

PIER GIORGIO MERLI (S)TEM SCHOOL IN MATERIALS SCIENCE

19-23 November 2018 - Theory
4-8 February 2019 - Practical

CNR IMM Bologna
Via Gobetti 101, 40129 - Bologna, Italy

DIRECTORS

Andrea PARISINI and Vittorio MORANDI

TEACHERS

Aldo Armigliato, Roberto Balboni,
Giorgio Lulli, Andrea Migliori,
Vittorio Morandi, Luca Ortolani, Andrea Parisini
- *CNR IMM Bologna*

Matteo Ferroni - *University of Brescia*
Giovanni Bertoni - *CNR IMEM Parma*
Gianluca Calestani - *University of Parma*

<http://temschoo1.bo.imm.cnr.it>

The 7th edition of the “Pier Giorgio Merli” Transmission Electron Microscopy School, jointly organised by SISM and CNR-IMM, in two full weeks, will provide students and researchers with a qualified introduction to TEM and STEM techniques for materials science.

In the first week, after an introduction to the (S)TEM working principles, the theoretical background of SAED, CBED, HREM, HAADF-STEM, EELS, EDS and Holography will be detailed. Examples of applications will include crystallographic phases identification, strain determination, studies of lattice defects, nanoparticles and nanotubes characterization in solids and devices, compositional investigations, analysis of phase variations.

In the second week, the knowledge acquired during the first part of the School will be put into practice. Students, under teacher’s supervision, will operate on the 200 kV Schottky FEG TEM-STEM (FEI Tecnai F20 ST) installed at the CNR-IMM Institute. Students will be also trained to the use of some of the available simulation and data processing software essential for (S)TEM work.

A certificate of attendance will be given to all the participants and upon request a certificate of the acquired skills, that may be also used for academic credits, will be issued after an examination.

As participation to the School is open to people from all countries the official language is English.

Please refer to the School’s web site, for a more complete description of the School’s subjects:

<http://temschoool.bo.imm.cnr.it>

Important notice: participants may choose to attend either the whole course or the theoretical part only (it is not possible to register for the practical course only). As to the practical course, to guarantee enough operating time to all the students, **the maximum number of participants is limited to 10**. The School will take place only if a **minimum number of 6 registrations** to both the theoretical and practical courses will be reached.

PROGRAM OF THEORETICAL WEEK

Monday 19 th	Tuesday 20 th	Wednesday 21 st	Thursday 22 nd	Friday 23 rd
09:00 REGISTRATION	09:00 Radiation Damage <i>G. Lulli</i>	09:00 Theory of Electron Diffraction <i>A. Parisini</i>		09:30 Electron Energy Loss Spectroscopy <i>G. Bertoni</i>
10:00 Electron Optics <i>G. Lulli</i>	10:00 Electron-Matter Interaction <i>R. Balboni</i>		09:30 High Resolution Electron Microscopy 1 <i>A. Parisini</i>	
11:30 COFFEE BREAK	11:00 COFFEE BREAK	11:00 COFFEE BREAK	11:00 COFFEE BREAK	11:00 COFFEE BREAK
12:00 Electron Sources <i>V. Morandi</i>	11:30 Elements of Crystallography <i>G. Calestani</i>	11:30 X-Ray Microanalysis of Thin Films <i>M. Ferroni</i>	11:30 High Resolution Electron Microscopy 2 <i>A. Parisini</i>	11:30 Electron Holography and Interferometric Methods <i>L. Ortolani</i>
13:00 LUNCH	13:30 LUNCH	13:30 LUNCH	13:00 LUNCH	13:30 LUNCH
14:30 Instrumentation and Detectors <i>M. Ferroni</i>	15:00 Introduction to electron diffraction in materials <i>R. Balboni</i>	15:00 Convergent Beam Electron Diffraction <i>R. Balboni</i>	14:30 Scanning Transmission Electron Microscopy 1 <i>V. Morandi</i>	14:30 In-Situ TEM <i>To be defined</i>
16:00 COFFEE BREAK	16:00 COFFEE BREAK	16:00 COFFEE BREAK	16:00 COFFEE BREAK	15:30 TEM Manufacturers Presentations
16:30 Introduction to Aberrations Correction <i>L. Ortolani</i>	16:30 A Diffraction Experiment: The Arago-Poisson's Spot <i>A. Parisini</i>	16:30 <i>To be defined</i>	16:30 Scanning Transmission Electron Microscopy 2 <i>V. Morandi</i>	16:30 Final discussion and Closing Remarks
17:30	17:30	17:30	18:00	17:30

