Preface

Thomas Walther, Dept. Electronic & Electrical Engineering, University of Sheffield
Lewys Jones, Department of Materials, University of Oxford

This issue contains selected invited and contributed presentations from the 20th international conference on *'Microscopy of Semiconducting Materials'* (MSM-XX) which was held at Lady Margaret Hall, University of Oxford, 9 -13 April 2017.

The meeting was organised by the Royal Microscopical Society (RMS), supported by the Institute of Physics and the European Microscopy Society and kindly sponsored by five companies: Hitachi High-Technologies Europe, ISS Group Ltd, JEOL (UK) Ltd, Leica Microsystems and LOT - Quantum Design.

This conference series has, since its inauguration by Anthony ('Tony') G Cullis in 1979, been held biennially in odd years and since 2003 alternates between locations in Oxford and Cambridge. It deals with advances in semiconductor studies carried out by all forms of electron and scanning probe microscopy with high spatial resolution, as well as new methods of imaging, diffraction, spectroscopy and signal quantification. This field has been flourishing for now more than three decades, due to the need for materials and device characterisation at the atomic level to continuously explore new materials and concepts for electronic and optoelectronic device applications.

Figure 1: Lannon Quad courtyard at early morning and at night (left), poster session in the Pipe Partridge building along with tea served in the courtyard (right).

The meeting was attended by 69 delegates from 19 countries, comprising ten European countries as well as Australia, Canada, China, India, Israel, Japan, Russia, Singapore and the USA. We had a total of 71 contributions, which included 11 invited talks, 29 contributed conference talks, 4 company presentations and 27 posters.

The dozen papers published in this special issue of *Journal of Microscopy* have each undergone full peer review by two or three reviewers, guaranteeing contributions are of high standard. Table 1 lists the materials studied in these articles and the methods used, from which it can be seen that a wide range of semiconductors have been covered, and that annular dark-field scanning transmission electron microscopy (ADF-STEM) imaging was the most popular technique by far.

Two students were awarded prizes for the high quality of their poster presentations. Their contributions on studies of core-shell nanowires (by James Gott, University of Warwick, 1st place) and thin wetting layers (by Veronica Braza, Universidad de Cádiz, 2nd place) documented well the high standard of electron microscopy that is now achieved by young scientists.

We express our gratitude to Lady Margaret Hall for provision of excellent accommodation, superb lecture facilities, including technical support, and perfect catering.

We would like to also thank the staff of the RMS for their expert help in planning and running the meeting - in particular Karina Lang - for their professional support and always joyful approach to anything.

Finally, we are grateful to Jill Hobbs as the Editorial Office Manager for the *Journal of Microscopy* at Wiley, as well as to the numerous contributors and reviewers for helping us to put together this special issue.

Figure 2. Conference photo taken in the college courtyard, just before a trip to the old town centre on Tuesday afternoon where some participated in a Walking Ghost Tour and others visited the Oxford Science Museum.

Figure 3. Print of the Oxford Science Museum near entrance to the college's dining hall (left). RMS donation of historical optical microscopes on display in this museum (right).

Table 1: overview of methods and materials discussed in the articles in this issue. Articles [1-4] were invited talks (speaker names underlined), [5-8] contributed oral and [9-12] poster presentations.

method / material	ABF-STEM	ADF-STEM	AFM	APT-FIM	BF-TEM	BF-STEM	CBED	DF-TEM	EDXS	EELS	FIB-SEM	He-ion SEM	HREM	LOM, Raman	SEM
(Al)GaAs		[11]			[11]			[11]					[11]		
AlN		[2]				[2]									
Ga(As)P		[1]					[1]								
Ga(In)As(Sb)		[6]													
(Ge)Si		[10]											[10]		
(In,Al)GaN		[9]	[9]				[9]	[9]							[9]
(In)GaN		[5], [12]	[5]					[5]	[12]						
Si/Al_2O_3		[8]							[8]		[8]				
Si:Ga			[4]						[4]			[4]		[4]	[4]
Si:O,As		[3]		[3]											
SnS	[7]	[7]					[7]		[7]					[7]	[7]

