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Editorial: EDGE 2017 – Enhanced Data Generated by Electrons, Okinawa, May 2017

P.A. van Aken[1], H. Kurata[2], Q.M. Ramasse[3,4]

[1]Stuttgart Center for Electron Microscopy, Max Planck Institute for Solid State Research, Heisenbergstr. 1, 70569 Stuttgart, Germany
[2]Institute for Chemical Research, Kyoto University, Uji, Kyoto 611-0011, Japan
[3]SuperSTEM Laboratory, SciTech Daresbury Campus, Keckwick Lane, Daresbury WA4 4AD, U.K.
[4]School of Chemical and Process Engineering, School of Physics, University of Leeds, Leeds, LS2 9JT, U.K.

The beautiful sandy beaches of Okinawa, Japan, provided an ideal setting for the 2017 edition of the workshop on "Enhanced Data Generated by Electrons" (EDGE). Every four years, electron spectroscopists the world over, friends and colleagues along with newcomers, students and scientists from related disciplines, gather to survey the cutting edge of analytical electron microscopy, attempt to peek into the future of the field, and, importantly, "have fun doing so" (in the words of the meeting series creator, Prof. O.L. Krivanek). As assiduous EDGE participants ourselves, it is a real honour to serve as guest Editors for the proceedings volume accompanying the 2017 edition. Through the years, these Special Issues have invariably contained reference articles in our field: many of us will have paper copies of the proceedings on our bookshelves, and leafing through them provides fascinating snapshots of the advances in instrumentation, theory and applications of analytical electron microscopy in its broadest sense.

This year's proceedings have been organised in thematic groupings, which we feel provide a perfect account of the diversity of topics discussed in Okinawa. The advent of high energy resolution monochromators was arguably a highlight of the EDGE 2013 meeting in Sainte Maxime, France. As this technology matures, scientists can now explore the possibilities it offers and EDGE 2017 showed how early forays into ultra-low-loss spectroscopy are coming to fruition: Lagos *et al.* demonstrate the excitation of surface vibrational modes in MgO cubes, Venkatraman *et al.* explore the influence of surfaces and interfaces on the vibrational signal localisation, while Allen *et al.* provide a theoretical framework to interpret aloof vibrational signals. In parallel to the identification of molecules through vibrational spectroscopy, Miyata *et al.* show later in the volume how imaging, rather than spectroscopy, can contribute to tackling this problem. Moving 'up' in energy, Abellan *et al.* map THz plasmons across a percolated gold film, Bicket *et al.* correlate cathodoluminescence and EELS 'nanoscopies' and Egerton provides insights into the role of the detector point spread function in these low loss studies.

While ultra-low loss is capturing headlines, further expanding the wealth of information available from core loss spectroscopy remains at the heart of the community's preoccupations, with contributors venturing into less traditional EM-based spectroscopies with a soft X-ray emission study of borosilicides (Terauchi *et al.*), extending upwards the usable range of EELS (MacLaren *et al.*), extracting magnetic information through electron magnetic chiral dichroism (Loeffler *et al.*) or turning to direct electron detectors for low dose applications (Maigné *et al.*). Many of these developments are enabled by innovative detectors – faster, more sensitive and producing ever

richer data streams, such as the new 'pixel array detector' described by Cao *et al.* As a result, efficient data processing is becoming essential to truly generate "enhanced data": detector noise must be considered (Heil *et al.*), distortion artefacts unavoidably associated with scanning probe techniques can be mitigated via multi-frame approaches (Jones *et al.*, Wang *et al.*) while multivariate statistical analysis (Zhang *et al.*) and high-precision data fitting (Bekarevich *et al.*) become key to quantification.

The variety and breadth of themes represented in these proceedings showcase the tremendous impact of this 4-yearly workshop. Although still at its heart a meeting dedicated to the advancement of electron energy loss spectroscopy, it has truly become the premier forum for discussion of all types of enhanced data generated by electrons. We cannot wait for the next edition, in 2021, and we look forward to hearing about the fascinating advances this thriving community will have produced. For now, however, we hope you enjoy this volume of Microscopy as much as we enjoyed editing it.