ProLipids Midsummer Workshop

on Future Trends in Biomembrane Research

Helsinki, 10 – 13 June, 2019

Workshop format: 1-day scientific symposium and 3-day Practical course with 3 different course modules to choose from.
Organizers: ProLipids Student Council, Elina Ikonen, Ilpo Vattulainen, Pekka Lappalainen, Andrea Dichlberger from the University of Helsinki. **Co-organizer**: Atte Sillanpää from CSC, IT Center for Science Ltd.

Program overview

Day 1	Day 2	Day 3	Day 4
MON 10 June	TUE 11 June	WED 12 June	THU 13 June
Symposium 8:30 - 18:00 National Museum Helsinki	**Practical course Module A** 9:00 – 17:00/18:00 CSC, Espoo	**Practical course** **Module B** 9:00 - 18:00, Viikki Campus, Biocenter 2 & **Module C** 9:00 - 13:00, Meilahti Campus, Biomedicum 1, Think Corner	**Practical course** **Module B** 9:00 - 18:00, Viikki Campus, Biocenter 2 & **Module C** 9:00 - 13:00, Meilahti Campus, Biomedicum 1, Think Corner

SYMPOSIUM – National Museum Helsinki

Monday, 10th June 2019

Venue: National Museum, Mannerheimintie 34, Helsinki.
Time: 8:30 – 18:00
Credits for students: 0.75 ECTs
Registration: **required!**
Registered participants will be able to enjoy **coffee and snacks** during the symposium. All registered participants will get a **free admission to the National Museum**! Practical course students are welcome to join a speakers-student-lunch free of charge!

INVITED SPEAKERS

Bruno Antonny, IMPC, Nice, FRA. *Combining Saturated and Polyunsaturated Fatty Acyl Chains in Phospholipids to strike the Balance between Impermeable and Flexible Membranes.*
Patricia Bassereau, Institute Curie, FRA. *Shaping membranes with ESCRT-III filaments.*
Oscar Ces, Imperial College, UK. *Exploiting Lipid-Protein Interactions to make Artificial Cells.*
Anne-Claude Gavin, CMU, Geneva, CH. *Protein-Lipid Interactome.*
Peter Horvath, BRC, HUN. *TBA*
Erik Lindahl, Stockholm University, SWE. *TBA*
Hector Martinez-Seara, IOCB, CZE. *The tricky Business of accurately Modeling Interactions in Simulations: The Lipid-Protein-Ion-Sugars Puzzle.*

Georg Pabst, Karl-Franzens-University, AUT. *Membrane-Mediated Effects on Integral Proteins as Revealed by Scattering Techniques.*
Christoph Thiele, University of Bonn, GER. *TBA*
Sharon Tooze, Francis Crick Institute, UK. *Autophagosome Initiation and Expansion*.
Mark Sansom, University of Oxford, UK. *TBA*
Hongxia Zhao, University of Helsinki, FIN. *Mitochondrial Membrane Morphogenesis*.

PRACTICAL COURSE

Tuesday, 11th – Thursday, 13th June 2019

IMPORTANT: Students, who will attend the practical course, are able to choose from three different course modules (up to 3 different modules can be selected by one student), but are encouraged to attend all 3 different modules for the maximum learning outcome. Attending the symposium is obligatory for students who will attend the practical course. All students participating in the practical course are very welcome to join a speakers-student lunch during the symposium day free of charge. *Students for the practical course will be selected on a first-come-first-serve basis!*

Practical Course Program

Module A: Introduction to Biomolecular Simulations: From Theory to Systems Preparation.

Tuesday, 11th June, 2019

Venue: CSC, Keilaniemi 14, Espoo
Time: 9:00 – 18:00
Credits for students: 0.75 ECTs
Maximum 25 participants.
Module organizers: Giray Enkavi, Atte Sillanpää
Module instructors: Giray Enkavi, Atte Sillanpää, Waldemar Kulig, Outi Haapanen, Juho Liekkinen
Module content: The aim of this module is to provide the participants with the basics of biomolecular simulations including both the theoretical background and practical means of building model systems and performing the simulations. The participants will learn how to set up molecular dynamics simulations of biological molecular systems and to analyze and visualize the results. In the first part of the module, students will first learn how to load and visualize common biomolecules, such as proteins and lipids, and molecular dynamics systems and trajectories with VMD. In the second part, the students will learn how to construct a simulation system that will be chosen based on its relevance to module B. They will also initiate simulations using Gromacs. Due to time constraints, we will provide the students with extended trajectories of the same system to introduce other analysis tools.

Time schedule Module A

09:00-10:00	Introduction to Molecular Dynamics: The theoretical underpinnings	Hector Martinez-Seara
10:00-10:30	Introduction to Linux and HPC	Atte Sillanpää
10.30-10:40	Break	
10:40-12:00	Molecular Visualization with VMD	Case study: NPC2
12:00-12:15	Discussion	
12:15-13:00	Lunch	
13:00-13:45	Lipid-Protein Systems *in Silico*	Hector Martinez-Seara
13:45-15:45	Constructing the Simulation System	Case study: BAR Domain Proteins
15:45-16:15	Discussion & Break	
16:15-17:45	Analyzing Molecular Dynamics Trajectories	Case study: B2AR
17:45-18:00	Discussion	

Module B: Biochemical Tools to study Lipid-Protein Interactions.

