UMC Meeting Agenda
St. Botolph Club, 199 Commonwealth Avenue
Boston, Monday, Dec. 1, 2003, noon - 3:00 PM

1. Welcome, self-introductions, UMC membership - Slade Cargill

2. Feedback on preliminary UMC Survey results - Bob Snyder

3. Recruiting undergraduates for materials programs - best practices, comparisons with other engineering enrollment trends - Mufit Akinc and others

4. ABET
   - second round EC2000 experiences, impacts on materials programs, best practices - Gary Messing
   - proposed changes to General Criteria - Slade Cargill
   - initiatives for ABET applied science accreditation - Kirk Kolenbrander

5. Graduate student issues - Alex King
   - INS, visas, delays, etc.
   - Minimum stipends
   - Graduate recruiting and enrollments

6. MIT's new undergraduate materials curriculum and labs - Subra Suresh
   (also opportunity for lab visits at MIT after the UMC meeting)

7. Need for coherent voice for materials community . . .
   - What does the Academic Community Need from Professional Societies?
   - Report from Materials Forum Meeting at CMU - Gary Messing
   - NMAB activities - Alex King
   - FMS activities - Aris Christou (not present)
   - Cooperative activities among materials societies

UMC Current Membership and Officers

64 institutions have paid dues this year

UMC meeting attendance:

<table>
<thead>
<tr>
<th></th>
<th>Spring</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Washington)</td>
<td>(MRS or TMS)</td>
</tr>
<tr>
<td>2003</td>
<td>17</td>
<td>today (Boston)</td>
</tr>
<tr>
<td>2002</td>
<td>27</td>
<td>23 (Boston)</td>
</tr>
<tr>
<td>2001</td>
<td>29</td>
<td>29 (Indianapolis)</td>
</tr>
</tbody>
</table>

Chair 2003-2004

Slade Cargill  
Dept. of Materials Science and Engineering  
Lehigh University

Vice-Chairs

Alan Cramb (Chair 2004-2005)  
Dept. of Materials Science and Engineering  
Carnegie Mellon University

Gary L. Messing (Chair 2005-2006)  
Pennsylvania State University  
Dept of Material Science and Engineering

Executive Committee

2002-2004
Mufit Akinc  
Dept. of Materials Science and Engineering  
Iowa State University

2003-2005
Alex King  
School of Matls. Engr.  
Purdue Univ

Past Chair  
(ex-officio)
Robert L. Snyder  
School of Materials Science and Engineering  
Georgia Institute of Technology
12-01-03 UMC Minutes

Agenda item #1. Slade Cargill (Chair of UMC) reported that there were 29 attendees at the meeting (see list at the end) and 64 paid members of UMC.

Agenda item #2 Bob Snyder gave a preliminary presentation on the results from the 2003 UMC Survey. He requested assistance in reviewing the presentation format, etc. An ad hoc committee of M. Akinc, K. Jones and J. Morrell volunteered to assist. A complete survey will be sent out early 2004.
UMC Benchmark Data (Fall 2003)

Compiled by

Robert L. Snyder
School of Materials Science and Engineering
Georgia Institute of Technology

E-mail: bob.snyder@mse.gatech.edu

Presented at the Fall UMC Meeting
December 1, 2003
UMC 2003 Benchmark Data

Institutions Participating in Survey

Colorado School of Mines
Carnegie Mellon University
University of Virginia
The University of Texas Austin
University of California, Los Angeles
The Ohio State University
University of Arizona
California Polytechnic Institute
Purdue University
The University of British Columbia
Penn State
Northwestern University
Winona State University
Auburn University
John Hopkins University
Lehigh University

North Carolina State University
University of Pittsburgh
University of Missouri -Rolla
University of Wisconsin Madison
Rutgers, The state university of New Jersey
University of Delaware
Virginia Polytechnic Institute and State University
Case Western Reserve University
University of Michigan
University of Illinois
Massachusetts Institute of Technology
Iowa State University
University of Washington
University of Florida
New York State College of Ceramics @ Alfred University
Michigan State University
Georgia Institute of Technology
Agenda item #3
Presentation by Mufit Akinc on undergraduate MSE student recruiting at Iowa State (ISU)

It’s a Materials World!

