ASME
SETTING THE STANDARD

Materials Division

Chair's Message

It is an honor to serve as the Chair of the Materials Executive Committee for 2006-2007. I appreciate Dr. Bill Curtin for recruiting me. The growth in building in the Materials Division (MD) that the previous chairs have forged is exciting. For over 80 years, the MD has existed, but just in the past fifteen years, it has experienced explosive growth, energy, and success. The notions of multiscale theoretical modeling, multiscale experiments, materials characterization, and computational materials are making huge impacts in the historical metal alloys community and in the composite and biological communities as well.

MD is very proud that we facilitate ASME's annual Nadai Medal and the Orr Awards. The Nadai Medal (http://www.asme.org/divisions/materials/awards/index.html) is awarded annually on the nomination of MD's Nadai Medal Committee to recognize distinguished achievements and contributions to the field of engineering materials. Recent winners of the Nadai Medal include Ted Nicholas, Rob Ritchie, Anthony Evans, and David McDowell to name a few. The Nadai Award for 2006 is Dr. Richard M. Christensen. Dr. Christensen while spending many years at Lawrence Livermore National Laboratory has made outstanding contributions in the area of mechanics of materials, heterogeneous media, viscoelasticity, polymer rheologies, and wave propagation. His Nadai presentation occurred at the Winter ASME meeting Chicago this year. The Orr Awards have been endowed by Leighton and Margeret Orr which are focused on fracture and/or fatigue. The "Orr Award" is for the Best Paper on Fracture or Failure Analysis administered by JEMT. Recent winners of the fairly new Orr Award include Sunil Saigal et al., and Pedro Peralta et al. To be eligible for this award, an investigator must publish in JEMT on the topic of fatigue or fracture from any perspective (computational, theoretical, experimental, etc.). Huseyin Sehitoglu, Editor of JEMT, oversees the award process. The other award endowed by the Orr family is for young researchers that will be administered through MD and is called the Orr Young Investigator Award. To be eligible for this award, the potential candidates must be within five years of their terminal degree. They can be nominated by themselves or by another person by submitting a summary paragraph of their accomplishments and a resume to the MD executive committee.

The Technical Committees re-organization from a couple of years ago appears to be a fruitful change. The Composites and Heterogeneous Materials Committee covers polymers, ceramic, and metal-based composites; high temperature materials; nanomaterials; alloys; semiconductors; optical materials and coatings; multiscale, multifunctional, and smart materials. The Multifunctional Materials Committee reflects current research trends that have shifted the emphasis from materials type to their functions within a structure. Along with these two committees, the AMD-MD Joint Committee on Constitutive Equations, Polymers Committee, Electronic Materials Committee, and the Materials Processing Committee cover the exciting, diverse research directions of today. The applications span a variety of size and time scales.

The preliminary report by Hussein Zbib, 2006 IMECE Chicago Program Chair, reports that we had 40 technical sessions involving 182 presentations sponsored by MD. These sessions were organized into 14 distinct themed MD sponsored symposia or sessions. We shared additional sessions with Aerospace and Fluids Engineering Divisions.

Passing the baton from a very fruitful elder MD generation to the upcoming MD generation is key for continued success. We have had National Academy members within MD and need to recognize mechanisms for mentoring young researchers in engineering materials. Awards for young researchers are important for their continued encouragement but opportunities for research collaborations with successful seasoned researchers is probably more important. I want to encourage our highly successful researchers to search out these younger investigators to offer advice and potential collaborations for research. It will work rewards for both parties.

Finally, I would like to thank the current members of the Executive Committee (EC), who have done a great job in representing the materials community. Devdas Pai is the Vice Chair and will be assuming the Chair position next year. Hussein Zbib, who performed yeomen's work on the winter meeting for 2006 will oversee the Honors and Awards next year. Dennis Siginer will oversee the 2007 Winter meeting program. I would also like to welcome our newest EC member, Raj Rajendran, who has been active in multiple materials initiatives over the recent years and will add great value to our team.

ASME *Journal of Engineering Materials and Technology*

Providing top-quality, peer-reviewed research papers on contemporary issues of engineering materials and technology, the *Journal of Engineering Materials and Technology* covers a broad spectrum of issues regarding experimental and theoretical studies of mechanical properties of materials. Important recent topics include: principles of the micro-macro transition; elastic behavior; plastic behavior; high-temperature creep, fatigue, and fracture; as well as metals, polymers, ceramics, intermetallics, and their composites. Other areas of interest are: mechanics of materials issues in joining, machining, and materials processing; environmental effects on material response; constitutive relations; and microstructure mechanical property relationships.

