ASME International

APPLIED MECHANICS DIVISION

Report of the Chair

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SUMMER NEWS 2005

KENNETH M. LIECHTI, EDITOR

Mary Boyce

It has been my honor and pleasure to serve on the Executive Committee of the Applied Mechanics Division for the past five years. Membership on this committee brings with it much work and great satisfaction. My last year as Chair has been particularly gratifying. The work comes through maintaining and strengthening the Applied Mechanics Division efforts within ASME – our strong participation at the IMECE Meetings, our Summer Meetings, our Journal of Applied Mechanics, our Technical Committees, our Award Committees, our representation and voice within ASME, and our finances. If I had known of all of the work involved when Alan Needleman invited me to succeed him on the committee, I may not have agreed so readily! However, the experience has been very rewarding and has provided me the opportunity to meet and work very closely with a very talented and dedicated group of individuals on the EC over the past five years -- Tom Hughes, Dusan Krajcinovic, Stelios Kyriakides, Pol Spanos, Wing Liu, Tom Farris, K. RaviChandar, and Dan Inman. You would be heartened to know the seriousness and sense of purpose each has brought to the AMD and their true love of mechanics. I am certain that our newest member, my replacement Zhigang Suo, will bring his own zeal to this committee and will continue to strengthen the central role of AMD within ASME and the broader Applied Mechanics community. Below, I briefly report on key activities of the AMD over the past year.

The AMD participation in the 2004 IMECE in Anaheim was once again very strong with 60 sessions. Our thanks go to our 2004 Program Chair Tom Farris as well as the Chairs of our 14 Technical Committees who coordinated sessions within each area. Each year, our program chair works doggedly with the rest of ASME to garner as many sessions as possible. Our demand for sessions is always larger than the supply which is one indication of the vitality of our field! The officers of our technical committees should be commended for their leadership; members of AMD should recognize that the best way to become more actively engaged in the division activities is by participating in a technical committee. The Summer Mechanics and Materials (joint ASME/ASCE/SES Meeting) in Baton Rouge was organized by George Voyiadjis and was a great success with strong participation from AMD, again through the leadership of our EC and our Technical Committee officers.

The Journal of Applied Mechanics continues to thrive under the editorship of Bob McMeeking. JAM publishes articles in all fields of mechanics. Article submission is now fully electronic and the processing time for an article from time of submission, through review, to time of publication is now averaging roughly 11 months. JAM has also begun to have special issues dedicated to particular topics. JAM continues to be the flagship journal of ASME and makes a significant profit for ASME. As of this time, this profit is not shared with AMD as will be commented on more below regarding our organization and finances.

Over the past few years, ASME has been undergoing a dramatic reorganization. This reorganization has been rather ambiguous and confusing with regard to how it directly impacts our division. I must admit that I do not fully understand all of the issues involved in this restructuring of the ASME; however I will attempt to give a brief synopsis of its potential impact on AMD. At issue is the creation of larger, somewhat autonomous entities to be referred to as "Institutes" within ASME which would have more direct control (and financial responsibility) of their administration, finances and revenue streams vs "Divisions" or subsets of other entities. The AMD EC has kept itself informed of the reorganization efforts of ASME and continue to discuss our options as an individual entity as well as an entity within the Basic Engineering Group (which itself is not yet classified as an "Institute") versus transitioning to an "Institute" entity. For the present, we have decided to maintain our current status as a Division within the Basic Engineering Group; we have been working more closely with BEG over the past couple of years since it has become clear that we have more leverage within ASME when we band together with the other divisions of BEG (Heat Transfer, Materials, Bioengineering, Fluids, Tribology). It is of importance to note that the Bioengineering Division has decided to dramatically reduce (nearly eliminate) its participation in the IMECE and, instead, hold an annual summer meeting instead. The AMD EC, together with input/discussion with the Technical Committee chairs, has decided to continue our strong participation in the IMECE in addition to our usual summer meetings. We have been working with ASME through the BEG on understanding and lobbying for various revenue streams in order to improve our financial status. Over the past couple of years, we have had some success in this regard – we now receive a small revenue stream from "revenue sharing" of IMECE revenues. The EC has also been lobbying for a revenue stream from our membership dues (AMD is the largest BEG division, with approximately 6,000 dues paying members) and our profits from JAM; however, these do not appear to be forthcoming. On a positive note, due to the IMECE revenue sharing as well as revenue sharing from the summer meeting, our division finances have strongly improved over the past couple of years. We have used a substantial portion of these funds to increase the Timoshenko Medal endowment and will continue to strengthen this endowment; the Koiter Medal and Drucker Medal endowments are already strong. We plan to create Medal accounts for the Young Investigator Award and the Applied Mechanics Award over the coming years.