Akinc
Activities

• **Materials Demos**
  – Hands-on, interactive, fun

• **Events on Campus**
  – Scholars’ Day, Minority Preview Day
  – PWSE “Road Less Traveled”
  – Destination Day, Legacy Day, Science Bound, Iowa Science Center, etc.

• **HS Women Summer Research Interns**

• **Open House for Undeclared Freshmen**
  – Follow up!
Internet Explorers

- Industrially Supported
- Web pages on engineering topics at 6th grade level
- 7 years, 96 interns, half minority, >90% in SMET majors, 10 in MSE at ISU
Recruiting Tips

Top 10 list

1. Make Materials a recognizable term for K-12
2. Focus on best, women & minority students
3. Stress the hands-on excitement of curriculum
4. Stress the quality of instruction
5. Stress personal attention
6. Offer participation in research projects
7. Offer tour of the facilities
8. Offer personal time with faculty
9. Offer Scholarships
10. Talk about jobs: type, salary, flexibility

Akinc
Motivate faculty

- Future of MSE depends on it
- Listed in *Performance Objectives*
- Fun to teach *larger* class & *better* students
- Feeds the research
  - ugrad research helper, graduate recruitment
- Offer reward, and *MEAN IT!*
- Set example: make yourself available

Akinc
Results

• Enrollment: from 67 to >160
• Women: from 15% to 35%
• Minority: from 5% to 10%
• ~1/2 Honors Program students
• 12 National Merit Scholars
• Highest starting salaries in the college

This has been a team effort

Special thanks to Profs. Larry Genalo and Kristen Constant

Akinc
Undergraduate MS&E Enrollment Trends and Recruiting at Lehigh University

UMC Meeting
December 1, 2003
Boston, MA

Slade Cargill
Recruiting Students for Undergraduate Materials Programs

Problem:
Most high school seniors and college freshmen do not know about “materials” as a field of study or as a profession.

Possible Solutions:
Outreach to middle schools and high schools
Materials “camps” (ASM Intern.) for high school students
Visiting days for high school students and their parents
Teaching K-12 teachers about “materials”
Early, continuing contacts with college freshmen
Importance of “common freshman year”
Materials faculty teaching freshman courses:
   Intro. to Engr., Mat. Chem., . . .
Exciting curriculum, excellent teaching and advising,
   research opportunities, internships, . . .

Cargill
U.S. BS Degrees in Metallurgy and Materials
(Flemings and Cahn, 2000)
Materials Degrees per Year

(R. Abbaschian, NMAB, 2002)

![Materials Degrees per Year Chart](chart.png)

Cargill
The Top Twelve U.S. Producers of Materials-Related BS Degrees in 2002

<table>
<thead>
<tr>
<th>Institution</th>
<th>Degrees</th>
<th>Program Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clemson University</td>
<td>37</td>
<td>Ceramic Engineering</td>
</tr>
<tr>
<td>University of Illinois U-C</td>
<td>34</td>
<td>MS&amp;E</td>
</tr>
<tr>
<td>MIT</td>
<td>31</td>
<td>MS&amp;E</td>
</tr>
<tr>
<td>Cal. Poly. San Luis Obispo</td>
<td>30</td>
<td>Materials Engineering</td>
</tr>
<tr>
<td>University of Florida</td>
<td>30</td>
<td>MS&amp;E</td>
</tr>
<tr>
<td>Univ. Missouri Rolla</td>
<td>29</td>
<td>Metallurgical Engr.</td>
</tr>
<tr>
<td>University of Washington</td>
<td>29</td>
<td>MS&amp;E</td>
</tr>
<tr>
<td>Penn. State University</td>
<td>29</td>
<td>MS&amp;E</td>
</tr>
<tr>
<td>Colorado School of Mines</td>
<td>27</td>
<td>Metall. &amp; Mat. Engr.</td>
</tr>
<tr>
<td>University of Michigan</td>
<td>27</td>
<td>MS&amp;E</td>
</tr>
<tr>
<td>Rutgers University</td>
<td>27</td>
<td>Ceramic Engineering</td>
</tr>
<tr>
<td>Michigan Tech. University</td>
<td>26</td>
<td>MS&amp;E</td>
</tr>
</tbody>
</table>
### Matls. BS Degrees as Percent of All Engineering BS Degrees (’00 or ’01)

