



Netherlands Centre of Electron Nanoscopy

Training



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Training

- How are users trained?
- What level of training is given?
- Who does the training?



What is NeCEN?

Netherlands Centre of Electron Nanoscopy (NeCEN)

NeCEN is a centralized open access facility dedicated to high resolution cryo-electron microscopy for life science applications

NeCEN offers research institutes and companies access to highly advanced cryo-transmission electron microscopy infrastructure and related services

NeCEN opened its doors in 2012 and was restructured in 2016.

www.necen.nl

NeCEN Team



Targeted users to be trained

The target group of users determines which techniques need to be taught and also to what extent skills need to be mastered.

A PhD student working in a group of cryoEM experts on a **very specific biological system** will require different teaching and practicing compared to a scientist who runs a microscopy facility and needs to be skilled on a variety of techniques to be applied to a **broad spectrum of biological system**.

- Scientific Collaborations
- Workshops
- Courses

Via Scientific Collaborations

- **via Scientific Collaborations**

- Aspects of a specific work-flow with the aim to solve a **scientific question that is posed by the user**
- The user will practice and apply the skills repeatedly on their system of interest being directly assisted by experts to help solve problems
- It is assumed that the skill is learned by having it demonstrated by an expert and practicing it directly on their own system
- Success is measured by having learned the skills sufficiently good to answer the scientific question posed by the user

For instance

- a PhD student aiming to solve the structure of a specific protein in a collaborative project.
- Member of a group with cryoEM instrumentation with a biological background (e.g. Virology expert)

Via Hands-on Workshops

- **via Hands-on Workshops**
 - Goal is to become **skilled in a certain aspect of the workflow** that involves specimen preparation, data collection and / or processing
 - The approach is to have taught a skill intensively for a short period of time **on a system that is defined within the workshop**
 - It is assumed that the skill will be practiced and applied by the user later for a long period of time on the system of the user after the workshop
 - Success is measured by knowing how to perform skill technically on the system defined within the workshop

For instance

- A post-doc working on a scientific question for which he needs a technique that he aims to set up and execute in his own lab
- EMBO workshops, Immuno-labeling workshops, Modeling workshops

- **via Courses**
 - Aim is to learn skills or techniques within a specific workflow, that could include preparation, data collection and / or image processing
 - Approach is that the user will **practice the skills partly during the course** on the system defined by the course, and partly on the system of the user after the course
 - Success is measured by having the skill technically evaluated on a system during the workshop and having it successfully applied on the system of the user afterwards

For instance

- A scientist who aims to expand his/her range of skills and deepen his/her knowledge to provide these skill in the home institute to others

Points to be consider


As a highly advanced center provides almost unique infrastructure one should realize that the occasional user will not be able to practice skills in his/own environment.


With a large user base that makes frequent use of the infrastructure, training of users will be effective. With a small user base that makes infrequent use of the infrastructure it will not be effective.

At NeCEN we stimulate users that aim to advance their cryoEM skills to closely collaborate with a good local cryoEM group as those instruments will be most likely similar for practicing.

At NeCEN the instrumentation is operated by NeCEN operators that can practice and introduce the latest technologies. To remain a state-of-the-art facility significant technological changes occur at a high rate.

Courses, conferences and meetings organized through Instruct



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Upcoming Events in Structural Biology

Training Course: Data Visualisation for Biology

Date: 30-01-2017

In collaboration with CORBEL the EMBL-EBI offers the training course "Data Visualisation for Biology: a practical workshop on design, techniques and tools". This 5-day workshop takes place January 30 - February 3, 2017 in Hinxton, UK. Note that there is an application deadline: November 11, 2016! For more information click [here](#)

Instruct-ARIA training for iNEXT and CORBEL facility managers

Date: 03-02-2017

A training event will take place in Amsterdam Friday 3 February from 11:00 -17:00 aiming to support managers of the Instruct Access management system in collaboration with iNEXT and Corbel. The workshop will take place at the Netherlands Cancer Institute (NKI) which is only 10 mins by taxi from the airport, about 30 mins by public transport. The organisers recommend the <https://www.corendonhotels.com/corendon-vitality-hotel-amsterdam/> hotel, which 5 minutes walking distance from the NKI if requ

University of Oxford Spotlight Talk on Instruct

Date: 16-02-2017

The intention of the series is to give a spotlight on the fantastic science being done in the Wellcome Trust Centre for Human Genetics, focussing on one theme in each session. The sessions will start with a 15 minute primer, given by the chair aimed particularly at scientist outside of the immediate research field, and highlight

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NEMI: Electron Microscopy groups in the Netherlands

