

Microscopy in the Classroom: Evolution of an Education and Outreach Community

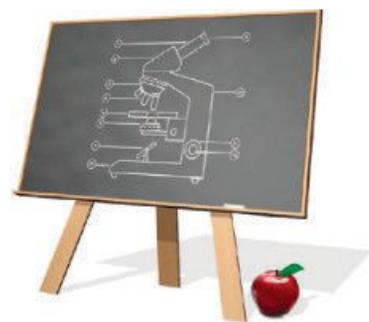
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Origins of MSA Educational Outreach

The Microscopy Society of America (MSA) has nurtured and promoted pre-college science education for over 20 years. The society's flagship effort was conceived and implemented under the guidance of Caroline Schooley. The creation of Project MICRO (Microscopy In Curriculum - Research Outreach) has placed MSA members, teaching materials, and microscopes in middle school classrooms nationwide [1]. From the early 1990s the MSA Education Committee sponsored symposia at MSA annual meetings on a wide variety of teaching and outreach topics including virtual microscope simulators, remotely connected microscopes accessible to schools, do-it-yourself training videos, and high school teacher training workshops. These sessions were usually well attended, often with over a hundred attendees. Other MSA efforts include HS_SEM, a discussion group for high schools with scanning electron microscopes [2], "A Family Affair"—activities for kids at the annual M&M meeting, and the MSA service called "Ask-a-Microscopist," where a the homework-challenged student can get answers to burning questions.

With all this effort by MSA, one might think that there is not much more that volunteers can do to help kids use microscopy in the classroom. Unfortunately, as described by Schooley [1], many elementary schools and middle schools have been forced to curtail innovative science education programs like Project MICRO because of budget cuts and because teachers need to prepare students for standardized performance tests. So the question remains: how can we continue to use microscopy to get students enthused about science, particularly in this difficult environment?

This was partially answered by Edwina Westbrook of Virginia State University. After an M&M 2008 symposium in Albuquerque, entitled "Teaching Microscopy and Microanalysis," Edwina cornered the organizers and made the following statement: "If you bring this symposium to the Richmond meeting next year, I will use my contacts in the local schools to bring to the session not just teachers, but also administrators." The symposium organizers, Elaine Schumacher and

Charles Lyman, were deeply moved by this heartfelt proposal. They immediately sat down and worked out a way to run an M&M session for this purpose outside the official M&M meeting—no red tape, no formal registration—as a free service to the local school community. In addition to presentations and demonstrations, each participant was presented with a ticket to the exhibition hall—all for free.

Microscopy & Microanalysis 2014 will be the sixth time that the M&M program will include a session called "Microscopy in the Classroom." This special session has evolved and grown over the years, but many of the core principles remain, including the effort to promote programs that are models for education and outreach, to serve as a forum to help those interested in outreach, and to attract local educators and administrators of the host city.

This article describes the evolution of the now annual M&M symposium, "Microscopy in the Classroom." The article aims to illustrate the value of this session for conference attendees, particularly those who share an interest in microscopy education for grades K–12, those who wish to improve outreach activities in their own facilities, and those who are interested in methods used at the college and professional levels.

Microscopy in the Classroom: 2007 and 2008

In 2007, Richard Bisbing, then executive vice president of McCrone Associates in Westmont, IL, organized a workshop for the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy (PittCon) titled, "Teaching Microscopy and Microanalysis," which was spurred by his personal interest in the question of how people learn to be microscopists. The program included contributors from McCrone Associates, Madison Area Technical College, Lehigh University, Oxford Instruments, and JEOL USA. Topics as diverse as learning microscopy in childhood, teaching at the college level, providing hands-on vendor training, and establishing a distance learning program were presented.

From PittCon, the idea for "Teaching Microscopy and Microanalysis" went on the road to the 2008 M&M meeting in

Albuquerque, where the PittCon participants were joined by others who spoke on various aspects of microscopy training and classroom teaching. The symposium also included a poster session. The papers for presentation were grouped into three categories: (1) K-12 and Outreach, which also included overviews of the technologist training programs offered by Madison Area Technical College and San Joaquin Delta College, (2) manufacturer efforts in remote training, and (3) university courses and short courses. Each platform session closed with a half-hour roundtable discussion.

Both the attendance numbers and the lively panel discussions underscored the strong interest in microscopy education to be found among conference attendees. A common theme emerged: microscopy is one of the best hands-on techniques with which to excite students about science and engineering. Another recurring theme was the importance of attracting students to the field of microscopy as a career and providing effective ongoing instruction through university curricula, short courses, and vendor training.

