

Bioengineering Division Newsletter

Farshid Guilak (BED Editor)
Summer 1996

Chair's Message

It is hard to believe that my tenure as Chair of the Bioengineering Division is completed. It only seems like yesterday we were standing in the rain in the Colorado Rockies at the 1995 Summer Bioengineering Conference. As I reflect on the accomplishments and the activities associated with our Division, I am struck by its renewed vitality and its potential for continued growth and support of our discipline. It has been a distinct honor to serve as Chair of the Division and in particular, to have the opportunity to work with and be supported by the dedicated membership.

I believe that the Bioengineering Division has entered a new era in support of biomechanical engineering. The quality of the scientific presentations and interaction among participants at the IMECE is at an all time high. We have established financial stability for the Division, and as a result, initiated and financed new awards, particularly targeted at our students. We have established an independently organized and extremely successful biennial summer conference, which has not only brought us a means for financial success but more importantly a greatly enriched forum for exchange and interaction among our membership and members from several other societies. These are all outstanding accomplishments and a result of extraordinary efforts by a large group of dedicated individuals within the Division. Given these successes, therefore, begs the following question: What's next?

I believe that the Division has only begun to reach its potential. There are many additional challenges that face the Division as it continues to strive towards supporting and enhancing the interests and needs of its membership. For example:

- 1) The Division has not succeeded in attracting or encouraging members from industry to actively participate in meetings or in planning programs.
- 2) Given the real or perceived increased constraints on the job market, the Division has not played a role in assisting in career development and placement activities for its students or members seeking alternative opportunities.
- 3) The Division has only begun to explore or capitalize on interactions with other societies working within the field of bioengineering.
- 4) The Division must continue to find ways to involve more members in its administrative and programmatic activities.

In closing, I would like to thank all of the members of the Executive Committee as well as all of the working committees in the Division for their enormous contributions in planning and executing the

activities of the Division. I look forward to the contributions of all of our members to new initiatives and our future direction.

Steven A. Goldstein, Ph.D.

1996 IMECE (WAM) in Atlanta

The Bioengineering Division will have another strong presence this year at the upcoming 1996 IMECE meeting in Atlanta. The BED sessions will occur from Tuesday, November 19th through Friday, November 22nd. There will be 32 podium and 3 poster sessions. They will consist of both contributed and invited papers and will include nearly 250 presentations. The theme of the IMECE this year will be 'Emerging Technologies'. BED will have three 'highlight' sessions around this theme. Two student paper competition sessions are also planned for Thursday afternoon without any other parallel sessions so everyone is able (and is strongly encouraged) to attend.

The BED general meeting is planned for Thursday at 7 p.m. while the BED dinner is planned for Thursday at 8 p.m. at Planet Hollywood - Atlanta, a short 4 blocks from the meeting site at the Atlanta Hilton. The Y.C. Fung Young Investigator Awardee, new Division Fellows, and the Student Paper Competition winners and Best Paper Award winners will be honored at the dinner. There may also be a few "surprises" at the dinner. Those planning on attending the dinner are reminded to purchase their tickets when they send in their advance registration.

The BED lecture by this year's Lissner awardee will be held at a separate time than the BED dinner. The H.R Lissner Award Lecture and Reception will be held Thursday, November 21, 1996 from 11:15 am to 1:00 pm. Following presentation of the lecture, Corporate Friends of the Division will sponsor a reception at which food and refreshments will be made available. The Lissner Awardee for 1996 is Albert I. King, Ph.D. of Wayne State University in Detroit.

If you have any questions regarding the conference, please contact Sohi Rastegar, 1996 BED Program Representative, at (409) 845-5427, email imece96@aggie.tamu.edu, or visit <http://www.tamu.edu:8000/~sr19/imece96-call.html>.

