National Educators' Workshop: Update 97

Standard Experiments in Engineering Materials, Science, and Technology

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NEW:Update 97, hosted by Boeing Commercial Airplane Company in Seattle, Washington, on November 2 - 5, 1997, marked our second workshop west of the Mississippi. Seattle took a break from heavy rains and provided beautiful weather.

We built on past themes, activities, and presentations based on extensive evaluations from participants of previous workshops. This 12th annual NEW:Update continued to the work of strengthening materials education. About 120 participants witnessed demonstrations of experiments, discussed issues of materials science and engineering (MSE) with people from education, industry, government, and technical societies; heard about new MSE developments; and chose from nine, three-hour mini workshops in state-of-the-art Boeing production facilities and R&D laboratories to attend. Faculty in attendance represented high schools, community colleges, smaller colleges, and major universities. Undergraduate and graduate students also attended and presented.

The generous fashion in which Alan Miller and Brian Smith, and the many scientist, engineers, and other staff of Boeing, provided funding, opened their facilities, developed presentations and activities, and acted as all around gracious hosts insured the on-going quality of this important educational series of workshops. With the very demanding production schedule Boeing faces, we are indebted for their sacrifices in hosting this workshop.

NEW:Update 97 participants saw the demonstration of about forty experiments and aided in evaluating them. We also heard updating information relating to materials science, engineering and technology presented at mini plenary sessions that focused on technology from aircraft and automotive technology, and materials research at Brookhaven National Lab. Through the considerable efforts of Kris Kern at LANL, Raj Chaudhury of NSU, and Roger Marshall and William Gerds of Boeing, most of the workshop was broadcast over the Internet.

The experiments in this publication can serve as a valuable guide to faculty who are interested in useful activities for their students. The material was the result of years of research aimed at better methods of teaching materials science, engineering and technology. The experiments were developed by faculty, scientists, and engineers throughout the United States. There is a blend of experiments on new materials and traditional materials. Uses of computers in MSE, designing experiments, and a variety of low-cost experiments were among the demonstrations presented.

Experiments underwent an extensive peer review process. After submission of abstracts, selected authors were notified of their acceptance and given the format for submission of experiments. Experiments were reviewed by a panel of specialists through the cooperation of the Materials Education Council. Most authors received comments from the panel prior to NEW:Update 97, allowing them to make necessary adjustments prior to demonstrating their experiments. Comments from workshop participants provided additional feedback which authors used to make final revisions which were submitted for the NASA editorial group for this publication.
The Materials Education Council of the United States publishes selected experiments in the 
Journal of Materials Education (JME). The international JME offers valuable teaching and 
curriculum aids including instructional modules on emerging materials technology, experiments,
book reviews, and editorials to materials educators. On a personal note, MEC honored Jim 
Jacobs as “1996 Materials Educator of the Year” at the December MRS meeting in Boston. 
This award must be shared with all the people who have contributed to the NEW:Update series,
our textbooks, and the many activities of our national materials education network.

Videotapes were made of the workshop by Boeing. Transparency masters for the mini plenary 
sessions are included in this publication. As with previous NEW:Updates, critiques were made 
of the workshop to provide continuing improvement of this activity. The evaluations and 
recommendations made by participants provide valuable feedback for the planning of 
subsequent NEW:Updates.

NEW:Update 97 and the series of workshops that go back to 1986 are, to our knowledge, the 
only national workshops or gatherings for materials educators that have a focus on the full range 
of issues and strategies for better teaching about the entire complement of materials. 
NEW:Update 97, with its diversity of faculty, industry, and government MSE participants, served 
as a forum for both formal and informal issues facing MSE education that ranged from the 
challenges of keeping faculty and students abreast of new technology to ideas to ensure that 
materials scientists, engineers, and technicians maintain the proper respect for the environment 
and human safety in the pursuit of their objectives.

We demonstrated the Experiments in Materials Science, Engineering & Technology, (EMSET) CD-
ROM with all 213 experiments from the first decade of NEW:Updates. This CD ROM is 
another example of cooperative efforts to support materials education. The primary 
contributions came from the many authors of the demo and experiments for NEW:Updates. 
Funding for the CD came from both private industry and federal agencies. Please see the 
attached information for obtaining the CD set.

We express our appreciation to all those who helped to keep this series of workshops viable. 
Special thanks goes to those on the planning committee, management team, hosts, sponsors, and 
especially those of you have developed and shared your ideas for experiments, demonstrations, 
and novel approaches to learning. All of us who participated in the workshop appreciated the 
excellent coordination of activities by Diana LaClairc, Kirsten Maassen, and Ginger Freeman.

We hope that the experiments presented in this publication will assist you in teaching about 
materials science, engineering and technology. We would like to have your comments on their 
value and means of improving them. Please send comments to Jim Jacobs, School of 
Technology, Norfolk State University, Norfolk, Virginia 23504.