One of the most rewarding aspects of Chairing the AMD EC is presiding over the 2004 IMECE AMD Banquet in Anaheim. It was my honor to be able to recognize such

outstanding mechanicians: Morton Gurtin received the Timoshenko Medal for "seminal contributions to nonlinear continuum mechanics and thermodynamics, with applications to problems in materials science" (his address is included in this newsletter), Frank McClintock received the Drucker Medal for "extraordinary accomplishments in furthering basic understanding of the process of fracture and fatigue in engineering materials, and for life long intellectual leadership in this field in both academe and professional practice" (a special symposium in his honor took place during the IMECE), Zenon Mroz received the Koiter Medal for "significant contributions to elastic/plastic material behavior modeling, to tribology, and to optimization" (and gave the Koiter lecture just prior to the banquet), Arthur Leissa received the Applied Mechanics Award for "fundamental contributions to mechanics and design, and for academic leadership", and Kaushik Bhattacharya received the AMD Young Investigator Award for "seminal contributions in identifying the critical crystallographic features that govern shape memory behavior in solids and thin films".

I am proud to announce the names of the 2005 awardees. The Timoshenko Medalist is Grigory Barenblatt of University of California, Berkeley; the Koiter Medalist is Raymond Ogden of Glasgow University; the Drucker Medalist is Robert Taylor of University of California, Berkeley. The Applied Mechanics Award goes to Carl Herakovich of the University of Virginia; two outstanding candidates were chosen for the Young Investigator Award: George Haller of the Massachusetts Institute of Technology and L. Mahadevan of Harvard University.

My term of service on the Executive Committee has now come to an end. In closing, I wish to once again thank you for entrusting me with this responsibility and for giving me the opportunity to work with such wonderful and dedicated individuals over the past five years. In addition to my colleagues on the EC and all of the representatives from the technical committees, I would also like to acknowledge the fine and patient work of Kenneth Liechti of the University of Texas who edits the AMD newsletter and Hyonny Kim of Purdue University who has served as our recording secretary for the past two years. Special thanks to Kevin O'Connor and Carol Griffin who handled administrative issues at ASME headquarters on our behalf. I will continue to serve on the Timoshenko, Koiter and Drucker Medal committees for the next five years and look forward to seeing you at the IMECE and Summer meetings!

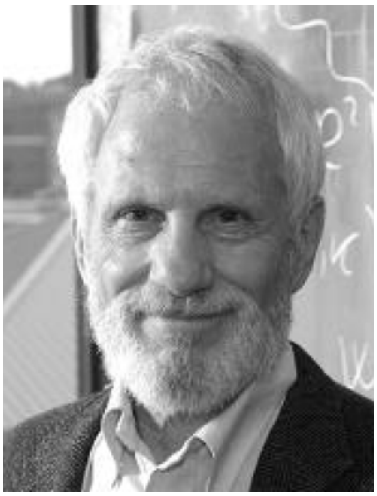
Mary C. Boyce, Chair

2004 Timoshenko Award

Presented to Professor Morton E. Gurtin in recognition of seminal contributions to nonlinear continuum mechanics and thermodynamics, with applications to problems in materials science.

Confessions of a slightly frayed continuum mechanician

Morton E. Gurtin



This award is a great honor: although I'm a mathematician, my career began as a mechanical engineer. After graduating from RPI with a Bachelor's degree in Mechanical Engineering, I worked as a structures engineer for Douglas Aircraft and for General Electric, where I spent many hours studying Timoshenko's books on vibration analysis and plates and shells.

My third year at General Electric was in a consulting group concerned with structures and vibrations. My work was interesting: during one period I worked on a problem involving a vibrating washing machine and at the same time performed a vibration analysis of a nuclear aircraft-engine. Our group consisted almost entirely of Ph.D.'s, and I wrote a few papers on topics related to my work. I was greatly influenced by two colleagues, Bob Plunkett and Paul Paslay, who strongly suggested that I go back to school. Under their counseling I applied to Stanford and MIT in Engineering Mechanics and to Brown University in Applied Mathematics. My first choice was MIT, but because of my college grades (which is another story for another time) MIT offered me a probationary assistantship, but Brown ignored my grades and offered me a National Defense Fellowship, which I accepted.

I wrote my thesis with Eli Sternberg and remained on the faculty for five more years. During my last few years at Brown the department became factionalized, with Ronald Rivlin on one side and the remaining senior faculty on the other. Mid afternoon the faculty would have coffee at a nearby delicatessen. This could be unpleasant, as it was necessary to decide with whom to sit. I solved this problem by going to coffee with Jack Pipkin, another young faculty member, and sitting with him. I've heard all sides of the story behind the split, and to this day don't understand what happened; all I know is that it made my last few years at Brown very difficult. Things were so bad that almost the entire senior faculty left within a three year period.

