

# MUDD DESIGN WORKSHOP IV DESIGNING ENGINEERING EDUCATION

Proceedings of a Workshop

10-12 July 2003

Clive L. Dym, Editor

## Foreword

The papers on this compact disk (CD) represent the proceedings of Mudd Design Workshop IV, "Designing Engineering Education," which was held on the campus of Harvey Mudd College in Claremont, California, during 10–12 July 2003. Supported by the Boeing Company, the GE Fund, Hughes Electronics, and Harvey Mudd College's Department of Engineering, this workshop brought together engineering educators and practitioners over three very busy days to discuss the state of engineering education and the prospects for the re-design of the engineering educational enterprise.

A broad variety of engineering education issues were discussed. Sessions were devoted to: ABET's EC 2000; barriers to change; learning and motivation; the many roles of design; and the ethos of and ethics in both education and practice. Major emergent themes included the need for engineers to educate the public and their policy makers about the processes of engineering; that research into engineering learning must be conducted by (at least in part) and recognized by engineering faculty; that design can motivate and enhance the place of values and ethics in undergraduate curricula; and that positive change is emerging in engineering education, notwithstanding the formidable and enduring barriers to such change. Before leaving, participants converged on a set of goals that they would try to advance — both individually and collectively.

The workshop sessions were constructed to give *everyone* a chance to participate, to be heard as well as to listen. Workshop sessions were typically scheduled for two hours, starting with brief presentations by three or four panelists in each session, and concluding with moderated, open discussion. Panelists were asked to reflect on ideas and attitudes about things to be done in the future, rather focusing on their own current research. The papers that appear here are (for the most part) the panelists' position papers. Clearly, these papers represent a rich body of experience and knowledge that, I hope, can be brought to bear in support of education revision and reform with the same intelligence and vigor that the participants brought to MDW IV.

Two luncheon talks were presented. Clive Dym briefly suggested at the opening lunch that the workshop participants should take a broad, systems- and design-oriented view of the engineering educational enterprise. Our keynote speaker, at the same luncheon, was William A. Wulf, President of the National Academy of Engineering. In his talk, "Some Thoughts on Engineering as a Humanistic Discipline," Dr. Wulf suggested that engineering faculty were not fulfilling their responsibility to educate the broader community about the processes of engineering, thus leaving a public that is technologically less than literate and so unable to understand technical decisions or to trust that good decisions would be made on their behalf.

We were fortunate in having two after-dinner speakers. Professor Thomas R. Chase of the University of Minnesota gave a wonderfully enthusiastic talk about the design of a device to capture neutrinos, "Large Scale Manufacturing for Tiny Particle." At our Friday banquet, Dr. Erik K. Antonsson, Chief Technology Officer of the Jet Propulsion Laboratory, provided a thoughtful and detailed overview of the design of Mars missions in, "Engineering Design: The View from Mars." The PowerPoint slides used by Drs. Chase and Antonsson are available on this CD.

I want to acknowledge once again the support of the remaining members of MDW IV's Organizing Committee. They worked hard to maintain the MDW's reputation for providing an informative, stimulating and inspiring venue for discussing engineering education: Denice D. Denton, University of Washington; Philip E. Doepker, University of Dayton; Larry J. Leifer,

Stanford University; John McMasters, The Boeing Company; Gregory B. Olson, Northwestern University; John W. Prados, University of Tennessee, Knoxville; Sheri D. Sheppard, Stanford University; and John W. Wesner, Carnegie Mellon University. The Organizing Committee's involvement led to another MDW that was stimulating, thought-provoking and interesting, as well as being serious, engaging and fun.

Finally, Harvey Mudd College continues to offer the MDWs a very supportive environment. Tony Bright, Chair of the Department of Engineering, deserves my thanks, as do Dean of Faculty Sheldon Wettack, President Jon Strauss, and College Relations' Sally Rich Arroyo. But most of all, I *vigorously* and *cheerfully* thank Sue Lindley of the Department of Engineering and Holly Hauck of the Department of Humanities and Social Sciences. Sue became the lead designer and implementer of all of our "deliverables," brilliantly maintaining "the MDW look and feel" for the MDW IV and Center for Design Education (CDE) web sites, as well as for this CD. Holly, as she has done twice before for MDWs II and III, again made the MDW IV trains run on time. Lastly, of course, I thank our generous benefactors once again: The Boeing Company, The GE Fund, Hughes Electronics, and Harvey Mudd College's Department of Engineering.

