

# American Society of Biomechanics Newsletter

Vol. 7

December, 1994

No. 2

## From the President

Phil Martin

Greetings from Arizona State University. As most of you are aware, ASB has enjoyed growth in recent years in terms of its membership and financial base. This reflects the vitality and general good health of the Society but also presents new challenges for ASB and the Executive Board. There are two major themes on which I would like to comment in this column: financial developments in the Society and ASB's expanding outreach to our professional colleagues.

The financial base of the Society has been on the rise, particularly in the past few years because of income generated by recent annual meetings. Our growing financial strength raises questions about the financial and programmatic goals of the Society. Under Tom Brown's initiative, an *ad hoc* task force was established last year to develop a plan for ASB's long term financial posture and goals. As part of this process, the Executive Board reviewed and accepted a proposal from IDS Financial Services to change the management of our assets and improve the rate of return on ASB funds. A final phase of the proposal that called for investment of a portion of ASB's money in growth-oriented mutual funds was submitted to and approved by the membership at the annual business meeting in Columbus. Our annual scientific meeting continues to be the primary function and purpose of ASB. Consistent with the practices of other professional societies, it is the view of the Executive Board that cash reserves approximating the cost of an annual meeting should be maintained. This cost has increased dramatically in recent years. Total expenses for the OSU meeting exceeded \$50,000 which helps put into perspective the current ASB balance of approximately \$70,000. In view of the rapid changes in ASB finances, the Executive Board is considering establishing a standing committee for financial affairs that will assist in overseeing ASB assets.

Several activities illustrate ASB's expanding role and influence in the development of biomechanics. First, at the request of the International Society of Biomechanics, ASB has contributed \$500 to help establish the ISB/ASB Stu-

dent Award for Economically Developing Countries. The first award is scheduled to be presented at the 1995 ISB biennial meeting in Finland. The Executive Board has approved similar support for 1997 and anticipates continuing this partnership indefinitely, pending periodic review. Second, the Executive Board is considering becoming an affiliated society of the American Institute of Medical and Biological Engineering (AIMBE), an organization whose purposes include promoting public awareness of medical and biological engineering and establishing important liaisons with government agencies and other professional groups. Third, a proposal that would establish an affiliation between ASB and the Science and Technology arm of the U.S. Olympic Committee is under consideration. This affiliation would facilitate access of the U.S.O.C. to the considerable expertise of the ASB membership. Finally, the feasibility of developing a competitive small grants program that would support graduate student research is being evaluated. The Executive Board will keep you apprised of these and other issues as they develop.

In closing I would like to extend a sincere thank you to a number of individuals for their service to ASB: Ron Zernicke, immediate Past-President who recently rotated off the Executive Board; Tom Brown, current Past-President who provided excellent leadership during the past

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## From the President, cont.

year; Alan Litsky and his colleagues at OSU who expended considerable time and effort as our hosts in Columbus; and Bob Gregor who organized the program for the OSU meeting. Without the dedicated and quality service of these and many other individuals, ASB would not be the positive force that it is in biomechanics. Please remember that your input to the Executive Board is always welcome. Best wishes for a great holiday season and a productive new year!

## From the Secretary/Treasurer

Mark Grabiner

There are a couple of informational items in which you may be interested. ASB has been notified by Pergamon Press that beginning January 1995 the cost of an individual subscription to the *Journal of Biomechanics* will be raised \$5.00. Thus, if you are a regular or student member who receives the *Journal of Biomechanics* through ASB, the increase you see in the 1995 dues (included in the present mailing) reflects this direct cost.

The results of the 1994 election were as follows. The President-elect for 1994-95 is Kai-Nan An from the Mayo Clinic and the Program Chairperson-elect is Dave Fyhrie from Henry Ford Hospital. The proposed by-laws change was overwhelmingly approved and, therefore, the Nominating Committee, formed each year at the annual Business Meeting, will comprise members from each of ASB's disciplinary categories.

The news that gives me great pleasure to report relates to the overall health of the Society. ASB presently has 609 members, nearly 100 of whom are students. The continued growth of the Society reflects, in large measure, the continued efforts of Melissa Gross and the Membership Committee. Financially, ASB is stronger than at any time in its history. To a large measure, this reflects the financial success of the recent Annual Meetings held at Arizona State University (1991), University of Iowa (1993) and NACOB II (1992). At the time of the meeting at Columbus, Ohio, the 1994 revenues for the Society were \$49,963.37 and its expenses were \$30,074.69. The Society's net balance at that time was \$73,487.65.

Spearheaded by Tom Brown during his year as President, and in conjunction with a professional financial planning expert from IDS, the Executive Board is presently consid-

ering just what to do with these funds. The plans essentially consider two things. The *first* is protected growth of the funds, which reflect the accrued efforts of the Society for the past 17 years. The *second* is new initiatives that can promote the activities of the Society and its members. Under the heading of protected growth, the Executive Board has proposed to partition the Society's resources into a number of investment vehicles, one of which was specifically considered for its higher interest yield, compared to that presently earned, but with little increase in risk to the principal. This was approved by the membership at the OSU Business Meeting. This aspect of the financial plan is directed toward preserving ASB's assets but also assuring greater growth of the principal.

One of the new initiatives in which ASB has been engaged for the past two years relates to student member involvement in the Society. Student members have enjoyed a substantially reduced registration rate at both the Iowa City and Columbus Annual Meetings and additional activities such as free registration for the tutorials and a student luncheon. Student participation in the Society is something the Executive Board wishes to encourage and nurture, and thus subsidizing this type of activity is considered of longterm importance to ASB. In this same vein, Phil Martin is presently developing a proposal to be considered that would establish a program to help fund some types of graduate student research. All in all, ASB is beginning 1995 with a strong membership and in a financially stable condition.

## From the President-Elect

Andy An

I would like to use this opportunity first to express my appreciation for your confidence in choosing me to serve the ASB as President-Elect. Fortunately, the Society is well developed and scientifically mature both professionally and financially due to the strong leadership of the executive board over the past years. I am looking forward to serving you and working with the new executive board to further enhance the functions and activities of the Society in the coming years. Any comments or suggestions are welcome. I may be contacted by phone, fax or e-mail. My details are included on page 4 of this newsletter. Best wishes for a successful 1995!



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## **Sustaining Members**

The sustaining membership category is aimed at encouraging affiliation by commercial organizations that market products which are used by the biomechanics research community, or companies that are otherwise engaged in activities that fall within the Society's general interest areas. Each member contributes \$500 per annum to the Society. A significant benefit for companies is that the exhibitor's fee at the annual meeting is waived. We are happy to acknowledge and thank the following companies for their support as Sustaining Members:

**Aircast**

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We invite all members of the Society to suggest names of potential sustaining members. Please send your suggestions to Melissa Gross (Membership Committee Chairperson) at the address indicated on page 4 of this newsletter. If you have a particular contact person at the company, please make sure to include his/her name.