The *Journal*'s target audience is university, government and industry researchers and practitioners engaged in design, materials selection, structural analysis, materials processing and failure analysis. Its goal is to be considered the leading international journal in the selected niche area by attracting high quality manuscripts from the world's leading researchers and practitioners of this subject matter, and publishing in a selective, timely manner.

Leighton E. and Margaret W. Orr Award for Outstanding JEMT Publication

This annual award recognizes the author/s of the best paper published within one of four specified areas of fracture and fatigue in the *Journal* each year. The recipients receive a certificate and an honorarium. The award is conferred at the annual ASME IMECE meeting following the year of publication.

The 2005 Orr Award for outstanding fracture and fatigue paper went to **P. Peralta, R. Dickerson, N. Dellan, K. Komandur,** and **M. Jameel,** for their paper, "Effects of Local Grain Orientation on Fatigue Crack Growth in Multicrystalline FCC Metallic Material," which appeared in the January 2005 issue.

The establishment of this award by the Materials Division was made possible by a donation from Dr. Leighton E. Orr and his wife Margaret. Dr. Orr, who headed the physical testing at PPG Industries Research Laboratory in Pittsburgh before he retired in 1972, was nationally known for his work on the properties of fractured glass. He was a long time ASME member and very interested in encouraging continuing scholarship in this field. Dr. Orr passed away in 2004.

Special Issues

Our strategy continues to focus on discernment in the review process and publication of targeted, high quality special issues of the *Journal*. These special issues typically emerge from symposia or workshops that foster new directions in research and development.

The October 2005 issue contained a special section on "Nanomaterials and Nanomechanics." Guest-edited by **Min Zhou** (Georgia Tech), it included a survey of current research activities and some of the latest research results on the behavior of materials at the nanoscale and the behavior of nanocomponents such as nanowires and nanotubes. The January 2006 issue was guest-edited by **Richard Hall** and **Greg Schoeppner** (Wright-Patterson AFB). This special issue on "Time Dependent Behavior in PMCs and Polymers," was based on papers presented at an ASME symposium on the same topic in Nov. 2004.

In 2006–07 two special issues have been scheduled. **Mohammed Cherkaoui** and **Yves Berthelot** (Georgia Tech) co-edited a special section on "Damping of Shape Memory Alloys, Composites and Foams" for the July 2006 issue. **Richard Hall** and **Jerry Qi** (University of Colorado) have co-edited a special issue on "Time Dependent Behavior in Polymer Composites and their Matrices," which will appear in October 2006.

Statistics

During the period July 1, 2005 through June 30, 2006, the *Journal* received two hundred fourteen papers, an increase of almost forty percent over the previous year. Of these, fifty-one were accepted for publication and eleven were rejected after external review administered by associate editors, eighty-four were rejected by the editor upon initial reading as either outside the scope of *JEMT* or as substandard, three papers were withdrawn, and sixty-five were still in review on June 30, 2006. Over the past year, the review time for a paper from initial submission to acceptance or rejection has averaged seven and a half months.

The annual page allocation presently stands at five hundred ninety pages per year. In the four issues published between July 2005 through June 2006, the total number of published pages was four hundred seventy-six (fifty-eight papers). However, the *Journal* has accumulated a backlog during the past year and the editor has requested an increase in its page allocation for 2006–07 to maintain its receipt-to-publication times, which averaged 15 months for the four issues July, October, January and April of the2005–06 year.

Associate Editors

During the period July 1, 2005 through June 30, 2006, JEMT was served by fourteen active associate editors and two guest editors. The current active associate editors are: **Mohammed Cherkaoui** (University of Metz/Georgia Tech), **Subhendu Datta** (University of Colorado, Boulder), **Kenneth Gall** (Georgia Tech), **Hamid Garmestani** (Georgia Tech), **Somnath Ghosh** (Ohio State), **Mark Horstemeyer** (Mississippi State), **Craig McClung** (Southwest Research Institute), **Matthew Miller** (Cornell), **Golam Newaz** (Wayne State), **Assimina Pelegri** (Rutgers), **Pedro Peralta** (Arizona State University), **Ann Marie Sastry** (University of Michigan), **Thomas Siegmund** (Purdue), and **Min Zhou** (Georgia Tech).

