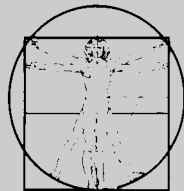




Bio



Bioengineering Division Newsletter

Christopher R. Jacobs, Editor

Winter 2001

Chair's Message



Ray Vanderby, Jr.

To chair the Bioengineering Division (BED) for the past year has been a great honor. It allowed me to sit next to Dr. Y.C. Fung at our banquet. It allowed me to witness from a broader perspective

the enormous energy of our members and the quality of our division. We are smaller, much smaller, than most other Basic Engineering divisions of ASME, yet far more vital. Our students and younger members are superb. Our older members, the ones who founded BED, are still active, still contributing, and still my role models. Our custodial account is at an all time high, thanks largely to our bold initiative to establish and run our own summer conferences. The 1999 Summer Bioengineering Conference had the highest attendance in history, demonstrating its growing eminence as a forum for bioengineering. The 1999 IMECE in Memphis had the highest number of BED sessions ever. The expanded number of issues for our *Journal of Biomechanical Engineering* has been a great success with more papers, special issues, and exceptional quality. In addition, the Bioprocess Engineering Subdivision continues to be successful with its 12th Annual Bioprocess Technology Seminars.

These are however tumultuous times, and great challenges lie ahead for BED.

Biomechanical engineering is exponentially growing. It is expanding the breadth and depth of older technologies, creating new technologies, and effectively redefining what it is. Through all of this, our Division membership has remained nearly constant in recent years. Since ASME provides the best overall forum for mechanical engineering and since mechanical engineering is an indispensable part of biological and medical science, BED has an essential role. To fulfill that role, our membership must expand.

Another challenge for BED has arisen due to the great success of our summer meetings. The BED sessions at the IMECE have suffered somewhat in attendance and interest. To address this, an open forum was held at the Memphis IMECE. The session was well attended with many people contributing observations and suggestions. In short, the result was that the IMECE must be made of exceptional and compelling value to the bioengineer. Then attendance will take care of itself. Immediate action was taken to accomplish this.

Starting this year at the Orlando IMECE, there will be a theme to unify much of the technical programming. There also will be keynote sessions featuring prominent speakers from outside of ASME, speakers who can provide new and different insights on cutting edge technologies. This year David Butler and Robert Nerem are organizing the technical program to emphasize "Functional Tissue Engineering". Their program will feature three leaders from industry to discuss dif-

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Editor's Message

I am very proud that this year's Newsletter has grown in size reflecting increased and increasingly diverse activities of BED members. As a result I will endeavor to keep my remarks brief and only highlight a few pieces of particular interest. This year, in addition to the reports of the standing technical committees, there is a report announcing the new Bioengineering Education Committee. In this formative time of new departments, programs, and curricula, Bioengineering is defining itself and the educational priorities and missions we adopt today will have a great deal to do with what we become tomorrow. The Education Committee represents an outstanding way for BED members to influence this process. I would advise all members to consider attending a meeting of the Education Committee with suggestions on what education-related activities the division might undertake. On a related note, did you know that the ASME provides financial aid for its student members including low interest student loans, scholarships, and graduate fellowships?

Many BED members are affected, either directly or indirectly by federal funding for research and development. The ASME, through its Washington DC office and the ICCFRD conducts an annual analysis of federal funding of Engineering that is incorporated into a bound report published by the American Association for the Advancement of Science that becomes

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Chair's Message

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ferent aspects of tissue engineering. These keynote speakers and a greater organizational effort by our program and technical committees promise the best IMECE yet.

A further challenge to BED arises because of its multidisciplinary nature. Biomechanical engineering often demands our affiliation with other societies. They compete for our time, our energy, and even for the professional affiliation of our students. For BED to remain the forum of choice in biomechanical engineering, it must draw upon its unique strengths to provide exceptional value and the technological underpinnings that are not available in these competing groups. Proposed changes to the BED Bylaws and Strategic Aims provide a framework to meet this challenge. Please visit the BED website and consider these documents. Let the Executive Committee know if we are headed in the right direction.

The 2001 Bioengineering Conference is scheduled for June 27-July 3, 2001 in Snowbird, Utah, with Roger Kamm as Chair. This is a conference in which other societies with bioengineering emphasis are invited to participate and organize sessions. This mix of attendees has always been beneficial to the presentations and discussions. There will be three plenary lectures on molecular, cellular, and tissue engineering. In addition, the mountain venue, the casual environment, and the open time sheduled into the conference format promise another exceptional meeting.

By many measures, the Bioengineering Division is the best it has ever been. But, our challenges are as demanding as they ever have been. The executive committee is in good hands as Vijay Goel becomes chair and our membership is outstanding. I am confident that the challenges will be met and BED will flourish as it serves your needs.

Ray Vanderby Jr, Chair, BED

Report from the American Institute for Medical and Biological Engineering

This year's annual meeting (9th) of the AIMBE was held in Washington DC from March 3-5, 2000. The theme of this year's meeting was "Functional Replacement of Organs: Opportunities and Challenges for Biomedical Engineering." The first session on the "State of the Art" had three well-known speakers: Dr. J.B. Vacanti of Harvard spoke on the "Promise of Tissue Engineering," Dr. Paul Citron of Medtronic presented an historical overview of "Implantable Electronic Stimulators," and Dr. H. David Humes from the University of Michigan talked about the important topic of "Artificial Renal

Substitutes." The session II on "Challenges to Innovation in Bionic Medicine" was comprised of a talk by A.C. Gelijus of Columbia University and a panel discussion. The keynote address was presented by Representative John Edward Porter, who emphasized his strong support for biomedical research. He also pointed out the need of biomedical scientists to contact their local representatives and keep them informed regarding the important research work they are doing in their home districts. The session III, "From Concept to Clinic," dealt with the topics, "Mechanical Heart Replacement" by Dr. W.S. Pierce of Penn State, "Skin Substitute" by Dr. D.R. Applegate from the Advanced Tissue Sciences, and "Sight for the Blind" by Dr. W.H. Dobelle of Dobelle Institute. Friday's session ended with the Pierre Galletti Award and the talks on when "Policy Meets Politics" by Susan B. Foote from the University of Minnesota and "The Patient's Viewpoint" by Dr. J. Brian Williams from the University of North Carolina. The Pierre Galletti Award was established in 1999 by the AIMBE Board of Directors to honor its founding member and past president Dr. Robert Langer of MIT received this award for his scientific work in controlled release of macromolecules, synthesis of new biomaterials, and tissue engineering; and his work in raising the public awareness of bioengineering through his chairmanship of the Food and Drug Administration Science Board and training of a generation of bioengineers.

