Materials Education SYMPOSIA 2016

8th International Materials Education Symposium Report

University of Cambridge, UK, April 7-8, 2016

The 8th International Materials Education Symposium (IMES) was the biggest to date, with 133 participants from 25 countries playing a full part in two days of stimulating discussion. Clare College, Cambridge, was the venue for the third successive year and the themes were engaging student interest, materials and design, bio-engineering, pedagogy, and broadening horizons.

Feedback was overwhelmingly positive – everyone who completed a feedback form said they would recommend the symposium to their colleagues, and almost all hope to return next year.

***Zoe Barber** (Cambridge) introduces the speakers*

Delegates prepare for the first session

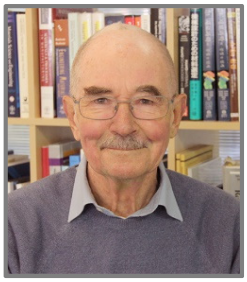
The Materials Education Symposia series: IMES, the North American Materials Education Symposium (NAMES) and the Asian Materials Education Symposium – have firmly established themselves in the calendar. They are the largest gathering for the university-level materials education community to come together to discuss ideas, tools, and best practice relating to the teaching of materials in across engineering, design, and science.

The Symposia have three main aims:

- to share ideas, innovations, experiences, successes and failures
- to provoke productive discussion around these issues
- to expand the links that form such a key feature of the Materials Community.

This summary report aims to give you a flavor of the presentations, the discussions, and the collegiate atmosphere in Cambridge at this year's Symposium.

Overview by Mike Ashby (University of Cambridge and Granta Design), Chair of Symposia Academic Advisory Committee



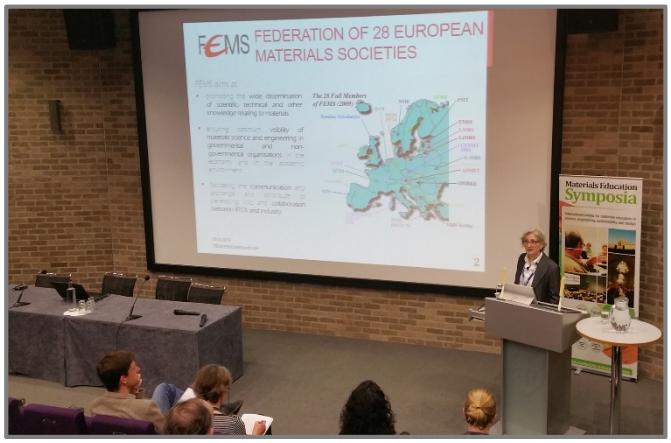
The 8th International Symposium was terrific! It came just three weeks after the 7th North American Materials Education Symposium (NAMES), hosted by the Department of Materials Science and Engineering at UC Berkeley, which was an exceptionally stimulating forum for sharing recent ideas and experiences. The International Symposium too was the biggest and, to my mind, the most diverse and far-reaching thus far. I won't attempt to describe all the talks but rather try to convey a sense of the breadth and range of the talks and the discussion. Here are some examples.

Harry Bhadeshia (Materials Science & Metallurgy, Cambridge) set the scene with a discussion of the rapid expansion of e-channels for making information available to anyone eager to learn – particularly in the rapidly-expanding field of Materials Modelling – and opened a discussion of Massively Open On-Line Courses (MOOCs). Open on-line teaching, if it is to succeed, has to be professional in preparation and delivery. Just what this means emerged clearly in **Mark Miodownik's** (UCL) description of the conceiving, story-boarding, filming and editing of his open-access course on the Materials Science of Steel. The new diversity in ways of transmission, and in the expansion of the subject itself, forces educators to make difficult choices. How to deal with this flood of information and communication channels without leaving students in a soup of facts with no underlying structure to order and prioritize them? One aspect of this was brought dramatically alive by **Sybrand van der Zwaag's** (TU Delft) challenge to the Symposium to propose new topics for inclusion in an existing distinguished Materials text with the precondition that an existing topic must go to make room for it – precipitating a heated discussion.