Huseyin Sehitoglu, **Editor**

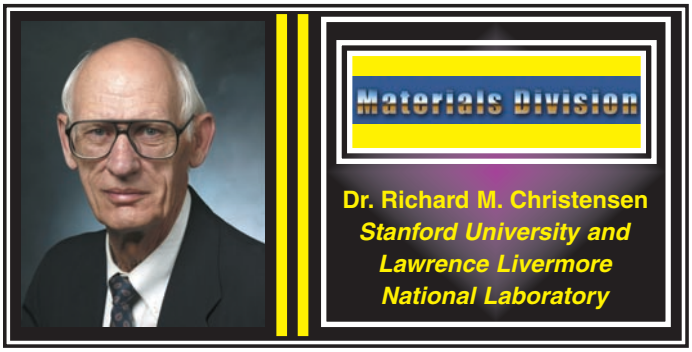
Materials Division Web Site

The web site for the Materials Division is located at

http://www.asme.org/divisions/materials/

Members are encouraged to contact the web editor if they have pertinent information for posting.

2006 Nadai Medal and Award Lecture



The Nadai Awardee for 2006 is **Dr. Richard M. Christensen.** Dr. Christensen while spending many years at Lawrence Livermore National Laboratory has made outstanding contributions in the area of mechanics of materials, heterogeneous media, viscoelasticity, polymer rheologies, and wave propagation.

Biography: Dr. Richard M. Christensen

Richard M. Christensen obtained his doctorate from Yale University in 1961. He has worked at several institutions, both in academia and in industry. In recent years he has been employed at Lawrence Livermore National Laboratory in the Chemistry and Materials Science Department and at Stanford University in the Aeronautics and Astronautics Department. He has written many papers on various aspects of the mechanics of materials and he is the author of two books, Theory of Viscoelasticity and Mechanics of Composite Materials. He is a member of the National Academy of Engineering and an Honorary Member of ASME.

Nadai Lecture 2006: THE PHYSICAL CHARACTERIZATION OF MATERIALS FAILURE: PAST AND PRESENT

Richard M. Christensen
Stanford University and Lawrence Livermore National Laboratory

The technical history of characterizing materials failure will be traced. The main goal was to find a general failure criterion that would cover the full range from ductile to brittle types of homogeneous and isotropic materials under all possible stress states. Many of the great personages of science were intimately involved. Clearly there were two or three "heroes" in the long quest and many fine efforts. Nevertheless, the accumulation of knowledge from the search is found to be fragmentary and ambiguous. Although parts are highly useful for some specific purposes, the overall historical effort is not helpful to the general objective of covering a wide range of materials.

With the present state of intensive materials applications, it is now more important than ever before to have an integrated failure characterization that applies to all major types of isotropic materials. A recently developed two property yield/failure criterion will be outlined. It has a reasonably comprehensive framework that includes and differentiates between ductile yielding and brittle failure, depending upon both the type of imposed stress state and the two calibrating failure properties. An explicit fracture criterion is part of the formalism. The non-associative plastic flow potential is included for use when yielding is determined to occur. Finally, some important applications with unexpected results will be discussed.

Statistics for Materials Division Symposia for IMECE 06 in Chicago, IL

Technical Committee	# of symposia or distinctly themed sessions	If joint, partner division/s	# of sessions	# of presentations	# of draft papers accepted
Composites	5	TRACKS	11	52	25
Constitutive Equations	3	AMD	3	13	3
Electronics	2		6	22	5
Multifunctional Materials	6	AERO	6	25	11
Materials Processing	2	FLUIDS	6	25	17
Polymers	3	Composites TC	6	29	18
Poster Session	1		1		
Nadai Lecture	1		1		
TOTAL	27		40	183	89

Hussein Zbib

Executive Committee 2006–2007

Chair
Mark F. Horstemeyer
Mechanical Engineering Dept.
Mississippi State University
206 Carpenter Blvd., P.O. Box ME
Mississippi State, MS 39762
Tel: 662-325-7308
Fax: 662-325-7223
Email: mfhorst@me.msstate.edu