The second days sessions covered diverse topics including the following: 1) "Educational Challenges in Biomedical Engineering" by Dr. John Linehan of the Whitaker Foundation and Dr. Thomas R. Harris of Vanderbilt University; 2) "Bioethics in Bioengineering: Should There Be Ethical Limitations To Technological Innovations?" by William R. Hendee from the Medical College of Wisconsin, Dr. Rosalyn Pinkus from the University of Pittsburgh and Dr. Arthur Ciarkowski from the FDA; 3) "Can Scientific and Engineering Expertise be Improved in the Courts?" by Dr. W.R. Hendee and Mrs. Deborah Runkle of AAAS; and 4) "How Safe is Our Food?" by Authur T. Johnson from the University of Maryland and a panel. At this Annual Meeting, 85 new Fellows were also elected.

On Sunday morning, March 5, 2000, the Council of Societies (COS) met. The International Society for Magnetic Resonance in Medicine (ISMRM) was elected to be a new society member of the AIMBE, Dr. Shu Chien of UCSD and President of AIMBE, discussed the need for the AIMBE office to grow in order to have a greater influence in its advocacy role for member societies. He pointed out that this can only happen with increased funding. Currently, AIMBE is supported by the Whitaker Foundation (\$125,000), the annu-

al dues from the College of Fellows, registrations for the annual meeting, industrial donations, and support from member societies. The Whitaker Foundation support will end in 3 years. Dr. Chien suggested that each member society should increase its contribution to AIMBE based upon the number of (bioengineering) members in each society, similar to the way FASEB works. FASEB collects \$10/member from each society Dr. Chien suggested that COS request \$5/member from each society. The majority of the society representatives agreed in principle that AIMBE serves a valuable function and needs further support from the societies. An extensive discussion followed on how would be the best way to increase financial support for AIMBE from the member societies. A working group was formed to discuss this issue further with their member societies. The College of Societies will meet again during the World Congress on medical Physics and Biomedical Engineering, to be held in Chicago, July 23-28, 2000. If any of the readers have suggestions regarding this, please let me know or contact any member of the executive committee of the Bioengineering Division.

Subrata Saha, ASME Rep. to AIMBE

Editor's Message

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a reference for political officials, administrators, and lobbyists. This year for the first time the analysis included an assessment of bioengineering funding and the NIH budget. The federal budget process and how ASME is involved is described in a piece on the work of the ICCFRD, which is seeking participation by more BED members.

Many members are probably not aware that by far the biggest source of revenue for the ASME is through the publication and sale of codes and standards, most of which are in the area of design and fabrication of pressure vessels and high-pressure piping systems. This year the ASME has announced it first biotechnology standard in the area biopharmaceutical equipment. In an effort to expand bioengineering codes and standards, a committee chaired by Peter Torzilli has been formed to explore areas that could benefit from new standards and has identified mechanical stress analysis of medical devices as an initial focus area. This work has the potential to not only benefit bioengineering as a profession, it may also become a significant source of funding for the division. BED members that have an interest or concerns regarding bioengineering codes and standards or suggestions for potential new standards are encouraged to attend the upcoming meeting of BED standards exploration committee.

Christopher R. Jacobs, BED News Editor

Inter-Council Committee on Federal Research and Development: The Federal Budget Process

As a member of ASME's Bioengineering Division, I had not traditionally followed the annual budget appropriations process that unfolds in Washington, DC each year. After all, what did the President's annual federal budget request to Congress have to do with my work as a mechanical engineer? After spending two days in the ASME Washington Center earlier this year, however, I found out why tracking the annual budget appropriations process, as it affects the mechanical engineering community, is vitally important to the work that I, and you, do each day.

I was asked, and agreed, to serve on the ASME Inter-Council Committee on Federal Research & Development (ICCFR&D) as its representative from the Bioengineering Division. As Chairman of the Task Force on the National Institutes of Health (NIH)-Bioengineering, I joined the other ASME volunteers who comprise ICCFR&D in taking on the responsibility of monitoring the budget request, and subsequent legislation or regulations, of a specific science and engineering mission agency for a given calendar year.

As the first step in a yearlong process, the ICCFR&D representatives met in Washington, DC, on Thursday and Friday, February 17-18, 2000. During those two days, we were briefed by a series of speakers from the government (e.g., Office of Management and Budget, National Institute for Standards and Technology), Capitol Hill, and the private sector (e.g., American Association for the Advancement of Science) on the annual budget process. Basically, that process consists of four steps:

1. The President initiates the annual budget process by presenting his budget proposal to Congress in early February. Congress may adopt or reject any of the President's recommendations.
2. Congress adopts a budget resolution to guide it as it acts on the various spending bills. This budget resolution, while not legally binding, establishes targets and assumptions that can affect results.
3. Each of the 13 appropriations subcommittees divides the funds allocated to it by the budget resolution among the agency programs within its jurisdiction. Each appropriations bill must pass the House and Senate in identical form and signed by the President.
4. The budget process must be complet-

ed by September 30th, the end of the fiscal year. If all 13 appropriations bills have not been signed into law by that time, Congress must pass a continuing resolution to provide temporary funding to keep the government running.

ICCFR&D members then met with high-ranking officials in their respective agencies to more closely examine the President's FY 2001 budget request to determine how it will affect mechanical engineers and the mechanical engineering community. I had an opportunity to meet with Dr. Wendy Baldwin, Director of the Office of Extramural Research. Among other issues, we discussed a proposal currently pending before Congress that would establish a separate center for Bioengineering Research under the NIH umbrella. Bioengineering research is currently conducted in each of NIH's 25 separate Centers and Institutes and coordinated by a non-funded Bioengineering Consortium (BECON) within the Office of the Director. I also had the opportunity to meet with three representatives of the National Institute of Dental and Craniofacial Research (NIDCR), including Dr. Eleni Kousvelari, Chief of Biomaterials and Tissue Engineering. NIDCR is a small Institute, receiving just one percent of NIH's annual R&D funding request. Yet, this small Institute will in 2000 support over eight percent of NIH's bioengineering budget.