## **For Sale**

For those of you who may be interested, there are extra copies of NACOB II abstract books, and the tote bags, available. Contact Mark Grabner (his details are on page 4) about these or other ASB conference proceedings that you wish to purchase.

# Executive Board

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## Membership Chair's Report

Melissa Gross

The Membership Committee continues to receive a growing number of applications for membership. A total of 87 applications were received in 1993, but this year 84 had already been received by September. Typical of past distributions, most of the applicants were in the area of Engineering/Applied Physics (60%). The Exercise/Sport Sciences and Health Sciences areas each received 14% of the applicants, the Biological Sciences area received 7%, and the Ergonomics/Human Factors area received 5% of the applications.

To continue the growth and vigor of the Society, the Membership Committee would like you to urge your colleagues and students to apply for membership. Please contact me (*cf.* details on page 4) to obtain information about membership.

How does the application process work? Applications are reviewed by the entire Membership Committee. To be approved for membership, the applicant must demonstrate original research contributions in biomechanics, typically by publications in peer-reviewed scientific journals. Commencing in 1995, applications will be reviewed four times each year, and applicants will be notified at the end of each of the following months: January, April, July, and October.

The Membership Committee consists of the following individuals: (1) Melissa Gross, Chair, representing Exercise/Sport Sciences, (2) Scott Delp, representing Engineering/Applied Physics, (3) Claire Farley, representing Biological Sciences, (4) Irene McClay, representing Health Sciences, and (5) Mark Redfern, representing Ergonomics/Human Factors.

## We Need Your Contribution

Members are encouraged to contribute to the newsletter. A note, a letter to the editor, a lead on an interesting story, information about a scientific meeting, in fact anything of interest to the ASB membership, would all be most welcome. Send information scrawled in longhand, via e-mail, or on computer diskette (5.25" or 3.5") for IBM or Macintosh. Plain ASCII text files are preferred! If you have any other ideas, please get in touch. The next newsletter will be published in June, 1995. Deadline for submission of material is 15 May 1995!

## Education Committee Chair

Jill McNitt-Gray

First, we would like to thank the 67 attendees of the 1994 Annual Meeting at Ohio State University for completing and returning their 1994 ASB Meeting Evaluation Forms (40% of the evaluation forms received were from students).

Highlights of the 1994 Meeting included: Tutorials, Mechanical Power and Work in Human Movement by Dr. V.M. Zatsiorsky, and Nicolai Bernstein and His Famous Problem by Dr. M. Latash; the Borelli Award Lecture by Dr. P.R. Cavanagh; keynote addresses on Controlling Chaos by Dr. A. Garfinkel and Skeletal Muscle Injury Mechanics by Dr. R. Lieber, and the banquet at the COSI.

Attendees enjoyed the tours to the OSU laboratories. Student attendees also appreciated the student luncheon and the reduced registration fees. Areas for improvement included hotel accommodations, transportation logistics, poster session location and layout, and size of rooms used for podium presentations. The comments made reflect spatial difficulties associated with accommodating a larger than expected number of attendees (>100). More detailed information was obtained from these evaluation forms and has been compiled and disseminated to the 1994 and 1995 Meeting and Program Chairpersons.

Second, the evaluation forms have also been helpful in enlarging and updating the ASB Graduate Program Database. The information provided by the conference attendees is currently being added to the existing database. Steps are also being taken to provide "on-line" access to the database.

Third, suggestions made for future tutorials are being considered. Other interested parties are asked to contact me directly (*cf.* details on page 4).

# A View from the Academical Village

Kit Vaughan

In this issue of the newsletter we have some welcome reports from members of the executive board. Our society enjoys a state of excellent health -- both in membership and finances -- as we gallop towards the millennium. One of our members, Barry Bates, was prompted (inspired?) to write a follow-up article on the problems faced by researchers in getting their work published in scientific journals. He addresses the contentious issue of experimental design and statistical interpretation and suggests that editors and reviewers should be open to non-traditional (or seemingly "risky") ideas. We have also added a new book review section and I reviewed two texts that are literally hot off the press. You will also note that there are over 30 jobs advertised in the newsletter -- surely a healthy sign for our field!

I have chosen as my theme for this issue the so-called Information Superhighway (I believe that Vice President Al Gore gets the credit for coining the term). Let me preface my remarks by stating that I am a traditionalist (my kids would say a stick-in-the-mud!) which means that I don't embrace any new technology merely because it is new. I still do most of my creative writing, including this column, long-hand. However, I am absolutely hooked on the Internet and the potential that it has for transforming the world in general and our own field of biomechanics in particular. My editorial will be one part historical, one part tutorial, and one part sermon. If I sound like an evangelist on this topic, I make no apologies!

I suspect that many of you have an electronic mail (or e-mail) address and you use this form of communication on a daily basis. It's rather like the photostat or fax machine -- how did we ever manage before they appeared on the scene? I use e-mail to communicate with fellow faculty and my post-docs and graduate students to inform them about lab meetings, material to be read, changes of venue, etc. Grant-writing is the bane (and the reality!) of faculty life and here too e-mail comes in handy. Very often my collaborators are from different departments which are scattered all over campus. Rather than using the internal mail system (which is notoriously unreliable, not to mention slow!), we can coordinate the separate sections of our grant over the campus-wide network. Most often the information is in a standard text format which can then be imported into a desktop publishing package for final production. The same strategy of e-mail assembly is adopted for the early drafts of research papers. E-mail also serves

as an important function in teaching activities. My undergraduate kinesiology class takes some multiple-choice tests which are scanned and electronically graded, and the results sent to me within a few hours. Graduate students in the skeletal mechanics class which Joe Hale and I teach are informed about reading assignments and lab write-up requirements. E-mail is, quite simply, an indispensable part of doing my job at the University of Virginia.