The direction of my scientific career was changed by Clifford Truesdell's classic 1952 paper on nonlinear continuum mechanics and Walter Noll's thesis, written in 1955. These papers and a course I sat in on by Albert Green introduced me to the rational study of nonlinear continuum mechanics, a subject I have pursued ever since. A scientist who had great influence on my work was Bernard Coleman. His papers, partly in collaboration with Noll, made thermodynamics understandable, at least to me. I had detested this subject since my undergraduate days at RPI, where thermodynamics was synonymous with steam tables. Coleman had a marvelous knowledge of the physical world and worked with great intensity. We would discuss work over the telephone, usually after midnight. One problem with Coleman is that he loves to talk and hates to end a conversation. Often I would put the phone down and work until I stopped hearing his voice; I would then pick up the phone and say; "Bernard, I agree completely".

As a young faculty member I was asked by Josef Meixner and Joseph Kestin, who were thermodynamicists, and Rivlin to present some lectures for the faculty on the thermodynamics developed by Coleman and Noll. Meixner, Kestin, and Rivlin despised

this work, as did most senior people working in thermodynamics and continuum mechanics. They did not like the idea of defining temperature outside of equilibrium, they did not like the idea of entropy as a primitive quantity, and they did not like abandoning the classical ideas of state. I was attacked continually during these lectures, with Rivlin, who has a great sense of humor, continually making jokes, mostly at me expense, but I do believe I held my own. Today the Coleman-Noll view of thermodynamics is generally accepted by workers in continuum mechanics, most often without acknowledgment, but a generation of scientists had to be replaced.

I have had more angry discussions about thermodynamics than about any other scientific topic. Thermodynamics is a strange, almost mystical subject. It is at the same time both abstract and practical. It's been my experience that engineers and applied scientists don't often understand the nature of primitive objects in a physical theory: in books on thermodynamics one often finds temperature defined in terms of entropy on one page and entropy defined in terms of temperature a few pages later. This type of circular reasoning along with pseudo mathematical definitions of standard mathematical objects lead students to either reject the subject or to accept it with an almost religious zeal.

In the mid sixties Coleman and I, in partial collaboration with Ismael Herrera, wrote a series of papers on wave propagation in materials with fading memory, which is a fancy way of saying viscoelastic materials. When I presented this work at Brown I was attacked by many of the faculty who said that, because of dissipation, the waves of discontinuity that our theory predicts could never exist. Jack Pipkin agreed with this point of view, and told me that he was going to use a simple model to show that our theory was flawed. A few days later Jack came to my office and said that we were correct; his model established the actual existence of these waves. Later we found an earlier paper by Lee and Kanter that did the same.

Through the years I have learned that in physics intuition can often be misleading: it's an excellent guide but a poor leader. During a visit to Brazil I worked on the thermodynamics of diffusing, chemically reacting materials with a chemical engineer to whom I will refer as V. Thermodynamics often leads to an inequality involving the relevant fields. When I showed V the inequality I had derived he became very excited and lectured me for an hour on how this inequality, as interpreted term by term, made perfect physical sense. That night I discovered that the inequality went the other way. The next day V gave me another lecture demonstrating the physical correctness of the reversed inequality.

By the Fall of 1965 all of my continuum mechanics colleagues except Pipkin and Rivlin had left Brown, and I left in 1966. My departure from Brown made me very sad, as I really loved the place. I always felt I would return, but that never happened.

This is the approximate midpoint of my talk and it reminds me of a workshop chaired by L. C. Young, a great mathematician and the originator of Young measures, a mathematical tool central to the study of phase transitions. Young, then approximately 80 years of age, was asleep at the front of the room. The speaker was midway through the talk and a question from someone in the audience resulted in an animated discussion with the speaker. The discussion woke up Young who sat quietly listening and when the discussion ended Young stood up and said: "Well, if there is no further discussion, let's give our speaker a great big hand and retire for lunch."

And, while we're in a non serious mood, let me add a quote from the writer Frederick Raphael about awards: Awards are like hemorrhoids; in the end every asshole gets one.

The early years at Carnegie Mellon were wonderful. We were possibly the best place in the world for nonlinear continuum mechanics. The 60's, driven by the research of Toupin, Ericksen, Noll, and Coleman, saw the solution of many of the conceptual problems that had plagued continuum physics, and much of this work was carried out at Carnegie Mellon.

