ASME International

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Bio

Bioengineering Division Newsletter

Farshid Guilak, Ph.D., Editor *Fall 1998*

Chair's Message

Peter A. Torzilli

Has it really been twenty-two years since Ed Grood asked me to take over as Newsletter editor? It seems a long time but surprising how fast it goes by. There have been many changes in the Division, of which increased member enthusiasm and participation in the Division's activities is but one. There is a new vitality in the Division, and this is amply demonstrated by the Division's accomplishments over the past year. In this message I would like to reflect on the Division's past, its accomplishments last year, and what lies ahead as we enter the 21st Century.

In 1977 the Division had a little over 700 members and four standing and six technical committees. Thanks to the efforts of our Membership Development Committee chairs, Mike Askew and Gerard Ateshian, BED membership has risen to 1,624 primary, 1,371 secondary, and 2,134 affiliated members. In 1990 and 1995 the Division reorganized its infrastructure and revised the By-Laws. The Executive Committee (EC) was expanded from five to eight members. New EC members for 1998 include Noshir Langrana as Secretary-Elect and Maury Hull as Member-in-Charge of Member Affairs. Two new technical committees were also formed last year, the Education and Professional Development Committee (EPDC) and the Bioprocess Engineering Committee (BPEC). The Division now has nine standing committees and eight technical committees. New committee chairs include Dave Butler, Finance, Jerry Miller, EPDC, and Roger Brunkow, BPEC. Information on the Division's organizational structure and technical activities can be found on the Division's new web site at ASMENET, established by Gerard over the past year.

The Division's primary goal for 1997-98 was to develop a long-range strategic plan for the year 2010. Three objectives were chosen for future development - interchange of technology; professional development; and education. Specific objectives and metrics were defined in each area, and a mission statement was developed:

BED Vision 2010: To provide international leadership in Biomechanical Engineering for the interchange of technology, direction of educational programs, and promotion of professional development in academia and industry.

One objective of the Division's Strategic Plan for 2010 was to make the BED the forum of choice in Biomechanical Engineering for intellectual activities and interchange of technology in research, development and manufacturing. The 1997 Summer Bioengineering Conference, held at Sun River, Oregon and cosponsored with the American Society of Civil Engineers, the Biomedical Engineering Society, and the American Institute of Chemical Engineers, attracted over 250 individuals. The BED's annual conference, held during the IMECE, consisted of 38 sessions, including three sessions for student paper presentations, presentation of the ASME H.R. Lissner Award by Ajit Yoganathan, and a special symposium on Ethics in Bioengineering. In the future, all meetings and conferences will include national and international participation with other bioengineering societies, and include symposia and sessions on Emerging Technologies, Bioprocessing, and Cell and Tissue Engineering. Another objective was to establish the Journal of Biomehanical Engineering as the journal of choice for authors publishing in biomechanical engineering. Through the initiative of Ken Diller, the journal's new Technical Editor, the journal has strengthened its publications at the cell and molecular level, diversified its Associate Editors into new areas of bioengineering, reduced the submission-to-publication time to less than one year, and most important, increased the number of issues from four to six per year.

A major goal of the Division was to establish the ASME as the society of choice for professional activities in Biomechanical Engineering. To accomplish this the Division would provide leadership through member participation in the Division's and ASME's activities. At the Societal level, BED members are active in the Basic Engineering Technical Group Operating Board and the IMECE Program Committee. In additon, the Division participated with ASME in government activities to promote bioengineering nationally by writing a position

statement titled *Bioengineering Research at the National Institutes of Health*. To help recruit new and younger members for participation in BED activities, the Division is developing a manual of Standard Operating Procedures and will fund a young BED member to attend the annual Technical Executives Conference.

Another major accomplishment in the area of professional development was through increased honors and awards activities. The Division's Y.C. Fung Young Investigator Award was elevated to a society award, the Lissner ASME Award was updated to include a medal (both awards include a medal, certificate, travel expenses and honorarium), the Division's Best Paper Award will be renamed in honor of Richard Skalak, permanent funding will be established for the student paper awards, the Division will co-sponsor the elevation of the Thurston Lecture to a society award, and the ASME's Dedicated Service Award was given to Mort Friedman.

Finally, the Division decided, in the light of the increasing importance and demand for bioengineering education, to provide educational activities and leadership in academic programs in Biomechanical Engineering. To accomplish this goal the Division established the Education and Professional Development Committee to define/refine academic programs in biomechanical engineering at the undergraduate, graduate, post-doctoral, and continuing education levels.

What is in the future for the Bioengineering Division? Based on our Strategic Plan for 2010 the Division intends to further increase its activities in the areas of technology, professional development, and education. In the technology area, the Division will develop training symposia for young bioengineers at the summer and winter meetings, make conference proceedings available on CD ROM and the Internet, increase the Journal's international presence (authors and readership) and internet availability, develop technology transfer capabilities via the ASME web site, develop codes and standards guidelines and definitions for medical devices, and provide in- house workshops for industry. Professional activities will include increased participation in student chapters and increase student participation in conferences (student papers and posters), develop mini-courses and workshops for industry (in-house/company continuing education), organize and participate in mentoring programs for students and young professionals, develop forums relevant to professional development for students, early careers, late careers and career changes, broaden BED award recognition, and establish additional awards for service, education and research. Educational activities and leadership in academic programs will include developing undergraduate and graduate scholarship programs through the ASME Foundation, increasing activities for bioengineering undergraduates through design competitions at the winter and summer conferences, and establishing a bioengineering educational web site to include material resources (books, proceedings, journal contents) and course and lecture materials.