Vice Chair
Devdas M. Pai
Dept of Mechanical Engineering
North Carolina A&T State University
Greensboro, NC 27411
Tel: 336-334-7620x316
Fax: 336-334-7417
Email: pai@ncat.edu

Honors and Awards Committee Chair
Hussein M. Zbib
Washington State University
Computational Mech & Mat Lab
School of Mech & Materials Engrg.
P.O. Box 642920
Pullman, WA 99164-2920
Tel: 509-335-7832
Fax: 509-335-4662
Email: zbib@mme.wsu.edu

Program Committee Chair
Dennis Siginer, Ph.D.
Wichita State University
Dept. of Mech. Engrg
1845 N. Fairmont Avenue
Wichita, KS 67260-0133
Tel: 316-978-6300
Fax: 316-978-3236
Email: dennis.siginer@wichita.edu

Secretary and Treasurer
Arunachalam M. "Raj" Rajendran
U.S. Army Research Office
RTP, NC 27709-2211
Tel: 919-549-4346
Fax: 919-549-4248
Email: raj@aro.arl.army.mil

ASME Staff
Jacinta McComie-Cates
Administrator, Unit Support
ASME International
Three Park Avenue, M/S 22W3
New York, NY 10016
Tel : 212-591-7159
Fax: 212-591-7671
Email: McComieJ@asme.org

Technical Committees 2005–2006

AMD-MD Joint Committee on Constitutive Equations
Mohammed Zikry
North Carolina State University
Mechanical & Aerospace Engineering
Box 7910 Room # 2412, Broughton Hall
Raleigh, N.C. 27695
Tel: 919- 515-5237
Fax: 919-515-7968
Email zikry@eos.ncsu.edu

Polymers
Karl I. Jacob
Georgia Institute of Technology
MRDC 4509 School of
Textile & Fiber Engrg
Atlanta, GA 30332-0001
Tel : 404-894-2541
Fax: 404-894-9766
Email: Karl.Jacob@tfe.gatech.edu

Committee on Composite and Heterogeneous Materials
Julie Chen
University of Massachusetts Lowell
One University Avenue
Lowell, MA 01854
Tel: 978-034-2992
Fax: 978-934-3048
Email: Julie_Chen@uml.edu

Electronic Materials
Taher Saif
128 Mechanical Engineering Building
1206 West Green Street
Urbana, IL 61801
Tel: 217-333-8552
Fax: 217-244-6534
Email:saif@uiuc.edu

Materials Processing
Ram V. Mohan
Department of Mechanical Engineering
North Carolina A&T State University
1407 E. Market St., NC, 27411
Fort IRC Bldg., Suite 130
Tel: (336) 256-1151x2272
Fax: (336) 256-1153
E-mail: rvmohan@ncat.edu

Multifunctional Materials (Metallic Materials)
Anette M. Karlsson
Department of Mechanical Engineering
University of Delaware
Newark, DE 19716-3140
Tel: 302.831.6437
Fax: 302.831.3619
Email: karlsson@me.udel.edu

Technical Editor - *Journal of Engineering. Materials & Technology*
Huseyin Sehitoglu
Department of Mechanical Science and Engineering
University of Illinois at Urbana-Champaign
140 Mechanical Eng. Building, MC-244
1206 West Green Street
Urbana, IL 61801
Tel: 217-333-4112
Fax: 217-244-6534
Email: huseyin@uiuc.edu

Newsletter Editor
Thomas Siegmund
School of Mechanical Engineering
Purdue University
585 Purdue Mall
West Lafayette, IN 47907
Tel: 765 494 9766
Fax: 765 496 7536
Email: siegmund@ecn.purdue.edu

News from the Technical Committees

AMD-MD Joint Committee on Constitutive Equations

The Technical Joint Committee (TJC) on Constitutive Equations (CE) of the Applied Mechanics Division (AMD) and Materials Division (MD) of the American Society of Mechanical Engineers (ASME) exists to promote, support, and advance the state of the art and science of Applied Mechanics and Materials in the area of modeling the mechanical and physical behavior of materials and structures. The committee's interests pertain to the understanding and the prediction of physical phenomena and material behavior through modeling and experiments that span scales from the nano to the macro levels. The committee held its annual meeting during IMECE 2005 in Orlando, Florida.

