

ES GILT DAS GESPROCHENE WORT

29.08.2011

Grußwort von DGE-Präsident Professor Reinhard Rachel

zur Microscopy Conference MC 2011 an der Christian-Albrechts-Universität zu Kiel

Dear Ladies and Gentlemen,
dear Colleagues,

On behalf of the DGE, the German Society for Electron Microscopy – one of the societies responsible for organizing this meeting – I would like to welcome you on the Microscopy Conference 2011 in Kiel. Kiel is well known to me. I am a guest in this city and the Christian-Albrechts-Universität zu Kiel since more than 10 years: Kiel, the capital of the most northern county of Germany, is a modern and vibrant city, it hosts cultural events with international reputation, like the "Kieler Woche", the Sailing Week, and Kiel has a beautiful surrounding, due to its unique location at the sea front. Kiel has a special geographical location – it has one common border with one of the SCANDEM countries, Denmark, with frequent ferry connections to Norway, Sweden, Finland, this means to Scandinavia, and Kiel is directly at the sea front of the Baltic Sea, which since many centuries is one important trade route between all North-European countries, including the three Baltic countries in the East. For this reason, we early decided to organize this meeting as a BALTIC CONFERENCE.

Initially, it was meant to be a kind of smaller microscopy conference. But looking from today, this baby became taller and taller each month, by integrating our colleagues from the northern and eastern part of Europe, notable the SCANDEM, including Denmark, Norway, Sweden, and Finland, then the Polish Society PTMI, from the Baltic Countries, and St. Petersburg in Russia. Now, we have reached a number of participants, which is well above 800. In addition, more than 50 companies are registered, performing two tasks for all of us: they show us their technical developments and latest products, (for many of us, as scientists, these are our favorite every-day toys, if you like: "Large girls and boys – enjoy large toys"; don't we?), and the companies support us in considerable amounts, as sponsors of this conference. Let me thank you all, for attending the conference, and for your generous contributions: We very much acknowledge this support!

This Microscopy Conference is – to my knowledge – the first to be held in Kiel, and it is one in a good tradition: last year, many of us met at the International Microscopy Congress in Rio de Janeiro, Brasil (also directly at the Sea front!). The year before, in 2009, the last Dreilängertagung, the Microscopy Conference was held in Graz, Austria, which was also larger than initially anticipated, by including 6 more countries from South-Eastern Europe. I feel and I anticipate that this conference in Kiel, the MC2011, will be another great meeting to commemorate, as an excellent opportunity to exchange ideas, knowledge, and information.

Finally, I want to thank in particular the representative of the local University, Professor Fouquet, for giving us the opportunity to hold the conference on this campus. My thanks also go to Mrs Dr. Andreßen and Mrs Cathy Kietzer, as representatives of the Local Government and the City, for coming to this Opening Ceremony, thus showing us their great interest in promoting science. Many thanks then go to the Local Organizing Committee, in particular to Wolfgang Jäger, who took the main burden to get this Microscopy Conference running, to the members of the Scientific Program Committee and the International Advisory Board, and all the other people involved, in the partner institutes in Kiel and Schleswig-Holstein. Finally, a "thank you" is going to all our colleagues in the DGE and the DGE board, from the partner societies who were involved, and from the companies who contributed to the planning of the conference.

On behalf of the DGE, I wish you all an interesting, successful and enjoyable week, with lots of time for exciting talks and lively discussions.

Now, it is my great honor to hand over the Ernst Ruska Price 2011 to two remarkable scientists and colleagues. They were suggested by distinguished colleagues, from the international community, worldwide. These proposals were then screened rigorously by a board of six reviewers, and after a process of discussions and evaluation, the two names of these two colleagues were – at the end – distilled out of these proposals: Dr. Johan Verbeeck, from Antwerp, Belgium, and Prof. Dr. David Mastrorade, from Boulder, Colorado, U.S.A.

Laudatio of the achievements by Johan Verbeeck:

“EELSMODEL”

Electron Energy Loss Spectroscopy (EELS) is considered the ideal analytical technique for light elements. However, reproducibility and reliability was for a long time problematic, because the evaluation - based on background correction, deconvolution from instrumental parameters, integration about excitation edges and noise reduction by averaging – is not appropriate.

Johan Verbeeck started a new way evaluating spectra with

- modeling the EELS-properties from an atomic level taking account of all thinkable effects according to the very complicated physics of inelastic interaction,
- running these spectra through the energy filter with given properties, and finally
- adding noise according to a noise model, which allows evaluation in terms of error bars.

Finally, the recorded data are compared to the model by means of parameter estimation.

He created the EELSMODEL program. This software connects the concepts of error bars, signal to noise ratio and cross sections. It reliably predicts the error bars for EELS quantification from the properties of the detector. The method performs at least a factor of three better than existing quantification techniques on the same data set.