As you can see a lot has happened over the last year, not to mention the past twenty-two years. The Division is strong, and will continue to strengthen through its expanded activities. Over the past year I have worked closely with the Executive Committee, especially Ken Diller and Ray Vanderby, to develop a comprehensive strategic plan for the Division as it moves into the 21st Century. I believe that the Division, through its membership and with the support of the ASME, will be the leading society in bioengineering. On a personal note, it has been a great honor and privilege to serve as Chair of the Bioengineering Division. Several years ago I asked myself, without success, why I so enjoyed being an active member of the Bioengineering Division. It was while I was attending the Professional Development session at the TEC that I realized that the ASME is the only society where I can interact with other bioengineers at the engineering level. While I am a member of several other biomedical societies, these are not societies where I interact professionally as an engineer. The BED and ASME provides me with this opportunity, and it is this that we as a Division should stress. I like to think of the ASME as "the society where bioengineers can go to learn what bioengineers really do". I am proud to be a member of the Division for all these years and look forward to future participation.

Peter A. Torzilli
BED Chair

Editor's message

I am amazed that my three years as editor of the BED Newsletter are up already. It has certainly been a wonderful experience working closely with the BED chairs and officers. I would just like to take this opportunity to thank everyone for providing me with reports, articles, and photographs for the newsletter over the years and especially for putting up with my harassing emails and phone calls. In particular, I'd like to thank Steve Goldstein, Mike Lai, and Peter Torzilli, the BED chairs of the past three years, and Gerard Ateshian, who has taken on the responsibility of maintaining the newsletter online. The newsletter would not be possible without the excellent assistant of Alex Majewski, our technical representative at ASME headquarters. If you are interesting taking over the position of newsletter editor for a three-year term, please contact me, Farshid Guilak (guilak@duke.edu), outgoing chair Peter Torzilli (TorzilliP@hss.edu), or incoming chair Ken Diller (kdiller@mail.utexas.edu).

Farshid Guilak

BECON: Bioengineering in the Millennium

The National Institutes of Health (NIH) held a first of its kind bioengineering symposium in Bethesda, Maryland, (U.S.A.) from February 27-28, 1998 at the Natcher Conference Center. This symposium was organized to chart the vision for the future of bioengineering research in the 21st century. Harold E. Varmus, MD, Noble Laureate in Medicine & Director, NIH welcomed the delegates and made opening remarks. According to Dr. Varmus "Bioengineering advances the nation's health by increasing biological knowledge through the use of engineering principles & techniques and contributes methods that have facilitated the development of novel devices & drugs". In February 1997 he established the NIH-Bioengineering Consortium (BECON). Dr. Varmus, introduced the Keynote Speaker Senator Bill Frist, MD, (R-Tennessee).

Senator Frist, elected in 1994, is the first practicing physician on the U.S. Senate since 1928. He is a heart trans-plant surgeon, research scientist and a "citizen legislator". Senator Frist serves on five key committees, and Chairman of the Subcommittees on Public Health and Safety, and Science, Technology & Space. In his address, he emphasized the need for funding research in bioengineering. In 1997 he was instrumental in establishing the National Center for Bioengineering Research Act to promote biological research. Congress would authorize $750,000 to be appropriated for the general operation of the center, with an additional $20 million through Fiscal Year 2007 to be used at the discretion of the NIH Director among the bioengineering activities carried out by the national research institutes or other agencies of NIH for bioengineering projects. Funding for the NIH has increased from $ 6.7 billion in 1988 to $ 13.7 billion in 1998, and this was earlier highlighted by President Bill Clinton in his State of the Union address.

Dr. Wendy Baldwin, Deputy Director for Extramural Research, NIH gave the insight into the formation of the Bioengineering Consortium (BECON) at NIH. This is composed of intramural & extra-

mural senior level representatives from all NIH Institutes, Centers, and Divisions (ICDs). This composition enables BECON to stimulate and facilitate cooperation, collaboration and new initiatives across all of NIH and provides a direct link between the bioengineering research programs of each ICD and the NIH Director. It is fostering liaisons with other Federal agencies and outside organizations.

Panel discussions were held in an effort to forge the future of bioengineering for the next 5 to 10 years and to recommend the NIH which course of action to be taken in investing into the future of the nation's health for the next century. The following panel discussions were held:

Functional Genomics: From the Genome to the Physiome; Imaging at the Molecular and Cellular Levels; Imaging at the Tissue and Organ Levels; Functional Biomaterials; Instruments & Devices; Bioengineering in Clinical Medicine; Education and Training; Nanobiotechnology; Beyond Informatics: The Future of Computation; New Approaches to Therapeutics; Combinatorial Approaches in Biology; Mathematical Modeling; Medical Informatics; Rehabilitation and Assistive Techniques; Biomechanical Solutions; and Bioelectrical/Biomagnetic Phenomena: Ion Channels to Organ Function.

This symposium identified the major challenges in biomedical research that will benefit from bioengineering approaches; elaborate the role of bioengineering in future advances in biomedical research; discuss how to integrate bioengineering with biological research in meeting those challenges; showcase accomplishments of NIH funded bioengineering researchers; increase the visibility of bioengineering to the NIH leadership, staff, and the intramural and extramural research community; and make recommendations for areas of future NIH investment. Basic bioengineering research can lead to the commercialization of new health care technology and thus maintaining the Nation's leadership in Health Care Technology.

The response to attend the bioengineering symposium was overwhelming and over 750 participants took part in the meeting. Over 110 scientific posters and exhibits related to biology and medicine provided a forum for showcasing NIH-funded bioengineering projects fostering future collaborations among academic investigators, industry and small business at the symposium.