Bioengineering at the 1995 IMECE

The Bioengineering Division sponsored 33 podium sessions at which 191 contributed papers were presented. Three of the sessions featured the Undergraduate, Masters, and Doctoral sessions of the Seventh Annual Student Paper Competition. Three of the Division's podium sessions were co-sponsored with the Heat Transfer Division. In addition, 25 studies were presented as posters. The presented papers were published in the 1995 Advances in Bioengineering, edited by Maury Hull, who had done an excellent job of organizing the program. After a wine and cheese reception, graciously sponsored by the Instron and MTS Corporations, the BED enjoyed chinese cooking at its banquet. Thanks to Tony Keveany for organizing this fine dinner. Thanks to all for a great San Francisco meeting. On to Atlanta!

Post-ASME Workshops at Georgia Tech

On Saturday and Sunday, November 23-24, the weekend after the 1996 ASME IMECE, Georgia Tech will host two workshops. These will be in the following areas: Blood Flow and Vascular Disease, and Cell Mechanics.

These workshops will be held in the SST Building on the Georgia Tech campus. Continental breakfast as well as a buffet lunch will be provided as part of the registration fee of \$20. There will also be a dinner hosted by Georgia Tech on Saturday evening for workshop participants.

Dr. David N. Ku is the organizer of the workshop on Blood Flow and Vascular Disease. This workshop will have two parts. The first part will focus on the influence of mechanics on vascular adaptation, remodeling, and pathology. A second part will focus on critical problems in noninvasive diagnosis of vascular disease.

Dr. Cheng Zhu is the organizer of the workshop on Cell Mechanics. This workshop will focus on the application of mechanics to biological cells, including mechanical properties of cells, cell-cell adhesion, cell locomotion, and biological responses to physical forces.

For further information, contact either Dr. Ku or Dr. Zhu at the following address: Institute for Bioengineering and Bioscience, Georgia Institute of Technology, 281 Ferst Dr., N.W., Atlanta, GA, 30332-0363.

A Workshop on Biomaterials and Tissue Engineering

Georgia Tech will host a workshop focusing on Biomaterials and Tissue Engineering, February 19-23, 1997. The location will be Hilton Head Island, SC. The workshop will start with a welcome reception on Wednesday evening, February 19, and continue to midday on Sunday, February 23. For further information, contact Bob Nerem at: Institute for Bioengineering and Bioscience, Georgia Institute of Technology, 281 Ferst Dr., N.W., Atlanta, GA 30332-0363, Fax: (404) 894-2291.

Message from the Editor

My thanks to all the committee members and ASME staff for their assistance with the preparation of this newsletter. Let me take this opportunity to highlight several of the exciting items in this issue. The Honors Committee is proud to announce that for the third year in a row, and for the fourth time in five years, the ASME-wide Melville Medal was awarded to the paper nominated by the Bioengineering Division. We are also excited to announce the recipients of the H.R. Lissner Award, the Y.C. Fung Young Investigator Award, and the Journal of Biomechanical Engineering Best Paper Award.

Through the efforts of Gerard Ateshian and Ed Grood, the Bioengineering Division now has a web homepage at '<http://www.asme.org/divisions/bed/>'. Check the web site for information on the upcoming IMECE conference in Atlanta and the 1997 Summer Bioengineering Conference, as well as other division news.

I welcome any input on the Bioengineering Newsletter. Please send your comments or suggestions to Farshid Guilak, Duke University Medical Center, Box 3093, Durham NC, 27710 (guilak@acpub.duke.edu).

1996 Herbert R. Lissner Award Lecture and Reception

The H.R Lissner Award Lecture and Reception will be held Thursday, November 21, 1996 from 11:15 am to 1:00 pm. Following presentation of the lecture, Corporate Friends of the Division will sponsor a reception at which food and refreshments will be made available. The Lissner Awardee for 1996 is Albert I. King, Ph.D. of Wayne State University in Detroit.

ASME Bioengineering Division World-Wide-Web Homepage

The ASME Bioengineering Division is going online with its own World-Wide-Web homepage. This web site is intended to information about the division, including its by-laws, various committees, as well as news on meetings and conferences of interest to the division members. Its URL address is '<http://www.asme.org/divisions/bed/>'. Division members and site visitors are welcome to make suggestions for additions, corrections, or improvements to the homepage to the webmasters.