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FEI/Thermo Fischer

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Förster lab
Peters lab
Koster lab
Oostergetel lab
Klumperman lab
Gerritsen lab
Van Heel lab
Engel lab
Kruit lab
Joost lab
Hoogenboom lab
Sommerdijk lab
Van Nifrik lab



Short tailored courses at NeCEN

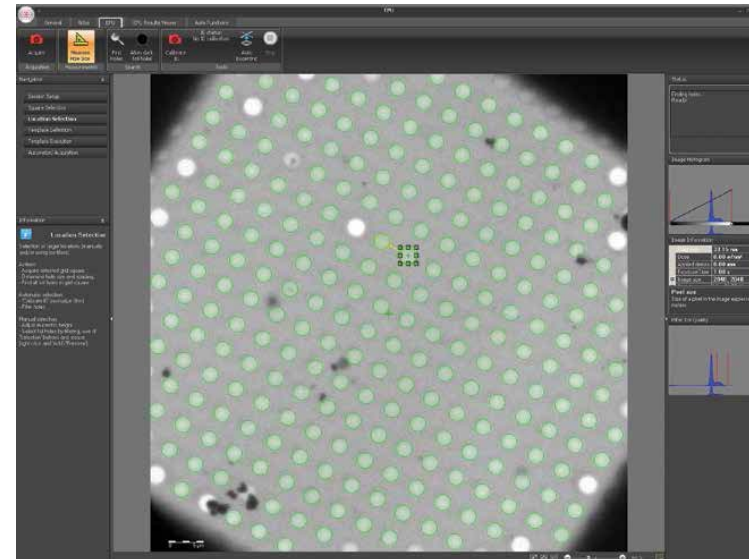
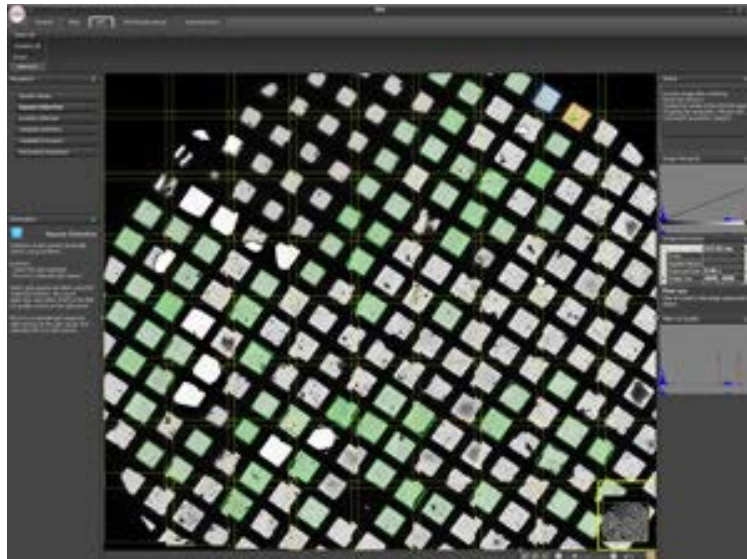
Short courses of a few days to a small group of persons given by a NeCEN operator. Each course can be tailored to a specific part of the cryoEM workflow that has the interest of the User..

- Specimen preparation using Plunge freezing, loading grids in the Autoloader, Screening grids on a Titan Krios
- Data collection on a Titan Krios, loading the Autoloader, Alignment, use of the Volta phase plate, use of a Direct Electron Detector, Movie mode, Counting mode, Energy filtering, Cs corrector, Data collection software, EPU, Tomo4
- Reconstruction software, Scipion

Pricing is commercial and it is directly linked to the costs per day of an instrument

Sample preparation and quality assessment

- Sample freezing with an FEI Vitrobot
- Screening of freezing conditions for optimization sample prep



Data collection

Titan 1

- FEI Falcon 2
- GIF with Gatan K2 Summit
- FEI Volta phase plate
- STEM Detector



Titan 2

- XFEG High Brightness Gun
- Cs Corrector
- FEI Falcon 3 – Counting mode
- STEM Detector



Expanding data collection services



Talos L120C

- Screening
- Helping users to optimize samples for the Krios



**Scios dual-beam
(End 2017)**

- Preparing lamellae for cryo-electron tomography

Goal is to realize a course to train highly skilled cryo EM experts by providing a theoretical framework, ample opportunity to perform hands-on experience on all the instruments within the cryo EM workflow on a variety of samples, and obtain experience in solving problems related to the specimen, microscopy and processing.

It is a combination of a hands-on workshop where specific skills are taught and a collaborative setting where repeatedly skills are practiced in the presence of experts.

During the course most pieces of equipment within an advanced cryoEM facility are used.