Dr. Harcharan Singh Ranu

1999 SUMMER BIOENGINEERING CONFERENCE
CALL FOR PAPERS
BIG SKY, MONTANA
JUNE 16 - 20, 1999

The Bioengineering Division of the American Society of Mechanical Engineers in conjunction with the Food, Pharmaceutical, and Bioengineering Division of the American Institute of Chemical Engineers, United States National Committee on Biomechanics, and the Biomedical Engineering Society is sponsoring the fourth Summer Bioengineering Conference to be held June 16 - 20, 1999 in Big Sky, Montana. Abstracts in all areas of bioengineering are solicited for the conference. In addition, specific sessions and forums are planned on the following topics:

Cell & Tissue Engineering
Spine and Impact Biomechanics
Computational Biomechanics
Tissue Adaptation and Growth
Electromechanics
Upper Extremity Mechanics
Pulmonary Epithelium Mechanics
Cellular Injury Mechanism
Biomaterials
Vessel Wall/Blood Flow
CFD Large Vessels & Optimization
Blood/Materials Interactions
MEMS/Microfluidics
Cardiac Valves
Pulmonary/Respiratory Fluid Mechanics
Biological Mass Transfer
Blood Flow Imaging
Virtual Reality/Flow Visualization
Intravascular Devices

A special symposium in honor of Professor Y-C. Fung's 80th Birthday by the U. S. National Committee on Biomechanics, 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: Program Chair, Vijay K. Goel, Ph.D. (Vijay-Goel@uiowa.edu), Nicole M. Grosland, Ph.D. (Grosland@icaen.uiowa.edu), or Gayle Stratton (Iowa-Spine-Research@uiowa.edu)

Iowa Spine Research Center
Department of Biomedical Engineering
1410 EB, College of Engineering
University of Iowa, Iowa City, IA 52242
FAX: 319-353-7516/319-335-5631

DEADLINES

Submission of abstracts: Nov. 12, 1998
Notification of authors: March 22, 1999

We encourage you to down load the author's instructions from our web site:
http://www.asme.org/divisions/bed/summer99.html/

The conference will be held in Big Sky, Montana. The setting is spectacular and offers plenty of opportunity for outdoor activities including hiking, biking, golf, tennis, swimming, rafting and more. Expect a relaxed atmosphere with stimulating scientific discussion and time to enjoy the area.

News from the Technical Committees

Solid Mechanics Committee

The Solid Mechanics Committee continues to be the largest Technical Committee both in terms of membership, number of sessions, and number of papers organized at the IMECE. At the 1997 IMECE meeting in Dallas, the Solid Mechanics Committee sponsored 12 podium sessions, 2 sessions jointly with the Design Committee, and no poster sessions. These sessions covered a wide range of topics including Spine Mechanics, Soft Tissue and Cell Mechanics, Joint Mechanics, Bone and Contact Mechanics, Plastics in Orthopaedic Implants, Computer Assisted Modeling and Imaging, Extracellular Matrix, Micro and Cellular Mechanics, and Electrokinetics and Transport.

For the 1998 IMECE in Anaheim, the Solids committee has organized 14 podium sessions, 1 podium session jointly with the Biomaterials Committee, and no poster sessions. Topics include Impact Biomechanics, Spine Mechanics, Joint Mechanics, Joint Replacement, Models for Soft Tissues, Cartilage Mechanics, and Bone Mechanics. Preliminary planning for the 1999 IMECE has also begun.

In addition, the Committee is actively organizing sessions for the 1999 Summer Bioengineering Conference to be held in Big Sky, Montana next June.

I would like to formally thank all the members of the Solids Committee, and particularly the session organizers, who put in so much work on behalf of the Bioengineering Division. Your effort is gratefully acknowledged. Importantly, sincere thanks go to Dr. Avinash "Pat" Patwardhan for his chairmanship of this committee the past few years. Pat has moved up to Chair of Technical Committees and we wish him all the best!

For further information on the Solid Mechanics Committee, please contact Lou Soslowsky (215-898-8653, e-mail: soslowsk@mail.med.upenn.edu).

Membership Committee

ASME has recently completed a campaign to promote eligible Associate Members to Member status. To qualify for the promotion, an applicant must establish that a minimum of 12 years of active practice, 5 years of which must be in a position of responsible charge, is part of the professional experience. A Masters, doctoral degree, teaching experience, or a PE license may all count toward the 12 year requirement. If you have not been promoted to Member status as part of ASME's recent campaign and believe that you are eligible, you can download an application for promotion from ASME's website at http://www.asme.org/work/frames/frame_member_forms.htm. If you are under the age of 30, promotion to Member status would raise your membership fee from $75 to $101; for applicants over the age of 30, the current membership fee of $101 would remain the same. The benefits of promotion to Member are (a) a recognition of the applicant's seniority, both within ASME and within the engineering profession; (b) the ability to indicate interest in, and receive newsletters from up to 5 divisions; and (c) eligibility for promotion to the honorary status of ASME Fellow. Questions can be addressed to ASME, Membership Department, 22 Law Drive, P.O. Box 2350, Fairfield, NJ 07007-9979, or by contacting Mr. John Beck at 212-705-8463.

Gerard A. Ateshian Chair
BED Membership Committee

K-17 Bio-Heat and Mass Transfer Committee Report

The K-17 Committee sponsored seven sessions at the 1997 IMECE in Dallas, TX, from Nov. 18-20, which were well attended and excellent in content. The committee met on Wed., Nov. 19, and everyone's participation was welcomed. The committee put together session titles and chairs for the 1998 IMECE meeting, Nov. 15-20, in Anaheim, CA. The sessions are "Modeling of Heat Transfer in Biological Systems," "Bioheat and Mass Transfer in Microgravity," "Thermal, Electrical and Physically Induced Alterations in Cells and Tissue," "Modeling of Mass Transfer in Biological Systems," "Laser Induced Transport in Diagnostic and Therapeutic Applications," "Ice Physics in Biological Systems."

The Committee also decided to propose two sessions for the 1999 Summer Bioengineering Conference. These were "Regulatory Issues on Medical Devices and Therapies" and "Thermo-electrical, Physical and Chemical Stresses on Biosystems." Committee members were also encouraged to participate the in the Bio Heat and Mass Transfer Conference in Turkey.

The Committee recognized several members who received honors and awards during the year: John Bischoff, A.S.M.E. Best Paper Award; Ken Diller, A.S.M.E. Distinguished Lecturer for Bioheat Transfer, Dave Colvin, SPIR award, John Chato, Fellowship to Japan Society for Promotional Science, and Vasan Venugopalan, Associate Editor for the Journal of Heat Transfer.

On other business, Standard Operating Procedures were developed for the K-17 Committee, including the offices of Chair, Vice-Chair and a representative to the Program Committee.