***Harry Bhadeshia** (Cambridge) takes questions*

The vital educational and career-building role of the Professional Societies (TMS, ASM, FEMS, IOM3 and others) is sometimes overlooked. **Stanley Howard**, (South Dakota School of Mines & Technology and 2016 TMS President) reminded us of the long history, great diversity and continuing innovation of the societies in this role. Among these innovations is the TMS Blacksmithing Competition: the challenge to make a sword blade starting from iron ore. Last year the competition was won by Berkeley: we saw the savage but beautifully textured two-foot blade at the NAMES Symposium three weeks earlier.

***Mark Miodownik** (UCL) talks about making his MOOC*



***Margarethe Hofmann** talks about FEMS and critical materials*

Engaging engineering students with the broader aspects of Design was actively discussed at Berkeley. It also featured in the International Symposium in the presentations on Materials and Industrial Design (**Elvin Karana**, TU Delft), the power of products as a gateway to engagement with materials and processes (**Magda Figuerola**, Granta Design), Nature as a source of inspiration and exemplar of the role of structure (**John Dunlop**, MPI of Colloids and Interfaces) and informative desk-top experiments, many with a culinary flavor (**Jose Gámez & Nuria Salán**, UPC, Barcelona).

The increasing complexity of material systems span transport, energy, construction and communication. These present challenges in dealing with materials supply chain risk and resilience (**Margarethe Hofmann-Amtenbrink**, Mat Search Consulting and 2015 FEMS President) and opportunities for learning via advanced game-playing (**Cecilia Berlin**, Chalmers University).

A recurring theme of recent Symposia, both at NAMES and at the International Symposium, has been the ways in which new educational techniques such as "flipped" or "reverse" classroom (**Alexandre Mege-Revel and Amina Tandjaoui**, Ecole Central de Lille), "bottom-up teaching" and "project-based learning" (**Danielle Cote**, WPI) are re-shaping the way we teach. These, and the challenge of introducing high-school students to materials (**Glenn Daehn**, The Ohio State) were actively discussed, with increasing recognition of the inadequacies of the traditional "lecture and listen" mode of transmitting knowledge.

Cecilia Berlin *(Chalmers) presents the In the Loop game*

I have only touched here on some of the highlights of the Symposium. I am personally grateful to all those who joined me on the Academic Advisory Committee, helping to put together the strong program from the many excellent submissions. I would also like to thank the following for their continued support: ASM International; European Society for Engineering Education (SEFI); Federation of European Materials Societies (FEMS); International Federation of Engineering Education Societies (IFEES); The Minerals, Metals & Materials Society (TMS); and the University of Cambridge.

I would like to end with my sincere thanks to the Granta team that made this excellent Symposium run so smoothly. If you would like to find out more, you will find the full abstracts and the talks themselves on the Symposium Archive website accessible through www.materials-education.com

Steffen Ritter *(Reutlingen) introduces his poster during the poster teaser session*

Mike Ashby

Feedback from other participants

Harry Bhadeshia (Cambridge): "This is my first time at the Symposium and I can guarantee I will be here next time. I was impressed by the quality and enthusiasm of the speakers who delivered presentations on teaching. To do good research, you need good students who are created by good teaching. We can all incorporate something from every presentation in our teaching."

The 'Twitter Wall' with Symposium tweets

Sybrand van der Zwaag (TU Delft): "This is a high priority education meeting for me. It stands out for its open communication between the participants, there is a far greater than average willingness to share and pick up ideas. In education, there is no unique solution but here you can find out about better techniques and more elegant ways of doing things."

Mark Miodownik (UCL): "It is unusual to have a group of materials educators in one place – there is no other opportunity like this to meet materials educators. I always learn a lot and come away with new ideas."

Núria Salán (UPC, Barcelona): "The presenters and the session chairs were excellent. I love this Symposium, I love the humility of the people – and it broadens my horizons. This is my fifth Symposium and each time I learn about new methods, innovations, techniques and challenges. I say to myself: 'I can include these in my teaching activities."

