



## Lake Como School of Advanced Studies – Course Proposal (spring 2020)

### UNRAVELLING THE COMPLEXITY OF BIOLOGICAL SYSTEMS BY TRANSMISSION ELECTRON MICROSCOPY

*L'essentiel est invisible pour les yeux* (Antoine de Saint-Exupery, 1943).

*We find organization everywhere and large forms resolve themselves into parts, but these parts are but organized out of other parts, down so far as we can see infinity* (Froude, 1871)

Our eyes are the first microscope for discovering the beauty and the architecture of the neighbouring world, but the concealed underlying complexity of the living organisms can be unravelled mostly by the observation through the transmission electron microscope (TEM). From its birth, in the past century, the exceptional TEM potentialities were applied particularly for tissue and cell biology studies. More than fifty years ago, an increasing number of molecular events started to be placed within a cellular context. The possibility to investigate the truly molecular aspects of the living matter was only achieved later, thanks to cryo-electron microscopy (cryo-EM); introduced twenty years ago, it grew more reliable and accessible only in the past four years thanks to important advancements in cryo-EM technologies. To date, not only tissues, but also cells, macromolecular complexes and individual molecules can be studied in their whole, shedding entirely new light on the complexity of biological systems. To express such methodological progress, the term “Resolution Revolution” has been coined, and the Nobel Prize 2017 for Chemistry was issued to three scientists that supported and developed the application of cryo-EM to biological systems.

Offering young scientists an advanced course for understanding and applying Transmission Electron Microscopy provides an essential knowledge for their research. We also note that training in this specific field is particularly lacking in the context of Academic education in our Country. In this proposal for Lake Como School of Advanced Studies we aim at sharing the most advanced knowledge needed to apply an ultrastructural approach in the different branches of life sciences.



- **SCIENTIFIC HEADS:**

- Martino Bolognesi (Università degli Studi di Milano, Dip. Bioscienze)  
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- Elena Bianca Donetti (Università degli Studi di Milano, Dip. Scienze Biomediche per la Salute )  
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- Maura Francolini (Università degli Studi di Milano, Dip. Biotechnologie Mediche e Medicina Traslazionale)  
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- **ORGANIZING COMMITTEE:**

Martino Bolognesi, Elena Donetti, Maura Francolini, Andrea Raimondi, Nadia Santo, Paolo Swuec

- **TIME PERIOD**

20-24 April 2020 - (Monday to Friday)

- **EXTIMATED NUMBER OF PARTICIPANTS:**

From a minimum of 20 to a maximum of 30 participants

- **Registration Fee:**

- 600 euros/participant without travel/accommodation fees



Five days meeting (Mon. to Fri.) with morning and afternoon sessions in which selected speakers will present their work (approx. 45 mins. talk). Three keynote lectures are planned. Two sessions (2 hours/each) will be devoted to selected presentations from participants and a further 2 hours session will be devoted to poster presentation.

The specific topics that will be addressed during the course sessions are detailed in the following tentative program:

**Day 1: Unravelling the complexity of biological systems by transmission electron microscopy**

13:30 – 14:00	<b>Welcome and introduction to the school</b> (the organizers)
14:00 – 15:00	<b>Keynote Lecture</b> – Gaia Pigino (MPI, Dresden Invited)
15:00 – 15:30	coffee break
15:30 – 16:15	<b>Talk 1</b> – Roman Polishchuk (TIGEM, Napoli, invited)
16:15 – 17:15	<b>Talk 2</b> – Carlo Tacchetti (HSR, Milano)
17:15 – 17:45	<b>A virtual tour at <i>NOLIMITS</i> and <i>CryoEM-lab</i></b> – Two of the technological platforms of Università degli Studi di Milano
19:30	Welcome dinner

**Day 2: Integrating structure and function – Correlative Microscopy in cell biology studies**

9:00 – 9:45	<b>Talk 3</b> – Paolo Ronchi (European Molecular Biology Laboratory – EMBL, D)
9:45 – 10:30	<b>Talk 4</b> – Galina Beznussenko (Campus IFOM-IEO, Milan)
10:30 – 11:00	coffee break
11:00 – 12:00	<b>Keynote Lecture</b> – Paul Verkade
12:00 – 14:00	Lunch
14:00– 16:00	<b>Selected presentations</b> (6)

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- 16:00 – 16:30 coffee break
- 16:30 – 17:15 Helmut Gnaegi (Diatome): title to be communicated
- 17:15 - 18:30 Poster presentation and discussion

**Day 3: The cryo-EM resolution revolution**

- 9.00 – 10.00 Talk 5 – Paolo Swuec “An introduction to single-particle EM”
- 10:00 – 11:00 Talk 6 – Ludovic Renault “High-res cryo-EM and cryo-ET applications”
- 11:00 – 11:30 *coffee break*
- 11:30 – 12:30 PLENARY: Jurgen Plitzko (MPI, Martinsried, D)
- 12:30 – 14:00 *Lunch*
- 14.00 – 15:00 Talk 7 – Francesca Coscia (LMB, Cambridge UK)
- 15.00 – 16:00 Talk 8 – Edoardo D’Imprima (EMBL, Heidelberg, D)
- 16:00 – 16:30 *coffee break*
- 16:30 – 17:15 Frederic Leroux (Leica Microsystems): Cryo-CLEM-Thunder workflow for cryoTEM
- 17:15 – 18:30 Selected presentations (5)

**Day 4: Tomography and Volume electron microscopy to unravel tissue architecture:**

- 9:00 – 9:45 **Talk 10:** Christel Genoud (FMI, Basel, CH)
- 9:45 – 10:30 **Talk 11:** Andrea Raimondi (HSR, Milano)
- 10:30 – 11:00 coffee break
- 11:00 – 12:00 **Keynote Lecture** – Graham Knott (EPFL, Lausanne, CH)

Afternoon: Excursion on the Como lake with boat trip and visit to Brunate (Tempio Voltiano)

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19:30 Social Dinner

**Day 5: Nanotechnology and other potential EM applications**

9:00 – 9:45	<b>Talk 12</b> - Roberto Marotta (IIT, Genova)
9:45 – 10:30	<b>Talk 13</b> – Mauro Gemmi (IIT Pisa, invited)
10:30 – 11:00	coffee break
11:00 – 12:30	<b>Selected presentations (6)</b>
12:30 – 13:00	<b>Concluding remarks</b>