Honors Committee

BED again produced an impressive array of recipients of honors and awards. Our 1997 Lissner Awardee was Professor Ajit Yoganathan from the School of Mechanical Engineering, Georgia Institute of Technology, "for his leadership in the understanding of the fluid dynamics of heart valves and in the development of prosthetic devices." His lecture at the IMECE '97 was on the "Fluid Mechanics of Valvular Heart Disease."

The Award for the Best Paper in our Journal of Biomechanical Engineering went to P. V. Pazhayannur and J. C. Bischof from the Department of Mechanical Engineering, University of MInnesota, for their report on "Measurement and Simulation of Water Transport During Freezing in Mammalian Liver Tissue."

The results of the Ph.D. Student Paper competition were: 1st Place - Mark Richards, Orthopaedic Research Laboratories, University of Michigan, for his paper on "Strain Environment Effects on Bone Regeneration and Tissue Differentiation During Distraction"; 2nd Place - Patricia M. Van Kemenade, Division of Mechanical Engineering, Eindoven University of Technology, The Netherlands; 3rd Place - Geoffrey C. Raynak, Department of Orthopaedics, University of Washington, Seattle.

The winning MS papers were: 1st Place - Nicole Urban, Kingsville, Texas, for her paper on "Altered Collateral Ligament Strain Following Total Knee Arthroplasty"; 2nd Place - Dwight Todd, Memphis, Tennessee; 3rd Place - Tammy Haut, Department of Mechanical Engineering, University of California at Davis.

The winning BS papers were: 1st Place - Benjamin Murphy, Department of Mechanical Engineering, the University of Alabama, for his paper on "Standing Assist Device"; 2nd Place - Louis E. DeFrate, Musculoskeletal Research Center, Pittsburgh; 3rd Place - Mohan Sathyamorrthy, E. Setauket, New York.

Mort Friedman was awarded the ASME Dedicated Service Award. The Fellow membership rank was awarded to Leslie Antalffy, Ali Engin, Latif Jiji, Robert Mates, Raymond Vito, Jafar Vossoughi, and Maury Hull.

The 1998 Y. C. Fung Young Investigator Awardee is Dr. Louis Soslowsky of the University of Pennsylvania.

Congratulations to all!

Biomaterials Committee

The first two technical sessions sponsored by the newly formed Biomaterials Committee at the 1997 IMECE were on two broad topics: Orthopaedic

Biomaterials and Cardiovascular Biomaterials. At the meeting in Dallas, the committee agreed that future session topics should be more focused. Thus at the 1998 IMECE in Anaheim the committee will sponsor two technical sessions on Wear and Fixation of Artificial Joints and Remodeling of Biological Tissues. The committee also plans to organize two sessions at the 1999 Summer Bioengineering Conference, and two sessions at the 1999 IMECE on a variety of topics that include biodegradable materials, mechanics of the biomaterial-tissue interface, and biotribology. As always, many thanks go the members of our committee whose tireless efforts have enabled our participation in the activities of the Bioengineering Division. If you are interested in joining this committee and in developing technical sessions and symposia at future meetings, please contact Vasanti M. Gharpuray (864-656-5555 or vasanti@ces.clemson.edu).

Fluids Committee

The Fluids Committee of the Bioengineering Division of ASME has completed planning for its sessions at the IMECE in Anaheim. Among the 10 sessions being organized will be two Industry Highlight Sessions on "Clinical Applications of CFD, Visualization and Virtual Reality" (Drs. Charles Taylor and Takami Yamaguchi, Organizers) and "Catheters and Perfusion Devices in Vascular Applications" (Drs. Rupak Banerjee and Lloyd Back, Organizers). Both of these sessions will include presentations on current techniques and devices being developed for clinical application with a number of these talks being given by industry engineers. In addition to these topics, other sessions will be held on "Vessel Wall and Fluid Mechanics" (Drs. Jimmy Moore and David Vorp, Organizers), "Heart Valve and Cardiac Modeling" (Drs. K.B. Chandran and Andreas Anayiotos, Organizers), "Validation and Optimization of Computational Fluid Dynamics" (Drs. C. Ross Ethier and John Siegel, Organizers), "Pulmonary and Respiratory Fluid Mechanics" (Dr. Cahit Evrensel, Organizer) and "Cellular and Tissue Engineering" (Dr. Stanley Rittgers, Organizer).

The BED / Fluids Committee is also making plans for the 1999 Summer Bioengineering Conference. Sessions are planned on Blood / Materials Interactions, Cellular Biomechanics, Computational Fluids, and Respiratory Fluids. In addition, informal sessions will be offered to expand discussions on the integration of biofluid phenomena as well as provide ideas on future directions for research.

Finance Committee

Dave Butler recently agreed to replace Jerry Miller as Chair of the Finance Committee of BED. Jerry did an excellent job in this capacity over the past several years and the Division thanks him for his tireless effort. As Incoming Chair, Dave Butler will first be working with Peter Torzilli, Jerry Miller, Bob Spilker, and Roger Kamm to draft a budget for the next Summer Biomechanics Meeting to be held in Big Sky, Montana in June, 1999. Over the next year, Dave will also be exploring several new initiatives for BED, based upon input from the Executive Committee and the entire Division. Please send suggestions for review by the Finance Committee to Dave via email (david.butler@uc.edu).

Education Committee

One of the strategic aims of the Bioengineering Division (BED) is to be the preeminent organization for educational activities in biomechanical engineering. Specifically, we want to increase student participation in student chapters and at national BED meetings, develop academic and educational programs, develop scholarship programs, develop an educational website for biomechanical resource materials, and provide instructional workshops that target students. These are lofty plans. Their accomplishment will require the substantial effort of many dedicated educators. The BED is therefore forming an Education Committee and looking for members. If you are interested, please contact Kenneth Diller (kdiller@mail.utexas.edu) or Ray Vanderby (vanderby@surgery.wisc.edu). In addition, please attend the first Education Committee meeting at the IMECE in Anaheim.