**Clive L. Dym**  
Director, Center for Design Education  
Harvey Mudd College  
Claremont CA 91711-5990  
clive\_dym@hmc.edu



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**Editor: Clive L. Dym**

**ORGANIZING COMMITTEE:** Denice D. Denton, *University of Washington*; Philip E. Doepker, *University of Dayton*; Clive L. Dym, *Harvey Mudd College (Chair)*; Larry J. Leifer, *Stanford University*; John H. McMasters, *The Boeing Company*; Gregory B. Olson, *Northwestern University*; John W. Prados, *University of Tennessee Knoxville*; Sheri D. Sheppard, *Stanford University*; and John W. Wesner, *Carnegie Mellon University*.

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**Robin S. Adams**

Center for Engineering Learning & Teaching  
University of Washington  
Room 225, Engineering Annex  
Box 352180  
Seattle, WA 98195-2100  
Voice: (206) 616-0615  
FAX: (206) 221-3161  
Email: radams@u.washington.edu

**Marisa Bauer**

Electrical Engineering and  
Computer Science  
University of California, Berkeley  
Berkeley, CA 94720  
Voice: (510) 847-3733  
FAX:  
Email: mbauer@uclink.berkeley.edu

**Alice M. Agogino**

Mechanical Engineering  
University of California, Berkeley  
5136 Etcheverry Hall  
Berkeley, CA 94720-1740  
Voice: (510) 642-6450  
FAX: (510) 643-5599  
Email: aagogino@me.berkeley.edu

**Carl J. Baumgaertner**

Engineering  
Harvey Mudd College  
301 E. 12<sup>th</sup> Street  
Claremont, CA 91711  
Voice: (909) 607-1842  
FAX: (909) 621-8967  
Email: baumgaer@hmc.edu

**Aaron Altman**

Mechanical and Aerospace Engineering  
University of Dayton  
300 College Park  
Dayton, OH 45469  
Voice: (937) 229-5353 or 229-2229  
FAX: (937) 229-4766  
Email: aaron.altman@notes.udayton.edu

**Tony Bright**

Engineering  
Harvey Mudd College  
301 E. 12th Street  
Claremont, CA 91711  
Voice: (909) 607-7940  
FAX: (909) 621-8967  
Email: abright@hmc.edu

**Erik K. Antonsson**

California Institute of Technology  
Jet Propulsion Laboratory  
4800 Oak Grove Drive  
Mail Stop 180-601  
Pasadena, CA 91109-8099  
Voice: (818) 393-7600  
FAX: (818) 354-1242  
Email: Erik.K.Antonsson@jpl.nasa.gov

**Mary P. Cardenas**

Engineering  
Harvey Mudd College  
301 E. 12th Street  
Claremont, CA 91711  
Voice: (909) 607-1249  
FAX: (909) 621-8967  
Email: mary\_cardenas@hmc.edu



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**Lawrence E. Carlson**

Integrated Teaching and Learning Lab  
University of Colorado at Boulder  
1045 Regent Drive  
522 UCB  
Boulder, CO 80309-0522  
Voice: (303) 492-8112  
FAX: (303) 492-8825  
Email: lawrence.carlson@colorado.edu

**Phillip E. Doepker**

Mechanical and Aerospace Engineering  
University of Dayton  
300 College Park Drive  
Dayton, OH 45469-0210  
Voice: (937) 229-2971  
FAX: (937) 229-4922  
Email: phil.doepker@notes.udayton.edu

**Tom R. Chase**

Mechanical Engineering Department  
University of Minnesota  
111 Church Street, SE  
Minneapolis, MN 55455  
Voice: (612) 625-0308  
FAX: (612) 625-9395  
Email: trchase@me.umn.edu

**Clive L. Dym**

Engineering  
Harvey Mudd College  
301 East 12th Street  
Claremont, CA 91711  
Voice: (909) 621-8853  
FAX: (909) 621-8967  
Email: clive\_dym@hmc.edu