When I assumed the position of editor two years ago, one of the articles included was an obituary for Herman J. Woltring (*ASB Newsletter*, Vol 5, No. 1, page 7, December 1992). Herman was one of the real characters in our field. Aside from being an outstanding research scientist (and linguist), he was also the founder of the BIOMCH-L bulletin board. Some of you may be among the many thousands of subscribers to this outstanding service. If you are, then you know what potential it has for contributing to our field. Herman helped set the tone for much of the discussion and lively debate. One I recall quite clearly was the issue of joint angles and whether the Eulerian or helical axis representation was more appropriate. A recent edition of the *Journal of Biomechanics* (Vol. 27, No. 12, 1994) included a posthumous article by Herman on this topic. Other interesting topics covered in the recent past include: the effect of inertial parameters on joint moment accuracy where the protagonists were Herbert Hatze, Brian Davis and Zvi Ladin; and the thorny issue of commercialism and the Internet, where Gideon Ariel was (as always!) on the receiving end. If you haven't yet signed on to this newsgroup, I urge you to become a part of the proverbial global biomechanics village. Just follow these instructions. First you send a message to the following Internet address:

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Your message should simply state

SUBSCRIBE BIOMCH-L Kit Vaughan (USA)

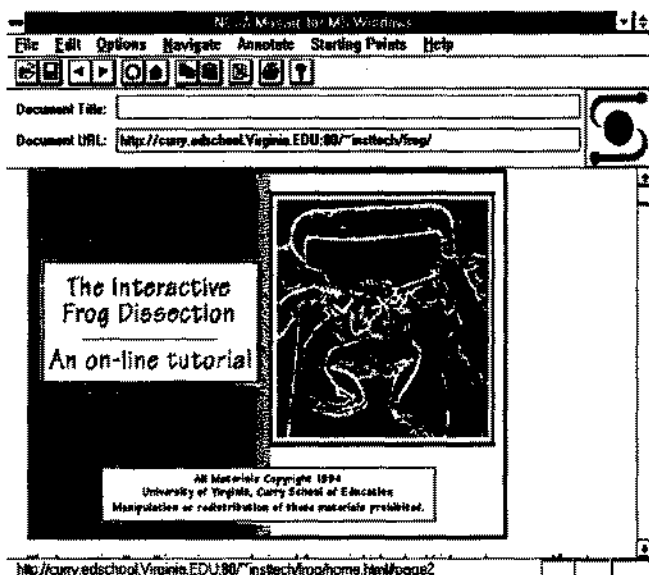
where you would obviously replace the second part of the command with your own name and country. When you post a message to the newsgroup, the Internet address that you would use is:

BIOMCH-L@NIC.SURFNET.NL

In case you're wondering, the NL stands for The Netherlands (remember the Herman Woltring connection). When participating in the BIOMCH-L newsgroup, you should be aware that there is a certain code of conduct (in Internet jargon, this is known as netiquette!) that should be observed.

One of my passions is the study of human gait. I recognized that the ubiquitous computer could play a pivotal role in





educating students of human movement: while few people get an opportunity to work in a sophisticated 3D gait lab costing hundreds of thousands of dollars, virtually everyone has access to a personal computer. Two years ago, Brian Davis, Jeremy O'Connor and I published a book/software package entitled *Gait Analysis Laboratory*. Of course, like most software, it was no sooner published than it became out-dated. We started working on the next edition and this is where the Internet has made a significant contribution. Originally we were all based in Cape Town and collaboration was simple. The subsequent diaspora took Brian to Cleveland and me to Charlottesville. The vast distances separating the three of us notwithstanding, we have continued our collaboration. Jeremy, in Cape Town, writes much of the code (now on the Windows platform) while Brian and I in the USA gather much of the raw data. Using the ftp (or file transfer protocol) utility, it is an easy matter to transfer the files among our three sites. Within a matter of minutes, I can download Jeremy's executable programs and have them up and running on the PC in my office. Using regular e-mail I can then provide him with rapid feedback. With the proliferation of the Internet, there are other outstanding opportunities to advance the cause of education. One such powerful tool is the World Wide Web (or Web for short) and its Mosaic graphical interface that allows the sharing of files containing text, numerical data, graphics, audio and video. The Instructional Technology Program at the University of Virginia has developed an interactive frog dissection for the Web. The tutorial combines text with 60 color images and 17 QuickTime movies to illustrate dissection procedures and internal organs. I have used some of their screen shots to illustrate this editorial. If you know anything about the Web, and have a Mosaic (or similar) browser, the home page to access is:

<http://curry.edschool.virginia.edu/~insttech/frog>

Be aware that the video files are quite large (5 or 6 MBytes) and may take a few minutes to travel over the Internet. I have been so inspired by the possibilities of the Web that I now have an undergraduate mechanical engineering student doing his final year project on a home page for my lab.

It is appropriate that I conclude this editorial on the role that the Internet has played, and will continue to play, in the ASB Newsletter. All the reports from the executive board members were sent to Stephanie Goar or me via e-mail as were the calendar of events and job opportunities. Stephanie simply imported these files into PageMaker for final layout. One of our members, Chris Jacobs of Penn State University, has offered to be the official archivist for the ASB Newsletters. His e-mail address is:

[cjacobs@ortho.hmc.psu.edu](mailto:cjacobs@ortho.hmc.psu.edu)

Both the current issue, and previous issues, of ASB News will be available as encapsulated PostScript files via anonymous ftp at:

<ftp.ortho.hmc.psu.edu>

by the time you read this. Chris is also busy building their Web page and so those of you who have the Mosaic browser will soon be able to access ASB News at

<http://www.ortho.hmc.psu.edu>

I hope I have convinced you that the possibilities for utilizing the Internet are almost without limit. Remember, though, it's the spirit of cooperation among the participants that will allow much of the potential to be achieved.



# Calendar of Events

## 8-9 Jan 1995

3rd Annual Conference on Scientific and Engineering Applications of the Macintosh (SEAM); San Francisco, CA; Shari Worthington, Executive Director, MacSciTech; Tel: 508-755-5242; scitechmac@aol.com.

## 29 Jan - 1 Feb 1995

95th Annual Conference of the Australian Society for Biomaterials; Melbourne Australia; ASB Conference Secretariat, c/o CSIRO Division of Biomolecular Engineering, 343 Royal Parade, Parkville 3052, Australia; Tel: +61-3-342-4239 FAX: +61-3-342-4218; jeromew@tigger.mel.dbe.csiro.au.

## 13-16 Feb 1995

941st Annual Meeting of the Orthopaedic Research Society; Orlando, FL; Orthopaedic Research Society, 6300 N. River Road, Suite 727, Rosemont, IL 60018-4226; Tel. 708-698-1625 FAX. 708-823-0536.

## 4-5 Mar 1995

International Comparison Meeting on Motion Measuring System, AMADA FORUM 246 Concourse, 350, Ishida, Isehara-City, Kanagawa-Prefecture, Japan; Fax 81-463-96-3707

## 8-9 April 1995

14th Southern Biomedical Engineering Meeting; Shreveport, LA.; D.P. Mukherjee, Sc.D., Conference Chairman, Dept. of Orthopaedic Surgery, LSUMC-S, 1501 Kings Highway, Shreveport, LA 71130; Tel: 318-675-6187 FAX: 318-675-6186; dmukhe@lsu.mc.edu

## 1-3 June 1995

2nd Annual North American Clinical Gait Laboratory Conference; Waterloo, Ontario, CA; Betty Bax, Department of Kinesiology, University of Waterloo, 200 University Ave. W., Waterloo, ON N2L 9Z9; Tel. (519) 885-1211, ext. 2610; bax@healthy.uwaterloo.ca; abstracts due January 10, 1995.