As a result of the discussions in Washington, DC, other ICCFR&D members and I undertook an analysis of the NIH-Bioengineering FY 2001 budget request. Not surprisingly, we concluded that R&D funding for bioengineering is currently inadequate. We also concluded that, in order to receive the funding it deserves, Bioengineering Research should be housed in a separate, funded center under the NIH umbrella.

These analyses, when completed, will provide the basis for ASME testimony and position papers in support of, or opposition to, specific legislation or regulations affecting mechanical engineers throughout the calendar year. You can find these position papers on ASMENET at www.asme.org/gric/ibook.html.

Of course, each Task Force Chair is supported by a number of ASME volunteers who assist in this annual budget analysis process. This year, members of the NIH-Bioengineering Task Force include: Dr. Tai-Ming "Tina" Chu, ASME Minority Leadership Program Intern; Dr. Sohi Rastegar, National Science Foundation; and, Dr. Ray Vanderby, Jr., Chair of the ASME Bioengineering Division. I extend my sincere thanks to each of them for their insight and guidance throughout this process.

Participating in the annual ICCFR&D budget process has been an exciting learning experience for me and for other members of the NIH-Bioengineering Task Force. What happens in Washington, DC does have a day-to-day impact on the mechanical engineering community. I encourage you to become involved: join the NIH-Bioengineering Task Force today!

For additional information, feel free to contact Mary Legatski of the ASME Washington Center staff at 202.785.3756 or by e-mail at legatskim@asme.org.

*Mohamed Samir Hefzy
Mary Legatski*

Editor's Note - BED members should also be aware that the ASME also provides written testimony and analysis of the NSF budget each year as well as NASA, DOD, and others. Another important ASME activity is organizing visitations to Washington D.C. for members to meet and exchange views with high-level administrators of these agencies and provide testimony to congress and presidential staffers. These activities are important and beneficial to BED as our field continues to grow and define itself and they can only succeed with strong member involvement.

ASME Publishes Biotechnology Standard

The ASME BPE-1997 Bioprocessing Equipment standard applies to vessels and tanks used in the biopharmaceutical industry. The standard includes and addresses such concerns as:

- * Equipment designs that can be cleaned and sterilized
- * The quality of weld surfaces
- * Material joining
- * Sealing
- * Standardized definitions that can be used by material suppliers, designers, fabricators, and users
- * Dimensions and tolerances for stainless steel automatic welding and hygienic clamp tube fittings
- * The need to integrate existing standards relating to vessels, piping, appurtenances, and other equipment necessary for the biopharmaceutical industry without infringing on those standards.

The price of the standard (ASME BPE-1997) is \$165 and can be ordered through ASME Information Central (800-843-2763 or infocentral@asme.org).

Fifth IOC World Congress on Sport Sciences

The Fifth World Congress of the International Olympic Committee was held from October 31-November 5, 1999 in Sydney with the theme of "The Science and Medicine of Skilled Performance: Optimization, Injury, Prevention and Rehabilitation". This multidisciplinary Congress featured renowned leading experts from around the world who shared breakthrough research and scientific knowledge to help people live active lives - from Olympic caliber athletes to sports and exercise enthusiasts of all ages and abilities.

The opening address was given by Professor Savio Woo on the "Use of Robotic Technology for Diarthrodial Joint Research". Other interesting Keynote speakers included: Ed Coyle "Determinants of endurance, exercise performance"; Bente Pedersen "Exercise and the immune system"; Cy Frank "Optimization of the biology of soft tissue repair"; Richard Lieber "Mechanisms of muscle injury after eccentric contraction"; Joachim Mester "The vibration of biological systems"; J J de Koning "Determination of optimal pacing strategy in track cycling with an energy"; Simon Gandevia "The neural basis of fatigue"; Lew Hardy "Stress, anxiety and performance". The next IOC World Congress will be held in Salt Lake City, Utah, USA, 16th-21st September, 2001. Theme of the Congress: "Science & Medicine of Human Movement"

*Harcharan Singh Ranu
with the Hon. Michael Knight MP*

1999 IMECE Report

The Bioengineering Division (BED) continued its successful scientific programming during the 1999 International Mechanical Engineering Congress and Exposition (IMECE) at the Opryland Hotel and Convention Center in Nashville Tennessee. We walked through lush tropical surroundings of the conference site to reach session rooms to then hear state-of-the-art research and development in various areas of bioengineering. The BED program consisted of 39 podium sessions where over 180 papers were presented by private companies, government laboratories, and universities from around the world. The theme for this year's IMECE was "Engineering Innovations for Increased Productivity". The BED program highlighted this theme with such topics as Interfacing Academia/Industry in Prosthetic Valve Research, Design/Manufacture of Footwear, and Microelectromechanical Systems in Biological Systems Designs/Measurements for Disease Treatment.

The technical committees of BED (Biofluid Mechanics, Biomaterials, Biosolid Mechanics, Design & Rehabilitation,

CALL FOR PAPERS

2001 Summer Bioengineering Conference Snowbird, Utah June 27 - July 1, 2001

The Bioengineering Division of the American Society of Mechanical Engineers cordially invites your attendance at the 2001 Summer Bioengineering Conference. The meeting will be cosponsored by the Biomedical Engineering Society, the American Institute for Chemical Engineering, and the Biophysical Society. An outstanding scientific program has been planned with Plenary Lectures, Symposia, Tutorials, Student Competition as well as Oral and Poster Sessions in a spectacular surrounding. Submissions of abstracts in all areas of biomechanics and bioengineering are invited. In addition special sessions are planned on a variety of topics. Plenary Lectures will be presented by Michael P. Sheetz, PhD, Columbia University; Peter J. Hunter, DPhil, University of Auckland, and a third speaker from the field of Molecular Biomechanics.

Abstracts are to be submitted electronically and on hardcopy for publication on 8.5 x 11" paper. The formatting and electronic submission instructions, as well as general information about the meeting may be obtained from
<http://www.asme.org/divisions/bed/summer01.html>

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Deadlines:
March 15, 2001 Notification of Authors

BioHeat & Mass Transfer) organized several symposia as part of the program. Some of the sessions were jointly developed by various technical committees within BED as well as by other divisions within ASME. One session on Crashworthiness appeared in the BED program with several others in the Applied Mechanics Division program. One session on Dynamics, Control, and Design of Biomechanical Systems was jointly developed by the BED and the Design Systems and Control Division. The BioHeat/Mass Transfer papers were jointly developed by the BED BioHeat/Mass Transfer Committee and Heat Transfer Division. Two bioMEMS (Microelectromechanical Systems) sessions were coordinated with the MEMS sub-division. Many of these presentations have accompanying papers in other ASME publications.

