



# Cryo-Electron Microscopy and 3D Image Processing - Virtual

EMBO PRACTICAL COURSE



## EMBL Courses and Conferences during the Coronavirus pandemic

With the onsite programme paused, many of our events are now being offered in virtual formats.

Registration is open as usual for many events, with back-up plans in place to move further courses and conferences online as necessary. Registration fees for any events affected by the COVID-19 disruption are fully refundable.

More information for participants of events at EMBL Heidelberg can be found [here](#).

## Programme

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- The course will start on **Monday, 17 August**, with a 1-day activity and access to the pre-recorded lectures. It will continue on **Sunday, 23 August** with the regular programme.
- The virtual course includes online lectures recorded in the previous course held in 2018, as well as updated lectures, interactive discussion sessions, online practicals and live poster sessions
- Video conference sessions will be held between 13:00 and 18:00 CEST each day
- The live practical session will include the choice between single particle and subtomogram image processing

- Information on the live stream and access to the discussion platform and digital posters will be provided shortly before the start of the event.
- Selected participant will have access to the recorded talks **1 week** before the start of the event. The talks will be available until the end of the course.

The following times are used in the programme below:

- Central European Summer Time (CEST): eg. Berlin, Amsterdam Paris
- Eastern Daylight Time (EDT): eg. New York, Quebec

To find out the equivalent time zone in your location, enter Berlin, the CEST programme time and your city into the [Time Zone Converter](#).

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## Day 1 - Monday 17 August 2020

### Time Speaker

Time	Speaker
	<b>Welcome &amp; Introduction / IT setup</b>
14.00 – 16.30 (CEST)	Carsten Sachse - Forschungszentrum Jülich, Germany
	John Briggs - MRC Laboratory of Molecular Biology, UK
08:00 - 09:00 (EDT)	Julia Mahamid - EMBL Heidelberg, Germany
	Lori Passmore - MRC Laboratory of Molecular Biology, UK
	Henning Stahlberg - University of Basel, Switzerland
16:30(CEST) 10:00 (EDT)	<b>End of day 1</b>

## Day 2 - Sunday 23 August 2020

### Time Speaker

11:00 - 12:00 (CEST)	<b>(Pre-recorded talk) Single particle introduction</b>
05:00 - 06:00 (EDT)	Bettina Boettcher - University of Würzburg, Germany
12:00 - 13:00 (CEST)	<b>(Pre-recorded talk) Introduction to cryo-tomography and sub-tomogram averaging</b>
06:00 - 07:00 (EDT)	Giulia Zanetti - Birkbeck College, UK
13:00 - 14:00 (CEST)	<b>Break</b>
07:00 - 08:00 (EDT)	

14:00 - 15:00 (CEST) 08:15 - 09:00 (EDT)	<b>Three-dimensional EM</b> Carsten Sachse - Forschungszentrum Jülich, Germany
15:00 - 16:00 (CEST) 09:00 - 10:00 (EDT)	<b>An overview of cryo-EM</b> Richard Henderson - MRC Laboratory of Molecular Biology, UK
16:00 - 16:15 (CEST) 10:00 - 10:15 (EDT)	<b>Break</b>
16:15 - 18:15(CEST) 10:15 - 12:15(EDT)	<b>Flash Talks</b>
18:15CEST) 12:15(EDT)	<b>End of day 2</b>

## Day 3 - Monday 24 August 2020

### Time Speaker

11:00 - 12:00 (CEST) 05:00 - 06:00 (EDT)	<b>(Pre-recorded talk) The electron microscope</b> Juergen Plitzko - Max Planck Institute for Biochemistry, Germany
12:00 - 13:00 (CEST) 06:00 - 07:00 (EDT)	<b>(Pre-recorded talk) Approaches to sample preparation</b> Lori Passmore - MRC Laboratory of Molecular Biology, UK
13:00 - 14:00 (CEST) 07:00 - 08:00 (EDT)	<b>(Pre-recorded talk) Heterogeneity</b> Slavica Jonic - CNRS and Sorbonne Université, France
	<b>Panel discussion: Sample preparation and heterogeneity</b> <b>Panelist:</b> Wim Hagen - EMBL Heidelberg, Germany Radostin Danev - The University of Tokyo, Japan Julia Mahamid - EMBL Heidelberg, Germany Jürgen Plitzko - Max Planck Institute for Biochemistry, Germany <b>Panel host:</b> Lori Passmore - MRC Laboratory of Molecular Biology, UK
14:00 - 16:00 (CEST) 08:00 - 10:00 (EDT)	
16:00 - 18:00 (CEST) 10:00 - 12:00 (EDT)	<b>Poster session even numbers</b>
18:00 (CEST) 12:00 (EDT)	<b>End of day 3</b>