In that meeting, which was chaired by Mohammed Zikry, the committee discussed proposed symposia for the forthcoming IMECE2006 and approved the three proposals: 1) Modeling and Experiments in Nanomechanics and Nanomaterials, Organizer: Dr. Yozo Mikata, Lockheed Martin, aquarius_ym@hotmail.com, 2) A Symposium on Deformation Process, Mechanics and Failure Characterization, Organizers: Chi L. Chow, University of Michigan-Dearborn, clchow@umich.edu, Xin Wu, Wayne State University, xwu@eng.wayne.edu, Cedric Xia, Ford Motor Company, zxia@ford.com, Ming Li, Alcoa Technical Center, Ming.Li@alcoa.com, 3) Bridging the Length Scales, Organizers: George Voyiadjis, voyiadjis@eng.lsu.edu, Cemal Basran, University of Buffalo, cjb@eng.buffalo.edu, Zhen Chen, University of Missouri, ChenZh@missouri.edu.

Committee meetings will be held at all ASME conferences, current members are encouraged to bring new ideas and symposia proposals, and new members are always welcome.

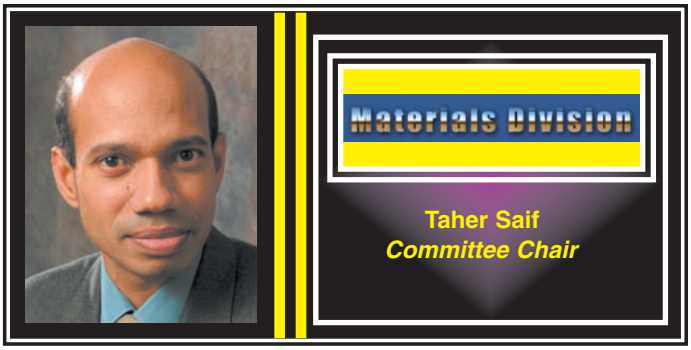
Composites and Heterogeneous Materials Committee

The Composites and Heterogeneous Materials Committee (CHMC) organized five symposia at the 2006 ASME-IMECE in Chicago. Symposia topics (and organizer in parentheses) include: (1) Materials and response to extreme events: ballistics, blast, and fire (Uday Vaidya) ; (2) Nanocomposites: fabrication, characterization, and novel properties (Kuang-Ting Hsiao); (3) Design and Manufacturing of Composites (Mahesh Hosur); (4) Applications of composites in biomaterials and bioengineering (Mina Pelegri and Ann Marie Sastry); and (5) Interfaces in heterogeneous materials and systems (Mina Pelegri and John Holmes). Several of these symposia were co-sponsored by other committees and divisions.

While participation in the CHMC sessions has been strong in the past, the CHMC has been discussing ways to continue to improve and strengthen its activities. Examples of potential future plans include invited symposia keynote speakers, student posters, networking activities, educational materials exchange, and cross-disciplinary "challenge issues" presentations. New ideas and suggestions are welcome.

The committee thanks Uday Vaidya for his outstanding service as 2005 committee chair and welcomes Mahesh Hosur as the incoming 2007 committee chair (currently vice-chair).

Electronic Materials Committee



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The primary TC activity includes organizing several Electronic Material symposia at the ASME International Mechanical Engineering Congress & Exposition (IMECE). This year we have 2 symposia: Multi-field Interactions in Micro/Nano and Organic Materials, organized by Aman Haque of Penn State University, Small Scale Structures in Electronic Materials, (Alex Volinsky, U of South Florida, Wei Lu of U. of Michigan).

In addition to the symposia, we meet every ASME congress to plan for the next year's symposia. We solicit proposals from potential organizers, encourage industry participation, discuss topics that are upcoming or is of significance to industry.

Material Processing Committee

The materials processing technical committee over the past year has been actively and successfully pursued organization of events for the exchange of technical information and findings related to various aspects of materials processing that are of current research interest to the community and ASME at large. The committee sponsored/co-sponsored three successful symposia at the IMECE 2005 in Orlando last November. They are: "Advances in Processing of Materials for Challenging Environments", "Electric and Magnetic Phenomena in Micro and Nano Material Systems", and "Rheology and Fluid Mechanics of Non-linear Materias". The last two symposia are jointly cosponsored by the Materials Division and Fluids Engineering Division with a total of 15 sessions with 4 sessions from materials division and 8 sessions from fluids engineering division. The two jointly sponsored symposia were organized by Dennis Siginer from Wichita State University. The symposium on "Advances in Processing of Materials for Challenging Environments" was organized by Devdas Pai, Ram Mohan, Jag Sankar and Sergey Yarmolenko from North Carolina A&T State University with a total of 3 well received and attended sessions. Dr. Devdas Pai and Dr. Dennis Siginer from materials processing committee serve as the vice chair and program chair of the materials division executive committee.