## 18-23 June 1995

International Meeting of ASAE; Chicago, IL; Timothy L. Foutz, Ph.D.; Biological and Agricultural Engineering; Driftmier Engineering Center; The University of Georgia; Athens, GA 30602; Tel: 706-542-0868 FAX: 706-542-8806; tfoutz@gamma.bae.uga.edu.

## 21-23 June 1995

BIOMED '95: 3rd International Conference, Simulations in Biomedicine (Organized by the Wessex Institute of Technology); Palazzo delle Stelline, Milan, Italy; Jane Evans, Wessex Institute of Technology, Ashurst Lodge,

Ashurst, Southampton, SO40 7AA UK; Tel: 44 (0)703 293223 FAX: 44 (0)703 292853; CMI@ib.rl.ac.uk

## 28 June - 2 July 1995

ASME Summer Bioengineering Conference; Beaver Creek, CO; Kathy Vickers, Dept of Mechanical Engineering and Materials Science, Box 90300, Duke University, Durham, NC 27708; Tel: 919-660-5309, -5310 FAX: 919-660-8963; kvickers@acpub.duke.edu.

## 30-31 June 1995

Vth International Symposium on Computer Simulation in Biomechanics; Jyväskylä, Finland; Dr. Erkki Laitinen, Laboratory of Scientific Computing, University of Jyväskylä, P.O. Box 35, FIN-40351 Jyväskylä, Finland; Tel. +358 41 602745 Fax. +358 41 602731; biomech@math.jyu.fi.

## 2-6 July 1995

XVth Congress of the International Society of Biomechanics Jyväskylä, Finland. XVth ISB Congress; Jyväskylä Congresses; P.O. Box 35; FIN -40351 Jyväskylä; FINLAND Tel. +358 41 603 664 FAX. +358 41 603 621 tvanttin@jyu.fi

## 18-22 July 1995

13th Annual International Biomechanics Symposium for Biomechanics in Sport; Thunder Bay, Ontario, CA; ISBS Conference Centre, School of Kinesiology, Lakehead University, Thunder Bay, Ontario, CA P7B5E1 -or-tony.bauer@lakeheadu.ca; abstracts due March 31, 1995.

## 24-26 Aug 1995

19th ANNUAL MEETING OF THE AMERICAN SOCIETY OF BIOMECHANICS; Stanford University, Stanford, CA; Gary Beaupré, Ph.D., Rehabilitation R&D Center (153), VA Medical Center, Palo Alto, CA 94304; Tel. 415-493-5000 ext. 4272 FAX. 415-493-4919; 95asb@bones.stanford.edu; abstracts due March 15, 1995.

## 6-8 Nov 1995

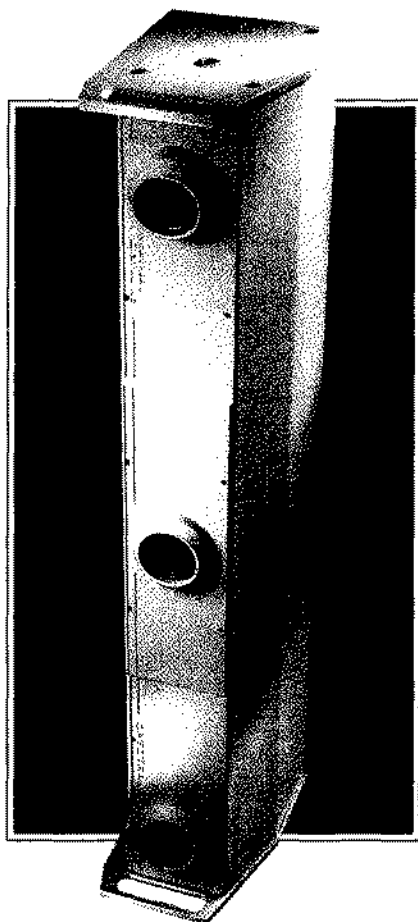
2nd Combined Meeting of the Orthopaedic Research Societies of USA, Japan, Canada and Europe; San Diego, CA; Sheril King, Orthopaedic Research Society, 6300 N. River Road, Suite 727, Rosemont, IL 60018; Tel. 708-698-1625 FAX. 708-823-0536.

## 28-31 Aug 1996

10th Conference of the European Society of Biomechanics; Leuven, Belgium; Division of Biomechanics and Engineering Design, Dr. J. Van der Sloten, Celestijnenlaan 200A, B-3001, Heverlee (Belgium); Tel. +321 632 7096 FAX. +321 629 2716; jos.vandersloten@mech.juleuven.ac.be.



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\*1 mm achieved at 2.5 m from the "camera", .45 mm achieved at 6 m from the camera (based upon a 1 mm marker on an 8 mm mount).  
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## **IOC OLYMPIC PRIZE PRIX OLYMPIQUE DU C.I.O**

In order to recognize the evolution of scientific research related to human movement, the International Olympic Committee, under the sponsorship of Parke-Davis, has created a prestigious prize - the IOC Olympic Prize. Scientific research related to human movement, physical activity, and sport has become indispensable. It contributes to a broader understanding of the healthy development of the human body and its main structures, bone, cartilage, ligament, tendon, and muscle; the prevention of injuries due to physical activities; the improvement of treatment and rehabilitation techniques for musculo-skeletal injuries; and the improvement and optimization of physical performance through an enhanced understanding of the functioning of the human body.

The IOC Olympic Prize will be awarded every two years in conjunction with the Olympic Summer and Winter Games and consists of

- a medal
- a diploma and
- \$250,000 (U.S.)

The Prize will be awarded for findings resulting from outstanding basic and /or applied research which fulfills one or several of the following aspects:

- represents a significant discovery
- contributes to the betterment of humankind
- has a significant impact upon science or society
- is related to human movement, physical exercise, and sport
- is the subject of publications

The main topics of interest are:

- basic or applied research which improves the understanding of human movement, exercise, and sport and their relationship to the healthy development of biological structures
- the study of etiology, prevention, treatment, and rehabilitation of injuries related to human movement and sports activities
- the study of factors influencing performance

This Prize will be awarded for findings resulting from outstanding research in the field of science applied to human movement, physical exercise, and sport. The Prize may be awarded in the following fields:

- biological sciences
- medical sciences
- physical sciences
- psychological sciences

For further information about the IOC Olympic Prize please contact the IOC headquarters in Switzerland: International Olympic Committee, Medical Commission, Chateau de Vidy, CH-1007 Lausanne, Switzerland Tel: 41 21 621 61 11; Fax: 4121 624 61 66

# Job Opportunities in Biomechanics

## DOCTORAL POSITIONS

**Pre/Post-Doctoral Fellowships** - multidisciplinary training program in Developmental Processes; research into normal and atypical development and young children. Multidisciplinary Training in Developmental Process; Dept of Psychology; Indiana Univ; Bloomington, IN 47405 Tel: 812-855-5590 Fax: 812-855-4691 DEVPROG@INDIANA.EDU