Several awards and honors were featured during the program. ASME's Committee on Honors and the Bioengineering Division selected Dr. Stephen C. Cowin from the City College of New York as the recipient of the 1999 *Herbert R. Lissner Biomedical Engineering Award*. The award highlights the outstanding contributions of the recipient to the field of Bioengineering. Dr. Cowin, whose principle area of interest is in the mechanics of materials, particularly in determining the influence of microstructure on the gross mechanical behavior of granular, composite and bio-

logical materials, was honored at a special session and reception during the BED program and presented a keynote lecture. Rebecca R. Richards-Kortum, Ph.D. from the University of Texas at Austin was the recipient of the 1999 *Y. C. Fung Young Investigator Award*. This award was established by the Bioengineering Division in 1985 as a Division award and elevated to an ASME award in 1999. The purpose of the award is 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. Dr. Richards-Kortum was honored at the Bioengineering banquet with this award for her work on the application of optical spectroscopy to the detection of pre-cancer and other diseases.

The program also continued the sponsorship of the annual BED student paper competition, including categories for undergraduate, master's, and doctoral level presentations. A large number of high quality papers were contributed of which 18 were chosen to be finalists. The last round of competition was based on the podium presentations by the student finalists, and awards were given at the Bioengineering banquet. New Division Fellows, and the Best Paper Award winners were also honored at the banquet.

Jennifer S. Wayne

Technical Committees

Solid Mechanics Committee

The Solid Mechanics Committee continues to grow in membership, and we have been able to support numerous outstanding sessions at the ASME conferences this year. The 1999 Summer Meeting in Big Sky, Montana was a tremendous success for the Bioengineering Division. The Solid Mechanics Committee sponsored 33 sessions that made up approximately half of the entire meeting. These sessions covered a wide range of topics, including Cell and Tissue Engineering, Soft Tissue Mechanics, Bone Mechanics, and Computational Biomechanics, Spine Mechanics, Upper Extremity Mechanics, and Vehicular and Impact Biomechanics. Our special thanks to many members of the Bioengineering Division for the considerable amount of work that went into organizing the conference and publishing the proceedings.

The 1999 IMECE meeting in Nashville, Tennessee was also a great success for the Solid Mechanics Committee and was very well attended. The Solid Mechanics Committee sponsored 14 sessions as well as joint sessions with the Applied Mechanics Division and the Biomaterials, Design, and K17 technical committees.

At the 2000 IMECE in Orlando, the Solid Mechanics committee has organized several sessions on Cardiovascular Mechanics, Soft Tissue Mechanics, Impact Biomechanics, Spine Mechanics, Knee Mechanics, and Bone Mechanics. Additionally, the conference will highlight several joint sessions with Biomaterials on Tissue Engineering.

In addition, the Committee is actively organizing sessions for the 2001 Summer Bioengineering Conference to be held in Snowbird, Utah next summer. Preliminary programming includes sessions on Cardiovascular Mechanics, Cell and Tissue Engineering, Cell Mechanics, Bone Mechanics, Spine and Impact Biomechanics, Soft Tissue Biomechanics, Image Guided Surgery, Pediatric Biomechanics, Geriatric Biomechanics, Computational Biomechanics, and Sports Biomechanics. We will also try a new program element this year consisting of three separate tutorial sessions in Biologic Techniques, Mechanical Testing, and Imaging and Microscopy. Your feedback on this forum will be very helpful for future conferences.

My thanks also to all of the members of the Solids Committee who have continuously put so much effort into making each of our conferences a success. I would also like to thank Lou Soslowsky, previous chair of the Solids Committee, who has provided a great deal of advice on the functioning of this committee. If you would like any other information on the Solid Mechanics Committee, please

contact Farshid Guilak (919-684-2521, e-mail: guilak@duke.edu).

*Farshid Guilak
Chair, Solid Mechanics Committee*

Fluid Mechanics Committee

The membership of the BED Fluids Technical Committee continues to evolve its activities in response to a variety of factors. This landscape of this area of research is changing at a more rapid pace than ever. The development of reliable computational and experimental methodologies has driven much of the basic research toward more applied research and interdisciplinary collaborations. We have responded by emphasizing problem-oriented (rather than technique-oriented) sessions, and experimenting with alternative session formats.

Last year's 1999 Summer Bioengineering Conference was a successful application of these strategies. There were a total of 16 fluids-oriented sessions in which nearly 100 papers were presented. This was done in just 9 time slots, so there were some of us who had to run the hallways to catch as many interesting talks as possible in parallel sessions. I hope those of you who attended agree with me that this was one of our best conferences ever. There is every indication that this success will continue in 2001 at Snowbird.

At the IMECE 2000 in Orlando, much of our efforts have gone into helping organize the Tissue Engineering sessions that were part of the highlight topic, "Beyond Traditional Boundaries." David Butler and Bob Nerem have done an excellent job gathering the true leaders in this exciting field. We of course had our own more traditional fluids program, in which 8 sessions with 43 papers were presented. Unfortunately, the trend of decreasing numbers of contributions is continuing. We will continue to schedule highlight speaker sessions, panel discussions and other formats to keep the IMECE relevant to our membership. We had considerable success with these formats at last year's IMECE in Nashville. It appears that we will push the IMECE program in the direction of increasing interactions with industry and other divisions of ASME.

The current activities of the committee are centered around the organization of the 2001 Summer Bioengineering Conference in Snowbird. We have many exciting topics listed in the call for papers already. I welcome any input from those of you who have additional ideas for both the summer conference and the IMECE. The success of the committee's activities depends on everyone's input. Finally, I would like to thank those of you who have helped out in the last year, in partic-

ular my Vice Chair, Ross Ethier.