One of the main things I learned during this period is the importance of concepts, of ideas. There are many levels of understanding: a theory generally has a few major ideas that form its backbone, and these are usually discovered first, but the real understanding lies in the interconnections that arise when layer after layer of extraneous material is removed. I learned most of this from Walter Noll, who is the deepest mathematician I have known.

Because the basic framework of continuum physics was not well understood prior to the 60's, the work during the 60's was often axiomatic. Unfortunately, the insistence on axiomatics later became a disease in which ideas of little depth were flowered with trivial demonstrations of rigor; also, unfortunately, I was one of those stricken with this disease.

In 1975 Jerry Ericksen wrote a paper on the equilibrium of bars that instituted phase transitions as a branch of continuum mechanics. Ericksen, who was central to the 60's renaissance of continuum mechanics and well known for his pioneering work on liquid crystals, began in the mid 70's applying continuum mechanics in situations for which behavior at micro-scopic scales becomes important. Concurrently materials scientists such as Cahn, Eshelby, Frank, Larché, and Mullins, among others, were developing theories of multiphase systems based on ideas of Gibbs and Herring. A central outcome of this work was the realization that problems involving phase transitions with sharp interfaces generally result in an interface condition over and above those that follow from the classical balances for forces, moments, mass, and energy. Granted equilibrium, this extra balance may be derived variationally, but such a variational paradigm is not available for dynamics; even so, materials scientists typically use, for dynamics, the variationally-derived interface condition for the system at equilibrium. In studying this body of work one is left trying to ascertain the status of the resulting interface condition: is it a balance, is it a constitutive equation, or is it neither? Successful theories of continuum mechanics are typically based on a clear separation of balance laws and constitutive equations, the former describing large classes of materials, the latter describing particular materials.

That additional configurational forces may be needed to describe phenomena associated with the material itself is clear from the seminal work of Eshelby, Peach and Koehler, and Herring on lattice defects. But, again, these studies are based on variational arguments, arguments that, by their very nature, cannot characterize dissipation. A completely different point of view was taken by Allan Struthers and me in 1990; using an argument based on invariance under observer changes, we concluded that a configurational force balance should join the standard (Newtonian) force balance as a basic law of continuum physics.

Over the past ten years of so — partially in collaboration with Paolo Cermelli, Eliot Fried, and Paolo Podio-Guidugli — I have used configurational forces, with its peculiar balance, to discuss a variety of phenomena, examples being solid-state phase-transitions,

solidification, grain-boundary motion, and epitaxy. In a forthcoming study, Cermelli, Fried, Dan Anderson, Jeff Mcfadden, and I discuss fluid-fluid phase-transitions; here the extra interface condition, being *viscous*, cannot be determined using a variational paradigm.

As a graduate student I was strongly influenced by a point of view — of my advisor and of others working in nonlinear continuum mechanics — that plasticity was not a field worthy of study because of its "rotten foundations". This view was strengthened by an undecipherable course taught by a major name in plasticity theory. But time has taught me that such a view is snobbish and unintellectual: if a theory that predicts well the qualitative behavior of real materials has questionable foundations, then, for a person interested in the foundations of continuum mechanics, that is all the more reason to study it.

Based in part on work of Aifantis, Anand, Asaro, Fleck, Hutchinson, Mandel, Needleman, and Rice, in part on my own work on phase interfaces, and in part on discussions with Lallit Anand, Alan Needleman, and Erik Van der Geissen, from which I have gained much, I have become interested in the description of crystalline and isotropic plasticity at small length-scales via dependences on *strain gradients*. Underlying my work is an accounting for the power expended by microstresses conjugate to plastic strain-rate and plastic strain-rate gradient, an accounting that leads naturally to a micro force balance for the micro stresses that, with thermodynamically consistent constitutive equations, forms a flow rule in the form of a nonstandard partial differential equation requiring boundary conditions. The resulting theories are shown to exhibit two distinct physical phenomena:

(1) *energetic hardening* associated with plastic-strain gradients and re-sulting in a size-dependent back-stress as well as boundary-layer effects;

(2) *dissipative strengthening* associated with plastic strain-rate gradients and resulting in a size-dependent increase in yield strength, with smaller being stronger.

The work on energetic hardening is in partial collaboration with Bitten-court, Cermelli, Needleman, and Van der Geissen; the work on dissipative strengthening is joint with Anand, Lele, and Gething; the strengthening phenomenon was discovered independently by Fredricksson and Gudmundson.