**Postdoctoral Position** - to perform a computational study of the head-neck due to impact accelerations, such as experienced by pilots during an ejection from moving aircraft. PhD with demonstrated expertise in musculoskeletal biomechanics is required. Dr. Ronald C. Anderson; Dept of Biomedical Engineering; Boggs Center, Suite 500; Tulane Univ; New Orleans, LA 70118-5674 Tel: 504-865-5867 rca@bmen.tulane.edu

**Graduate & Post-Doctoral Fellowships** - spine-related research projects directed at roles of muscles in the stability of the lumbar spine and mechanical factors in progression of skeletal deformity; detailed anatomical studies, analytical modeling of muscle, and studies of growth plate response to mechanical forces. Ian Stokes; Dept of Orthopaedics and Rehabilitation; Univ of Vermont; Burlington, VT 05405-0084 Fax: 802-656-4247 stokes@med.uvm.edu

**Post-Doctoral Fellowship in Assistive Technology Research** - research of promising military/aerospace technologies with application to rehabilitation medicine. Candidates will be expected to submit research articles for publication; present scientific or technical papers at conferences; and develop grants for external funding. Bill Peterson; Director Rehabilitation Engineering; National Rehabilitation Hospital; 102 Irving Street, NW; Washington, D.C. 20010-2949 Tel: 202-877-1498

**Post-Doc in Biomedical Engineering** - research/development of a hybrid walking system to restore mobility of paraplegic patients. Dr. Bart Koopman; Faculty of Mechanical Engineering; Laboratory of Biomedical Engineering; Univ of Twente; P.O. Box 217; 7500 AE Enschede, The Netherlands Tel: +31-53 892465 Fax: +31-53 356490 h.f.j.m.koopman@wb.utwente.nl

**Post-Doctoral/Sabbatical Positions** - research in computer- and robot- assisted orthopedic surgery and lower limb biomechanics (especially knee). Dr. Sandra Martelli; Istituti Ortopedici Rizzoli; Lab. Biomeccanica; via di Barbiano 1/10; I-40136 Bologna ITALY Fax: +39-51-583789

## RESEARCH POSITIONS

**Motor Development Lab Position** - research includes arm trajectory control in infants, locomotion, and 3-D torque perturbations on infant limbs. Esther Thelen; Dept of Psychology; Indiana Univ; Bloomington, IN 47405 Tel: 812-855-2042 THELENE@ucs.indiana.edu

ASB Newsletter

**Biomechanical Engineer** - to assist in designing and implementing biomechanics research experiments with focus on the spine. BS or MS in engineering. Manohar M. Panjabi, PhD; Biomechanics Research Laboratory; Dept of Orthopaedics; Yale Univ School of Medicine; P.O. Box 208071; New Haven, CT 06520-8071 Tel: 203-785-4924 Fax: 203-785-7069

**Bioengineering Lab Technician** - responsibilities include setup and execution of mechanical experiments on hard/soft tissue, protocol refinement, cadaveric specimen preparation, specialized fixture fabrication, and programming of data acquisition software. BS or MS with 5 years experience preferred. Jeffrey C. Lotz, PhD; Orthopaedic Bioengineering Laboratory; Dept of Orthopaedic Surgery; Univ of California at San Francisco; 533 Parnassus Ave; San Francisco, CA 94143-0514

**Materials Scientist** - research relating deformation processes in animal skin, hide and leather to macroscopic structure, microscopic texture, and chemical composition, using methods of biomechanics and physical chemistry. Dr. Paul Kronick; USDA-ARS-ERRC; 600 E. Mermaid Lane; Philadelphia, PA 19118 Tel: 215-233-6506 Fax: 215-233-6795 pkronick@arserrc.gov

## FACULTY POSITIONS

**Asst/Assoc Professor** - tenure track, full-time faculty positions in Upper Extremity Biomechanics and Soft-Tissue Biomechanics. Savio L-Y. Woo, PhD, Ferguson Professor and Vice-Chair for Research, Dept of Orthopaedic Surgery, Univ of Pittsburgh, Suite 1010 Lilliane Kaufmann Bldg., 3471 Fifth Ave, Pittsburgh, PA 15213

**Director, Institute for Medicine and Engineering** - academic leadership of newly created institute to interface medicine and engineering. Arthur K. Asbury, MD, Chair, Search Committee, Professor and Acting Chair, Dept of Neurology, Univ of Pennsylvania, 3 West Gates, Philadelphia, PA 19104-4283

**PhD in Biomechanics** - for forensic group consulting in trauma biomechanics. Academic appointment and research possible. Alan M. Nahum, MD, Medical-Legal Consultants, Inc, 6361 Nancy Ridge Drive, San Diego, CA 92121 Tel: 619-457-9711 Fax: 619-457-9775

**Asst/Assoc Professor** - Biomechanical Engineer with background in experimental and analytical methods related to musculoskeletal system. Fred F. Behrens, MD, Chair, Dept of Orthopaedics, New Jersey Medical School - UMDNJ, MSB G-574, 1985 South Orange Ave, Newark, NJ 07103

**Asst Professor in Biomedical Engineering** - tenure-track faculty position in cellular biomechanics and transport. Andrew E. Kertesz, Chair, Biomedical Engineering Dept, Northwestern Univ, 2145 Sheridan Road, Evanston, IL 60208-3107

**Physical Therapy** - 9 month, tenure-track faculty position; responsibilities include teaching musculoskeletal bases of physical therapy practice, research, and advising. Doctoral degree plus research experience required. Mary Moffroid, PhD, PT; Search Committee Chair; Univ of Vermont; Dept of Physical Therapy;

305 Rowell Bldg; Burlington, VT 05405-0068  
MMoffroid@cosmos.uvm.edu

**Asst Professor in Sports Medicine** - tenure track appointment, with teaching, research and service responsibilities. Doctoral degree in Physical Education/Sports Medicine with a specialization in Exercise Physiology or Biomechanics. Dr. L. Marlene Mawson, Chairperson; Dept of Health, Physical Education, Recreation and Dance; 5120 Illinois State Univ; Normal, IL 61790-5120 Tel: 309-438-8661 Fax: 309-438-5559  
MMAWSON@ILSTU.EDU

**Asst/Assoc Professor** - tenure track position in the motor learning program. Competency in computer-based kinematic/kinetic analysis of human movement required. Teach graduate courses; design/supervise research in rehabilitation and clinical settings. A. M. Gentile; Teachers College; Columbia Univ; New York, NY 10027.