*James Moore,
Chair, Fluid Mechanics Committee*

Design and Rehabilitation Committee: Tissue Engineering

The Design and Rehabilitation Committee is organizing a session titled "Integrating into the Living System" which was part of the Tissue Engineering Symposium at the IMECE 2000 meeting in Orlando. The session addressed the design and clinical issues related to the emerging area of tissue engineering. The speakers addressed two potential clinical areas of application including musculoskeletal tissue replacement and cardiovascular tissue replacement. The topics addressed these issues from a broad range of viewpoints including clinical, engineering and biological. The speakers included Paul Yock (cardiologist), Lane Smith (biochemist), David Ku (bioengineer) and Tom Andriacchi (biomechanical engineer). The topic focused on the functional demands of tissue engineered replacements. These functional demands include both physical and biological issues that must be taken into consideration before viable tissue replacements will become clinically successful. In addition, clinical issues related to the delivery of replacement tissue were discussed. This session represents a new direction for the Design and Rehabilitation Committee which the Committee feels is increasingly important as the emergence of tissue engineering reaches more clinical applications. The Committee is looking for new members that may be interested in developing sessions and topics related to this interface between design and tissue engineered replacements.

*Thomas Andriacchi
Chair, Design and Rehabilitation Committee*

Biomaterials Committee

This year has seen healthy activity in the Biomaterials Committee, which is continuing for next year. At the IMECE 2000, the Biomaterials Committee cosponsored two symposia. The first symposium entitled "The design and performance of functional biomaterials" Co-organized by Noriko Katsube, (Ohio State University), Wole Soboyejo (Princeton University), and Michael Sacks (University of Pittsburgh). The objective of the symposium was to bring together scientists and engineers from teaching hospitals, academia and industry to discussing cutting edge research on the design and performance of functional biomaterials. The symposium focused on materials for human prostheses. These include new concepts or materials for: dental, heart valve, hip

and knee implants in biological systems. Papers will focus on new insights into potential damage/failure mechanisms and the interfaces between tissue and the surfaces of materials used in prosthetic devices are strongly encouraged. The proceedings will be published as a book.

The second symposia is a novel collaboration with the Society for Biomaterials, at their May 2001 annual meeting in Minnesota. The symposium will actually be a workshop entitled "Biomechanical evaluation of native and engineered tissues" chaired by Michael S. Sacks (University of Pittsburgh) and Robert Tranquillo (University of Minnesota). The focus of this workshop is the experimental, analytical, and computational techniques appropriate for biomechanical evaluation of native, biologically derived and engineered tissues. State-of-the-art techniques will be presented that will serve to address questions of "how" and "when" to apply the appropriate techniques for mechanical analysis soft biological materials. Particular issues with these materials are encountered due to the lack of standard approaches, methods of analyses, and inherent material non-linearities. Speakers from a wide range of biomechanical backgrounds will present state-of-the-area approaches for the major load-bearing biological tissues.

At the IMECE00 Meeting I organized a meeting and would like for more people who have an interest in biomaterials to participate. As currently envisioned, Biomaterials in ASME would consist of two broad areas: 1) Wear and fatigue of traditional biomaterials (mainly in orthopedic applications), and 2) novel living biomaterials, especially in the design tissue-mimicking scaffolds. Vice-chairs for these areas will be sought. If you are interested, please contact Michael S. Sacks (msacks@pitt.edu) if you are interested in becoming involved with the Biomaterials Committee.

*Michael S. Sacks
Chair, Biomaterials Committee*

United States National Committee on Biomechanics (USNCB) Report

The United States National Committee on Biomechanics (USNCB) is a representative committee of a variety of organizations, including ASME. The committee has several Executive Committee members, as well as representative members from each of the representative societies. Essentially all of the USNCB Executive Committee members are or have been active ASME members (effective July 1, 2000, Bob Spilker will be Chair; Steve Goldstein will be Vice-Chair; Roger Kamm will be Secretary; and John Tarbell, Larry McIntyre, and Dave Butler will be Members-at-Large).

The major new activity of USNCB was

sponsoring the first Functional Tissue Engineering Workshop held in September 2000 in Tampa, Florida. Functional Tissue Engineering has been adopted by the USNCB to emphasize the importance of biomechanical considerations and the design and development of cell and matrix-based implants for soft and hard tissue repair. An update on activities from this meeting will appear in a subsequent newsletter.

If you have any questions about the USNCB, please feel free to contact Lou Soslowsky (soslowsk@mail.med.upenn.edu) or the Chairman of the US National Committee on Biomechanics, Dr. Bob Spilker (spilker@rpi.edu).

*Louis J. Soslowsky
ASME Representative to USNCB*

Education Committee

The education committee is a nascent committee that is undergoing a process of issue identification and adding members with an interest in this critically important area to serve on the committee. BED members interested in education topics should contact the committee chair, Dr. Gerald Miller at gemiller@vcu.edu. Although not allocated any sessions at the congress, the first committee meeting took place at the 2000 Congress in Orlando.

*Gerald Miller
Chair, Education Committee*

Membership Development Committee

The Committee is happy to report that the Bioengineering Division membership continues to increase, with 1610 ASME members who consider it their primary division, and 910 members considering it their secondary. Recently, with the support of ASME staff under the direction of Alex Majewski, the web site for the Bioengineering Division was overhauled to provide a new and more pleasing interface with extensive links to the various online ASME resources. Members are invited to visit this site at <http://www.asme.org/divisions/bed/> to learn more about the Division and the Society, as well as upcoming events. Of particular note to those members who wish to post or search for job advertisements on the ASME server, please follow the link for Jobs or go directly to <http://www.asme.org/jobs/>.

The Membership Development Committee encourages participation by all Division members in the various activities and responsibilities of the Division's committees. Its members, in a process that typically starts two years prior to the conference, decide the organization and scientific topics of the various conferences sponsored by the BED. The strategic initiatives and future directions of the Division are similarly decided at the grass-

root level, and therefore membership participation in these efforts is essential. All that is required to participate in these activities is to show up at the meeting of the committee that interests you, at the next conference; generally, all committees meet during the IMECE. A list of standing committees of the BED is provided on the Division's web site (<http://asme.org/divisions/bed/bioadm.html>). The time and location of these meetings are generally announced in the preliminary program for the conference. If you require additional information about participation in the various committees of the Bioengineering Division, send an e-mail to ateshian@columbia.edu.