Wednesday, 12th and Thursday 13th June, 2019

Venue: Viikki campus, Biocenter 2, Viikinkaari 5, 00790 Helsinki
Time: 9:00 – 18:00
Credits for students: 0.75 ECTs
Maximum 10 participants/day.
Module organizer: Markku Hakala
Module instructors: Markku Hakala, Konstantin Kogan, Tommi Kotila
Note: This module is a one-day event. It will be organized twice.
Module content: Introduction to protein-lipid interaction studies with biochemical methods. Students will perform a vesicle co-sedimentation assay with different lipid compositions and MIM I-BAR protein. We will also discuss how to prepare protein and lipid samples for the assay properly. By using a co-sedimentation assay, we will study how different proteins interact with large unilamellar vesicles (LUVs) having different lipid compositions.
Learning outcomes: Students will learn how to perform lipid co-sedimentation assay with large unilamellar vesicles (LUVs). They will learn how to set up the reaction, separate bound and unbound fractions with SDS-PAGE, and how to analyze the results. They will also learn the theory of LUV preparation. After the course they are able to perform the experiment in their own lab. Students will also learn about the limitations of different experimental methods in protein-lipid interaction studies.

Time schedule Module B

09:00-10:00	Lecture about experimental approaches to protein-lipid interaction studies	Markku Hakala, Konstantin Kogan, Tommi Kotila
10:00-12:30	Preparing samples for co-sedimentation assay	
12:30-13:15	Lunch break	
13:15-13:30	SDS-PAGE	
13:30-15:00	Workshop: How to prepare recombinant protein samples (cloning, expression, purification)	
15:00-15:15	Break	
15:15-16:00	Workshop: How to handle lipid stocks and prepare LUVs for co-sedimentation assay	
16:00-17:30	Analysis of SDS-PAGE gels with ImageJ or Bio-Rad ImageLab software.	
17:30-18:00	Results discussion	

Module C: Interplay between Computational and Experimental Methods: Limitations and Strengths

Wednesday, 12th and Thursday 13th June, 2019

Venue: Meilahti, Haartmaninkatu 8, Biomedicum 1, Think corner/P-floor

Time: 9:00 – 13:00

Credits for students: 0.75 ECTs

Maximum 20 participants/day.

Note: This module is a half-day event. It will be organized twice.

Module organizers: Fabio Lolicato, Simon Pfisterer, Elena Kremneva

Module instructors: Fabio Lolicato, Simon Pfisterer, Elena Kremneva, Tomas Blom, Xavier Prasanna

Module content: The collaboration between experimental and computational researchers is not a straight line but rather an iterative process. Understanding the limitations and the strengths of the two methodologies is key to a fruitful communication and collaboration. Before the actual course day, participants will be asked to familiarize themselves with selected published studies that make use of both experimental and computational methods. Participants must pre-submit an online questionnaire before the start of the module indicating the difficulties encountered in reading and interpreting the methodology outside their fields of expertise. The starting point of the current module will be an introduction into the methodologies used in the selected articles. Interactive discussions (max 5-7 students per group) of the encountered problems, stated in the questionnaire, will be mentored by an expert from each discipline. Results/figures and related methodologies will be analyzed to gain a deeper understanding of the interconnection between experimental and computational results. The second part of the module will focus on the limitations and strengths of the methodologies. After completing module C, the students should understand the interplay

between computational and experimental approaches, which will help to build successful collaborations.

Time schedule Module C

09:00-09:30	Introduction into selected methodologies	Simon Pfisterer, Juho Liekkinen, Elena Kremneva, Fabio Lolicato, Tomas Blom, Xavier Prasanna
09:30-10:00	Analysis of problems encountered in the selected articles	
10:00-11:00	Interpretation of scientific data and methods outside your area of expertise	
11:00-11:30	Break	
11:30-13:00	Limitations and strengths of selected methodologies	

Important information for students:

Students successfully attending the Workshop will get ECTs credits awarded by the ILS, MATRENA, and CHEMS doctoral programs of the University of Helsinki.
ECTs credits:

- 0.75 ECTs for attending the symposium only
- 0.75 ECTs for attending any of the three different practical course modules (A, B, or C)

Workshop evaluation

A successful completion of the Workshop (symposium and/or practical course modules) and learning outcomes will be evaluated and monitored as follows:

1. The **full attendance** of the symposium only or the symposium plus practical course.
2. **Completion of a short feedback form** about the symposium and/or practical course by the participant. **Online feedback forms will be sent after the course!**
3. **Active participation** during the practical course will be evaluated by the course instructors.

For further information, please contact andrea.dichlberger@helsinki.fi.