Design and Rehabilitation Committee

The Design and Rehabilitation Committee has continued to focus on all aspects of mechanical engineering related to physical devices and human movement. From stress analysis and functional performance of implants to the analysis of gait, committee members are seeking to evoke meaningful discussion about important topics into which mechanical engineers have a firm background. The committee has organized three sessions for the ICEME in November.

A session will be devoted to prosthetics and orthotics, an area that deserves special attention in Design and Rehabilitation. Dr. Barbara Silver-Thorn of Marquette University organized this session on a topic that immediately affects health care and clearly combines design and rehabilitation. With the direction of Dr. Fathi Gorbel of Rice University and Dr. Yildirim Hürmüzlü of Southern Methodist University, the committee will present a two session symposium in Gait and Control in conjunction with the Dynamic Systems and Control Division. One session of the presentation is directly sponsored by BED and one session by DSC. The committee continues to find considerable interest in implant design and, with the help of Dr. Dave Thompson of the University of New Mexico, a session will be devoted to this area. The committee is aiming to coordinate the timing of the presentations, so that the Implant, Prosthetics / Orthotics and a session from the Solids Committee on Orthopaedic Implants, are sequentially scheduled on one day of the meeting. A fourth session concerning the importance of federal regulation in the design of biological implants was postponed. The Food and Drug administration kindly agreed to participate, but the timing of the necessary submission turned out to conflict with other commitments. Hopefully, the session will be on the agenda for 1999.

The committee continues to discuss the difficulty in publicizing jointly sponsored sessions. The current method of keeping sessions directly in the Bioengineering Division may work if the final conference program can clearly indicate sessions that cross division lines. The hope is that the program will cross-list related sessions. More work may be needed so that the division can foster desirable collaboration.

Future planning has also occupied the members. The committee formed a membership planning task force to publicize the scope of Design and Rehabilitation. The area of design is so large that many possible members do not identify themselves as involved in the design process. Similarly, the area of rehabilitation needs to be understood as one which deals with all areas of human motion. The task force hopes that more participation can be developed from the large number of people working in these fields. Anyone interested in committee membership is encouraged to contact Maury Hull at mlhull@ucdavis.edu. Secondly, more effort is needed to make sure that sessions can be organized in time for the summer 1999 meeting. And finally, nominations for the position of committee secretary will be taken at the meeting in November.

Impact of JBME

As we are all aware, the Journal of Biomechanical Engineering (JBME) has enjoyed tremendous success in the last few years, with increased readership, page allocation, and decreased publication times (see related article on JBME). One of the main reasons for this recent growth has been the high readership and impact that JBME has had among the biomechanics community. One measure of a scientific journal's influence is its "Impact Factor" - number of times its contents are cited in other articles, divided the total number of articles published in that journal. In this regard, JBME is currently the most cited journal among all of the ASME Transaction journals. The number of times an individual article is cited in peer-reviewed articles provides a objective measure of the extent of its dissemination and influence in the field. While older articles will have a greater opportunities to be cited in the literature, some papers exhibit an extraordinary impact upon the field. Here we highlight the top ten most cited JBME articles over the last two decades, which have contributed substantially to journal's high impact factor.

Rank	Source	# Citations
1.	Dewey, C.F., Bussolari, S.R., Gimbrone, M.A., Jr., and Davies, P.F. The dynamic response of vascular endothelial cells to fluid shear stress. JBME 103:177-185, 1981.	274
2.	Mow, V.C., Kuei, S.C., Lai, W.M., and Armstrong, C.G. Biphasic creep and stress relaxation of articular cartilage in compression: Theory and experiments. JBME 102:73-84, 1980.	230
3.	Grood, E.S., and Suntay, W.J. A joint coordinate system for the clinical description of three-dimensional motions: application to the knee. JBME 105:136-144, 1983.	125
4.	Levesque, M.J., and Nerem, R.M. The elongation and orientation of cultured endothelial cells in response to shear stress. JBME 107:341-347, 1985.	120
5.	Williams, J.L., and Lewis, J.L. Properties and an anisotropic model of cancellous bone from the proximal tibial epiphysis. JBME 104:50-56, 1982.	108
6.	Ahmed, A.M., and Burke, D.L. In-vitro measurement of static pressure distribution in synovial joints—Part I: Tibial surface of the knee. JBME 105:216-225, 1983.	103
7.	Weinbaum, S., and Jiji, L.M. A new simplified bioheat equation for the effect of blood flow on local average tissue temperature. JBME 107:131-139, 1985.	102
8.	Young, D.F. Fluid mechanics of arterial stenosis. JBME 101:157-175, 1979.	96
9.	Schultz, A.B., Warwick, D.N., Berkson, M.H., and Nachemson, A.L. Mechanical properties of human lumbar spine motion segments—Part 1: Responses in flexion, extension, lateral bending, and torsion. JBME 101:46-52, 1979.	90
10.	Nerem, R.M., Levesque, M.J., and Cornhill, J.F Vascular endothelial morphology as an indicator of the pattern of blood flow. JBME 103:172-176, 1981.	80

Although it is difficult to predict which articles will be "high impact", these ten articles are characterized by the fact that each approached a highly complex problem in biomechanical engineering using a novel and exciting approach, thus setting the stage for other researchers to follow and build upon the foundations of these studies. "The work was certainly exciting to us as authors, and I am sure that some of the success is attributable to that excitement coming through in the manuscript itself," commented Dr. C. Forbes Dewey, on the most cited article in JBME. "In this case the idea that mechanical forces, especially the friction forces of flowing blood, could alter cell form and function caught the imagination of many in biology as well as in engineering. The combination at the time was very provocative. It still is!". Dr. Van C. Mow, first author of the landmark 1980 paper on the biphasic theory for soft hydrated tissues, remarked, "This had been a difficult, and important, problem facing many biomedical researchers for over half a century. I believe it was the completeness of our paper (theory and experiment), and our rigorous derivation, that had appealed and attracted many bioengineers to follow our approach in their studies on tissue biomechanics. Interestingly, facets of this study won both the ASME Melville Award and the AAOS Kappa Delta Award in 1981 and 1982, respectively." Dr. Robert Nerem, previous editor of JBME, attributed the impact of his two papers on the list to the fact that they were some of the first to approach the topic. "The 1981 article was the first in vivo study (using the vascular casting technique) to suggest that endothelial cell morphology provided a view of the flow pattern in the immediate vicinity of the vessel wall and that endothelial cells would be more elongated in high shear regions and less so in low shear regions."