**J. Edward Colgate**

Mechanical Engineering  
Northwestern University  
2145 Sheridan Road  
Evanston, IL 60208-3111  
Voice: (847) 491-4264  
FAX: (847) 491-3915  
Email: colgate@northwestern.edu

**John M. Feland**

Mechanical Engineering  
Stanford University  
Center for Design Research  
Bldg. 560, 424 Panama Mall  
Stanford, CA 94305-2232  
Voice: (650) 868-0114  
FAX: (650) 725-8475  
Email: gohogs@cdr.stanford.edu

**Richard F. Devon**

Engineering Design/SEDTPP  
Penn State  
213 Hammond Building  
State College, PA 16802  
Voice: (814) 865-3163  
FAX: (814) 863-7229  
Email: rdevon@psu.edu

**Dominico Grasso**

Picker Engineering Program  
Smith College  
51 College Lane  
Northampton, MA 01063  
Voice: (413) 585-7000  
FAX: (413) 585-7001  
Email: mschaft@smith.edu



Designing Engineering Education  
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---

**Ray Haynes**

Northrop Grumman Space Technology  
One Space Park Drive  
Redondo Beach, CA 90278  
Voice: (310) 812-5572  
FAX:  
Email: ray.haynes@ngc.com

**Larry J. Leifer**

Design Engineering (Mechatronics)  
Stanford University  
831 Esplanada Way  
Stanford, CA 94305  
Voice: (650) 723-1869  
FAX: (650) 493-6481  
Email: leifer@cdr.stanford.edu

**Stephen J. Lukasik**

1714 Stone Canyon Road  
Los Angeles, CA 90077  
Voice: (310) 472-9872  
FAX: (310) 472-0019  
Email: steve@gnsl.org

**Christopher L. Magee**

Mechanical Engineering & ESD  
Massachusetts Institute of Technology  
77 Massachusetts Avenue  
Room E60-275  
Cambridge, MA 02139  
Voice: (617) 252-1077  
FAX: (617) 258-0845  
Email: cmagee@mit.edu

**Spencer P. Magleby**

Mechanical Engineering  
Brigham Young University  
435 CTB, Mechanical Engineering  
Provo, UT 84602  
Voice: (801) 422-3151  
FAX: (801) 422-0516  
Email: magleby@byu.edu

**John H. McMasters**

Commercial Airlines & Engineering  
The Boeing Company  
P. O. Box 3707  
M/C 6Y-93  
Seattle, WA 98124-2207  
Voice: (425) 393-2610  
FAX: (425) 393-2616  
Email: john.h.mcmasters@boeing.com

**Ton Meijknecht**

Technical University of Delft  
Voorstraat 60  
2611 JS Delft  
The Netherlands  
Voice: +31 15 2123421  
FAX: +31 15 2136141  
Email: t.meijknecht@motiv.tudelft.nl

**Catherine Newman**

Mechanical Engineering  
University of California, Berkeley  
6102 Etcheverry Hall  
Voice: (510) 541-3439  
Email: kay@tildenpark.com



Designing Engineering Education  
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---

**David Ollis**

Chemical Engineering  
North Carolina State University  
Raleigh, NC 27695-7905  
Voice: (919) 515-2329  
FAX: (919) 515-3465  
Email: ollis@eos.ncsu.edu

**John W. Prados**

Chemical Engineering  
The University of Tennessee  
419 Dougherty Engineering Building  
1512 Middle Drive  
Knoxville, TN 37996-2200  
Voice: (865) 974-6053  
FAX: (865) 974-7076  
Email: jprados@utk.edu

**Greg B. Olson**

Materials Science & Engineering  
Northwestern University  
MLSF 2036  
2225 N. Campus Drive  
Evanston, IL 60208-3108  
Voice: (847) 491-2847  
FAX: (847) 4912-7820  
Email: g-olson@northwestern.edu

**Jenn Rossman**

Department of Engineering  
Harvey Mudd College  
301 E. 12th Street  
Claremont, CA 91711  
Voice: (909) 607-7048  
FAX: (909) 621-8967  
Email: jenn\_rossmann@hmc.edu

