The school, jointly organised by SISM and CNR-IMM, consists of two full weeks of theoretical and practical lessons and will provide researchers and microscopists a qualified introduction to transmission and scanning transmission electron microscopy techniques for materials science. After an introduction to the working principles of the instrument, a description of the main techniques for structural and analytical characterization will be provided. The topics covered include: electron emission and electron optics, theory of electron diffraction, mechanism of contrast formation, atomic resolution via coherent (HREM) and incoherent (HAADF/STEM) imaging techniques, electron holography and interferometric methods, convergent beam electron diffraction, analytical methods (EDX and EELS).
The school is divided into a theoretical part (14-18 Nov 2016) and a practical part (6-10 Feb 2017). It is possible to participate to either the whole course or the theoretical part only (it is not possible to attend the practical course only).
The practical course will take place at the Electron Microscopy Laboratory of the CNR-IMM Institute, where the students will directly operate on the FEI Tecnai F20ST, under teachers supervision, practicing with the techniques exposed during the first week. To guarantee enough operating time to all students, the total number of participants to the practical week will be limited. In case of much larger request, an additional practical week may be arranged.
An overview of some of the available simulation and data processing softwares for transmission electron microscopy will be also provided.
Representatives of TEM/STEM manufacturers, sample preparation instruments and accessories for electron microscopy will also give brief presentations of their new products .
As participation to the School is open to people from all countries the official language will be English.

General information

Dr. R. Balboni: balboni@bo.imm.cnr.it

Accomodation

For information on accommodation and how to reach CNR-IMM Bologna, please refer to www.bo.cnr.it or contact:
Mrs. Giorgia Giovannini, CNR – IMM Sezione di Bologna
Tel: +39 051 6399143
giovannini@bo.imm.cnr.it

Registration

Registration to the school is obtained by signing up before October 15, 2016, directly on the site www.sism.it,
The fee includes participation to the courses, education materials, coffee breaks and lunches to the local CNR canteen. SISM members at 31/07/2016 will obtain a 20% discount. Students and young researchers with a temporary position can claim an additional 30% discount on the fees (VAT excluded).

Theoretical part only (1st week):

Non SISM mebers	€ 700 + VAT
SISM members	€ 560 + VAT

Whole school (2 weeks):

Non SISM mebers	€ 1700 + VAT
SISM members	€ 1360 + VAT

For any payment an invoice will be issued. Please note that for employees of public institutions the fee is exempt from VAT (Article 10 of DPR 633/72).
Registration fees may be paid through :

Credit card (www.sism.it)

Bank transfer to

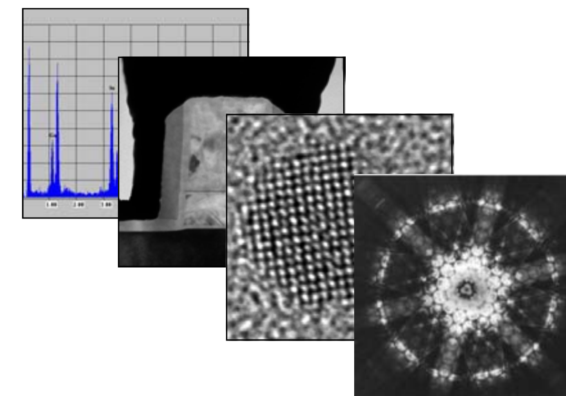
S.I.S.M
IBAN: IT 43 Q 02008 02455 000103039142
BIC-SWIFT: UNCRITM1PM5 or UNCRITMM
address: Unicredit - Ag. Dante, Bologna
reference: "**Name of the participant + BOTEM2016**"

A minimum number of 6 students is required to start the School, while the maximum number of participants to the practical course is limited to 10 people.
Participation to the school will give right to a free SISM membership for year 2017 upon request.