The Richmond Meeting 2009

The next year “Microscopy in the Classroom” became an annual event at M&M meetings. This new session became “Microscopy in the Classroom: How to Use It and How to Teach It,” with a format falling somewhere between a formal symposium and an informal workshop. With Edwina Westbrook, a member of the M&M 2009 Local Arrangements Committee, acting as an enthusiastic link to the Richmond education community, a half-day program was organized that included seven presentations and a half-hour coffee break in the room, during which attendees could mingle with the speakers and view microscopy demonstrations. The latter included a tabletop SEM provided by Robert Gordon of Hitachi High Technologies America and a tabletop AFM manned by Donovan Leonard, then of Appalachian State University. A display of Project MICRO activities designed to bring light optical microscopy into the classroom was contributed by Caroline Schooley, Project MICRO Coordinator for MSA, and Stuart McKernan of 3M, a Project MICRO volunteer (Figure 1). The morning closed with a discussion session and a drawing for local educators to win two MSA memberships, two teaching kits that included student microscopes, generously donated by Charles Crookenden of The Microscope Store LLC, and several teaching texts. The local educators, who attended at no cost, were then free to visit the M&M Exhibition Hall.

The audience attending the Richmond session was comprised of M&M conference attendees and key members of the Richmond education community. As a result of the session, Edwina Westbrook was later asked to organize several hands-on microscopy workshops in Richmond elementary schools and was named as co-author on a grant proposal for an ongoing microscopy outreach program. Several attendees at the session were eager to participate, and some offered to contribute papers for the next session at M&M 2010 in Portland, OR. Thus, the Richmond meeting provided the general outline for the future “Microscopy in the Classroom” events.

Portland 2010

Donovan Leonard agreed to co-chair the 2010 symposium with Elaine Schumacher. This session included several new speakers, papers for the M&M Proceedings [3], and a program listing in the M&M EXPO publication. The program again encompassed a mix of classroom and outreach teaching techniques and experiences (Figure 2). Authors of two education-related posters, which were submitted to the regular symposia, were invited to present their posters during the break. With the tabletop SEM and other displays (Figure 3), two posters, tables for break refreshments, multiple deliveries of extra chairs to accommodate the growing audience, and positive feedback from attendees, the session was a success.

To make the session an ongoing fixture in the M&M program, “Microscopy in the Classroom” was established as a sub-committee of the MSA Education Committee in 2010. Donovan Leonard agreed to chair the new sub-committee,



Figure 1: Stuart McKernan gives the Richmond audience an overview of MSA's outreach program.



Figure 2: The audience continues to grow in Portland in 2010.



Figure 3: A tabletop SEM was among the displays and demos viewed by Portland attendees as they mingled during the break.

along with Richard Weinkauf of Schoolcraft College, Livonia, MI.

Nashville 2011

Donovan also agreed to co-chair the symposium in Nashville with Sherry Cady of Portland State University. The Nashville session had a format similar to the previous sessions [4]. This time, the list of speakers included Alyssa Calabro, Craig Queenan, and Dave Becker from the Bergen County Academies (BCA), a high school in New Jersey with a research program and an electron microscopy facility (Figure 4) [5]. The session was once again well attended. The team from BCA agreed to take a more active role and volunteered to chair the sessions for the 2012 meeting in Phoenix.

Phoenix 2012

When planning the Phoenix session, the BCA group wanted to make a few changes, the most important being a greater focus on audience interaction and discussion. In order to do this, the number of invited speakers was reduced from previous years, allowing more time for round-table discussions after each presentation.

