

# Guest Editorial

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The papers in this special issue of the *International Journal of Engineering Education* represent much of the proceedings of Mudd Design Workshop V, “Learning and Engineering Design,” that was held on the campus of Harvey Mudd College in Claremont, California, during 19–21 July 2005. Supported by The Boeing Company and Harvey Mudd College’s Department of Engineering, this workshop brought together engineers and social scientists over three very busy days to discuss what is known about learning, cognition, and assessment in engineering education.

A broad variety of engineering education issues were discussed. Sessions were devoted to: engineering as a profession; learning in design and in engineering education; definitions of design knowledge; design, inquiry, and learning; inspiring learning in design courses; assessment of learning in design courses; and a (small) cornucopia of programmatic and institutional issues. 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 various goals that they would try to advance—both individually and collectively. These are summarized in John W. Wesner’s wrap-up paper (below).

At MDW V’s opening lunch Clive Dym briefly suggested that learning and design are both very complex subjects, outlined some of the facets of design thinking, and noted that the benefits associated with teaching design are increasingly seen as the primary goals of engineering education. The keynote speaker, at the same luncheon, was James W. Pellegrino, Distinguished Professor of Psychology and Education at the University of Illinois at Chicago. In his talk, “Engineering the Design of Learning Environments for Engineering Design: Can the Psychology of Learning and Assessment Help?”, Pellegrino described some recent research results on learning, as well as their implications for institutional teaching and assessment. He also emphasized the importance of cognitive findings about how students (and people) represent knowledge and develop competence in their domains. Pellegrino ended by placing instructional research in the context of Pasteur’s theory-and-application quadrant, pointing out that no name was as yet identified for the quadrant high in both theory and application in this context! An abstract of Pellegrino’s talk is contained herein.

The MDW V audience was fortunate in having two outstanding after-dinner events. In the first, Chaplains Ton Meijknecht and Hans von Drongelen of *Motiv* of the Technical University of Delft engaged the evening audience with a colorful exposition about how a student at Delft identified and articulated her own spirituality in her senior design project. Ton and Hans then went on to lead a wonderfully stimulating discussion of how educators might stimulate student awareness of spirituality in engineering education. At the Workshop’s banquet, Penn State’s Professor John S. Lamancusa engaged the audience by thoughtfully delineating the challenges of meaningful curricular reform—especially including the introduction of new design courses—in his talk, “Design as the Bridge Between Theory and Practice.” Lamancusa’s paper and that of Chaplains Meijknecht and von Drongelen also follow below.

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 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 V. (Further details about the MDW V and its organization can be found on a CD that is available through the Department of Engineering at Harvey Mudd: Clive L. Dym (Editor), *Mudd Design Workshop V: Learning and Engineering Design*, Harvey Mudd College, Claremont, CA 91711.)

I want to acknowledge once again the support of the remaining members of MDW V’s Organizing Committee. They worked hard to maintain the MDW’s reputation for providing an informative, stimulating and inspiring venue for discussing engineering education: Alice M. Agogino, University of California at Berkeley; Cindy J. Atman, 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 still 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. Anthony Bright, Chair of the Department of Engineering, deserves my thanks, as do Interim Dean of Faculty Thomas M. Helliwell, President Jon Strauss, and College Relations' Sally Rich Arroyo. But most of all, I *vigorously* and *cheerfully* thank Sue Lindley and Daniel Pereira of the Department of Engineering and Cathy Corder of the Department of Humanities and Social Sciences: Sue for a design that clearly maintains "the MDW look and feel" for the Proceedings CD, and the Center for Design Education (CDE) web site; Cathy for providing both editorial and logistical assistance; and Dan and Sue for making the MDW V trains run on time. Thanks as well to Cynthia Wheeler for ensuring that MDW V vendors were paid and that all of accounts balanced. Brian Kirkpatrick (HMC '07) also deserves thanks for implementing Sue's design, building the Proceedings CD, and getting it out. Lastly, of course, I thank our generous benefactors once more: The Boeing Company and Harvey Mudd College's Department of Engineering.

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