<table>
<thead>
<tr>
<th>University</th>
<th>Engr. BS Degrees</th>
<th>Matls. BS Degrees</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rutgers University</strong></td>
<td>376</td>
<td>31</td>
<td>8.2%</td>
</tr>
<tr>
<td>Carnegie Mellon University</td>
<td>302</td>
<td>22</td>
<td>7.3%</td>
</tr>
<tr>
<td><strong>Colorado School of Mines</strong></td>
<td>490</td>
<td>34</td>
<td>6.9%</td>
</tr>
<tr>
<td><strong>Lehigh University</strong></td>
<td>324</td>
<td>22</td>
<td>6.8%</td>
</tr>
<tr>
<td>University of Cincinnati</td>
<td>260</td>
<td>17</td>
<td>6.5%</td>
</tr>
<tr>
<td><strong>University of Washington</strong></td>
<td>572</td>
<td>33</td>
<td>5.8%</td>
</tr>
<tr>
<td><strong>University of Florida</strong></td>
<td>762</td>
<td>42</td>
<td>5.5%</td>
</tr>
<tr>
<td>Northwestern University</td>
<td>364</td>
<td>19</td>
<td>5.2%</td>
</tr>
<tr>
<td><strong>Cal. Polytechnic State University</strong></td>
<td>747</td>
<td>38</td>
<td>5.1%</td>
</tr>
<tr>
<td>University of California at Davis</td>
<td>489</td>
<td>24</td>
<td>4.9%</td>
</tr>
<tr>
<td>University of Idaho</td>
<td>133</td>
<td>6</td>
<td>4.5%</td>
</tr>
<tr>
<td><strong>University of Missouri-Rolla</strong></td>
<td>562</td>
<td>25</td>
<td>4.4%</td>
</tr>
<tr>
<td><strong>Massachusetts Institute Technology</strong></td>
<td>660</td>
<td>27</td>
<td>4.1%</td>
</tr>
<tr>
<td><strong>Michigan Technological University</strong></td>
<td>724</td>
<td>30</td>
<td>4.1%</td>
</tr>
<tr>
<td><strong>Univ. of Illinois at Urbana-Champaign</strong></td>
<td>1136</td>
<td>43</td>
<td>3.8%</td>
</tr>
<tr>
<td>Ohio State University</td>
<td>690</td>
<td>25</td>
<td>3.6%</td>
</tr>
<tr>
<td>University of Pennsylvania</td>
<td>336</td>
<td>12</td>
<td>3.6%</td>
</tr>
<tr>
<td>University Of California, Berkeley</td>
<td>899</td>
<td>22</td>
<td>2.4%</td>
</tr>
<tr>
<td><strong>Pennsylvania State University</strong></td>
<td>1370</td>
<td>32</td>
<td>2.3%</td>
</tr>
<tr>
<td>Virginia Polytech. Inst. and State Univ.</td>
<td>961</td>
<td>20</td>
<td>2.1%</td>
</tr>
<tr>
<td><strong>University of Michigan</strong></td>
<td>1183</td>
<td>23</td>
<td>1.9%</td>
</tr>
<tr>
<td>Auburn University</td>
<td>554</td>
<td>6</td>
<td>1.8%</td>
</tr>
<tr>
<td>North Carolina State University</td>
<td>961</td>
<td>15</td>
<td>1.6%</td>
</tr>
<tr>
<td>Purdue University</td>
<td>1074</td>
<td>17</td>
<td>1.6%</td>
</tr>
<tr>
<td>University of California, Los Angeles</td>
<td>387</td>
<td>6</td>
<td>1.5%</td>
</tr>
<tr>
<td>Iowa State University</td>
<td>968</td>
<td>13</td>
<td>1.3%</td>
</tr>
<tr>
<td>Georgia Institute of Technology</td>
<td>1243</td>
<td>15</td>
<td>1.2%</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>18,527</strong></td>
<td><strong>609</strong></td>
<td><strong>4.0%</strong></td>
</tr>
</tbody>
</table>
Engineering Undergraduate Enrollments at Lehigh University ’95-'04

