resolution models.

The course will start with a hands-on training session for the Beckman Optima AUC and the older Beckman Proteomelab XLI/A instruments. We will cover the data acquisition software, UltraScan integration with the Optima AUC, the building of cells, and setting up experiments. We will also deal with XLA/I instrument issues, such as maintenance, calibration and diagnosis of hardware/software problems, and provide strategies for optimizing the information quality obtainable from the instrument. Next, the course will feature an introductory session to review hydrodynamic theory and background, and to teach the basics of the software, including editing of the data and the implementation of the UltraScan Laboratory Information Management System (LIMS). This will be followed by hands-on data analysis sessions where the students work either on supplied or their own data. In these sessions we will cover experimental design, analysis of interacting and noninteracting solute systems, model - independent and model-dependent analysis, and result presentation.

Our goal is to provide ample hands-on time for practice and to allow students to gain the confidence for biophysical data analysis and software use, and develop skills for the design of successful experiments and confidence in the interpretation of the results. Students will gain a solid understanding of the types of questions that can be answered with analytical ultracentrifugation, but they will also learn about the limitations of the technique. The participants will learn how to design an experiment for optimal run conditions using the design modules of UltraScan, and learn how to optimize the run parameters of the instrument. Equally important, participants will learn how to identify hardware issues with the instrument and how to ascertain that the instrument is functioning optimally.

We will provide representative experimental data examples, but the participants are encouraged to also bring data from their own data for analysis. Each student should bring their own laptop computer to practice the examples and excercises presented in class. Students will receive intensive computer training with the UltraScan software by the author of the software. You will have the opportunity to practice the software with your own data and have all your questions about data analysis with UltraScan answered by the author. Staff will be available to assist with the installation of the software.

All laptop models and operating systems are supported, including Windows, Mac OSX or Linux. The minimum requirements for the laptop are:

- Modern 64-bit operating system
- 4 GB RAM
- 1 GB free diskspace (min)
- Network
- 1100x900 Screen Resolution

Instructors:

Dr. Borries Demeler, PhD
Professor
UTHSCSA, Dept. of Biochemistry
(Course Director)