*The information in this article was retrieved from the Institute for Scientific Information's "Web of Science" database. The accuracy of the citation counts is not guaranteed.

Farshid Guilak
Newsletter Editor

Journal of Biomechanical Engineering

1998 brings a year of major changes for the ASME Journal of Biomechanical Engineering. The most obvious is the new format; JBME has become the first of ASME's technical journals to be published six times per year. This new format enables us to bring new research to the readers in a more timely manner, which is important in a field such as biomedical engineering with a rapid pace of intellectual discovery and application. An added benefit of the new format is that ASME has agreed to maintain the size of the individual issues, with a result that there are now 50% more pages available for publication of manuscripts than before. A primary consequence of this arrangement is that the waiting time for publication of accepted manuscripts has been reduced dramatically. In some cases manuscripts are now sent to the publisher for processing within a few weeks of completion of the review and revision process. We anticipate that JBME should become a more attractive venue for publication of the most important new research in biomedical engineering as we are able to bring manuscripts into print more quickly. The added page capacity also provides flexibility critical to serving the needs of the biomechanical engineering community. For example, we will soon devote a special issue to the exciting new area of microfabrication in biology and medicine. It is important to be able to bring informative and exciting results from rapidly developing new aspects of the discipline to the attention of the biomechanical engineers.

The key to ensuring the quality of the JBME is the Board of Associate Editors. The journal has established an eviable record of excellence, having won the prestigious ASME Melville Award for the past four years and five of the past seven. In this vein I want to acknolwedge the outstanding service of two Associate Editors who completed their second three year term on the Board in December, 1997; Tim Secomb of the University of Arizona, and Peter Torzilli of the New York Hospital for Special Surgery. In January, 1998 four new Associate Editors were added to the Board, bring the total to 18. The new members are Maury Hull of the University of California at Davis, Tony Keaveny of the University of California at Berkeley, Lou Soslowsky of the University of Pennsylvania and Mehmet Toner of Harvard University.

One of the objectives in the strategic plan for the JBME is to maximize the impact of manuscripts published in the journal. An approach to achieving this objective is to attract as large a readership as possible. Although the JBME is well

known within engineering circles, there are many workers in clinical and life sciences who do not regularly encounter the journal. A contributing factor is that some of the medical and life sciences abstracting services do not list the JBME, even though is would be of interest to their subscribers. We would like to work to correct this situation, and I need your help. If you or your institution use an abstracting service that does not list JBME and you think it should, can you please notify me via any of the means listed below. It will most useful for you to provide the name of the abstracting service and the contact person, along with the address and phone number. We will then follow up to try to have JBME added to the list of publications they service.

As always, I am eager to hear of any suggestions that you have for ways to improve the journal. Please do not hesitate to share your ideas. Ken Diller, Technical Editor (kdiller@mail.utexas.edu).

Dedicated Service Award

Morton H. Friedman

The 1997 ASME Dedicated Service Award was awarded to Morton H. Friedman, Ph.D. for his continuous service and participation in the activities of the Bioengineering Division. The society award honors unusual dedicated voluntary service to the Society marked by outstanding performance, demonstrated effective leadership, prolonged and committed service, devotion, enthusiasm, and faithfulness. Mort has been an active member of BED for well over ten years. He was Chair of the Fluids Committee (83-85), Associate Editor of the Journal of Biomechanical Engineering (84-90), a member of the Executive Committee (85-91), Division Chair (89-90), Nominating Committee Chair (90-91), and Co-Chair (87-95) and Chair (91-92) of the Joint Biomechanics Committee. Mort received a Ph.D. in Chemical Engineering from the University of Michigan, and is currently Professor of Biomedical and Chemical Engineering and Pathology at the Ohio State University, and Acting Director of the Biomedical Engineering Center at OSU.

Y.C. Fung Award

Louis J. Soslowsky

The *Y.C. Fung Young Investigator Award* was established by the Bioengineering Division of ASME in 1985 to encourage young investigators to pursue research in Bioengineering by acknowledging recipients early in their career for the quality of their research and their commitment to Bioengineering. The Honors Committee of the Bioengineering Division of the American Society of Mechanical Engineers is proud to announce that Louis J. Soslowsky, Ph.D. is the recipient of the 1998 Y.C. Fung Young Investigator Award in recognition of his outstanding achievements in bioengineering research. Dr. Soslowsky is currently Associate Professor of Orthopaedic Surgery and Bioengineering and Director of Orthopaedic Research at the University of Pennsylvania.

Dr. Soslowsky completed his B.S. degree in Engineering Mechanics in 1986 at Columbia University. He was then appointed the first Frank E. Stinchfield Fellow in Orthopaedic Biomechanics (1986-1991) at the Columbia-Presbyterian Medical Center and completed his Ph.D. in Engineering Mechanics in 1991 also at Columbia. Later that year, he was appointed to the faculty at the University of Michigan where he remained until the fall of 1997 when he moved to Penn.

Dr. Soslowsky's research contributions have been in the area of orthopaedics. Specifically, his research program on the biomechanics of the shoulder is recognized as a leader in the field by both engineers and orthopaedic surgeons. He has made important contributions to the understanding of the etiology of rotator cuff disease and to the factors that contribute to stabilizing the glenohumeral joint. In addition to his shoulder work, his models for tendon basic science, injury, repair, healing, and regeneration are providing important information about tendon function and dysfunction. Dr. Soslowsky has or has had research grants from the Whitaker Foundation, the Orthopaedic Research and Education Foundation, the Foundation for Sports Medicine Education and Research, the Steadman-Hawkins Sports Medicine Foundation, two R01 grants from the National Institutes of Health, as well as several industrial grants. He has published over twenty peer reviewed full length papers and has been an invited lecturer at national and international conferences, symposia, and courses. For the Bioengineering Division of ASME, he has been active in organizing and chairing sessions at several meetings. In addition, he currently serves as Chairman of the Solid Mechanics Committee, representative to the United States National Committee on Biomechanics, Head of Publications and Steering Committee Member for the 1999 Summer Bioengineering Conference, and Associate Editor of the ASME Journal of Biomechanical Engineering.