Cargill
Welcome to Lehigh!
Have you decided what you'll be studying for the next four years?

Whether you are a prospective engineer or arts major, you use many different materials in your daily life. Still, these pictures are probably unfamiliar to you -

(Images from NIST Electron Physics Group Nanostructure Collection)

They show aspects of two different advanced materials: domains in an amorphous magnet and nanoscale metal lines on a silicon surface. How are these materials being used to improve everyday life? How were the images made? Find out by learning more about Materials Science and Engineering! You’ve probably heard of electrical, mechanical, civil, and chemical engineering, but

Materials Science and Engineering

may be new to you. It is an undergraduate major in the School of Engineering and Applied Science in which students learn hands-on about developing new materials for advancing technology: to drive the next generation space vehicles, to improve athletic equipment, to make faster computers, to repair broken bones, and to produce safer cars, just to name a few of our goals.

Curious? To learn more about opportunities in Materials Science and Engineering at Lehigh, see the department’s website

http://www.Lehigh.EDU/~inmatsci/major.html

or email Ms. Janie Carlin (jacq@lehigh.edu) for a brochure about MS&E Careers and Lehigh’s program. Drop by the Department Office, 370 Whitaker Lab. Look over the displays and posters about Materials Science and Engineering throughout Whitaker Lab. We can also put you in touch with current MS&E undergraduate majors who can tell you why they chose this major. Finally, to learn more about the many job opportunities available to materials professionals, check out the MS&E Career Resource Center on the web at http://www.crc4mse.org/.
Have you decided what you’ll be studying for the next three years? April 7-8 is the time to choose MS&E as your engineering major!

You use many different materials in your daily life. Still, these pictures are probably unfamiliar to you -

(Images from NIST Electron Physics Group Nanostructure Collection)

They show aspects of two different advanced materials: domains in an amorphous magnet and nanoscale metal lines on a silicon surface. How are these materials being used to improve everyday life? How are the materials made? How are the images obtained? Find out in Materials Science and Engineering. You’ve probably heard of electrical, mechanical, civil, and chemical engineering, but you may know much less about

**Materials Science and Engineering**

Students in Materials Science and Engineering learn hands-on about developing new materials for advancing technology: to drive the next generation space vehicles, to improve athletic equipment, to make faster computers, to repair broken bones, and to produce safer cars, just to name a few of our goals. Our B.S. graduates work for major corporations, local companies, or government labs, or go on to graduate school in engineering, business, law, or education.

To learn more about opportunities in Materials Science and Engineering at Lehigh, see our website http://www.Lehigh.EDU/~inmatsci/major.html, drop in to see our department chair, Slade Cargill, or associate chair, Alwyn Eades, in 370 Whitaker Lab, or talk with other faculty or students in MS&E.

Look over the displays and posters about Materials throughout Whitaker Lab and in the Packard Lab lobby. We can also put you in touch with current MS&E undergraduate majors who can tell you why they chose this major -- small classes, hands-on labs, lots of social events. Finally, to learn more about the many job opportunities available to materials professionals, check out the MS&E Career Resource Center on the web at http://www.crc4mse.org/.

Register as a Materials Science and Engineering major in 367 Packard Laboratory on Monday or Tuesday, April 7 - 8, at 4:10 p.m.

Cargill
Freshmen entering Materials Science and Engineering . . .