China-Japan-U.S.-Singapore Meeting Promotes Collaboration

The Fourth China-Japan-United States-Singapore (CJUSS) meeting on biomechanics was held in Taiyuan, PRC on May 21-25, 1995. The meeting was followed by a two-day satellite meeting at Wu-Tai Mountain. The meeting was organized by Dr. Savio L.-Y. Woo of the University of Pittsburgh, Dr. Van C. Mow of Columbia University, and by Dr. Yuan-Cheng Fung of the University of California, San Diego under the auspices of the United States National Committee on Biomechanics (USNCB).

A number of young investigators from the United States received travel awards to attend through a grant to the National Science Foundation attained by Dr. Woo. The USNCB Young Investigator Awardees were Gerard Ateshian (Columbia University), Scott Diamond (State University of New York at Buffalo), Cheng Dong (Pennsylvania State University), Tony Keaveny (University of California, Berkeley), David Ku (Georgia Institute of Technology), Lori Setton (Duke University), Lou Soslowsky (University of Michigan at Ann Arbor), Roger Tran-Son-Tay (University of Florida, Gainesville) and Cheng Zhu (Georgia Institute of Technology).

In addition to Drs. Woo, Mow, and Fung, senior delegates from the United States included Tom Brown (University of Iowa), Ken Diller (University of Texas, Austin), Steven Goldstein (University of Michigan, Ann Arbor), Robert Hochmuth (Duke University), Tin Kan Hung (University of Pittsburgh), Roger Kamm (Massachusetts Institute of Technology), Albert King (Wayne State University), Michael Lai (Columbia University), Larry McIntire (Rice University), Robert Nerem (Georgia Institute of Technology), Aleksander Popel (Johns Hopkins University), Richard Skalak (University of California, San Diego), Robert Spilker (Rensselaer Polytechnic Institute), Paul Sung (University of California, San Diego), Shelly Weinbaum (City College of New York), and Ajit Yoganathan (Georgia Institute of Technology).

The CJUSS meeting was initiated by Dr. Fung to promote international collaboration, and has been very successful over the years in establishing ties between biomechanics investigators from these countries. The next CJUSS meeting will be held from August 9-12 in Sendai, Japan, following the Third World Congress of Biomechanics which will be held on the campus of Hokkaido University in Sapporo, Japan, on August 3-8, 1998.

Solid Mechanics Committee

At the 1995 IMECE in San Francisco, the Solid Mechanics Committee sponsored 13 podium sessions and 1 poster session on a wide range of topics including upper extremity mechanics, cardiovascular solid mechanics, soft-tissue mechanics, bone mechanics, implant stability and retrieval, spine mechanics, joint mechanics, and multibody dynamics. At the next IMECE in Atlanta, the committee has planned to organize sessions in the following areas: injury mechanics and vibration, damage of soft and hard tissue, muscle mechanics, contact and interface mechanics, bone and soft tissue remodeling, cardiovascular mechanics, computer-aided and robot-assisted surgery, gait and running, and sports medicine related topics. In addition, an Industry Session on ergonomics in the workplace is planned. The liaison members are identified to help steer the Solid Mechanics Committee and other committees of the ASME toward greater cooperation in the planning of the technical program/sessions. Any one wishing to contribute in this capacity should contact Dr. Patwardhan (708) 343-7200, ext. 5804.

Elections for the Chair and Secretary of the Solid Mechanics Committee were held at the 1995 meeting. Avinash Patwardhan and M. Samir Hefzy were unanimously elected as the Chair and Secretary, respectively, for a three-year term.

Finally, we thank the members who took time to attend the committee meeting in San Francisco. Your active participation will enable the Solid Mechanics Committee to enhance the quality of technical sessions and organize symposiums that are of interest to the membership.