REGISTRATION

Registration to the school is obtained by signing up before September 30, 2018, directly on the SISM website <http://www.sism.it>

Theory		Theory + Practical	
SISM Member	560€	SISM Member	1360€
Non Member	700€	Non Member	1700€

The fee includes participation to the courses, education materials, coffee breaks and lunches to the local CNR canteen. Students and young researchers with a temporary position can claim an additional 30% discount on the fees (VAT excluded).

For any payment an invoice will be issued. Please note that, for employees of Italian public institutions, the fee is exempt from VAT (Article 10 of DPR 633/72).

Registration fees may be paid through:

Credit card

SISM website: <http://www.sism.it>

Bank transfer

S.I.S.M
IBAN: IT 43 Q 02008 02455 000103039142
BIC-SWIFT: UNCRITM1PM5
Address: Unicredit - Ag. Dante, Bologna
Reference: “Name of the participant + BOTEM2018”

PROGRAM OF PRACTICAL WEEK

February 2019

Monday 04th

	Group A	Group B
14:00	● Introduction to TEM <i>L. Ortolani</i>	Introduction to Electron Diffraction <i>R. Balboni</i>
15:30	COFFEE BREAK	
16:00	Introduction to Electron Diffraction <i>R. Balboni</i>	● Introduction to TEM <i>L. Ortolani</i>
17:30		

Thursday 07th

	Group A	Group B
09:00	● STEM <i>Morandi</i>	TEM Sample Preparation <i>Ferroni</i>
10:30	COFFEE BREAK	
11:00	● STEM <i>Morandi</i>	FIB Sample Preparation <i>Ortolani</i>
12:30	LUNCH	
14:00	TEM Sample Preparation <i>Ferroni</i>	● STEM <i>Morandi</i>
15:30	COFFEE BREAK	
16:00	FIB Sample Preparation <i>Ortolani</i>	● STEM <i>Morandi</i>
17:30		

Tuesday 05th

	Group A	Group B
09:00	● Electron Diffraction <i>Balboni</i>	Diffraction Pattern Indexing <i>Migliori/Ortolani</i>
10:30	COFFEE BREAK	
11:00	● Electron Diffraction <i>Balboni</i>	Introduction to HREM <i>Parisini</i>
12:30	LUNCH	
14:00	Diffraction Pattern Indexing <i>Migliori/Ortolani</i>	● Electron Diffraction <i>Balboni</i>
15:30	COFFEE BREAK	
16:00	Introduction to HREM <i>Parisini</i>	● Electron Diffraction <i>Balboni</i>
17:30		

Friday 08th

	Group A	Group B
09:00	● EDX Spectra Acquisitium <i>Parisini</i>	EDX Spectra Processing <i>Migliori/Balboni</i>
10:30	COFFEE BREAK	
11:00	EDX Spectra Processing <i>Migliori/Balboni</i>	● EDX Spectra Acquisitium <i>Parisini</i>
12:30	LUNCH	
14:00	CLOSING OF THE SCHOOL	
15:30		

Wednesday 06th

	Group A	Group B
09:00	● HREM <i>Parisini</i>	HREM Simulations <i>Migliori/Morandi</i>
10:30	COFFEE BREAK	
11:00	● HREM <i>Parisini</i>	Image Processing <i>Ortolani</i>
12:30	LUNCH	
14:00	HREM Simulations <i>Migliori/Morandi</i>	● HREM <i>Parisini</i>
15:30	COFFEE BREAK	
16:00	Image Processing <i>Ortolani</i>	● HREM <i>Parisini</i>
17:30		