**Alan Parkinson**

Mechanical Engineering  
Brigham Young University  
435 CTB  
Provo, UT 84604  
Voice: (801) 422-6544  
FAX: (847) 422-0516  
Email: parkinson@byu.edu

**Joseph A. Shaeiwitz**

Chemical Engineering Department  
West Virginia University  
P. O. Box 6102  
Morgantown, WV 26506  
Voice: (304) 293-2111 x2410  
FAX: (304) 293-4139  
Email: jashaeiwitz@mail.wvu.edu

**J. Roger Parsons**

Engineering Fundamentals  
The University of Tennessee  
College of Engineering  
103 Estabrook Hall  
Knoxville, TN 37996-2353  
Voice: (865) 974-9810  
FAX: (865) 974-6162  
Email: jparsons@utk.edu

**Sheri D. Sheppard**

Mechanical Engineering  
Stanford University  
The Carnegie Foundation  
555 Middlefield Road  
Menlo Park, CA 94025  
Voice: (650) 566-5160  
FAX: (650) 326-0278  
Email: sheppard@carnegiefoundation.org



## Designing Engineering Education List of Participants 10-12 July 2003

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### **Jonathan Stolk**

Olin College  
Olin Center  
Olin Way  
Needham, MA 02492  
Voice: (781) 292-2500  
FAX: (781) 292-2505  
Email: jonathan.stolk@olin.edu

### **Robert H. Todd**

Mechanical Engineering  
Brigham Young University  
435 CTB  
Provo, UT 84602  
Voice: (801) 422-6342  
FAX: (801) 422-0516  
Email: todd@byu.edu

### **Jon C. Strauss**

President  
Harvey Mudd College  
301 E. 12th Street  
Claremont, CA 91711  
Voice: (909) 621-8120  
FAX: (909) 621-8360  
Email: jon\_strauss@hmc.edu

### **Jennifer Turns**

Technical Communication  
University of Washington  
Room 245, Engineering Annex  
Box 352195  
Seattle, WA 98195-2195  
Voice: (206) 221-3650  
FAX: (206) 221-3161  
Email: jturns@u.washington.edu

### **Dwight C. Streit**

Technology Development  
Northrop Grumman Space Technology  
One Space Park E1-5010  
Redondo Beach, CA 90278  
Voice: (310) 814-1722  
FAX: (310) 812-3243  
Email: dwight.streit@ngc.com

### **J. Fredericks Volkwein**

Center for Study of Higher Education  
The Pennsylvania State University  
400 Rackley Building  
University Park, PA 16802-3203  
Voice: (814) 865-8366  
FAX: (814) 865-3638  
Email: volkwein@psu.edu

### **Jacquelyn F. Sullivan**

Integrated Teaching and Learning Lab  
University of Colorado at Boulder  
1045 Regent Drive  
522 UCB  
Boulder, CO 80309-0522  
Voice: (303) 492-8303  
FAX: (303) 492-8825  
Email: jacquelyn.sullivan@colorado.edu

### **F. Sheldon Wettack**

Dean of Faculty  
Harvey Mudd College  
301 E. 12th Street  
Claremont, CA 91711  
Voice: (909) 621-8122  
FAX: (909) 621-8465  
Email: sheldon\_wettack@hmc.edu



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---

**William H. Wood**

Mechanical Engineering  
University of Maryland—Baltimore  
Baltimore, MD 21250  
Voice: (410) 455-3314  
FAX: (410) 455-1052  
Email: bwood@umbc.edu

**David N. Wormley**

Dean, College of Engineering  
The Pennsylvania State University  
101 Hammond Building  
University Park, PA 16802  
Voice: (814) 865-7537  
FAX: (814) 865-8767  
Email: dnwdo@enr.psu.edu

**William A. Wulf**

President, National Academy of Engineering  
National Academy of Sciences  
500 5th Street, NW  
NAS #218  
Washington, DC 20001  
Voice: (202) 334-3201  
FAX: (202) 334-1680  
Email: wwulf@nae.edu

**Maria Yang**

Mechanical Engineering  
California Institute of Technology  
Mail Code 104-44  
Pasadena, CA 91125-4400  
Voice: (626) 395-3390  
FAX: (626) 583-4963  
Email: mcyang@design.caltech.edu