Welcome to MS&E! Here are TWO invitations to you for THURSDAY, APRIL 24 --

Join us for pizza lunch at NOON, in the MS&E Student Lounge, 349 Whitaker Lab. This is a chance for most of you to meet your faculty advisors and to meet faculty who will be teaching the MS&E courses you will be taking in Fall term. Also we will have "MS&E Class of 2006" T-shirts for you, and we will be taking snapshots for our Class of 2006 photo collection.

Please join us later on Thursday afternoon, for the annual Spring Student-Faculty Picnic, sponsored by the Student Materials Society, at 4:30 P.M. on the plaza between the front and back parts of Whitaker Lab. This year you will be a guest of the Department, but next year you will have to pay your own way, and help with the work! This is a chance to meet other MS&E undergraduates, faculty, and staff members, as well as have dinner.

Please confirm by email to Arnita Copeland (ACL8), or simply by replying to this email, to let her know whether you will be able to come to the pizza lunch and to the picnic.

I do hope that you will be able to come. I look forward to meeting all of you.

Regards,

Slade Cargill
Professor and Department Chair
Materials Science and Engineering

Cargill
Welcome! We are very glad you have decided to major in MS&E. You will find that we are much more than just classes -- like picnics, coffee time, and friendships with other students, faculty and staff.

Please take a few minutes to let us know why you decided to major in MS&E by answering the following questions:

**How important were the following factors in your deciding on MS&E?**

1. What you knew about MS&E before coming to Lehigh……….Very 1 / Some 10/ None 9
2. What you learned about MS&E in the MS&E lecture in Engr 2…Very 10/ Some 7/ None 1
3. Your visit to the MS&E department as part of Engr 2…………….Very 11/ Some 2/ None 5
4. Information you received from other MS&E undergraduates……Very 7/ Some 9/ None 4
5. Information you received from MS&E graduate students…………Very 2/ Some 6/ None 12
6. Did you take Engineering 95?  Y 10 or N 10?  Fall term?_____ or Spring term?_____
   If yes . . . . .
   What you learned in the MS&E lecture in Engr 95……………..Very 7/ Some 2/ None 1
   By doing an Engr 95 projects in MS&E………………………..Very 7/ Some 0/ None 3
   By hearing about one of the MS&E Engr 95 projects………..Very 1/ Some 8/ None 1
7. Did you take Mat 33?  Y or N?
   If yes . . . . .
   What you learned about MS&E in Mat 33…………………..Very / Some / None?
8. Other factors?  Info in Lehigh Catalog?  MS&E web pages?  MS&E mailings?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Cargill
Other factors? Lehigh Catalog? MS&E web pages MS&E mailings?

It looked like fun.
Course Catalog helpful, speaking with other undergraduates in the program.
Course Catalog was helpful in demonstrating what the classes involve.
MSE undergrads helped the most.
Candidates Day visit to the department last April.
Work Study.
MS&E web page was a big help.
MSE mailing, Lehigh Catalog somewhat, web page very helpful.
Courses in the catalog looked interested, sounded more interesting than other majors.
My advisor was from MS&E.
Mailings.
Info. in the catalog helped.
My uncle was a MS&E major, and he also helped convince me.
Seemed like a very flexible major, and that I would enjoy it.
What's Distinctive about Undergraduate Materials Science and Engineering at Lehigh?

1. Hands-on learning to forge links between theory and practice and to develop new and improved materials for advancing technology

2. Close student-faculty interactions, with only 25 - 30 undergrads per year and 14 full time faculty - small classes, intensive labs, lots of social events

3. Broad scope of materials applications - nanotechnology, electronics, photonics, automotive, sports, aerospace, medicine, energy . . .