1st International cryo-EM school pilot

Duration: 9 weeks full time
Location: NECEN, Leiden (The Netherlands)
Equipment: Titan Krios, Basic Screening TEM, Vitrobot, Scipion and cloud computing

Program:

- Week 1: Introduction and Sample Preparation
- Week 2: Image Formation and Basic Processing (CNB-CSIC)
- Week 3: Screening and Optimal Grid Preparation
- Week 4: Optics and Optimal Microscope Setup
- Week 5: Camera's and Optimal Settings (including Falcon, K2)
- Week 6: Data Collection
- Week 7: Full Workflow
- Week 8: Advanced Processing (CNB-CSIC)
- Week 9: Exam

Includes: For the duration of the course: 35 hands-on microscope days (Krios), breakfast, lunch, lodging, a laptop with Scipion environment and server access, dedicated specialized FEI, NECEN and CNB teachers, site-seeing trip, best known methods and video lectures and a bike!

Application: Send application to Matthijn.Vos@FEI.com

NeCEN

 instruct
Integrating
Biology

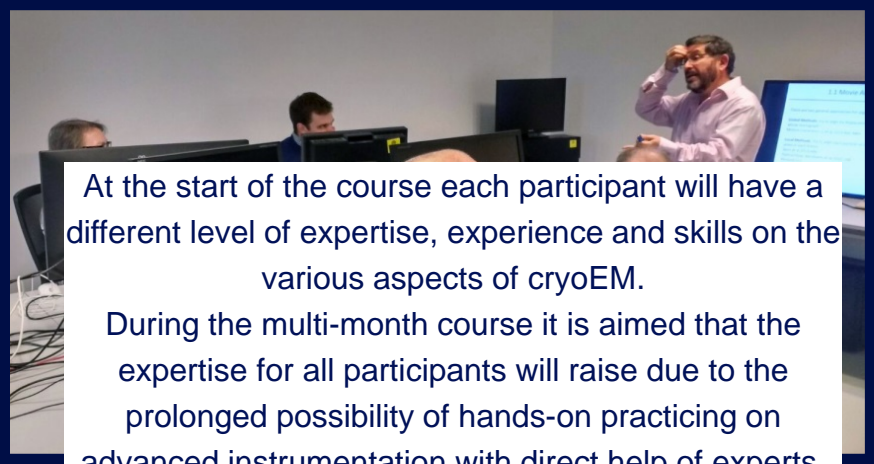
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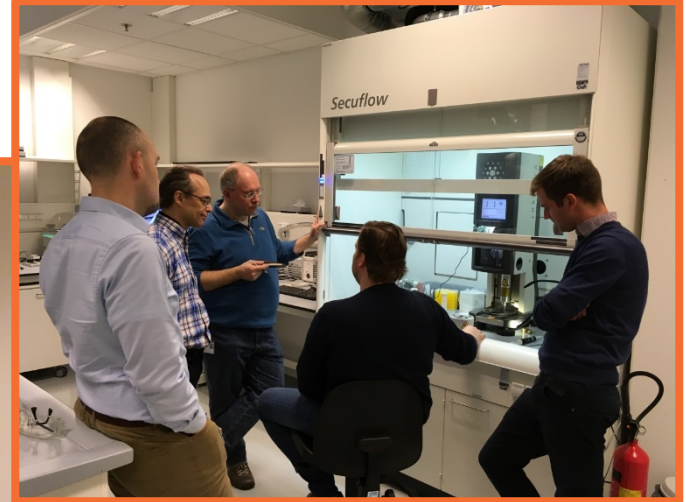
1st International cryo-EM school



At the start of the course each participant will have a different level of expertise, experience and skills on the various aspects of cryoEM.

During the multi-month course it is aimed that the expertise for all participants will raise due to the prolonged possibility of hands-on practicing on advanced instrumentation with direct help of experts. Evaluation of having the required skills and expertise on the various techniques are scaled from 1 to 5:

- 1 Full proficiency: capable of independently performing analyses for users
- 2 Advanced proficiency: can perform sample analyses and solve problems
- 3 Basic proficiency: can perform basic sample analyses but needs supervision in case of issues
- 4 Supervision required
- 5 Not proficient



The pilot is given at NeCEN and organized in a collaborative manner by FEI / Thermo Fisher, CNB group Carazo and the LUMC group

Concluding remarks

Questions to be addressed

- *Training*

Collaborations: mostly organized through other academic groups

Workshops: wide variety of workshops coordinated on a European scale by Instruct. @NeCEN workshops mostly with other groups in the Netherlands

Courses

short courses tailored to a specific user and a specific technique

Multi-month course aimed to train expert cryoEM facility managers

- *How are users trained?*

Hands-on practice

- *What level of training is given?*

Advanced cryoEM level

- *Who does the training?*

NeCEN operator

Occasionally outsourced