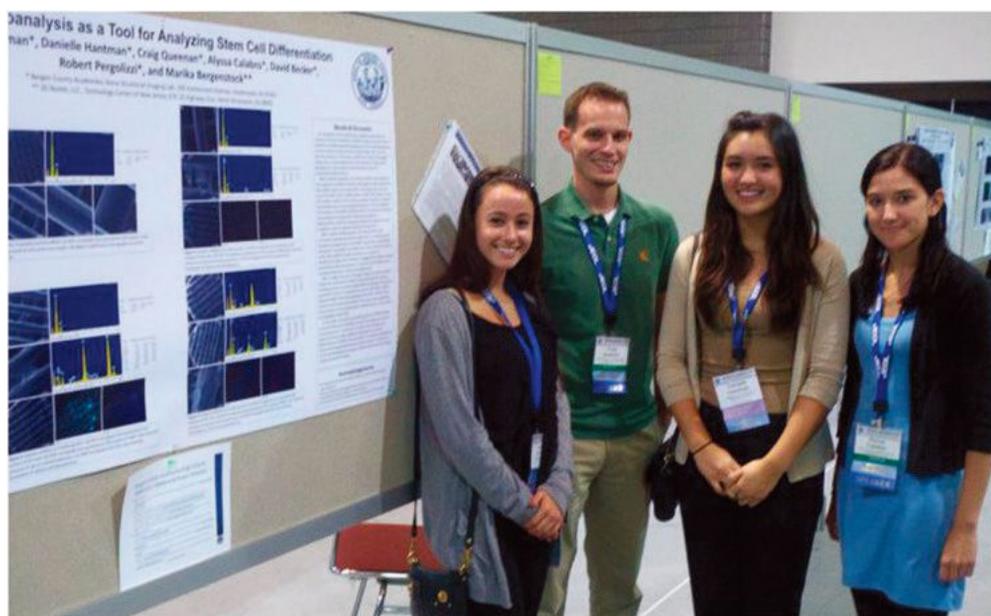


Figure 4: Two high school sophomores from the Bergen County Academies with their mentors Craig Queenan (second from left) and Alyssa Calabro (right) in front of their poster at M&M Nashville.

In addition, each presentation was targeted to a particular group of attendees. The name of the session was changed from “Microscopy in the Classroom: How to Use It and How to Teach It” to “Microscopy in the Classroom: Strategies for Education and Outreach” in order to interest a wider audience. The presentations were planned in a way to avoid overlap in the types of attendees who might be interested in each topic, while still maintaining the theme of strategies for education and outreach. There were three 45-minute presentations, each followed by extended round-table discussions. The presentations were given by Alyssa Calabro of BCA, with updates on their in-house high school microscopy program; Roanna Montoya from a local Phoenix outreach program; and Robert Gordon of Hitachi High Technologies, who described their national microscopy outreach activities [6]. Judged by the attendance and interest, the session again was a success, and the BCA group decided to remain as chairs for the 2013 M&M meeting in Indianapolis.

Indianapolis 2013

Small adjustments were made to the 2013 session. A fourth speaker was added to the session, the presentation and discussion for each speaker was set to 30 minutes, and the presentation times were aligned with the timing structure for the rest of the meeting. The presentation topics included descriptions of a local K–8 outreach program (Jaimie Tiley—Wright-Patterson Air Force Base), a national K–8 outreach program (Nancy Healey—National Nanotechnology Infrastructure Network), a program that paired the Broader Impact requirements of university NSF grants with outreach programs (Tanya Katovich—Office of STEM Education Partnerships, Northwestern University), and a microscopy education program for professionals (Charles Lyman—Lehigh University). Instrument demos by Nanoscience, Hitachi High Technologies, and Nikon provided attendees with hands-on

experience. Papers from the platform presentations and the accompanying poster session were published in the conference program and proceedings [7].

After the success of the session, Alyssa Calabro and Craig Queenan decided to chair the session for a third time at the 2014 M&M meeting in Hartford. They also volunteered to co-chair the Education Outreach component of the MSA Education Committee. The goal for 2014 is to coordinate the different education sessions at the conference and promote the advertising of the sessions to conference attendees, local educators, and administrators.

Hartford 2014

The aim of this year's "Microscopy in the Classroom" is to be even more inclusive. The symposium will again have four 30-minute sessions, each attempting to appeal to different types of attendees interested in education and outreach. The opening 9:00 a.m. presentation will be by Larry Bell of the Nanoscale Informal Science Education Network, Boston Museum of Science, who will discuss a national program for education and outreach and how attendees can get involved. The second presentation will be given by Christine Broadbridge of the Yale University Center for Research on Interface Structures and Phenomena program, which operates a local outreach initiative to surrounding school districts. There will again be an in-room coffee break at 10:00 a.m., where attendees can mingle and demo bench-top microscopes, thanks to a number of vendors that continue to support this session.

After the break, the 10:30 a.m. presentation will be given by Pat Kysar, who will discuss MSA's Certified Electron Microscopy Technologist certification program. The final presentation of the session at 11:00 a.m. will be given by Turgut Fettah Kosar of the New England Microscopy Society, who will describe education and outreach activities through MSA's Local Affiliated Societies. The latter talk should lead to a discussion about how the Local Affiliated Societies can have a greater impact on education and outreach across the country.

Attendees at M&M 2014 are encouraged to participate in one or more of these sessions. If you have an outreach program that would be an interesting topic for presentation next year in Portland, or if you just want to get involved, please reach out to Alyssa Calabro or Craig Queenan.

References

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