For IMECE 2006 in Chicago, the committee sponsored 2 symposia in the areas of "Advances in Materials Processing Science", and "Advances in Processing of Advanced Materials for Challenging Environments". Both symposia had a total of 3 sessions with the first symposium organized by Dennis Siginer and Sayavur Bakhtiyarov, and the second symposium organized by Devdas Pai, Ram Mohan and Jag Sankar.

The materials processing committee plans to organize future symposia and forums, workshops and other technical exchange activities at IMECE and other conferences for 2007 and beyond, in several emerging materials processing technology areas of interest and relevance to the field. The materials processing technical committee met at the 2006 IMECE. The materials processing committee is committed to supporting symposia and forum for technical exchanges in emerging materials processing technology areas that require interdisciplinary focus and interactions, and encourage members of material community and other ASME divisions to contact the chair with proposals for symposia. Please contact me (rvmohan@ncat.edu) if you would like to participate in ongoing activities or initiate new activities in the technical areas of relevance to materials processing and in interdisciplinary technology areas, and industrial practices.

The Multifunctional Materials Committee

The Multifunctional Materials Committee has finished its second year as an ASME technical committee within the Division of Materials, which has been a successful and active year. The current chair of the committee is Professor Anette M. Karlsson of University of Delaware.

The Committee hosted a mini-symposium on Multifunctional Materials and Structures at the ASME International Mechanical Engineering Congress and Exposition (IMECE), which was held in November 2005 in Orlando, Florida. The nine sessions where co-sponsored by the Materials Division and the Aerospace Division, with six and three sessions respectively. The mini-symposium consistent of four subtopics topics: Materials for Clean Energy (organizer: A.M. Karlsson, University of Delaware); Bio-medical and Bio-inspired Materials (Pranav Shrotriya and Shriram Sundararajan, Iowa State University); Novel and Adaptive Multifunctional Material Structures (Zoubeida Ounaies, Texas A&M and Hilary Bart-Smith, University of Virginia); Nano and Micro-Structures (Junlan Wang, UC-Riverside and Rui Huang, UT-Austin).

We held our annual meeting at the IMECE, November 2006 in Chicago, Illinois. In addition to the current committee members, we welcome all individuals who would like to join our committee. At the IMECE 2006, we planned to sponsor a mini-symposium of Multifunctional materials, consisting six sessions within the Division of Materials, three within the Aerospace Division and three from the "Transportation Track." The response we had for soliciting talks to our symposium for IMECE 2006 was significantly larger than we expected. We managed to place a number of talks within other sessions, but unfortunately had to reject several high quality talks due to the lack of sessions. We do apologize for this, and hope that the authors will submit new papers for future meetings, where we hopefully can accommodate more presentations. The sessions for IMECE 2006 included: Materials for Clean Energy (organizer: M.H. Santare and A.M. Karlsson, University of Delaware); Bio-inspired Materials (S. Allameh, University of Northern Kentucky, Z. Ounaies, Texas A&M University, J. Wang University of California, Riverside); Bio-medical Materials (P. Shrotriya and S. Sundararajan, Iowa State University); Active nanostructures (X. Chen, Columbia University, Z. Ounaies, Texas A&M University, Jeff Kysar, Columbia University,); Novel and Adaptive Materials and Structures (Hilary Bart-Smith, University of Virginia and Karla M. Mossi, Virginia Commonwealth University); and Nanostructured Materials (Junlan Wang University of California, Riverside and Jun Lou, Rice University.)

During the committee's annual meeting held in conjunction with IMECE 2005, Professor Junlan Wang of University of California, Riverside, was elected chair of the committee. Dr. Wang will thus be the chair of the committee for 2007–2008, starting at the annual meeting of 2006, which will be held in conjunction with IMECE 2006.

If you are interested in joining our committee, please contact Prof. Karlsson (karlsson@udel.edu) or Prof. Wang at (wang@engr.ucr.edu). We welcome new, hard working members with good ideas and energy for future activities and their implementation.