Vijay Goel, Chair

Avinash Patwardhan, Secretary (Chair-elect)

BioFluids Committee

The BioFluids Committee of ASME is planning its sessions for the IMECE in Atlanta. Among the 9 sessions being organized, a Highlight Session will be presented on "Tissue Engineering: Medical Implants for the 21st Century". Dr. Robert M. Nerem has invited notable speakers from industry and academics to address this very current issue and to look ahead at how our exploration of disease mechanics and treatment may be influenced by a better understanding of processes at the cellular and sub-cellular levels. In addition to this topic, other sessions will be held on New Image Processing and Display Technologies in Biofluid Mechanics (Drs. Mort Friedman and Lloyd Back, Organizers), Interaction of Wall Mechanics and Blood Flow (Dr. Jimmy Moore, Organizer), Computational Fluid Dynamics: Cardiovascular Applications (Dr. David Ku, Organizer), Computational Fluid Dynamics: Respiratory Applications (Dr. Cahit Evrensel, Organizer) and Cardiovascular Devices (Dr. Rittgers, Organizer). A poster session will also be held covering a broad range of additional topics.

The BioFluids Committee is also making plans for the 1997 Summer Bioengineering Conference in Sunriver, Oregon. Sessions on Blood/Materials Interactions, Mass Transfer, Cellular Biomechanics, Computational Biofluids, Respiratory Fluids, Interstitial Flow and Imaging Techniques will be presented. In addition, informal sessions will be offered to further expand discussions on the integration of known BioFluid phenomena as well as conjecture on future directions for research.

Biomaterials Committee

The executive committee is in the process of forming a Biomaterials Technical Committee, all interested persons are invited to submit their names to Peter Torzilli, the Secretary of BED.

Membership Development

The Bioengineering Division membership continues to grow, but the growth is slow, too slow. In 1995, primary membership grew to 1,640, only a 3% increase over the previous year. The future success of the Division relies upon continued support of current members and continuous enrollment of new, active members. Membership development is YOU, the active Division member. Please renew your membership in a timely manner, and encourage nonmember colleagues to join the ASME and the Bioengineering Division. For more information, contact Michael J. Askew, Membership Development Committee, Bioengineering Division, at (330) 379-5580, Fax: (330) 379-5551, or email: askewm@uakron.edu

Design and Rehabilitation Technical Committee

At the 1995 IMECE meeting in San Francisco the Design and Rehabilitation Committee sponsored 4 sessions on Materials and Methods for Tissue Replacement, External Orthotics and Prosthetics, Computer Applications in Biomedical Design, and Orthopaedic Implant Design. In keeping with the 1996 IMECE theme of "Emerging Technologies", the division plans to sponsor five sessions at the 1996 meeting in Atlanta. These sessions will include Design for Testing and Wear of Implants, Motion Analysis in Rehabilitation, Orthopaedic Implant Design, Intelligent Materials, and Transducer Design in Biomedical Applications. A session entitled, "Design of Devices for Assistive Technologies in Rehabilitation" will be organized as part of the special Emerging Technologies session.

An important thrust of the Design and Rehabilitation Division will be to improve technology transfer through more active liaison with academia and industry. For more information contact Ted Conway (r1tac@vm1.cc.uakron.edu).

Heat and Mass Transfer

The theme of the IMECE meeting for the next several years is "Emerging Technologies". The Heat and Mass Transfer Committee (K-17) has finalized the following session titles and chairs for the 1996 ICE meeting to be held in Atlanta.

1. "Emerging Clinical Thermal Therapies" S. Clegg and G. Anderson

2. "Nucleation Crystallization and Phase Change in Biological Systems" J. Bischof and M. Toner
3. "Low Temperature Processing of Biomaterials" E. Scott and A. Dutton
4. "Novel Instrumentation in Bioheat and Mass Transfer" J. McGrath and T. Diller
5. "Advances in Modeling Biologic Heat and Mass Transfer Processes" J. Valvano and J. Chato
6. "Mathematical and Physical Models as Replacements for Animal Experiments" R. Roemer and R. Levin

The K-17 committee will be arranging a trip to a cryo lab in the Atlanta area and dinner at a local restaurant. Details will be available at the K-17 planning meeting or by contacting the Chair (Linda J. Hayes, University of Texas at Austin, lhayes@mail.utexas.edu) or Co-chair (Scott T. Clegg, Duke University, clegg@radonc.duke.edu).

