Materials Education
Materials Education

Symposium held December 1–3, 2009, Boston, Massachusetts, U.S.A.

EDITORS:

M.M. Patterson
University of Wisconsin-Stout
Menomonie, Wisconsin, U.S.A.

E.D. Marshall
New York Hall of Science
Queens, New York, U.S.A.

C.G. Wade
IBM Almaden Research Center
San Jose, California, U.S.A.

J.A. Nucci
Cornell University
Ithaca, New York, U.S.A.

D.J. Dunham
University of Wisconsin-Eau Claire
Eau Claire, Wisconsin, U.S.A.

Materials Research Society
Warrendale, Pennsylvania
CONTENTS

Preface .............................................................................................................................................. ix

Materials Research Society Symposium Proceedings ........................................................................ x

Teaching Materials’ Properties to K-12 Students Using a Sensor Board ............................................. 1
Theodoros Pierratos, Evangelos Koltsakis, and Hariton M. Polatoglou

*Deaf and Hard of Hearing Undergraduate Interns Investigate Smart Polymeric Materials ............... 7
Peggy Cebe, Daniel Cherdack, Robert Guertin, Terry Haas, Wenwen Huang, B.S. Ince-Gunduz, Roger Tobin, and Regina Valluzzi

Research Grade Instrumentation for Nanotechnology and MSE Education .......................................... 17
Christine Broadbridge, Jacquelynn Garofano, Eric Altman, Yehia Khalil, Victor Henrich, Yaron Segal, Myrtle-Rose Padmore, Philip Michael, and Fred Walker

*Innovative Evaluation of Two Materials Science Education Enrichment Programs ......................... 23
Daniel J. Steinberg, Shannon L. Greco, and Kimberly Carroll

Marni Goldman Tribute: Contributions to Materials Science Education ............................................. 35
Charles G. Wade and Curtis Frank

Addressing Diversity in STEM Education: Authenticity and Integration .............................................. 39
Fiona M. Goodchild and Maria O. Aguirre

Identification, Development and Implementation of Nanoscience Activities for Alabama K-12 .......... 45
Martin Bakker, Katrina Staggemeier, Amy Grano, Aaron Kuntz, Jim Gleason, Leigh McKenzie, Brenda O’Neal, and Rachel Pace

*Invited Paper
Multi-Institute Team Teaching (MITT): A Novel Approach to Highly Specialized Graduate Education

William R. Heffner, Himanshu Jain, Steve W. Martin, Kathleen Richardson, and Eric Skaar

Tackling Science Communication with REU Students: A Formative Evaluation of a Collaborative Approach

Carol Lynn Alpert, Eliot Levine, Carol F. Barry, Jacqueline Isaacs, Alex Fiorentino, Kathryn Hollar, and Karine Thate

Academic/Industrial/NSF Collaborations at the IBM Almaden Research Center — Benefits from Dr. Marni Goldman's Involvement

Charles G. Wade, Dolores C. Miller, Kristin Black, Curtis Frank, and Joseph Pesek

Using a Low Cost Indentation Apparatus for the Study of Mechanical Properties of Thermoinsulating Materials and Its Utilization in the Laboratory Practice of Students

Charilaos A. Tsihouridis and Hariton M. Polatoglou

Introduction of Role Playing to a Research Ethics Module for the Undergraduate

Dolores C. Miller, Frances A. Houle, Janet Stemwedel, Joseph Pesek, and Charles G. Wade

Discovery Learning Tools in Materials Science: Concept Visualization with Dynamic and Interactive Spreadsheets

Scott A. Sinex and Joshua Halpern

Authentic Science Research and the Utilization of Nanoscience in the Non-Traditional Classroom Setting

Deborah A. Day, Zizi Yu, Zelun Wang, Jennifer Dalecki, Arian Jadbabaie, Emily Z. Feng, Thomas J. Mattessich, Christine Broadbridge, Mark Reed, and Ryan Munden

Materials Science as a High School Capstone Course for the Physics First Curriculum

Nathan A. Unterman

Development and Delivery of an Online Graduate Certificate in Materials Characterization for Working Professionals

Pamela L. Dickrell and Luisa A. Dempere
Increased focus on educational transformation in STEM disciplines has led to a burgeoning field of materials education research. Its style is largely based on physics education research (PER), but some contributors also model the scholarship of teaching and learning (SoTL). Materials Education's scope is growing rapidly. This volume captures the events of Symposium PP, "Materials Education," held December 1–3 at the 2009 MRS Fall Meeting in Boston, Massachusetts. An inspirational story motivated the unique focus of this symposium: accessible education at all levels, "K through Grey."

Marni Goldman was honored as a pioneer in the field, promoting excellence and accessibility in materials research education at Stanford, while also promoting educational opportunities for the disabled. The work presented in this volume therefore spans traditional materials education research in higher education; SoTL work in K-12 schools, higher education, museums and outreach organizations; accessibility research for learners and professionals with disabilities (ranging from acute physical to "hidden" mental); and materials education and outreach programs of Materials Research Science and Engineering Centers (MRSECs), Nanoscale Science and Engineering Centers (NSECs) and the Nanoscale Informal Science Education Network (NISE Net).

This symposium would not have been able to coalesce, nor would speakers and participants be able to focus on cross-cutting issues affecting different audiences, without the tireless efforts of Materials Research Society staff and generous financial support from the National Science Foundation (DMR-0951410), the IBM Almaden Research Center, Hysitron, Stanford University, and the Goldman Family.

M.M. Patterson  
E.D. Marshall  
C.G. Wade  
J.A. Nucci  
D.J. Dunham  

March 2010