**Asst Professor in Exercise Physiology** - responsibilities include research, teaching, student advising and committee participation. Doctorate and research experience required. Expertise in muscle physiology and ability to teach human physiology/research method desirable. Exercise Physiology Search; Louis R. Osternig, PhD, Search Committee Chair; Dept of Exercise and Movement Science; Univ of Oregon; Eugene, Oregon 97403-1240

**Asst Professor** - tenure track position with emphasis in sport biomechanics and motor development; teaching and advising undergrad/grad students; teaching experience in college and elementary phy. ed. and adapted phy. ed. background preferred. Dr. Jon Nelson; Dept. of Health, Phy. Ed. & Rec.; Northern Michigan Univ.; Marquette, MI 49855 Tel: 906-227-1133  
Jonelson@nmu.edu

**Physical Therapy Faculty (3)** - with expertise in neurosciences, basic science, and/or management of neurological/musculoskeletal disorders. Instruction of clinical/basic sciences and scholarly activities associated with area of expertise. PT licensed or eligible; doctoral degree and minimum 5 yrs experience preferred. Academic rank and availability of tenure dependent on qualifications. A. Joseph Threlkeld, PT, PhD; Search Committee Chair; Creighton Univ; Dept of Physical Therapy; 2500 California Plaza; Omaha, NE 68178 Tel: 402-280-5676 Fax: 402-280-5692  
Jthrelke@Creighton.edu

**Tenure Track Faculty Position** - teaching residents motor control and basics in motor development and/or adapted physical activity; research focus on effects of treadmill practice on the onset of walking and quality of walking patterns in infants with neurophysiology and conducting independent research in motor control and biomechanics. PhD in Physiology, Neuroscience, or Biomechanics. John J. Nicholas, MD; Professor and Chairman; Rush Medical College; 1653 West Congress Parkway; Chicago, IL 60612.

**Junior Faculty Position in Radiology** - research in diagnostic medical physics, specifically imaging techniques for diagnosis of osteoporosis. PhD with experience in medical imaging and bone densitometry required. Harry K. Genant, MD; Professor of

Radiology, Medicine and Orthopaedic Surgery; Box 0628; Dept of Radiology; University of California, San Francisco, CA 94143.

## GRADUATE ASSISTANTSHIPS/SCHOLARSHIPS

**Research Assistants (2)** - responsibilities include fabrication of measurement systems for study of joint mechanics, conducting biomechanics and lab experiments, data analysis, and assisting in technical writing. Minimum of BS in basic science required. William L. Buford, Jr., PhD; Director, Orthopaedic Biomechanics Lab, Univ of Texas Medical Branch; Galveston TX 77553-0353  
wlbuford@beach.utmb.edu

**Graduate Students** - to study basic mechanical principles which govern movement, with particular emphasis on locomotion; using direct experimental manipulations, simple mechanical models, and comparisons between diverse animal species. Tuition waivers, research and teaching assistantships available. Prof. Rodger Kram, rkram@garnet.berkeley.edu

**Research Assistantship** - for doctoral studies of Down syndrome. Dr. Beverly Ulrich; Dept of Kinesiology; Indiana Univ; Bloomington, IN 47405  
ulrichb@ucs.indiana.edu

## OTHER POSITIONS

**Physical Therapist** - with interest in sports biomechanics and kinesiology electromyography for management/research position. Marilyn Pink; Centinela Hospital Biomechanics Lab; 555 E. Hardy St.; Inglewood, CA 90301 Tel: 310-673-2086 Fax: 310-671-5923  
biocent@class.org

**Gait Lab Director** - M.S. or PhD preferred. Responsible for analysis of Cerebral Palsy patients, adult neurological and sports related injuries. Work in collaboration with orthopaedic surgeons and PM&R physicians. Research and clinical orientation preferred. Contact: Ron Stone, Director, Santa Rosa Outpatient Rehabilitation, 4319 Medical Drive, San Antonio, TX, Phone: 210-614-8534.

**President, Harrington Arthritis Research Center** - responsible for planning, directing, funding and management of the Center. PhD plus 3-5 years administrative experience required. Joan Buell, RN, Health Care Recruiter, St. Luke's Medical Center, 1800 E. Van Buren, Phoenix, AZ 85006 Tel: 602-251-8336

**Scientific Officer** - initiate and direct research projects in orthopaedic biomechanics and biostatistics. PhD in science or biomedical engineering preferred. Prof. K. M. Chan, Chair, Dept of Orthopaedics & Traumatology, The Chinese Univ of Hong Kong, Prince of Wales Hospital, Shatin, N.T., HONG KONG Fax: 852-637-7889

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NOTE: Applicants are strongly encouraged to contact the listing individual/institution directly to determine current status and obtain additional information.

# Publishing Woes Revisited

Barry Bates

The article by Brian Davis on the publishing woes of William Harvey in the June 1994 Newsletter inspired me to discuss some of my own (and maybe your) publishing woes which may be interpreted as similar to Mr. Harvey's. In any case, these woes have to do with referee/editor interpretations and research philosophies. First, let me state that I find no fault with the review process *per se*. In fact, I agree that having individuals critique and evaluate the work of others is probably the most reasonable way to decide which research studies should be published, assuming the reviewers produce valid and, unbiased critiques. My expressed observations about the process are based upon reading reviews, discussing reviews with others and reviewing articles that have "successfully" made it through the review process (i.e. been published).

Certainly, most research studies published have some merit and contribute to the body of scientific knowledge. However, I am sure that some studies not published (like Mr. Harvey's) could also have contributed to the body of scientific knowledge. Of course, this immediately raises a question: "What is science?" According to Webster, science can be defined as "systematized knowledge derived from observation, study and experimentation to determine the nature or principles of what is being studied." Given this rather broad definition, it would seem reasonable that most of our research efforts can be deemed "scientific" and it should then be a matter of evaluating the quality and contribution of the effort which brings me to my primary concern which addresses "How we do science".

Many researchers and reviewers have a somewhat limited statistical background. In addition, the background of these individuals is typically one of conventional or traditional philosophy and research techniques. It is also the case that acceptance of convention or the norm is a much safer and more comfortable position to take since it is easier and usually conforms with one's background and training. A lack of understanding of divergent opinions in measurement can often result in limited consideration of these opinions or positions. All measurement schemes, no matter how thorough and well-conceived, lose more information than they gather. This information is lost forever since all outcomes are dependent upon the state of the organism interacting with the environment at a specified moment in time. Not even replication can recover lost data. Given the inevitability of this phenomenon, it would seem highly desirable to encourage as many research approaches as possible to maximize our chances of "stumbling upon"

answers to questions related to our understanding of the underlying mechanisms and processes controlling human movement. This is often not the case, however, since many reviewers and editors are often biased against alternative approaches due to limited perspectives on these approaches. Proponents of conventional research methods and design (group ANOVAs for example) might gain some insight by reviewing the history of these designs which were largely developed by R.A. Fisher. Fisher was an agronomist and was primarily concerned with overall crop output and not individual plants. This is analogous to being concerned with the "average" effect on the group without any concern for individuals which I contend is not always the best approach. This suggests to me that it is essential to science that reviewers and editors be sensitive to alternative approaches in order to gain additional insight into the movement process.