New Directions Committee

During the 1995 WAM, the NDC (New Directions Committee) was re-activated. Don Giddens was appointed by Steve Goldstein as acting chair. Members of the committee are Steve Goldstein, Mike Lai, Gerry Miller, Ajit Yoganathan, Dave Butler, Bob Spilker and Don Giddens. The New Direction Committee is a standing committee of the BED whose function is to make recommendations to the Executive Committee as to new directions for divisional activity. The NDC will meet annually at the ASME-WAM and at other times as necessary to conduct its activities. Activities will include review and assessment of factors affecting the future of the Division (such as funding climate, available science base, educational trends, public policy and societal issues), discussions relating to identification and prioritization of new directions and opportunities, and development of recommendations to the Executive Committee. It is expected that the NDC will present one or more recommendations to the Executive Committee at each ASME-WAM.

The following recommendations by NDC have been accepted by the Executive Committee:

1. The current BED Chair and Secretary serve as ex officio members in the NDC committee.
2. The Executive Committee act to establish a Biomaterials Technical Committee within the Bioengineering Division.
3. The BED develop a symposium on "The Role of Bioengineers in Health Care Cost Containment" for the 1997 Summer Meeting. The Symposium should include invited speakers from business, public health, medicine and government who are expert in the area.
4. A session of the BED be devoted to "Ethics and Enterprise" at the 1997 WAM.

The New Direction Committee solicits inputs from BED members on any specific issue which may affect the future of the Division. Please send your input to Don P. Giddens, Dean, Whiting School of Engineering, John Hopkins University (dgiddens@jhu.edu). Honors and Awards

The Bioengineering Division Honors Committee has again identified a number of outstanding accomplishments by division members. This year's highlights include presentation of the H.R. Lissner Award to Dr. Robert Mates of the State University of New York at Buffalo, and the Y.C. Fung Young Investigator Award to Dr. Cheng Dong of Penn State University.

The Best Paper Award of the Bioengineering Division was presented to Drs. Y. Huang, D. Rumschitzki, S. Chien, and S. Weinbaum for their paper entitled, "A Fiber Matrix Model for the Growth of Macromolecular Leakage Spots in the Arterial Intima". The paper presented a new model for the cellular level growth of macromolecular leakage spots in the arterial intima. This model utilizes a heterogeneous fiber matrix theory, which includes proteoglycan and collagen components based on recent ultrastructural observations of the extracellular subendothelial proteoglycan matrix. The paper was published in the ASME Journal of Biomechanical Engineering, Volume 116, pp. 430-445, 1994.

The Student Paper competition, held each year at the Winter Annual Meeting, continues to showcase some of the most outstanding papers of the conference. A session is held for undergraduate students and another for graduate students, each with six participants. The cost of attending the Bioengineering Awards Banquet is paid for all student participants. Awards of \$100, \$50, and \$25 were given to the first, second, and third place awardees respectively, in each of three categories, B.S., M.S., and Ph.D. Also, three honorable mentions were given in each category. The 18 finalists were selected from 36 applicants, with 11 or 12 applicants in each category. Ethicon Endosurgery, Inc. has generously donated \$10,000 to be used for the undergraduate student paper awards beginning this year and continuing for a ten year period. In addition, the Whitaker Foundation has provided funds will be used to increase the travel awards that are given to the winner of each category. Our thanks to Drs. Gerry Miller and Ed Grood for their continued fundraising efforts in this area.

For the third year in a row, the ASME Melville Medal was awarded to a paper from the Bioengineering Division. The winners of the best paper award last year, Drs. Flaura K. Winston, Lawrence Thilbault, and Edward J. Macarak were awarded the 1995 Melville Medal for their paper entitled, "An Analysis of the Time-Dependent Changes in Intracellular Calcium Concentrations in Endothelial Cells in Culture Induced by Mechanical Stimulation", published in the ASME Journal of Biomechanical Engineering, Volume 115, pp. 160-168, 1993. This represents the fourth time in five years that the Bioengineering Division nomination has received the ASME-wide award.

Two Bioengineering Division Fellows were elected in 1995: Dr. Ali Sadegh of the City College of New York, and Dr. Paul Stein of Henry Ford Hospital.