***Stanley Howard** talks about TMS student activities*

Margarethe Hofmann-Amtenbrink (Mat Search Consulting, and 2015 President of FEMS): "I am not a teacher but I have met lots of teachers and professors, and I have learned a lot about opportunities for teaching materials. This is my first time at the Symposium, I am really impressed with the atmosphere, and I will come again to learn more. I will take away a lot of ideas about teaching people in industry, and how to bring industry into lifelong learning about materials."

***Mike Ashby** closes the Symposium*

Stanley Howard (South Dakota School of Mines & Technology, and 2016 President of TMS): "I've been very impressed with the talks and the speakers. They are all very accomplished professionals. I'm pleased to see the proportion of women involved at all levels in the Symposium."

Glenn Daehn (The Ohio State): "This is a very high-quality event with a different focus to what you have a research conference. There is the clear vision of Mike Ashby, it brings together a community of like-minded people, and it is very influential."

Symposium photograph at the end of day two

Courses, posters, networking and social program

The main Symposium program was preceded by a CES EduPack course (led by **Mike Ashby** and **Claes Fredriksson**) and workshops on e-learning (led by **Mark Endean** from the Open University), sustainable development (led by **Mike Ashby** and **Tatiana Vakhitova**) and advanced materials selection with CES Selector (led by **Charlie Bream**). Suggestions and feedback from participants at the

The Department of Materials Science & Metallurgy

CES EduPack short course

Mark Endean opens the e-learning workshop

Group photograph after the department tour

2015 Symposium led to three new workshops being added to the program. 45 Symposium participants joined these activities, exploring aspects of these topics in detail and enjoying fruitful discussions. We are very grateful to the Cambridge Department of Materials Science & Metallurgy and in particular **Noel Rutter** and **Jess Gwynne** for providing vital input and securing excellent facilities. In light of the positive feedback received we will run follow up events in 2017.

Thirty-one poster presenters had 60 seconds each to make their pitch during the 'poster teaser' slot on the Symposium's first morning. This provoked lively discussions and networking over the two days. Views and ideas were also shared over social media and displayed on the 'Twitter wall'.

The Social Program offered the opportunity to meet existing friends and make new ones. The candlelit Presenters' Dinner at Clare College (founded in 1326) and the Symposium Dinner held in Peterhouse (founded in 1284) brought together the growing Symposium community. At the Symposium Dinner, **Mark Miodownik** (UCL) received the inaugural Symposium Award for his contributions to materials education.

The Presenters' Dinner at Clare College

__Mark Miodownik__ receives the 1st Symposium Award for "Contributions to Materials Education" from __Mike Ashby__ and __Noel Rutter__ (Cambridge)

Final words by Marc Fry (Granta Design), Secretary of Symposia Academic Advisory Committee

I would like to thank all 133 participants and Granta colleagues for making this event a great success, with two days of thought-provoking discussions and fun. We greatly value the ongoing input and suggestions from the Symposium community which helps identify new directions and develop further. We now look forward to continuing to work with the Symposium Academic Advisory Committee and local hosts towards future Symposia.

I'm delighted to confirm the following dates, locations and themes for upcoming events:

- **2nd Asian Materials Education Symposium (AMES)**
  December 8-9, 2016, National University of Singapore
  Theme: Materials and Sustainable Development Education
  Talk abstract deadline: May 31, 2016
- **9th International Materials Education Symposium (IMES)**
  April 6-7, 2017, University of Cambridge, UK
  Theme: Education and Industry
  Talk abstract deadline: September 30, 2016
- **8th North American Materials Education Symposium (NAMES)**
  August 24-25, 2017, Massachusetts Institute of Technology, USA
  Theme: Materials Education Innovation. Sub-themes: Engaging students; Online Education; and the "Maker" Movement
  Talk abstract deadline: January 31, 2017

I would like to invite you all to submit an abstract for these events and look forward to continuing the conversation. For further details, please visit www.materials-education.com You are also very welcome to contact members of the Granta Education Team if you have any questions or require further information.

With best wishes,

Marc Fry

Director, Education Division, Granta Design