It is my opinion that the purpose and responsibility of the reviewers and editors is to challenge, question and ultimately decide the fate of the manuscript but only after adequate evaluation and a sincere attempt to understand the author's position or perspective. It is not their prerogative to be judgemental when evaluating a manuscript. I am aware of manuscripts being rejected on the basis of judgement. If as a reviewer one is in doubt (isn't absolutely sure) then minimally, the author deserves a second chance to provide a better explanation of what was done and why. It certainly is unfortunate when a manuscript is rejected on the basis of a lack of knowledge or a philosophical difference.

Given these potential problems, it is certainly possible that the "quasi-democratic" process of peer review could result in a regression of the product to the mean in the absence of great care on the part of the editors to assure the incorporation of divergent ideas and research approaches. This would eventually lead to all published papers looking and sounding alike within a single or limited number of approaches.

I have expressed some concerns I have regarding the peer-review process. Again, I must emphasize that I am not speaking against the process. I believe that an honest and constructive debate between scholars is the best way to advance science. This can take the form of formal or informal discussion or in critiquing a colleagues's work. Assuming we all have the same goal of gaining a better understanding of human movement, perhaps we should be more tolerant and trusting of our colleagues and be grateful that they are sometimes wandering down a different scientific path looking for data lost in someone else's measurement process.

### Footnote: Factors Supporting a Single-Subject Experimental Design.

The human is an extremely complex system. We really do not understand very much about the underlying mechanisms of performance although a review of the conclusions drawn from some studies suggests that some people believe they do. Coupled with this general lack of understanding of the human machine is a lack of understanding of some critical topics including performer variability, statistical power and performer strategies.

Variability is an inherent component of all human performance. Exact replication of a movement is not possible due to the vast number of functional degrees of freedom within the human system. Even Olympic athletes exhibit performer variability. Variability is not error per se although it is extremely difficult to separate true performer variability from measurement error. The resulting observed variations are directly related to our ability to detect statistical differences since these differences in simple terms are a function of the ratio between effect size (mean differences) and variability (standard error). The ability to detect real differences is of course the statistical power of the experiment. Given the existence of real differences and sufficient data, we can always detect these differences. This, however, has no direct bearing upon the biomechanical or functional value of the differences. That is an independent question that is not relevant to this discussion. What is critical relative to statistical power is the conclusions one draws in light of the statistical power (or its lack) of the experiment. All too often researchers state their findings that support the null hypothesis (no differences exist) in definitive or absolute terms when in fact their chance of detecting differences was highly unlikely based upon the statistical power of their experimental design. Although a power analysis should be completed prior to concluding, it is seldom done. An alternative approach is to be conservative in concluding and limit yourself to hypothesizing or speculation, making it clear to the reader that you are doing so. A secondary problem associated with these false conclusions (beta errors) is that studies supporting the null hypothesis are often not replicated because there is no perceived value in re-examining the question.

Another critical topic I want to address has to do with performer strategies. Certainly in an evolutionary sense, we are all very similar. Normal, healthy individuals (the subjects of many experiments) all have the same skeletal system that is controlled by the same muscles via the same nervous system resulting in a plethora of inherent potential movement patterns. The musculo-skeletal system is the most constraining in that it dictates what patterns are

mechanically possible. The nervous system is, however, quite pliable and allows for numerous choices in constructing responses to problems imposed by the environment. Our response to a specific task is based upon our experiences and perceptions. Given our different movement-related backgrounds and the almost infinite number of functional degrees of freedom within the system, it would appear that similar response patterns among individuals should be the exception rather than the rule. This observation strongly suggests a place for within-subject research designs which are not conventional and are often not well-received by many reviewers. Since this type of design is often not a part of the reviewer's background and training, it can easily be rejected. Violations of underlying statistical assumptions (that are unfounded) are often cited as a basis for rejecting these types of studies. Lack of generalizability is the other primary objection. It is interesting to speculate how these same individuals (reviewers) would accept being treated as the "mythical average" person using these same criteria. How many people would suggest that all athletes even on the same team should be treated alike and be subjected, for example, to exactly the same conditioning and weight training program let alone athletes on different teams or in different events? An obvious statistical outcome, independent of the practical concerns of grouping individuals who use different performer strategies, is that the null hypothesis is often falsely supported, producing the outcomes previously discussed.

These issues and concerns suggest the need for alternative approaches (to group designs) to gain a better understanding of the processes and underlying mechanisms of human movement. Certainly one such approach is the single-subject design.

## Outstanding Educator Award

The Biomedical Engineering Division of the American Society of Engineering Educators is seeking nominations for the *Theo Pilkington Outstanding Educator Award*. This award is conferred by the division for significant contributions to biomedical engineering education as evidenced by the development of successful undergraduate or graduate level programs, curricula, textbooks and professional papers as well as by membership and activities in ASEE/BED and other biomedical engineering organizations. The award consists of a commemorative plaque and a check of \$300. Deadline is **February 1, 1995**. For more information, contact:

Vijay K. Goel  
Biomedical Engineering Department  
1202 Engineering Building  
University of Iowa, Iowa City, IA 62242  
Phone (319) 335-5638



# Students' Corner

Michael Torry

Has COSI recovered yet? Letting over 350 scientists with backgrounds in physics, mathematics and anatomy (among others) may have been a bit extreme. I believe some of the COSI staff are still in therapy wondering what hit them!

The Annual ASB meeting in Columbus was a great success for the students. Attendance was comparable to the 1993 convention with 137 students participating. Students attending the event were once again treated to a host of benefits sponsored by the Society. Among other things, the ASB treated the students to a splendid luncheon and talk by Dr. Kit Vaughan, a catered banquet at COSI and Dr. Peter Cavanagh (1995 Borelli recipient) gave an extraordinary talk which enabled all in attendance to add a few "Rings to the Well". On behalf of the students, congratulations Dr. Cavanagh. Numerous items were discussed at the executive meeting. Among them were the policies regarding sustaining members and the current membership status. Membership of the Society has grown in volume with 84 new applications (40% of which were students). The increase in numbers did not affect the relative distribution of the disciplines (for more info see the Membership Chair report). The Membership Committee has also discussed raising the cost of attending the annual meeting for non-member students. I urge all student members to recommend to their non-member colleagues to join as a regular member. Currently, regular student membership is just \$15, and this entitles the student to the newsletter, which provides valuable information (see job listings) and a reduced rate to attend the annual meeting. In short, the benefits of regular student membership far outweigh any financial cost. Invest in your future! Another topic was the annual meeting. The date has been set for August 24-26 at Stanford University in California. The 19th meeting of the Society will be sponsored in part by Stanford, the NASA Ames Research Center, and the Palo Alto VA Rehabilitation R&D Center. Abstracts must be received by March 15, 1995 and a notice of acceptance will be given by May 15, 1995. Although not all details for the meeting have been finalized, those ideas tossed about lead me to believe the Stanford group will make the 1995 meeting an exceptional event. So let's get those abstracts in and I'll see you there. On a not-so-uplifting note, it was brought to the attention of the Executive Board that *no* application was received for the ASB Travel Fellowship Award for the 1994-95 term. Let's not let this happen in 1995. We could use the additional cash flow! There are several awards distributed by the ASB annually. These include:

- One Pre-Doctoral Award and one Post-Doctoral Award offering \$200 each.
- A Clinical Biomechanics award of \$250 presented by the Butterworth-Heinemann Publishers in association with the ASB. In addition, the recipient will receive a one year free subscription to the *Clinical Biomechanics* journal.
- The Travel Fellowship Award (up to \$1000) is available to any ASB member (including students). See the special Awards section on page 16 for additional information or contact the Awards Committee Chairperson, Tom Brown.