The Bioengineering Division continues to solicit nominations for these awards. Nominations for the Y.C. Fung Award should be send to Peter Torzilli (torzillip@hss.edu). For the Student Paper Competition, contact Robert Spilker (spilker@rpi.edu) For nominations for the Lissner Award or for further information, please contact the Chair of the Honors committee (Robert Roemer, roemer@me.mech.utah.edu).

Y.C. Fung Young Investigator Award

The ASME Bioengineering Division is proud to present the 1995 Y.C. Fung Young Investigator Award to Dr. Cheng Dong. Dr. Dong's earned a B.S. degree in Engineering Mechanics from Jiao-Tong University in Shanghai, China in 1982. He then completed an M.S. degree in Civil Engineering and Engineering Mechanics in 1984, and a Ph.D. in Bioengineering and Engineering Mechanics in 1988 at Columbia University in New York. Following post-doctoral studies at the Dept. of Applied Mechanics and Engineering Sciences at the University of California, San Diego, and a Staff Fellowship at the National Institutes of Health, he was appointed Assistant Professor in

the Department of Bioengineering and Engineering Science at the Pennsylvania State University in 1992. He currently holds this position.

Since coming to Penn State, Dr. Dong has built upon his training with new studies to enhance our fundamental knowledge of the mechanics of biological systems at the cellular level. His long-term goals are to delineate the biomechanical and biophysical aspects of cellular structure that affect the function of the circulatory system. More specifically, his research has focused on the behavior of leukocyte-surface interaction in light of its role in the inflammatory process and in the development of artificial organs associated with prolonged blood contact. In addition, he is conducting studies on the active micromotion of tumor cells in response to a chemotactic signal involved in cancer invasion and metastasis. Dr. Dong's approach to these problems represents a departure from traditional methods of the fields of medicine and biology and embodies an innovative quantitative approach to cellular research.

Dr. Dong has received research grants from the Whitaker Foundation, the American Cancer Society, and the National Science Foundation, including the new NSF CAREER Award. He has also received a number of academic honors, including the ASME Best Paper Award for the Journal of Biomechanical Engineering, the ASME Melville Medal, and the Harold Lampton Young Investigator Award from the Biomedical Engineering Society. Dr. Dong is actively involved in several professional societies, particularly the Bioengineering Division of ASME.

Herbert R. Lissner Award

The Bioengineering Division of the ASME is proud to announce Dr. Robert E. Mates as this year's H.R. Lissner Awardee. Dr. Mates is currently Professor of Mechanical and Aerospace Engineering and Director of Center for Biomedical Engineering at the State University of New York at Buffalo. Dr. Mates received his B.S. degree in Mechanical Engineering from the University of Rochester in 1957, followed by M.S. and Ph.D. degrees in Mechanical Engineering from Cornell University in 1959 and 1963, respectively.

Dr. Mates has been a member of the faculty of the University at Buffalo since he received his PhD degree. He began as an Assistant Professor in 1962, was promoted to Associate Professor in 1965 and Professor in 1969. He served as Chair of the Department of Mechanical and Aerospace Engineering from 1967-70 and 1979-83. In 1989 he founded the Center for Biomedical Engineering and continues to serve as Director.

Dr. Mates' research interests are in cardiovascular biomechanics. He has carried out experimental investigations and developed mathematical models describing the mechanics of the left ventricle, flow through constricted coronary arteries, and the relationships between pressure and flow in the coronary circulation. Together with his students, he developed a feedback-controlled hydraulic perfusion system to study the dynamic behavior of the coronary circulation in animal models.

Dr. Mates is actively involved in the ASME has was appointed to the rank of Fellow in 1984. He has held several positions in the Bioengineering Division of the ASME, including Program Chair (1976-77), Secretary (1977-78), and Chair (1979-80). He also served as Associate Editor of the Journal of Biomechanical Engineering from 1976-1983 and was a member of the Bioengineering Division Honors Committee from 1984-1990. During this time period, he also served as Chair of the Basic Engineering Group Program Committee (1984-1987) and has been involved in the organization of several of the Bioengineering Division symposia and meetings. He is currently serving as Vice-President of the Board on Communications. Dr. Mates was awarded the Dedicated

Service Award by the ASME in 1988, and has received several other honors including the SUNY Chancellor's Award for Excellence in Teaching.