## Day 4 - Tuesday 25 August 2020

Time	Speaker
09:00 - 10:00 (CEST) 03:00 - 04:00 (EDT)	<b>(Pre-recorded talk) 4D cryo-EM</b> Michael Schatz - Image Science, Germany
10:00 - 11:00 (CEST) 04:00 - 05:00 (EDT)	<b>(Pre-recorded talk) Maximum likelihood</b> Nikolaus Grigorieff - University of Massachusetts Medical School, USA
11:00 - 12:00 (CEST) 05:00 - 06:00 (EDT)	<b>(Pre-recorded talk) Focussed classification/refinement</b> Sjors Scheres - MRC Laboratory of Molecular Biology, UK
12:00 - 13:00 (CEST) 06:00 - 07:00 (EDT)	<b>Break</b>
13:00 - 14:30 (CEST) 07:00 - 08:30 (EDT)	Panel discussion: Single particles and high resolution <b>Panelist:</b> Nikolaus Grigorieff - University of Massachusetts Medical School, USA Arjen Jakobi - Kavli Institute for Nanoscience Delft, The Netherlands Sjors Scheres - MRC Laboratory of Molecular Biology, United Kingdom <b>Panel host:</b> Carsten Sachse - Forschungszentrum Jülich, Germany
14:30 - 18:00 (CEST) 08:30 - 12:00 (EDT)	<b>Main practical: Single-particle/Subtomogram averaging</b> Alister Burt - Institut de Biologie Structurale, France Daniel Castano-Diez - University of Basel, Switzerland Christos Gatsogiannis - Max Planck Institute of Molecular Physiology, Germany Tim Grant - University of Wisconsin, USA Nikolaus Grigorieff - University of Massachusetts Medical School, USA Dari Kimanius - MRC Laboratory of Molecular Biology, UK Thorsten Wagner - Max Planck Institute of Molecular Physiology, Germany
18:00 - 19:00 (CEST) 12:00 - 13:00 (EDT)	<b>Break</b>
19:00 - 21:00 (CEST) 13:00 - 15:00 (EDT)	<b>Poster session odd numbers</b>

21:00 (CEST)  
15:00 (EDT)

**End of day 4**

## Day 5 - Wednesday 26 August 2020

### Time Speaker

09:00 - 10:00  
(CEST)  
03:00 - 04:00 (EDT)

**(Pre-recorded talk) Heterogeneity and structural disorder**  
Ali Punjani - University of Toronto, Canada

10:00 - 11:00  
(CEST)  
04:00 - 05:00 (EDT)

**(Pre-recorded talk) Reproducibility approaches to heterogeneity**  
Pawel A. Penczek - The University of Texas, USA

11:00 - 12:00  
(CEST)  
05:00 - 06:00 (EDT)

**(Pre-recorded talk) High-resolution tomography**  
John Briggs - MRC Laboratory of Molecular Biology, UK

12:00 - 13:00  
(CEST)  
06:00 - 07:00 (EDT)

**Break**

### Panel discussion: Tomography

#### Panelist:

Alister Burt - Institut de Biologie Structurale, France

Wim Hagen - EMBL Heidelberg, Germany

Julia Mahamid - EMBL Heidelberg, Germany

Jürgen Plitzko - Max Planck Institute for Biochemistry, Germany

Giulia Zanetti - Institute of Structural and Molecular Biology, UK

**Panel host:** John Briggs - MRC Laboratory of Molecular Biology, UK

13:00 - 14:30  
(CEST)  
07:00 - 08:30 (EDT)

### Main practical: Single-particle/Subtomogram averaging

Alister Burt - Institut de Biologie Structurale, France

Daniel Castano-Diez - University of Basel, Switzerland

Christos Gatsogiannis - Max Planck Institute of Molecular  
Physiology, Germany

Tim Grant - University of Wisconsin, USA

14:30 - 18:00  
(CEST)  
08:30 - 12:00 (EDT)

Nikolaus Grigorieff - University of Massachusetts Medical School,  
USA

Dari Kimanius - MRC Laboratory of Molecular Biology, UK

Thorsten Wagner - Max Planck Institute of Molecular

Physiology, Germany

18:00 - 19:00  
(CEST)  
12:00 - 13:00 (EDT)