Jo Verbeeck has made his software EELSMODEL freely available to the community with about 500 users to date. It has found many applications in materials science. such as

- precise concentrations in nanoscale regions
- study of the bonding character
- determination of valence states
- mapping the valency of individual atom columns

This method allows obtaining a maximum amount of information from a smaller and smaller volume of material. This means a huge step forward in answering the questions “Which atom is where? Which bonds are around?”, which are so fundamental for understanding the structure-properties relation of emergent materials.

“Vortex Electron Beams”

Last year, Jo Verbeeck again showed his ability to leave the beaten track by creating electron vortex beams in the electron microscope by diffraction of electron beams at a non-symmetrical diffraction grating containing a fork-like pattern.

In fact, Verbeeck broke loose an avalanche of subsequent papers in Nature and Science generalizing his idea. His discovery opens a completely new domain of research, which attracted already a lot of attention from the physics world in general. Indeed, he demonstrated that it is now possible to focus electrons to a state, which very closely resembles atomic orbitals both in terms of size and the angular momentum they possess.

Thereby, Johan Verbeeck opened a novel parameter of electron beams for most interesting investigations both of the nature of the electron and structure features such as magnetism down to an atomic scale. An example is: Using vortex beams to obtain magnetic information from EELS experiments.

Undoubtedly, this field will grow rapidly from now, with applications in (S)TEM, EELS and beyond.

Laudatio of the achievements by David Mastronarde:

Laudatio for David Mastronarde

Prof. Dr. David Mastronarde did his bachelor in chemistry, mathematics and physics at the University of Amherst (USA). Later, he worked at the University of Boulder (Co, USA) in the field of the physiology of vision. In 1988, he finished his PhD in Biology and Neurophysiology. Since then he is employed at the Boulder Laboratory for 3D Electron Microscopy of Cells. In 1995, he was appointed associate professor, and since 2001, he is full professor and co-director of this institute.

David Mastronarde is awarded with the Ernst Ruska Price for developing, making available and maintaining electron tomography software. The programs are used for the automatic generation of images from tilt series, and enable the three-dimensional reconstruction, segmentation and analysis of an object.

The Ernst-Ruska-Price Committee found it especially remarkable, that the programs are freeware. They run on all popular platforms, the installation is easy and no special computers are requested, so that students can use the programs *on their notebooks*.

The user group for the software package IMOD has grown significantly over the years, along with the application of electron tomography. David Mastronarde does maintain a web site from which the software can be downloaded together with manuals and tutorials for its use. During the year 2010 IMOD was downloaded to 4600 distinct IP addresses, and the two mailing lists, for discussion, and for notifications, include 820 people. IMOD has come to be regarded as the "gold standard" for tomographic reconstruction.

David Mastronarde also developed the data acquisition software SerialEM. It is now running on most microscope types that are used for tomography. As for IMOD, SerialEM is very popular and has been downloaded and installed on many microscopes worldwide.

David Mastronarde interacts in a highly responsive way with researchers to help them to get started, as well as to implement new features to the software. He has run frequent workshops at the University of Colorado and all over the world to provide hands-on experience and training. He has performed all his research as a member of the Boulder 3D-EM Laboratory without any personal compensation apart from his university salary.

To give a glimpse of the high standard the work of David Mastronarde, I cite a short passage from a recommendation letter: "For SerialEM David has devised methods to correct for specimen shift and change in focus with tilt. At the same time, he has minimized dosage for frozen hydrated samples. To do so, David devised a clever strategy that allowed the software to predict specimen shifts and changes in focus and therefore correct for them by adjusting microscope settings **prior** to taking the next micrograph in a series. He uses each image to tune his predictions for the succeeding one. Thus, this automated program can take a tilt series without having to take additional "assessment" images, which would increase both electron dose and the time taken to generate a tilt series."

I would like to finish with two sentences from the recommendation letter of Professor Wa Chiu: "It is my opinion that David's intellectual contributions are immense to facilitate biological end-users to engage in electron tomography research easily. The applications of his software by many investigators have yielded many fundamental cell structure discoveries, which have been published in various high profile journals."

I would like to ask you both, Joe and David, to come to the platform, for the hand-over of the documents. Thank you very much again, for your excellent scientific work, and also for coming to this conference.

I want to let you all know that both, Joe and David, will present their Ernst Ruska Lectures in form of Plenary Talks, in which they will give a summary of their scientific work, on Wednesday morning starting at 08:30 a.m., here in this lecture hall. You are all cordially invited to come and listen.

Now, finally, it is my pleasure to introduce to you the first scientific speaker on this Microscopy conference, Professor Dr. Max Haider, from CEOS – Heidelberg, Germany, who will give us a lecture with the provocative title "Is there a need for further instrumental developments?"

Introduction to Max Haider