



# International Society of Biomechanics Newsletter

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### AFFILIATE SOCIETIES OF ISB:

American Society of Biomechanics; British Association of Sport and Exercise Sciences; Bulgarian Society of Biomechanics; Canadian Society of Biomechanics/Société canadienne de biomécanique; Chinese Society of Sports Biomechanics; Comisia de Biomecanica Inginerie si Informatica (Romania); Czech Society of Biomechanics; Japanese Society of Biomechanics; Korean Society of Sport Biomechanics; Polish Society of Biomechanics; Russian Society of Biomechanics; Société de biomécanique (France).

**From the President- Peter Cavanagh**  
Investing in the Future -  
Bringing Students into the ISB

This is the last Presidential message that I shall write before turning over the gavel to the able hands of Professor Guenter Rau from Germany at the ISB Congress in Japan. I cannot let the opportunity pass without thanking the many ISB members who have taken time to respond to the messages that I have written over the last 2 years and to the membership as a whole who gave me the opportunity to serve in this role. It has been a pleasure and a privilege to have been your President.

In this last message, I want to turn the spotlight onto the most significant resource that the Society has - and that is those individuals who are currently students of biomechanics at universities throughout the world. It is, of course, cliché to say that the students of today are the leaders of tomorrow - but it is nevertheless accurate and, therefore, it is extremely important to the future of the ISB to ensure that the Society is serving the needs of today's students.

The following list outlines what the Society presently does for students members:

- ⇒ Membership rates of only \$US 19 per year. (This is a 55% discount on regular rates).
- ⇒ A discount of \$US 14 on the Journal of Applied Biomechanics subscription.
- ⇒ Reduced registration fees at ISB Congresses and the meetings of affiliated societies.
- ⇒ Tutorials are offered before each ISB Congress which are primarily aimed at students. From 1997 onwards, the notes from the tutorials will be on the ISB Web page for permanent reference. The cost for the tutorials is \$25 per session.
- ⇒ The ISB Web site and the Newsletter post job opportunities at all levels (post-doc through senior faculty positions).
- ⇒ The data and software source pages of the Web site are valuable resources for students.
- ⇒ Student résumés can be posted on the Web page.
- ⇒ The working and technical groups provide in-depth information in areas of particular focus.
- ⇒ The Biomechanics Bargain Barn offers a place to find low cost equipment to start a lab or move in a new research direction.

- ⇒ The Society offers two young investigator awards (one each for Podium and Poster presentations) at each ISB Congress.
- ⇒ There is a fledgling "Student BIOMCH-L" where questions that might be thought of as inappropriate for BIOMCH-L can be posted, but there are
- ⇒ few subscribers at present.

Despite the above services, the current total number of "paid-up" student members in the Society is only 109. By any criterion, this is a remarkably small number when one considers the many biomechanics programs around the world. This leads to the inevitable conclusion that we are not offering enough services which make ISB membership attractive to student members. The purpose of this message is to offer some ideas of my own to increase student membership, but most of all to solicit input, particularly from present and recently graduated students themselves.

I should now list what we are not doing. By implication, this suggests some directions which should be considered:

- ⇒ The constitution does not provide for student or post-doctoral representation on the ISB Council.
- ⇒ There is no formal student association and no elected student leadership within the ISB. Perhaps individuals elected as doctoral students could continue to serve a 2 year term even if they graduate.
- ⇒ The ISB does not offer recommendations for course content or textbooks.
- ⇒ The ISB does not provide a summary of biomechanics graduate programs.
- ⇒ There are no travel grants for student members.
- ⇒ There are not enough awards for quality student presentations.
- ⇒ There are no sessions exclusively devoted to student presentations at the ISB Congress (although not all students would like this segregation!).
- ⇒ There is no regular student section and there are only occasional student contributions in the Newsletter.
- ⇒ There is no formal "Electronic Mentoring" system in place (although BIOMCH-L certainly serves this purpose).
- ⇒ We do not have a formal recruitment drive among our members where we encourage each advisor to enroll his or her advisees as student member of the Society.

- ⇒ There is no formal network of opportunities for international research experiences for students and post-docs. This could be an excellent place to look for summer internships.
- ⇒ We do not have "Meet the Professor" sections at our Congresses as some other organizations do.