*Gerard A. Ateshian
Chair, Membership Development Committee*

Honors Committee

The Honors Committee is responsible for administering the awards activities of the Bioengineering Division of ASME. These duties include the awarding of the ASME's H.R. Lissner and Y.C. Fung Young Investigator Awards, the BED's Richard Skalak Best Paper (ASME Journal of Biomechanical) and Student Papers (IMECE) Awards, Fellow Awards, and interacting with the Basic Engineering Technical Operating Board (BETGOB) in awarding the ASME Thurston Award and the Dedicated Service Award. For 1999, the Lissner Award was presented to Stephen Cowin, City University of New York, the Y.C. Fung Award to Rebecca Rae Richards-Kortum, University of Texas at Austin, and the Skalak Best Paper to G.I. Zahalak, V. de Laborderie, and J.M. Guccioine (JBME, v. 121). In 2000 the Lissner Award was presented to Morton Friedman, Ohio State University, and the Fung Award to Farshid Guilak, Duke University. Several of these awards are reported elsewhere in this Newsletter.

The Honors Committee held its annual meeting during the 1999 ASME IMECE in Nashville, TN. Several issues were discussed concerning the committee's organizational structure, and a new organizational plan was developed to improve its functionality. The Honors Committee will consist of the following sections: ASME Lissner Award, ASME Fung Award, Student Papers Award, Fellow Awards, and a General Awards. The members of the Honors Committee (5 total) will be comprised of the Honors Chair (P. Torzilli), the chairs of the Lissner (D. Giddens), Fung (M. Hull), and Student Paper Awards (T. Conway), and the BED's Member-in-Charge of Member Affairs (M. Hull). The Lissner, Fung and Student Paper Award Committees will continue to function as in the past, reporting to the Honors Committee chair. The Student Paper Award Committee will continue to consist of three members, one in charge of doctoral (Ph.D.), masters

(M.S./M.E.) and undergraduate (B.S./B.E.) level papers. The doctoral level member will serve as the chair of the committee, with the members rotating from bachelor to masters to doctoral level. In addition, the members will be selected as to rotate through the disciplines of solids, fluids, and heat and mass transfer.

The mechanism for elevating BED member's to ASME Fellow status was also revised. It was decided to have only current ASME Fellows nominate BED members for promotion to Fellow status. This will be accomplished via email, on an annual basis, by requesting nomination packages from current BED members who are ASME Fellows. The Member-in-Charge of Member Affairs will be responsible for administering the Fellows nominations, and act as the chair of the Fellow Awards.

The General Awards section will be responsible for the Skalak Best Paper Award, chaired by the Honors Committee chair, and for nominations submitted to BETGOB. Nominations for the best paper from the ASME's Journal of Biomechanical Engineering will be requested from the Technical and Associate Technical editors of the journal, during a one year period from October-to-August (6 issues). Nominations for BETGOB awards (Thurston Lecture, Dedicated Service Award) will be put forward by the members of the Honors Committee.

*Peter A. Torzilli
Chair, Honors Committee*

Editor's Note - Other noteworthy achievements of BED members this year include election Albert King to the National Academy of Engineering, the selection of Peter Walker to deliver the Calvin W Rice lecture at the BED Summer meeting, and three BED members were elected to fellow grade (V. Raghavan, Avraham Shitzer, and Dean C. Winter).

Standards Exploratory Committee

The BED Standards Exploratory Committee (formally Codes & Standards) meet at the 1999 ASME International Mechanical Engineering Conference and Exposition (IMECE) in Nashville, TN. There were two primary objectives of the meeting. The first was to review the responses to the email survey of the BED members concerning what they considered the most important aspect of a code or standard, relative to biomechanical engineering, that the committee should consider for its first code development. The members were asked to choose one of three areas for standards development - devices, evaluation methods, or experimental testing, and asked to suggest a specific standard. A total of 2458 surveys were emailed to BED members who selected BED as their primary or sec-

ondary interest group. Sixty-five (65) responses were returned, of which 45 included suggestions and/or expressed an interest in becoming active with the committee. The overwhelming consensus of the members was in the area of evaluation methods, specifically finite element analysis (FEA/FEM) and statistical methods, with experimental testing being next (axial/biaxial/fatigue methods).

The second objective was to choose a specific standard which would be used to submit a proposal to the ASME to establish a new committee to develop standards for biomechanical devices. After a general discussion, the committee decided to base the proposal on the development of a standard related to criteria for finite element analysis. Subsequently, a proposal titled "Stress Analysis Based Design for Medical Devices" was submitted to the ASME for review. Highlights of the proposal are summarized below:

Scope. To establish fundamental rules and criteria of mechanical design by stress analysis for the integrity and safety of medical devices.

Background. Stress analysis is the key to understanding critical device performance characteristics, failure modes, and for maintaining device integrity and reliability. Advanced technology based tools and capabilities for measurement, simulation, monitoring, testing and computation are now available which could be used by industry to develop predictive approaches for mechanical design. ASME/BED is independent of the industry and regulatory agencies; there are members from academia, government and industries throughout the world with expertise in many technical areas relevant to medical devices; it is the most appropriate technical society to take a lead in developing mechanical design codes for stress analysis of medical devices.

Purposes. To provide integrated and reliable mechanical analysis rules and stress criteria to the medical device industry for design and to the regulatory agencies for regulation management.

Tasks. To define allowable design stresses for given loading conditions and failure modes per the safety classes of medical devices; to define rules of stress combination under complex loads; to define safety margins using statistical or probabilistic methods; to define rules for numerical modeling; and to define methods for validation of numerical models.

Benefits. Stress analysis codes would afford an effective methodology for medical industry and governmental agencies to reduce the time and cost of product development and regulation, respectively; improve product quality and reliability; enable reduction in the size of pre-clinical trials by virtue of the ability to assess and optimize in vivo performance prior to testing.

If approved by the ASME's Council on Codes and Standards, an ASME committee will be formed and staffed to begin the development process. If you would be interested in participating in the development of standards, please email to Peter Torzilli at torzillp@hss.edu and provide your name, address, affiliation, phone/fax numbers, and email address. Committee activities and meetings will be emailed to all members.

*Peter A. Torzilli
Chair, Standards Exploratory Committee*

Journal of Biomechanical Engineering

The Journal of Biomechanical Engineering continues to grow and develop as it serves the intellectual needs of the biomechanical engineering community. Since the ASME two years ago increased the number of issues annually from four to six, with a proportional increase in number of budgeted pages, the time in queue between acceptance of a manuscript and initiation of processing by the publisher for print has been reduced to near zero. Manuscripts submitted have increased steadily for six consecutive years, reaching a total of more than 200 in 1999.