Nominations for 1999 Y.C. Fung Award

The Bioengineering Division of ASME is soliciting nominations for the 1999 ASME Y.C. Fung Young Investigator Award. The Y.C. Fung Young Investigator Award is a Society level award established by the Bioengineering Division to encourage young investigators to pursue research in Bioengineering by acknowledging recipients early in their career for the quality of their research and their commitment to Bioengineering. Only candidates whose names have been submitted in nomination will be considered for the award. Eligibility for the award will be restricted to candidates who have earned a Ph.D. or equivalent degree in any field of engineering, physics, medicine or life sciences. Candidates must have received their terminal degree within 7 years of their nomination for this award or be under 36 years of age on June 1st of the year in which they are nominated. Nominations must be made using a Nomination Form and the nomination package must include a curriculum vitae of the nominee, a statement of the candidate's research goals (limited to two pages), and five letters of recommendation in support of the candidate. The letters should provide evidence of the candidate's past research accomplishments, future potential, and commitment to pursuing Bioengineering research. The award consists of a certificate, medal, travel expenses to the IMECE, and a $1,000 honorarium. Ten copies of the candidate's package, including curriculum vitae, letters of recommendation, and the nomination form should be prepared and forwarded to the Chair of the Y.C. Fung Young Investigator Award Committee no later than February 1, 1999. Send nominations and inquiries to Peter A. Torzilli, Ph.D., Chair, Fung Award Committee, Laboratory for Soft Tissue Research, Hospital for Special Surgery, 535 East 70th Street, New York, NY 10021; 212-606-1087; torzillip@hss.edu. Additional information can be found at http://www.asme.org/divisions/bed/.

USNCB

The USNCB was active during this past year. Emphasis was placed on sponsorship of international meetings, new and increased interactions with the Biomedical Engineering Society, the NIH Bioengineering Consortium Symposium, and future directions for the USNCB. The following specific activities were undertaken in the past year:

1. World Congress on Biomechanics (Sapporo, Japan, August 2-8, 1998): The USNCB serves as a co-sponsor of this event. The USNCB has played an important role in the previous World Congresses.
2. Fifth Japan-US-Singapore-China Biomechanics Symposium (Sendai, Japan, August 9-12, 1998): Dr. Morton Friedman will lead the US delegation. Approximately 30 attendees are expected from the U.S., approximately equally divided amongst junior and senior investigators. To date, financial support for the junior investigators has been obtained from NSF of $10,000 ($600-$700 for each investigator). Additional support is being investigated.
3. World Congress 2000 (Chicago, IL, July 23-28, 2000): This meeting is co-sponsored by AMPA, IEEE/EMBS, and AIMBE who have agreed to program at the meeting. Dr. Morton Friedman represents AIMBE.
4. Biomedical Engineering Society (BMES): USNCB is increasing its interaction with BMES. In addition to involvement with the Annals of Biomedical Engineering (a BMES sponsored journal) where Drs. Friedman, Goldstein and Spilker of the USNCB have been appointed Associate Editors and USNCB is listed on the cover, USNCB is involved in programming at the annual BMES meeting. The 1998 meeting will be held in Cleveland, Ohio in October 1998. Eight USNCB sponsored sessions are planned. Significant discussions are planned for the upcoming months regarding increasing the formalization of the interactions with BMES.
5. NIH Bioengineering Consortium (BECON): Significant discussion occurred both before and following the NIH BECON symposium at the NIH, February 27-28, 1998. Prior to the meeting, there was a significant concern regarding the lack of "biomechanics" participation by the symposium organizers. Following much work, Dr. Y.C. Fung was included as a session co-chair and a panel on "biomechanics" was included. The biomechanics panel identified three areas of research needs. These were: a) studies concerning the adaptation of tissues to stress including repair, fatigue, and failure; b) studies on in vivo biomechanics in an effort to better define boundary conditions for all hierarchical scales and time; c) studies in molecular biomechanics. It is hoped that these recommendations will lead to RFAs for research projects, centers of excellence, and increased education of the public about the need for and benefits of biomechanical studies.
6. National Academy of Engineering (NAE): Significant discussion, led by Dr. Mow, occurred regarding increasing the numbers of biotechnology and biomechanics people involved in NAE activities and eventual membership.
7. Interaction of USNCB and ASME: Essentially all USNCB members are also members of ASME, including many past BED chairs. Other than meeting at the ASME congress, no formal joint activities were discussed or planned.

Chair: Morton B. Friedman, Ph.D. USNCB
Chair-Elect: Robert Spilker, Ph.D.
Report Prepared by:
Louis J. Soslowsky, Ph.D.

News from AIMBE

The annual meeting of the American Institute for Medical and Biological Engineering (AIMBE) was held this year in Washington, DC, March 1-3, 1998. The theme of this year's meeting was **From Gene to Function: Bioengineering's Role.** On March 1, 1998, the meeting opened with a panel discussion on Issues in Academic-Industrial Relationships and Technology Transfer, in the morning. The afternoon sessions dealt with: 1) Undergraduate Engineering Curriculum, and 2) Bioengineering at NIH (see related article on BECON). On March 2, 1998, the program was held at the National Academy of Sciences building and it started with a program overview by Dr. Larry McIntire of Rice University, President of AIMBE. Several speakers paid tributes to Dr. Pierre M. Gallelti, who recently passed away. Subsequent sessions dealt with various topics related to : 1) Genes to Function: Fundamental Research, and 2) Genes to Function: Implications for Industry and NIH. Afternoon sessions also included a panel and a session on Regulating New Technologies. The final session was on Bioengineering at NIH, a plenary address delivered by Dr. Wendy Baldwin, Director of BEACON at NIH. The meeting ended with the induction of new Fellows of AIMBE. The final day's program on March 3, 1998, included a plenary address on The Future of U.S. Science Policy by Representative Vernon Ehlers (R-MI). This was followed by presentations from various federal agencies regarding their research activities and funding opportunities in areas important to bioengineering. This year's AIMBE meeting was held as a part of the Week of Medical and Biological Engineering and followed a NIH Symposium entitled Bioengineering: Building the Future of Biology and Medicine, held at NIH, February 27-28, 1998.