This recent excursion into plasticity has demonstrated to me, once again, the power of continuum mechanics and the importance of collaborations between continuum mechanicians of my ilk and engineers more interested in applications. But, unfortunately, at a time when technology requires sound models of exotic materials and of materials applied at smaller and smaller length scales, continuum mechanics is dying. This subject, with its focus on the rational formulation of theories and on the unification of disparate theories, is being dropped from engineering curricula in favor of separate sometimes archaic courses in solids and fluids — and this at a time when materials whose underlying structure is neither solely solid nor solely fluid are being developed and utilized. Ironically, physicists in droves are now turning to the use of continuum models, but are doing so without even a minimal understanding of the underlying mechanics. I am deeply saddened by this situation, and I don't see it improving in the near future.

In discussions regarding life-choices I am often asked if I enjoy being a mathematician. My answer is always the same: I'm a lucky person; I can't believe I get paid to do what I

do. It's difficult to describe to a lay person that wonderful, almost magical moment of revelation in the solution of a problem or in the understanding of a concept. The problem or concept need not be grandiose, or even important, and often it is forgotten the next day. But that seems unimportant.

I try to frame rational theories of continuum physics. Once in a while I am successful, most often I am not. And the work is very painful. But the successful theories are worlds, exciting worlds through which I can roam, perhaps for just moments, but those moments, like no other, are free of the ambiguity, confusion, and meaninglessness that pervade most of everyday life.

Good theoretical science is done by a few dedicated people working alone or with one or two colleagues; this science does not need the large grants that have made prostitutes of most of us, including me. The need to be relevant, the need to be applicable to industry; these are not forces that lead to advances; what leads to advances, often spectacular, is simply the curiosity of the individual scientist, just as Einstein's curiosity about the structure of space-time led to the theory of relativity. Big science is a driving force for mediocrity.

But I don't know the answer. Perhaps we can one day return to the times of small individual grants for summer salary and occasional trips to meetings. Perhaps we can return to the times when one's university salary was tied to quality of research and teaching, rather than to the amount of government support.

In many respects this diatribe is hypocritical, as I have received large amounts of government support, but often there is a dichotomy between what one does and what one believes would be best for society as a whole.

In closing let me thank you so very much for the Timoshenko medal, for your time, and for your interest. THANKS.

Awards

2004 Applied Mechanics Division Award

Presented to Dr. A. W. Leissa in recognition of his fundamental contributions to mechanics and design and for academic leadership.

2004 Daniel C. Drucker Award

Presented to Professor Frank A. McClintock for extraordinary accomplishments in furthering basic understanding of the process of fracture and fatigue in engineering materials, and for life long intellectual leadership in this field in both academe and professional practice.

2004 Koiter Medal

Presented to Z. Mróz and recognizing his contributions to elastic/plastic material behavior modeling, to tribology and to optimization.

2004 Young Investigator Award

Presented to K. Bhattacharya in recognition of his seminal contributions in identifying the critical crystallographic features that govern shape memory behavior in solids and thin films.

News from the Technical Committees

Most committees maintain an open policy toward membership. Please contact the Committee chair if you wish to join or participate in the activities of the committee.

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 holds its annual meeting during the regular ASME Congress, its last meeting was held at the IMECE 2004 in Anaheim, California. Professor Mohammed Zikry from North Carolina State University assumed the chairmanship from Professor Hussein Zbib from Washington State University for the term 2004-2007. Professor George Voyiadjis, Louisiana State University was elected Vice- Chair for the term 2004-2007. The committee would like to extend its gratitude to Professor Zbib for his selfless leadership and guidance over the past three years.

The committee discussed proposed symposia for the forthcoming IMECE2004 and approved the six following proposals: 1) Symposium on the Formability of Lightweight Materials, organized by Professors Xin Wu, xwu@eng.wayne.edu, Chi L. Chow, clchow@umich.edu, and Ming Li, ming.li@alcoa.com; 2) Symposium on Time Dependent Behaviors of Polymeric Composites and Their Matrices organized by Drs. R. Hall, Richard.Hall@wpafb.af.mil) and G. Schoeppner, Gregory. Schoeppner @wpafb.af.mil**;** 3) Symposium on Low-Cycle and Ratcheting Fatigue Failures of Structures and Materials, organized by Professors T. Hassan, thassan@eos.ncsu.edu and R. Neu, rick.neu@me.gatech.edu; 4) Symposium on Characterization and Constitutive Modeling of Nanostructured Materials, organized by Professors J. Li, j.li@ccny.cuny.edu and L. Sun, lizhi-sun@uiowa.edu; 5) Symposium on Recent Progress in the Mechanics of Embedded Inclusions and Related Problems organized by Dr. Y. Mikata, aquarius_ym@hotmail.com and Professor P. Sharma, psharma@uh.edu; 6) Multi-scale, Multi-paradigm and Multi-physics Modeling of Materials organized by Drs. Y. Mikata, aquarius_ym@hotmail.com), M. Buehler, mbuehler@caltech.edu, and Professor J. Kysar, jk2079@columbia.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. •