In addition to his involvement with the ASME activities, Dr. Mates has served as a Director of the Biomedical Engineering Society and a member of its Publications Committee. He is a founding fellow of the American Institute of Medical and Biological Engineering and is the Chair-elect of its Academic Council.

Call for Papers - 1997 Summer Bioengineering Conference

The Bioengineering Division and the Bioprocess Subdivision of the American Society of Mechanical Engineers in conjunction with the Food, Pharmaceutical, and Bioengineering Division of the American Institute of Chemical Engineers, the Bioengineering Committee (Engineering Mechanics Division) of the American Society of Civil Engineers and the Biomedical Engineering Society will be sponsoring the third Summer Bioengineering Conference to be held June 11-15, 1997 in the picturesque area of Sun River, Oregon.

Abstracts in all areas of bioengineering are solicited for this conference. Specific sessions and forums are planned on the topics of Bioartificial Materials, Biological Mass Transfer, Blood-Material Interaction, Cellular Biomechanics, Computational Biomechanics, Contact Mechanics, Damage Accumulation and Adaptive Response of Bone, Electromechanics, Imaging/Biomechanical Modeling, Interstitial Flow, Micromechanics of Bone, Multibody Modeling, Rapid Prototyping in Medicine, Respiratory Fluid Mechanics, Robotic Applications, Soft Tissue and Joint Mechanics, Upper Extremity Mechanics, and Vascular Grafts/Implants.

In addition, a plenary session on Reducing Health Care Costs through Bioengineering, an evening poster session (including a student poster competition), and workshop sessions on general topics of interest are planned.

Abstracts are to be submitted on 8.5 x 11" paper. The format instructions may be obtained from: K. B. Chandran (chandran@icaen.uiowa.edu) or Stephanie Winterbottom (wntrbtm@icaen.uiowa.edu). Address: Department of Biomedical Engineering, 1202 EB, College of Engineering, University of Iowa, Iowa City, IA 52242, Fax: (319) 335 5631. The deadline for submission of abstracts is December 16, 1996. Authors will be notified by March 15, 1997.

The conference will be held in the Sun River Resort, in Sun River, Oregon (15 Miles south of Bend, Oregon) on US Highway 97. Commuter airlines serve the Redmond/Bend airport from San Francisco, Portland and Seattle. Bring the family for a fun-filled week with an exciting conference along with many outdoor activities in the resort (bicycling, fishing, horseback riding, tennis, swimming, canoeing, kayaking, and white water rafting).

1996 Thurston Lecturer: Don P. Giddens -- Abstract

Engineering Education for an Increasingly Technological World: Useful Axioms and Theorems

Engineering education, by its very nature, must respond to and anticipate technological change. Yet the time required for modifications in curricula is now becoming shorter than the time over which changes in knowledge and in technology occur, leading to what some might consider a

potentially unstable dynamical system. Engineering educators thus face a dilemma not common with our colleagues in the arts and humanities: how do we adapt to the educational needs of students when these needs change so rapidly? The answers are not found simply in the traditional refrain, "teach the fundamentals". Rather, we should articulate basic axioms, demonstrated by experience and logic, and should devise theorems to be tested for the present and the future which can serve as guiding principles for design, and redesign, of engineering education.

We must first start at the observational stage of the scientific method: what have we done well and what have we done poorly in engineering education? Next, we should consider defining certain axioms which can be stated as a result of our collective experience. Universities and colleges must obviously confront the issue of our mission(s) as educational institutions and whether or not these should be redefined. Armed with a few basic principles and concepts, it then becomes possible to postulate theorems for application and testing as we attempt to provide the best possible education for our students and, simultaneously, serve the needs of society.

Drawing upon 30 years experience as a faculty member, multidisciplinary center director and engineering dean, the Thurston Lecture will take a serious, though sometimes humorous, look at constructing a set of axioms and theorems to guide in insuring excellence in engineering education in an increasingly technological world. The Lecture will be more a framework for discussion and debate rather than a prescription for change, but interest in this subject is critical to educators (including "research" faculty), industry leaders and policy makers alike.