The key to ensuring the quality of the *JBME* is the Board of Associate Editors. In this vein I want to acknowledge the outstanding service of three Associate Editors who completed their second three year term on the Board in December, 1999; Kainan An of the Mayo Clinic, Roger Haut of Michigan State University, and Stan Rittgers of the University of Akron. In January, 2000 three new Associate Editors were added to the Board, maintaining the membership total at 20. The new members are Gerard Ateshian of Columbia University, Lori Setton of Duke University, and Ajit Yoganathan of Georgia Tech.

One significant change for authors submitting papers starting January, 2000 is that the number of printed pages permitted before the mandatory excess-page charge is invoked has been increased from six to eight pages. Given that the average length of papers published in *JBME* is approximately eight, this new policy should make the journal an even more attractive option for prospective authors.

We continue to work to improve the effectiveness of our operation of the editorial office, and I owe a debt of gratitude and sincere thank you to the excellent Editorial Assistant with whom I work, Jenni Cork, for making essential contributions to this effort.

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.

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The Journal of Biomechanical Engineering: Cell and Tissue Engineering

The ASME Journal of Biomechanical Engineering sponsored a special issue on "Cell and Tissue Engineering", published in June, 2000 (Volume 122, Number 3). The issue stemmed from presentations in the Cell and Tissue Engineering sessions of the Summer Bioengineering Conference held in Big Sky, Montana, June 16-20, 1999. Cellular engineering and tissue engineering are exciting and rapidly growing fields that seek to replace injured or diseased tissues and organs by implanting "engineered" cells, scaffolds, DNA, and/or growth factors. These fields merge important aspects of engineering and biology, and many of the early achievements in cellular and tissue engineering have arisen from recent breakthroughs in the fields of cell and molecular biology, biomaterials, and biomechanics. Indeed, the origins of the field of tissue engineering can be attributed to the vision of biomechanical engineers such as Richard Skalak and Yuan-Chen Fung. The special issue includes several studies on new biomaterials, cell-matrix interactions, cellular response to mechanical stimuli, heat and mass transfer in tissue engineering, and cell mechanics.

Despite breakthroughs, there are still many "biomechanical" challenges that face the fields of cellular and tissue engineering. Cells and tissues of the body possess highly complex structures and mechanical behaviors that will be difficult to reproduce. Fundamental questions remain unanswered regarding the material and structural properties of normal tissues, as well as those of the biomaterials and tissue-engineered constructs used to replace them. Mechanical influences are implicated in the pathologies and etiologies of many diseases. Therefore, mechanotransduction, i.e. elucidation of the mechanisms by which cells sense and transduce mechanical stimuli, remains an important issue and a great biomechanical challenge. As reflected in the diversity of cells types represented in the special issue (e.g., from smooth muscle, brain, liver, heart, cartilage and bone), cellular and tissue engineering promote cross-fertilization of ideas between fields (e.g., orthopaedics, neurotrauma etc.) and unite

the traditional sub-disciplines of biomechanical engineering, bringing us together into common discussions. Because of this, "Functional Tissue Engineering" was the overall theme for the Bioengineering Division of ASME at the next International Mechanical Engineering Congress and Exhibition which was held in Orlando, FL November 5-10, 2000. It will also play a prominent role in the 2001 Summer Bioengineering Conference. We hope that this special issue of the ASME Journal of Biomechanical Engineering and the upcoming ASME conferences will stimulate more research contributions in cellular and tissue engineering. We also hope that authors will consider the Journal of Biomechanical Engineering as an excellent forum for these studies.

Farshid Guilak
Clark T. Hung
Ray Vanderby, Jr.

1999 H.R. Lissner Medal



Stephen C. Cowin

P.E., Ph.D., distinguished professor, department of mechanical engineering, City College of the City University of New York, N.Y., for advancing the fields of biomechanics and orthopaedics through extensive research and numerous scholarly publications on bone adaptation and remodeling, flowing granular materials and cellular mechano-sensory transduction in bones.

After spending a year on the faculty at Pennsylvania State University, University Park, Dr. Cowin began a 25-year-long association with Tulane University (New Orleans, La) in 1963. He joined City College of CUNY in 1988 and co-founded the New York Center for Biomedical Engineering, a multi-institutional consortium for research in biomedical engineering. He has also been serving as an adjunct professor of orthopaedics at the Mt. Sinai School of Medicine (New York, N.Y.) since 1989. Dr. Cowin's principal research interest is the mechanics of materials, particularly in determining the influence of microstructure on the gross mechanical behavior of granular, composite and biological materials. He is the author of over 180 research papers, editor or co-editor of five books and keynote speaker at technical meetings throughout the world. A pioneer in modeling the adaptive behavior

of bone, Dr. Cowin's efforts continue to be the benchmark against which all subsequent work has been measured. His recent work in the coupling of local cell-level mechanics and the adaptive behavior of bone may lead to important clinical applications relating to surgical implant of orthopaedic prostheses.

A Fellow of ASME, Dr. Cowin was associate editor of the Journal of Applied Mechanics and the Journal of Biomechanical Engineering. Current editorial appointments include the Journal of Biomechanics, the handbook of Bioengineering, and the handbook of Mechanics, Materials and Structures. Dr. Cowin is also a fellow of the American Academy of Mechanics and the American Association for the Advancement of Science, Founding Fellow of the American Institute of Medical and Biological Engineering and senior member of the Biomedical Engineering Society. Among his numerous honors is the Society of Tulane Engineers and Lee H. Johnson Award for Teaching Excellence (1985), the Best paper Award from the Bioengineering Division of ASME (1992), ASME's Melville Medal (1993) and the European Society of Biomechanics Research Award (1994). Dr. Cowin received his bachelor's and master's of science degrees in civil engineering from The Johns Hopkins University (Baltimore, Md.) in 1956 and 1958, respectively. He earned his doctorate in engineering mechanics at Pennsylvania State University, University park, in 1962. Dr. Cowin is a registered professional engineer in civil and mechanical engineering in Louisiana.

2000 ASME Y.C. Fung Young Investigator Award



Farshid Guilak

ASME's Committee on Honors and the Bioengineering Division are delighted to announce that Farshid Guilak, Ph.D. is the recipient of the 2000 ASME Y.C. Fung Young Investigator Award.