Bioengineering Division

Chair
Kenneth R. Diller, Ph.D., SC.D., PE
University of Texas
T: (512) 471-7167 F: (512) 471-0616
kdiller@mail.utexas.edu

Past Chair
Peter A. Torzilli, Ph.D.
Hospital for Special Surgery
T: (212) 606-1087 F: (212) 717-1192
torzillip@hss.edu

Member- Technical Affairs
Amit Patwardhan, Ph.D.
Loyola University Medical Center
T: (708) 343-7200 F: (708) 343-7928

Member-Member Affairs
Maury L. Hull, Ph.D.
University of California at Davis
T: (916) 752-6220 F: (916) 752-4158
mlhull@uldevis.edu

Member-External Affairs
Vijay K. Goel, Ph.D.
University of Iowa
T: (319) 335-5638 F: (319) 355-5631
goel@eng.uiowa.edu

Secretary
Ray Vanderby, Jr, Ph.D.
University of Wisconsin
T: (608) 263-9593 F: (608) 263-0454
vanderby@surgery.wisc.edu

Secretary-Elect
Noshir A. Langrana, Ph.D.
Rutgers University
T: (908) 445-3618 F: (908) 445-5313
langrana@caip.rutgers.edu

Finance
David L. Butler, Ph.D.
University of Cincinnati
T: (513) 556-4167 F: (513) 556-4162
david.butler@uc.edu

Group Operating Board Rep.
Kenneth R. Diller, SC.D., PE
University of Texas
T: (512) 471-7167 F: (512) 471-0616
kdiller@mail.utexas.edu

Membership Development
Gerard A. Ateshian, Ph.D.
Columbia University
T: (212) 305-7965 F: (212) 305-2741
ateshian@cuorma.orl.columbia.edu

Newsletter Editor
Farshid Guilak, Ph.D.
Duke University
T: (919) 684-2521 F: (919) 681-8490
guilak@acpub.duke.edu

Nominations
Peter A. Torzilli, Ph.D.
Hospital for Special Surgery
T: (212) 606-1087 F: (212) 717-1192
torzillip@hss.edu

International Congress Program Committee Chair
Sohi Rastegar, Ph.D.
Texas A&M University
Tel: (409) 845-5427 Fax (403) 845-4450
rastegar@tamu.edu

International Congress Program Representative
Ajit P. Yoganathan, Ph.D.
Georgia Institute of Technology
T: (404) 894-2849 F: (404) 894-2291
ajit.yoganathan@che.gotech.edu

International Congress Program Secretary
Bruce R. Simon, Ph.D.
University of Arizona
T: (520) 621-4451 F: (520) 621-8191
simon@ame.arizona.edu

Journal of Biomechanical Engineering
Kenneth R. Diller, SC.D., PE
University of Texas
T: (512) 471-7167 F: (512) 471-0616
kdiller@mail.utexas.edu

U. S. National Committee on Biomechanics Rep.
Louis J. Soslowsky, Ph.D.
University of Pennsylvania
T: (215) 898-8653 F: (215) 573-2133
soslowsk@mail.med.upenn.edu

Industrial Liaison
Tawfik B. Khalil, Ph.D.
NAO Center
T: (313) 986-7241 F: (313) 986-8722

American Institute for Medical & Biological Engineering
Subrata Saha, Ph.D.
Clemson University
T: (864) 656-7603 F: (864) 656-4466
ssaha@clemson.edu

Summer Bioengineering Conference Chair
Robert L. Spilker, Ph.D.
Rensselaer Polytechnic Institute
T: (518) 276-2154 F: (518) 276-3035
spilker@rpi.edu

National & International Affairs
Arthur G. Erdman, Ph.D., PE
University of Minnesota
T: (612) 625-8580 F: (612) 625-8844
agerdman@maroon.tc.umn.edu

New Directions Committee
Don P. Giddens, Ph.D.
Johns Hopkins University
T: (410) 516-8350 F: (410) 516-8627
dgiddens@jhuvms.hcf.jhu.edu

Honors - Chair
John Chato, Ph.D.
University of Illinois
T: (217) 333-0623 F: (217) 244-6534
chato@uiuc.edu

Biomaterial
Vasanti M. Gharpuray, Ph.D.
Clemson University
T: (864) 656-5555 F: (864) 656-4466
vasanti@ces.clemson.edu

Bioprocess Engineering
Roger Brunkow
Eli Lilly & Co
T: (317) 276-7276 F: (317) 277-0897
brunkow_roger_v@lilly.com

Bioheat and Mass Transfer
Elaine Scott, Ph.D.
Virginia Polytec Institute
T: (540) 231-3940 F: (540) 231-9100
scottep@vt.edu

Design & Rehabilitation
Ted A. Conway, Ph.D.
University of Akron
T: (216) 972-7742 F: (216) 972-6027
rltac@vml.cc.uakron.edu

Fluid Mechanics
Stanley E. Rittgers, Ph.D.
University of Akron
T: (216) 972-6031 F: (216) 972-8834

Solid Mechanics
Louis J. Soslowsky, Ph.D.
University of Pennsylvania
T: (215) 898-8653 F: (215) 573-2133
soslowsk@mail.med.upenn.edu

Design/Rehab Chair
Mark C. Miller, Ph.D.
University of Pittsburgh
T: (412) 624-9755 F: (412) 624-1108
mcmllr@sprite.me.pitt.edu

Staff Contact
Alexander Majewski
ASME
T: (212) 591-7284 F: (212) 591-7671
majewskia@asme.org