My responsibilities as Student Rep have kept me busy. I have been adding names to the student e-mail listing weekly, and I urge all those I have talked to in the last two months to get your applications in to Melissa Gross ASAP. The admission process takes awhile, as it is our intention to screen each applicant thoroughly before making decisions on their membership status. Many members have commented upon the lengthy time it takes for membership to be evaluated, processed and admitted. However, this time period is shorter than most societies, and more importantly it ensures the quality of the ASB membership. I have also been busy trying to find suitable speakers to talk about career opportunities (industry vs academics) at the student luncheon at Stanford. I have a few prospects, but I could use some help finding potential speakers to represent the industry aspect. If you know of anyone or have suggestions please e-mail me and I will try to recruit them into contributing to the program.

Lastly, the position of student representative is an elected position, where the responsibilities are to inform students of the actions of the ASB and to provide input to the ASB about student concerns. The representative is invited to attend all Executive Board meetings throughout the year (financial assistance is available if needed). This position provides an avenue for meeting eminent people in the field of biomechanics and to be a part of a distinguished group dedicated to enhancing the caliber of our profession. I urge anyone interested in the position for next year to contact me by e-mail for more information.

As always, if you know of students who may be interested in becoming a member of the ASB, ask them to contact myself or Melissa Gross. We would be happy to send the materials needed for membership.

Think about running for the student rep position over the next few months. I will post an e-mail note in reminder as we get closer to the annual meeting date. I must be going - I have an abstract to write for an award!



## Book Reviews

Kit Vaughan

*Biomechanics of the Musculo-skeletal System* edited by Benno M. Nigg and Walter Herzog, John Wiley and Sons, New York, 1994. 578 pp., 252 illustrations, cloth, \$63.95.

This text could probably be described as the Calgary book on biomechanics. The editors and their chapter authors and co-authors are all affiliated with the University of Calgary in Alberta, Canada. Many do their research in the Human Performance Laboratory and other Departments represented include Mechanical Engineering, Surgery, Civil Engineering and Mathematics. Their book is intended for graduate students and researchers in biomechanics. The organization is simple and elegant: there are four primary chapters (indicated below in italics) and 24 sub-chapters. These include: *introduction*; definition of biomechanics; historical highlights; mechanics; *biomaterials*; bone; articular cartilage; ligament; tendon; muscle; joints; *measuring techniques*; force; pressure distribution; acceleration; optical methods; strain measurement; EMG; inertial properties; *modelling*; a nearly possible story; general comments about modelling; the free body diagram; mathematically determinate systems; indeterminate systems; general considerations; energy considerations; and simulation. One of the potential pitfalls when producing a textbook with multiple authors is that the chapters tend to have a different "look and feel". I am pleased to see that the editors have avoided this problem and have succeeded with a format that is consistent throughout. This applies not only to the layout of the individual chapters but also to the many illustrations. One interesting feature of the book, not immediately evident, is that *all* the production (page layout, etc.) took place in Calgary. This certainly eased the burden on their publishers! There are many positive aspects to *Biomechanics of the Musculo-skeletal System*. Among those that I particularly appreciated were: selected historical highlights which traced our biomechanical heritage from antiquity (650 BC) all the way through the Renaissance and up to the 20th Century; chapters on articular cartilage and ligament which combined both the rigor of engineering principles and the insight of clinical experience; and an extensive treatment of energy considerations in mathematical modelling which included over thirty worked examples. I was rather surprised that Chapter 1.3 on mechanics, which introduced, at an early stage, some fairly advanced topics such as angular momentum and products of inertia, did not include a single illustration. Another minor weakness was the lack of problem sets at the end of each chapter. In conclusion, this book is a welcome addition to the field and I recommend it to all serious students of biomechanics.

*Fundamentals of Orthopaedic Biomechanics* by Albert H. Burstein and Timothy M. Wright, Williams & Wilkins, Baltimore, 1994. 226 pp., 125 illustrations, cloth, \$55.

This introductory text, written by two long-time engineering collaborators from the Hospital for Special Surgery in New York City, is directed towards orthopaedic surgeons, residents, physical therapists and other health care professionals who deal with the musculoskeletal system. It is laid out in seven logically ordered chapters: (1) forces and moments; (2) musculoskeletal performance; (3) joint stability; (4) mechanical behavior of materials; (5) mechanical behavior of skeletal structures; (6) mechanical behavior of bone; and (7) performance of implant systems. The focus is on the forces encountered during everyday activities and also forces experienced during trauma. The emphasis is on well-established engineering principles and, given the intended target audience, the mathematics has been limited to basic algebra. Clear and simple line drawings, many of them illustrating free body diagrams, are liberally used throughout the text. One particularly strong feature of the book is the use of clinically relevant examples to illustrate mechanical principles. In Chapter 1, where moments are introduced, the example given -- with a clear diagram -- is the moment of 10 Nm applied by the surgeon using a wrench to tighten a nut on an external fixation frame. In Chapter 7, where load sharing is discussed, a numerical example is used to illustrate the failure mechanism for the stem of a well-fixed cemented stainless steel femoral component of a total hip replacement. A photograph of an actual case study shows how the geometry (i.e. the area moment of inertia) dictates where the implant failed. These are concepts which clinicians can relate to very easily. It is a pity that the authors do not have any problem sets at the end of each chapter. This would certainly enhance the book's appeal as a text book. I was also a little surprised that there is almost nothing on cartilage mechanics and when gait is discussed, the vertical ground reaction force is overlooked while the anterior-posterior and medio-lateral forces are included. Another minor quibble is the statement, on page 36, that knee motion during swing phase is unilateral, when in fact the range of motion is maximal during this phase (approximately 60 degrees for normals). As indicated previously, *Fundamentals of Orthopaedic Biomechanics* is based on solid engineering principles and it is pleasing to note that SI units are used throughout. Most of the emphasis is at a macroscopic rather than a cellular level. This book will serve as a very useful reference for orthopaedists and a sound introduction for engineers who are interested in musculoskeletal mechanics.