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Update 97: Standard Experiments in Engineering Materials, Science, and Technology

November 2 - 5, 1997 - Boeing Commercial Airplane Company

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Draayer, B. F., Dahiya, J. N. "A Computerized Microwave Spectrometer for Dielectric Relaxation Studies"
Marshall, John A. "Magneto-Rheological Fluid Technology"
Umana, Carlos E. "How to Compute the Atomic Magnetic Dipole Moment of An Element: An Engineering Approach"
Warren, Matthew E., Loutts, George. "Optical Experiments With Manganese Doped Yttrium Orthoaluminate, A Potential Material For Holographic Recording and Data Storage"
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Nelson, James A.  "Composites: Fiberglass Hand Laminating Process"

NEW: Update 89  NASA Conference Publication 3074
Beardmore, Peter.  "Future Automotive Materials - Evolution or Revolution"
Chung, Wenchiang R.  "The Assessment of Metal Fiber Reinforced Polymeric Composites"
Coleman, J. Mario.  "Using Template/Hotwire Cutting to Demonstrate Moldless Composite Fabrication"

NEW: Update 90  NIST Special Publication 822
Bunnell, L. R.  "Simple Stressed-Skin Composites Using Paper Reinforcement"
Schmenk, Myron J.  "Fabrication and Evaluation of a Simple Composite Structural Beam"
West, Harvey A. and Sprecher, A. F.  "Fiber Reinforced Composite Materials"

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Greet, Richard J.  "Composite Column of Common Materials"

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Webber, M. D. and Harvey A. West.  "Continuous Unidirectional Fiber Reinforced Composites: Fabrication and Testing"

NEW: Update 95  NASA Conference Publication 3330
Craig, Douglas F., "Role of Processing in Total Materials"
Wilkerson, Amy Laurie, "Computerized Testing of Woven Composite Materials"

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Gardea, Luis, Weick, Brian L.  "A Method for Measuring the Shear Strength of Polymers and Composites"
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- Nelson, James A.  "Glasses and Ceramics: Making and Testing Superconductors"
- Schull, Robert D.  "High Tc Superconductors: Are They Magnetic?"

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- Beardmore, Peter.  "Future Automotive Materials - Evolution or Revolution"
- Link, Bruce.  "Ceramic Fibers"
- Nagy, James P.  "Austempering"
- Ries, Heidi R.  "Dielectric Determination of the Glass Transition Temperature"

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- Dahiya, J. N.  "Dielectric Behavior of Superconductors at Microwave Frequencies"
- Jordan, Gail W.  "Adapting Archimedes' Method for Determining Densities and Porosities of Small Ceramic Samples"

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- Dahiya, J. N.  "Dielectric Behavior of Semiconductors at Microwave Frequencies"
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- Henshaw, John M.  "Fracture of Glass"
- Stephan, Patrick M.  "High Thermal Conductivity of Diamond"
- Vanasupa, Linda S.  "A 5.69 Look at Thermoplastic Softening"

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- Burchell, Timothy D.  "Developments in Carbon Materials"
- Dahiya, J.N.  "Dielectric Measurements of Selected Ceramics at Microwave Frequencies"
- Ketron, L.A.  "Preparation of Simple Plaster Mold for Slip Casting and Slip Casting"
- Masi, James V.  "Experiments in Diamond Film Fabrication in Table Top Plasma Apparatus"
- Westler, David E.  "Microwave Sintering of Machining Inserts"

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- Long, William G., "Introduction to Continuous Fiber Ceramic Composites"
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Masi, James V. "Experiments in Corrosion for Younger Students By and For Older Students"

Needham, David. "Micropipet Manipulation of Lipid Membranes: Direct Measurement of the Material Properties of a Cohesive Structure That is Only Two Molecules Thick"

Perkins, Steven W. "Direct Tension Experiments on Compacted Granular Materials"

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Rustum Roy  
Evan Pugh Professor of the Solid State  
The Pennsylvania State University

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The Pennsylvania State University

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Carlos E. Umana - University of Costa Rica

## TEACHING REPORT WRITING USING MSE LABORATORIES

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RECOGNIZING CONTRIBUTIONS
REGISTRATION

Diana LaClaire, Ginger Freeman, and Brian Smith
MINI WORKSHOPS
MINI WORKSHOPS (CONCLUDED)
777 Advanced Materials Use

Alloys:

1. Ti 10-2-3 (BMS 7-260)
2. 2XXX-T3, -T42, -T36 (BMS 7-316, 327)
3. 7055-T77 (BMS 7-307, 308)
4. 7150-T77 (BMS 7-306)
5. Ti 6-4 6-ELI
6. Ti 15-3-3-3 (BMS 7-324, 281)
7. Ti 821S

Composites:

8. Toughened CFRP (BMS 8-276)
9. Pitch corr (BMS 8-339)
10. ATL CFRP tape (BMS 8-256)
11. AL Mesh (BMS 8-336)

Note: 7050-T76 (BMS 7-325), 6013-T6, and GLARE (BMS 7-325) sheet not shown