CNR – IMM Bologna

SISM

Electron Microscopy School "Pier Giorgio Merli"



6th Theoretical - Practical course on

Transmission Electron Microscopy in Materials Science

Bologna, Area della Ricerca del CNR

November 14 - 18 , 2016

February 6 – 10, 2017

temschool.bo.imm.cnr.it

Director: *Roberto Balboni*

Teachers: *Aldo Armigliato, Roberto Balboni, Gianluca Calestani (Univ. Parma), Matteo Ferroni (Univ. of Brescia), Giorgio Lulli, Andrea Migliori, Vittorio Morandi, Giuseppe Nicotra, Luca Ortolani, Andrea Parisini.*

Organised by CNR-IMM, Bologna, Italy and the Italian Society for Microscopical Sciences (SISM)

TEM SCHOOL IMM-BOLOGNA

FEI

JEOL Solutions for Innovation

Gambetti Vacuum Technology and Related Solutions

Nikon

Theoretical part 14 –18 November 2016

Monday 14 November

9:00 - 9:30	Registration
9:30 - 10:00	Introduction
10:00 - 11:30	Electron optics (**G. Lulli**)
11:30 - 12:00	*Coffee break*
12:00 - 13:00	Electron sources (**V. Morandi**)
13:00 - 14:30	*Lunch*
14:30 - 16:00	Intrumentation and detectors (**M. Ferroni**)
16:00 - 16:30	*Coffee break*
16:30 - 17:30	Introduction to aberration correction (**L. Ortolani**)

Tuesday 15 November

9:00 - 11:00	Elements of crystallography (**G. Calestani**)
11:00 - 11:30	*Coffee break*
11:30 - 12:30	Radiation damage (**G. Lulli**)
12:30 - 13:30	Electron-matter interaction (**R. Balboni**)
13:30—15:00	*Lunch*
15:00 - 16:00	Introduction to electron diffraction from materials (**R. Balboni**)
16:30 - 17:00	*Coffee break*
17:00 - 18:00	Theory of electron diffraction: an experiment (**A. Parisini**)

Wednesday 16 November

9:00 - 11:00	Theory of electron diffraction (**A. Parisini**)
11:00 - 11:30	*Coffee break*
11:30 - 13:00	X-ray microanalysis of thin films I (**A. Armigliato**)
13:00 - 14:30	*Lunch*
14:30 - 16:00	X-ray microanalysis of thin films II (**A. Armigliato**)
16:00 - 16:30	*Coffee break*
16:30 - 17:30	Convergent beam electron diffraction (**R. Balboni**)

Thursday 17 November

9:30 - 11:00	High resolution electron microscopy I (**A. Parisini**)
11:00 - 11:30	*Coffee break*
11:30 - 13:00	High resolution electron microscopy II (**A. Parisini**)
13:00 - 14:30	*Lunch*
14:30 - 16:00	Scanning transmission electron microscopy I (**V. Morandi**)
16:00 - 16:30	*Coffee break*
16:30 - 18:00	Scanning transmission electron microscopy II (**V. Morandi**)

Friday 18 November

9:00 - 11:00	Electron energy loss spectroscopy (**G. Nicotra**)
11:00 - 11:30	*Coffee break*
11:30 - 13:30	Electron holography and interferometric methods (**L. Ortolani**)
13:30 - 14:30	*Lunch*
14:30 - 15:30	*TEM manufacturers presentations*
15:30 - 16:30	*Final discussion and closing remarks*

Practical part 6 –10 February 2017

The participants will be divided into two groups, **A** e **B,** that alternately attend to microscope (**M**) or simulation (**S**) sessions. (**CB**: Coffee Break)

Day		9 – 11	11	11 – 13	13 – 14	14 – 16	16	16 – 17
Mon 6	M					A Introduction to the TEM	CB	B Introduction to the TEM
	S					B Introduction to diffraction	CB	A Introduction to diffraction
Tue-7	M	A Electron Diffraction			*Lunch*	B Electron Diffraction		
	S	B Diffraction pattern indexing	CB	B Introduction to HREM	*Lunch*	A Diffraction pattern indexing	CB	A Introduction to HREM
Wed 8	M	A HREM			*Lunch*	B HREM		
	S	B HREM simulation	CB	B Intro STEM / Image processing	*Lunch*	A HREM simulation	CB	A Intro STEM / Image processing
Thu 9	M	A STEM			*Lunch*	B STEM		
	S	B TEM sample preparation	CB	B Instruments for sample preparation	*Lunch*	A TEM sample preparation	CB	A Instruments for sample preparation
Fri 10	M	A EDX spectra and sample thickness measurements	CB	B EDX spectra and sample thickness measurements	*Lunch*	**Closing of the school**		
	S	B EDX spectra processing	CB	A EDX spectra processing	*Lunch*	**Closing of the school**		