Mohammed A. Zikry, Chair
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Committee on Composites

The Applied Mechanics Composite Materials Committee meeting this year was held on November 18, 2004. Prof. John Holmes (Georgia Tech), was elected Vice Chair, to become Chair in 2007. The five symposia sponsored or co-sponsored by the Committee for 2004 were discussed. These included: *Sandwich Composites I and II* (2 sessions), organized by L. Carlsson and V. Birman; *Durability and Damage Tolerance of Heterogeneous Materials* (1 session) organized by A. Karlsson and I. Jasiuk; *Time Dependent Behavior in PMC and Polymers* (1 session), organized by R. Hall; *Dynamic Response of Advanced Materials and Structures* (2 sessions), organized by U. Vadya and S. Abrate; *Nanocomposites I and II* (2 sessions), organized by E. Ayorinde and X.-L. Gao).

Symposia were also planned for the 2005 IMECE, including: *Nano, Bio and Cellular Materials,* organized by X.-L. Gao, M. Saha and E. Ayorinde; *Structural Nanocomposites,* organized by H. Mahfuz and G. Kardomateas; *Structural Integrity of Sandwich Structures,* organized by H. Mahfuz and L. Carlsson; *Time Dependent Behavior in PMC and Polymers,* organized by R. Hall; *Mixed Mode Fracture of Sandwich and Honeycomb Structures*, organized by J. Holmes and G. Kardomateas; and *Ballistic and Blast Mitigation using Advanced Materials and Structures,* organized by J.S. Davidson, R.J. Dinan and U. Vaidya.

The committee will consider additional requests for sessions at our annual meeting in 2005. As we have done in the past, we strongly encourage securing agreements to publish special journal issues for symposia, papers, in advance of requesting sessions from the Committee. Also, we continue to encourage workers in nontraditional areas to consider organizing symposia through our committee.

Anne Marie Satry, Chair
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Committee On Dynamics And Control Of Structures And Systems

H.S. Tzou, Chair
hstzou@engr.uky.edu

Committee on Dynamic Response of Materials

Wayne Chen, Acting Chair
weinong@u.arizona.edu

Committee on Education in Mechanics

Professor Sanjeev K. Kanna (University of Missouri at Columbia) took over as the chair of the committee on July 1, 2005. Many thanks go to George Johnson (UC Berkeley) for his work as the chair for several years. If you have an interest in joining the committee or in organizing sessions at the winter meetings please contact me.

Sanjeev K. Kanna
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Committee On Elasticity
The Committee on Elasticity sponsored two symposia during the 2004 IMECE:
(a) Nanomechanics of Materials: Modeling on Multiple Length Scales – Robert Kukta and Pradeep Sharma,
(b) Self Assembly in Electronic and Biological Systems – Vivek Shenoy and Surya Ganti.
Both symposia were very well attended and could have utilized additional sessions.

AMD Elasticity Committee Members honored:
During the meeting of the Committee on November 18th, Professor **Zhigang Suo** (Harvard University) was presented with the ASME Fellow certificate. Professor Suo was nominated by the Elasticity Committee.
Cornelius (Niall) O. Horgan, University of Virginia, has been awarded the 2005 A. C. Eringen medal by the Society of Engineering Science (SES). The prize is awarded by the SES in recognition of " sustained outstanding achievements in Engineering Science". The award certificate cites Horgan's " seminal contributions to applied mathematics and the theory of elasticity". The medal was presented to Professor Horgan at the joint SES/ASME/ASCE Meeting on Mechanics and Materials, Baton Rouge, LA, USA, June, 2005 on which occasion he presented the SES Annual Engineering Science Plenary Lecture entitled " Continuum mechanics based hyperelastic strain-stiffening constitutive models for rubber-like materials".

Professor Robert Kukta was nominated and voted unanimously to serve as Vice Chair of the Elasticity Committee.

Three symposia were proposed for IMECE 2005:
(a)" Mechanical Properties and Microstructural Evolution of Surface and Interfaces" – organized by Robert Kukta (SUNY Stony Brook) and Wei Cai (Stanford).
Description: The purpose of this symposium is to present recent advances in the modeling, computation, and characterization of surfaces and interfaces. Contributions will be accepted on topics related to mechanical properties and microstructural evolution. These include but are not limited to

- Self-assembly of nanostructures on a substrate
- Spontaneous pattern formation in thin films
- Internal stress and mechanical properties of epitaxial heterostructures
- Mechanical properties of thin films and multilayers
- Relaxation of crystalline-amorphous interfaces
- Morphological evolution by ion-bombardment
- Mechanical behavior of nanostructured materials
- Mechanical properties of polycrystals, ultra-fine grain crystals, nano-crystals
- Grain boundary sliding, migration, interaction with dislocations
- Plasticity in small volumes