**Free evening / Optional live session on iPoster**

21:00 (CEST)  
15:00 (EDT)

**End of day 5**

## Day 6 - Thursday 27 August 2020

### Time Speaker

09:00 - 10:00  
(CEST)  
03:00 - 04:00 (EDT)

**(Pre-recorded talk) Phase plate theory and applications**  
Radostin Danev - Max Planck Institute for Biochemistry, Germany  
Sara Sandin - Nanyang Technological University Singapore, Singapore

10:00 - 11:00  
(CEST)  
04:00 - 05:00 (EDT)

**(Pre-recorded talk) Microscopy**  
Wim Hagen - EMBL Heidelberg, Germany

11:00 - 12:00  
(CEST)  
05:00 - 06:00 (EDT)

**(Pre-recorded talk) Online microscopy**  
Henning Stahlberg - University of Basel, Switzerland

12:00 - 13:00  
(CEST)  
06:00 - 07:00 (EDT)

**Break**

#### **Panel discussion: Validation**

##### **Panelist:**

Edward Egelman - University of Virginia, USA  
Nikolaus Grigorieff - University of Massachusetts Medical School, USA  
Ardan Patwardhan - EMBL-EBI Hinxton, UK  
Ricardo Righetto - Helmholtz Zentrum München, Germany  
Sjors Scheres - MRC Laboratory of Molecular Biology, UK  
Maya Topf - Institute of Structural and Molecular Biology, UK  
**Panel host:** Henning Stahlberg - University of Basel, Switzerland

#### **Main practical: Single-particle/Subtomogram averaging**

14:30 - 18:00  
(CEST)  
08:30 - 12:00 (EDT)

Alister Burt - Institut de Biologie Structurale, France  
Daniel Castano-Diez - University of Basel, Switzerland  
Christos Gatsogiannis - Max Planck Institute of Molecular Physiology, Germany  
Tim Grant - University of Wisconsin, USA  
Nikolaus Grigorieff - University of Massachusetts Medical School, USA  
Dari Kimanius - MRC Laboratory of Molecular Biology, UK  
Thorsten Wagner - Max Planck Institute of Molecular Physiology, Germany

18:00 - 19:00 (CEST)	<b>Break</b>
12:00 - 13:00 (EDT)	
19:00 - 21:00 (CEST)	<b>Pubquiz</b>
13:00 - 15:00 (EDT)	
21:00 (CEST)	<b>End of day 6</b>
15:00 (EDT)	

## Day 7 - Friday 28 August 2020

### Time      Speaker

09:00 - 10:00 (CEST)	<b>(Pre-recorded talk) EMDB and EMPIAR</b>
03:00 - 04:00 (EDT)	Ardan Patwardhan - EMBL-EBI Hinxton, UK
10:00 - 11:00 (CEST)	<b>(Pre-recorded talk) Fitting of low-resolution EM maps</b>
04:00 - 05:00 (EDT)	Maya Topf - Birkbeck College, UK
11:00 - 12:00 (CEST)	<b>(Pre-recorded talk) Atomic coordinate refinement for high-resolution EM maps</b>
05:00 - 06:00 (EDT)	Arjen Jakobi - Kavli Institute for Nanoscience Delft, The Netherlands
12:00 - 13:00 (CEST)	<b>(Pre-recorded talk) Integrative Modeling of Macromolecular Assemblies</b>
06:00 - 07:00 (EDT)	Jan Kosinski - EMBL Hamburg, Germany
13:00 - 14:30 (CEST)	<b>Practical presentation</b>
07:00 - 09:30 (EDT)	<b>Panel host:</b> Julia Mahamid - EMBL Heidelberg, Germany
14:30 - 15:00(CEST)	<b>Break</b>
09:30 - 10:00 (EDT)	
15:00 - 16:00 (CEST)	<b>Site Specific Cryo-FIB Preparation Aimed at in situ Cryo-Electron Tomography</b>
10:00 - 11:00 (EDT)	Julia Mahamid - EMBL Heidelberg, Germany
16:00 - 17:00 (CEST)	<b>Final discussion</b>
11:00 - 12:00 (EDT)	Chair: Carsten Sachse - Forschungszentrum Jülich, Germany
17:00 (CEST)	<b>End of the course</b>
11:00 (EDT)	