4. World-wide reputation in materials characterization - undergraduates use electron microscopes and other state-of-art instruments in labs and in projects

5. Strong interdisciplinary links to other departments, universities, companies, and national labs provide opportunities for technical minors, joint degrees, student projects, internships, and jobs
Recruiting Students for Undergraduate Materials Programs

Problem:
Most high school seniors and college freshmen do not know about “materials” as a field of study or as a profession

Possible Solutions:
Outreach to middle schools and high schools
Materials “camps” (ASM Intern.) for high school students
Visiting days for high school students and their parents
Teaching K-12 teachers about “materials”
Early contacts with college freshmen
Importance of “common freshman year”
Materials faculty teaching freshman courses:
   Intro. to Engr., Mat. Chem., . . .
Exciting curriculum, excellent teaching and advising,
   research opportunities, internships, . . .
Other experiences about undergraduate recruiting

Bob Snyder – emphasis on nano and bio has had a positive impact

Alex King – Freshman engineering class is fertile ground for recruiting. Engage current undergrads in the recruiting process.

Ian Robertson – Open house(s) have had a major impact on raising awareness (71 frosh this year!)

Gary Messing – use four year scholarships to recruit for the long term. Open houses have been very effective for recruiting high school students and uncommitted frosh.
Agenda topic #4

ABET 2000 review in Fall of 2000

Department of Ceramic and Materials Engineering
Rutgers University. (Tom Tsakalakos)

We got an interim visit as a result of the fact that we had only closed the feedback and improvement loop one time.

The reason for this was that we were late in getting all our feedback mechanisms in place, and had only been practicing ABET 2000 for about 1 year prior to this visit.

Tsakalakos
In the ABET 2000 visit in the Fall of 2000, they found that we had three weaknesses:

1. informal and emerging procedures regarding demonstration of achievement of our educational objectives and program effectiveness.

2. outcomes assessment was limited and informal and incomplete, and no process to assess student preparation for grad school was in place, nor was there documentation of student achievement relevant to enter the field.

3. co-op was treated as a capstone design experience, but there were no guarantees in place to insure that all capstone requirements were met by all students.

During the Fall 2002 interim visit, they found that all weaknesses had been resolved! I think we can say that it requires a great deal of effort and commitment to carry out ABET 2000.

I also feel that it gives Departments means to improve its program in real time.

ABET 2000 requires all faculty to buy-in to the process and a very dedicated Undergraduate Director. We plan to create an additional position of ABET Coordinator.

Tsakalakos
Agenda topic #4

Slade Cargill showed proposed changes in the General ABET criteria.

Actually the changes had already been approved in June ‘03. It was recommended that future changes be brought to the UMC earlier for input.

Also, the possibility for a new ABET applied science in materials for schools not having MatSE departments was suggested by Slade Cargill. There was not enough time for discussion but initial response was to go slow with creating yet another division in the materials community.

Agenda topic #5 was differed to another meeting
Topic #6

This is the PDF of Subra Suresh’s presentation on the new undergraduate curriculum at MIT (double click)

Agenda topic #7 – Need for coherent voice for materials was differed to another meeting. Notes from NMAB sponsored Materials Forum meeting on professional societies was emailed to all UMC members


Minutes reported by Gary L. Messing on behalf of Alan Cramb (12/24/03)
In attendance
Slade Cargill <gsc3@Lehigh.EDU>
Alexking@ecn.purdue.edu
Bob.Snyder@mse.gatech.edu
Cammarata@jhu.edu
Carl_koch@ncsu.edu
Clemens@soe.stanford.edu
Daniel.young@wright.edu
davies@lrsm.upenn.edu
duqued@rpi.edu
gogotsi@drexel.edu
ianr@uiuc.edu
j.wittig@vanderbilt.edu
Jonathan E Spanier <spanier@drexel.edu>
jtodd@psu.edu
kdk@mit.edu
kjones@eng.ufl.edu
makinc@iastate.edu
mdudley@notes.cc.sunysb.edu
messing@matse.psu.edu
misture@alfred.edu
nutt@usc.edu
peterjon@engin.umich.edu
pliaw@utk.edu
P-voorhees@northwestern.edu
Rabolt@udel.edu
smahajan@asu.edu
Ssuresh@mit.edu
tsakalak@rci.rutgers.edu