- Nucleation and growth of twinning, martensitic phase transformation
- Novel experimental methods, in-situ techniques

(b) "Nano, Bio, and Cellular Materials" – organized by Emanuel O. Ayorinde (Wayne State), Xiu-Liu Gao (Texas A&M) and Mrinal Saha (Tuskegee University).
Description: Exploration of material characteristics, models and response to load is being extended to smaller scales. The relationships between the various scales of reference and the blending at various levels is also important. This proposal is for a symposium on structural cellular and bio materials at various scales. The topics are of great current and projected interest. They include:

- Material models
- Loading responses: static and dynamic
- Failure criteria
- Experimental techniques
- Tissue and cellular mechanics
- Nano and cellular structure – property relationships
- Mechanics of living tissue
- Artificial bio-materials

(c) "Durability and Damage Tolerance of Heterogeneous Material Systems" – organized by Iwona Jasiuk (Concordia University) and Michael Santare (University of Delaware).

Eventually, AMD appropriated enough sessions for symposia (a) and (b).

We hope to see all of you in Orlando at the IMECE 2005!

Demitris Kouris, Chair
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Committee On Experimental Mechanics
The Experimental Mechanics committee held its regularly scheduled meeting on Wednesday 17, 2004 during the IMECE 2004 in Anaheim CA. Fourteen members were in attendance. The committee officials are John Lambros (University of Illinois, Urbana-Champaign), Chairman, and Ruquiang Feng (University of Nebraska, Lincoln), Secretary. A sub-committee consisting of Ken Liechti and Jeff Kysar continued its efforts to identify and nominate eligible members of the community for some of the ASME awards.

The committee has been very active in organizing sessions during both the 2004 and the upcoming 2005 IMECE. Many of these sessions are co-sponsored with the Dynamic Response of Materials and the Fracture and Failure technical committees. In IMECE 2004 symposia (co)sponsored by the committee included three sessions on the "High rate response of ductile materials" (organized by J. Lambros, UIUC, and KT Ramesh, Johns Hopkins), one session on "Mechanics and failure of material interfaces and structural

joints" (organized by L. R. Xu, Vanderbilt) and two sessions on "Fatigue and fracture at the micro- and nanometer scales" (organized by I. Chasiotis, UIUC). The committee is currently (co)sponsoring four sessions for the IMECE 2005 to be held in Orlando, FL.

Finally, I would like to thank the many individuals (committee members, symposia organizers, chairs and co-chairs, symposia participants etc.) who have volunteered their time and work to bring the committee efforts to fruition. Their active participation is the basis of the continued healthy functioning of the committee. Membership in the committee is open and I encourage anyone interested in Experimental Mechanics to participate in the IMECE 2005 committee meeting or to contact the committee chair or secretary with any comments.

John Lambros, Chair
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Committee on Fluid Mechanics

At the 2005 ASME International Mechanical Engineering Congress, in Orlando, Florida, November 5-11, 2005, the Fluid Mechanics Committee is sponsoring a three-session mini-symposium titled "Fluid-Structure Interactions, Moving Boundaries and Interfaces, and Fundamental and Enabling CFD Technologies". The mini-symposium is organized by Tayfun Tezduyar (Rice University) and Keith Stein (Bethel University). This mini-symposium is coordinated with the one-session mini-symposium titled "Stabilized and Multiscale Methods", sponsored by the Committee on Computing in Applied Mechanics and organized by Arif Masud (University of Illinois, Chicago) and Thomas Hughes (University of Texas, Austin). The Fluid Mechanics Committee is also sponsoring, jointly with the Fluids Engineering and Heat Transfer Divisions, a six-session mini-symposium titled "Gas-Liquid and Phase-Change Flows at Macro-and Micro-Scales". The lead organizer for this mini-symposium is Amitabh Narain (Michigan Technological University). A number of leading researchers in fluid mechanics, computational mechanics and heat transfer will give presentations at these three mini- symposia. Many of the speakers will be from the United States, but we will also have speakers from Japan, Brazil, France and Italy.

Tayfun E. Tezduyar, Chair
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Committee on Fracture and Failure Mechanics

The current officers of the fracture and failure mechanics technical committee (FFMTC) are Jack Beuth (Carnegie Mellon), chair; John Lambros (UIUC), vice-chair; and Mark Walter (Ohio State), secretary. The committee's last meeting was during the 2004 IMECE in Anaheim and it was attended by 16 members. At this meeting, Jean Francois Molinari (Johns Hopkins) was elected as the committee's new secretary, effective July 1, 2005. At that time, he joins John Lambros as committee chair and Mark Walter as vice chair.