References

[1] Beyer, A., Duschek, L., Belz, J., Oelerich, J.O., Jandieri, K. & Volz, K. (2017) Surface relaxation of strained Ga(P,As)/GaP heterostructures investigated by HAADF STEM. J. Microsc., doi: 10.1111/jmi.12622

[2] Dycus, J.H. & LeBeau, J.M. (2017) A reliable approach to prepare brittle semiconducting materials for cross-sectional transmission electron microscopy. J. Microsc., doi: 10.1111/jmi.12601

[3] Ohno, Y., Inoue, K., Fujiwara, K., Kutsukaka, K., Deura, M., Yonenaga, I., Ebisawa, N., Shimizu, Y., Inoue, K., Nagai, Y., Yoshida, H., Takeda, S., Tanaka, S. & Kohyama, M. (2017) Nanoscopic analysis of oxygen segregation at tilt boundaries in silicon ingots using atom probe tomography combined with TEM and ab initio calculations. J. Microsc., doi: 10.1111/jmi.12602

[4] O'Connell, R., Chen, Y., Zhang, H., Zhou, Y., Fox, D., Maquire, P., Wang, J.J. and Rodenburg, C. (2017) Comparative study of image contrast in scanning electron microscope and helium ion microscope. J. Microsc., doi: 10.1111/jmi.12xxx

[5] Chery, N., Ngo, T.H., Chauvat. M.P., Damilano, B., Courville, A., de Mierry, P., Grieb, T., Mehrtens, T., Krause, F.F., Müller-Caspary, K., Schowalter, M., Gil, B., Rosenauer, A. & Ruterana, P. (2017) The microstructure, local indium composition and photoluminescence in green-emitting InGaN/GaN quantum wells. J. Microsc., doi: 10.1111/jmi.12657

[6] Kükelhan, P., Beyer, A., Fuchs, C., Weseloh, M.J., Koch, S.W., Stolz, W. & Volz, K. (2017) Atomic structure of 'W'-type quantum well heterostructures investigated by aberration-corrected STEM. J. Microsc., doi: 10.1111/jmi.12647

[7] Nalin Mehta, A., Zhang, H., Dabral, A., Richard, O., Favia, P., Bender, H., Delabie, A., Caymax, M., Houssa, M., Pourtois, G. and Vandervorst, W. (2017) Structural characterization of SnS crystals formed by chemical vapour deposition. J. Microsc., doi: 10.1111/jmi.12652

[8] Rogov, O.Y., Artemov, V.V., Gorkunov, M.V., Ehhov, A.A. & Khmelenin, D.N. (2017) FIB-fabricated complex-shaped 3D chiral photonic silicon structures. J. Microsc., doi: 10.1111/jmi.12644

[9] Ben Ammar, H., Minj, A., Chauvat, M.-P., Gamarra, P., Lacam, C., Morales, M. & Ruterana, P. (2017) The structure of InAlGaN layers grown my metal organic vapour phase epitaxy: effects of threading dislocations and inversion domains from the GaN template. J. Microsc., doi: 10.1111/jmi.12651

[10] Norris, D.J., Myronov, M., Leadley, M.R. & Walther, T. (2017) Comparison of cross-sectional transmission electron microscope studies of thin germanium epilayers grown on differently oriented silicon wafers. J. Microsc., doi: 10.1111/jmi.12654

[11] Walther, T. & Krysa,. A.B. (2017) Transmission electron microscopy of AlGaAs/GaAs quantum cascade laser structures. J. Microsc., doi: 10.1111/jmi.12655

[12] Wang, X., Chauvat, M.-P., Ruterana, P. & Walther, T. (2017) Effective absorption correction for energy dispersive X-ray mapping in a scanning transmission electron microscope: analysing the local indium distribution in rough samples of InGaN alloy layers. J. Microsc., doi: 10.1111/jmi.12643