The ASME Y.C. Fung Young Investigator Award was established by the Bioengineering Division of the American Society of Mechanical Engineers in 1985 as a division award and elevated to an ASME societal award in 1999. The purpose of the award is 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 bio-

engineering. The award is named in honor of Yuan Cheng Bertram Fung, Ph.D., Professor of Bioengineering at the University of California, San Diego. Professor Fung is considered by many to be the father of modern bioengineering. Professor Fung is a long-standing member of ASME, and a past recipient of the ASME H.R. Lissner Award for his outstanding achievements in the field of Bioengineering. To date, the Bioengineering Division has awarded twelve Y.C. Fung Young Investigator Awards.

Dr. Guilak is an Assistant Professor in the Department of Mechanical Engineering and Materials Science and the Department of Biomedical Engineering at Duke University. Dr. Guilak received both his BS (1985) and MS (1987) degrees in Biomedical Engineering from Rensselaer Polytechnic Institute, and his PhD degree (1992) in Mechanical Engineering from Columbia University. His research focuses on the biomechanics of osteoarthritis. More specifically, he studies quantitatively the role of biomechanical forces in the physiology and pathophysiology of articular cartilage, he develops minimally invasive diagnostic techniques for joint disease, and he develops and validates novel therapeutic treatments either for slowing the progression of osteoarthritis or for improving the regenerative capabilities of cartilage. To support his research, Dr. Guilak has received many grants including those from the Whitaker Foun-

ation, the National Institutes of Health, as well as various industrial sponsors. To describe the results of his research findings, Dr. Guilak has co-authored more than 30 full-length articles in scientific journals and 8 book chapters. He has also co-authored one book. In recognition of his research contributions, Dr. Guilak has received numerous honors and awards including the Kappa Delta Young Investigator Award (1998) and the George W. Thorn Award (1997).

Nominations for the 2001 Y.C. Fung Award

The Bioengineering Division of the ASME is soliciting nominations for the 2001 ASME Y.C. Fung Young Investigator Award. The Y.C. Fung 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 the 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 recommendations, 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, 2000. Send nominations and inquiries to Maury Hull, Ph.D., Chair, Fung Award Committee, Professor Maury L. Hull, Department of Mechanical Engineering, Bainer Hall, One Shields Avenue, University of California Davis, CA 95616; mlhull@ucdavis.edu. Additional information can be found at <http://www.asme.org/honors/MS71/saa/fung.html>.

International Mechanical Engineering Congress and Exposition

November 11-16, 2001

New York Hilton Hotel & Towers and
Sheraton New York Hotel & Towers
New York, New York

Call for Papers - Bioengineering Division

The Bioengineering Division of the American Society of Mechanical Engineers will be pleased to receive original abstracts in all areas of Bioengineering for publication and presentation at the 2001 International Mechanical Engineering Congress and Exposition. The Highlight topic for the meeting is "Progress through Partnerships: Team Approaches for Today's Economy." Submissions of abstracts in this area or any area of Bioengineering are encouraged. The Bioengineering Division will be organizing special sessions, several of which are described below.

CELLULAR AND TISSUE ENGINEERING — Cell Mechanics; Nano- & Micro-Mechanics; Mechanics of Remodeling of Tissue; Cell and Tissue Engineering Education; and other general topics.

SOLID MECHANICS — Impact Biomechanics; Pediatric Biomechanics; Soft Tissue Biomechanics; Vehicular Biomechanics; Computational Biomechanics; Bone Adaptation and Mechanics; Cardiovascular Mechanics; Cardiovascular and Orthopedic Biomaterials, Biomechanics Education; and other general topics.

FLUID MECHANICS — Cardiovascular Mechanics; Cell and Tissue Engineering; Microfluidics and BioMEMS; Microcirculatory Mechanics; Pulmonary Mechanics; Implantable Devices; Drug Delivery; and general biofluid mechanics

HEAT AND MASS TRANSFER — Modeling of Biotransport Phenomenon; Image Guided Surgery; Visualization and Imaging in Biotransport; Regulation of Mass Transport in Cell Systems; Thermal Injury and Treatment; Biotransport Education; and other general topics.

DESIGN/REHABILITATION — Computer Aided Design, Rapid Prototyping; Robotics/Assisted Surgery; Minimally Invasive Surgery; Space Related Exercise Counter Measures; Sports Injuries; Joint Mechanics/Kinematics; MEMS applications.

STUDENT PAPER COMPETITION — The Bioengineering Division will sponsor its thirteenth annual student paper competition at the 2001 IMECE. Papers from all levels of study, undergraduate through Ph.D candidates will be considered. Separate awards for each level of study will be presented during the Bioengineering honors banquet at the IMECE. Abstract should be sent to the same address as regular abstracts. Instructions and eligibility should conform to criteria listed in the STUDENT PAPER COMPETITION solicitation document.

ABSTRACT FORMAT — Abstracts are not to exceed two 8.5"x11" pages and are to be prepared and submitted following the instructions in the abstract preparation instruction kit, which can be found at: <http://www.asme.org/divisions/bed/imece01.html>.

ABSTRACT SUBMISSION — The submission of abstract will be done electronically through the Bioengineering Division web site (www.asme.org/divisions/bed/imece01.html) and following the appropriate link. In addition, one paper copy of the abstract INCLUDING ASME Form M&P 1903, "Offer of a technical paper/assignment of copyright," which can be found at <http://www.asme.org/pubs/copy.html> must be submitted with the paper copy of the abstract to the address below.

FURTHER INFORMATION CAN BE OBTAINED FROM: — Professor B. Barry Lieber, State University of New York at Buffalo, Center for Biomedical Engineering, 337 Jarvis Hall, Buffalo, NY 14260, Tel: (716) 645-2593 x-2313, Fax: (716) 645-3875, Email: lieber@eng.buffalo.edu

DEADLINE DATES: Submission of Abstracts: March 15, 2001 — Notification to Authors: June 5, 2001

The Bioengineering Division is just a click away!

The Bioengineering Division continues to make its presence felt online at www.asme.org/divisions/bed. You can now access the latest information on conferences, publications, call for papers and much more. If you need to know whom the new chair of the division is, simply click and go.

The new roster contains information on: Executive Committee, Technical Committees and Administrative Committees. If you need to contact someone within a specific technical area for some help, you can find it here. We want to make this website more dynamic and interactive. We need your suggestions and comments. Please send your thoughts to Rupal Mody, Web coordinator, Engineering Programs at modyr@asme.org. Look forward to hearing from you. *Edison Aulestia, ASME staff*

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