The FFMTC sponsored or co-sponsored 7 symposia at the 2004 IMECE meeting. Symposium organizers included Ashraf Bastawros (Iowa State), Jeffrey Kysar (Columbia), Sinisa Mesarovic (Washington State), Yozo Mikata (Lockheed Martin), Xi Chen (Columbia), Ching-Shan Cheng (General Motors), Philippe Geubelle (UIUC), Sergey Shkarayev (Arizona), Weinong Chen (Arizona), Ioannis Chasiotis (Virginia), Sanjeev Khanna (Missouri, Columbia), and Jack Beuth (Carnegie Mellon). The committee will sponsor or co-sponsor 3 symposia at the 2005 meeting. Symposium organizers are: Raman Singh (SUNY, Stony Brook), Toshio Nakamura (SUNY, Stony Brook), Jean Francois Molinari (Johns Hopkins), Philippe Geubelle (UIUC), Sanjeev Khanna (Missouri, Columbia), and Jerry Qi (Colorado).

The committee maintains a web site at the address: http://www.asme.org/divisions/amd/committees/fracture/index.html.
The web site is updated 2-3 times per year and includes announcements, minutes from committee meetings, procedures for proposing symposia to the committee, and a list of committee members. The FFMTC currently has 46 members. The committee is an open one. Those interested in participating in FFMTC activities are encouraged to attend the committee's annual meeting at the IMECE conference.

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Committee on Geomechanics
The Geomechanics Committee held its annual meeting at the 2005 Joint American Society of Mechanical Engineers/ American Society of Civil Engineers/ Society of Engineering Science (ASME/ASCE/SES) Mechanics and Materials Conference (McMAT2005), May 31-June 3, 2005, Baton Rouge, LA. At this conference, the committee co-sponsored the following: a 2-session symposium on Bifurcation and Instability in Geological and Granular Materials (organized by Marte S. Gutierrez and Kathleen A. Issen), and a 2-session symposium on Multi-scale Mechanics of Hierarchical Materials and Interfaces (organized by C. S. Chang, J. Lawrence Katz and Anil Misra). Professor Anil Misra will rotate out of his term as the committee chair end of June 2005,Professor K. T. Chau of the Hong Kong Polytechnic University will assume his duty as the new committee chair according to the committee by-laws, and Professor T.T. (Percy) Ng of the University of New Mexico was elected the recording secretary for the next term. The next committee meeting will be held during the upcoming 15th USNCTAM, at the University of Colorado, Boulder June 25-30, 2006, where the committee will be sponsoring several sessions.

Anil Misra, Chair
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Committee on Instability in Solids and Structures
The committee participated in the 2004 Congress in Anaheim and in the recent Mechanics and Materials Conference in Baton Rouge. In both cases symposia were organized by E. Corona and S. Kyriakides, and centered on a range of instability

problems, from the material to the structural level. We would like to thank all participants for their contributions. A similar symposium will take place at the 2005 Congress, organized by E. Corona, S. Kyriakides, N. Triantafyllidis and L. Librescu. We are also expecting to participate in the upcoming 15th US National Congress on Theoretical and Applied Mechanics in Boulder. We encourage colleagues interested to participate in the activities of the committee to please contact the chair for more information.

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Committee On Uncertainty and Probabilistics (COUP)

The Committee On Uncertainty and Probabilistics met on November 18, 2004 as part of the IMECE in Anaheim, California. This year the Committee was a co-organizer of two sessions, jointly organized with the Committee on Adaptive Structures, and sponsored by the National Institute of Aerospace. The members present at the meeting discussed the importance of encouraging attendance at the upcoming International Conference on Structural Safety and Reliability to be held on June 19-23 in Rome, Italy, where three of the Committee members have organized a mini-symposia on Reliability of Aircraft and Aerospace Structures. It was also suggested that we work more closely with the Probabilistic Methods Committee of ASCE and organize joint sessions at IMECE or ASME/ASCE specialty conferences. We also discussed the importance of expanding the Web Site of the Committee to include invited bi-annual position papers written by eminent researchers in the field of uncertainty and probabilistics, as well as articles on the new trends in the field. A more active collaboration with industry was also discussed. In order to promote a better interaction with industry, the Committee planned to organize a panel session at the IMECE 2005 with a focus on the *future developments in uncertainty based codes and standards*. In addition to this panel session, the Committee will have another session at the IECE 2005 in Orlando. The Committee Chair and Co-Chair next year will be Mohammad Noori from North Carolina Sate University and Lori Graham-Brady from Johns Hopkins University, respectively.

Mohammad Noori, Chair
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