SciLifeLab course: **Cryo-EM sample preparation and data collection**

Course information: During a 3-day course you will learn the basic theory and get introduced to the practical skills required to work with cryo-EM methods. The basic functions and technical properties of a transmission electron microscope used for cryo-EM will be introduced. You will discuss challenges and practice cryo-EM sample preparation. Different methods for data collection will be introduced; demonstrations of single particle and tomography methods and software at Titan Krios, the high-end instrument for cryo-EM at SciLifeLab in both Stockholm and Umeå. Approaches for initial image processing will be introduced as a computer tutorial. The course will host 18 participants, PhD students and Postdocs have priority. Prerequisite experiences are basic EM and/or structure biology experiences. Organized by the SciLifeLab cryo-EM facility at Umeå Core facility for Electron Microscopy.

Teachers and course instructors: Thomas Boesen, Sonja Welsch, Marta Carroni, Jose Miguel de la Rosa Trevin, Lars-Anders Carlson, Michael Hall, Camilla Holmlund and Linda Sandblad.

Preliminary schedule:

**Day 1: Monday 3\(^{rd}\) June, morning, 3 lectures (9:00-12:00 Stora Focussalen KBC KBF301)**

9:00  Introducing the course, presentation of teachers and participants [all teachers]
9:30  Basic function of a TEM, and special requirements for cryo-EM [Camilla Holmlund]
10:15 Coffee break
10:30 Vitrification and how to work with cryo-EM samples [Linda Sandblad]
11:15 Increasing Automation and Throughput in cryoEM: news from Thermo Fisher Scientific [Sonja Welsch]
11:45 Brief introduction into each practical [Linda, Marta and Jose Miguel]

**Day 1: Monday 3\(^{rd}\) June, afternoon, 3 groups (13:00-16:00 EM Building)**

A:  Plunge freezing – Cryo prep lab – Linda Sandblad
B:  Data collection at Titan Krios – Titan Krios control room – Michael Hall and Marta Carroni
C:  Image pre-processing – Computer room KBC - Jose Miguel de la Rosa Trevin

16-18:00  Mingle, finger food – short talks (3 slides, 6 min) by participants

**Day 2: Tuesday 4\(^{th}\) June, morning 3 lectures (9:00-12:00 Stora Focussalen KBC KBF301)**

9.00  Get ready for cryo-EM, biochemical methods and negative staining, and repetition for day 1 [Michael Hall]
9:45  Direct electron detectors, motion correction and CTF [Lars-Anders Carlson]
10:30 Coffee break
Practicalities of data acquisition, Single particle data collection [Marta Carroni]

Day 2: Tuesday 4th June, afternoon, 3 groups (13:00-16:00 EM Building)
A: Image pre-processing
B: Plunge freezing
C: Data collection at Titan Krios

17:00 Course dinner – all students and teachers

Day 3: Wednesday 5th June, morning 3 lectures (9:00-12:00 Stora Foccusalen KBC KBF301)
9:00 Starting single particle processing, pre-processing and introduction to 3D reconstruction methods, single particle methodology [Jose Miguel de la Rosa Trevin]
9:45 Tomography, sub-tomogram averaging and inspiration by cryo-EM projects [Marta Carroni]
10:30 Coffee break
10:45 >> To be announced << [Thomas Boesen]

Day 3: Wednesday 5th June, afternoon, 3 groups (13:00-16:00 EM Building)
A: Data collection at Titan Krios
B: Image pre-processing
C: Plunge freezing

17:00 Feedback, course evaluation, certificates