Obviously, one of the problems with an international society is that attending society meetings is usually beyond the budget of most students except when the meeting happens to be on the doorstep. The contrarian might suggest that we cannot expect students to join a society whose meeting's they can rarely attend. Perhaps the national biomechanics organizations are better placed to enhance the quality of a student's professional life. Perhaps it is the duty of Council and senior members to provide as many services as possible for students even though they might not join the Society until they graduate. I disagree with this point of view and believe that for \$US 18 per year, a student will find that the feeling of belonging to an international professional organization that is working in their best interests is much preferable to simply taking the benefits and being on the outside. And, of course, "electronic traveling" is cost free and there are many things we are doing on our Web site (and more we could be doing could!) to enhance learning and to make students feel an integral part of the international biomechanics community as early as possible in their careers.

I would very much appreciate your suggestions on the above ideas and on other ways in which we can increase the usefulness of the ISB to students. We have a large network of members in many parts of the world and this has to be an attractive asset which can be used for the benefit of students. Surely we can double the number of student members over the next two years and provide the Society with a firm foundation for future growth. I can certainly promise to devote some of my efforts as immediate past-President towards such an initiative but your guidance and support will make the growth more likely to happen. Input from students and recent graduates would be most appreciated!

**From the Editor-Mark D. Grabiner**

Summer can become a slow time in the Newsletter game. Biomechanists across the world their concerns with grant applications, manuscripts, grant applications, teaching, grant applications, and grant applications, they run amok at the world's pleasure centers...giving little thought to the need to fill the Newsletter with cool and challenging stuff. However, at least one person laid down their pina colada to send me the quiz that you will find below. I am pleased to announce this quiz "contest worthy" and thus announce the latest ISB Newsletter contest. You can easily work on the contest at the beach, the casino, polo fields, coal mines or wherever you now spend all your free time since laying aside all of your above-mentioned activities. Send your answers to me by October 31, 1997 and I will coronate all the winner(s) in all of the categories in the gala Christmas issue of the Newsletter. I am told that more than 20 correct answers means something of significance but I'm not quite sure of what that may be. The instructions are easy. Each "equation" below contains the initials of words that will make it correct. Furnish the missing words. Work in groups, indeed, work as entire countries!! GL (see example below)

For example: 60 = M in an H, which is 60 Minutes in an Hour.

1. 26 = L of the A.
2. 7 = W of the A W
3. 1001 = A N
4. 12 = S of the Z.
5. 54 = C in a D (with the J)
6. 9 = P in the S S
7. 88 = P K.
8. 13 = S on the A F
9. 18 = H on a G C
10. 32 = D F at which W F
11. 8 = S on a S S
12. 200 = D for P G in M.
13. 3 = B M (S H T R)
14. 90 = D in a R A.
15. 4 = Q in a G
16. 24 = H in a D
17. 1 = W on a U
18. 5 = D in a Z C
19. 57 = H V
20. 11 = P on a F T
21. 1000 = W that a P is W



22. 29 = D in F in a L Y
23. 64 = S on a C
24. 40 = D and N of G F
25. 80 = D to G A the W
26. 2 = # it T to T
27. 6 = P on the S of D
28. 50 = W to L Your L
29. 31 = F of B R
- 30 = H in a W W

*Thanks to Tina Biswas, Cleveland, Ohio, for providing the questions, and hopefully the answers to the quiz.*

#### **From the ISB Education Officer - M.R.Yeadon**

The following are descriptions of the tutorials that will be presented later this summer at the ISB Congress. We hope to see you at these very interesting sessions..

##### **Eccentric Muscle Contractions**

Roger Enoka  
9-00 to 12.00

Over the past several decades, numerous studies have established that eccentric contractions can maximize the force exerted and the work performed by muscle, that they are associated with a greater mechanical efficiency, that they can attenuate the mechanical effects of impact forces, and that they enhance the tissue damage associated with exercise. Additionally, it now seems that eccentric contractions are controlled by unique neural commands. This tutorial will examine the experimental evidence that provides the foundation for our current understanding of the benefits, consequences, and control of eccentric contractions.

##### **Signal Processing in Biomechanics**

Brian Davis and Virgil Stokes  
9-00 to 12.00

This tutorial will examine issues central to biomechanical methodologies --data collection and data analysis. Data collection will include: analog-to-digital conversion, multiple-channel synchronization, undersampling and digital filter design. Data analysis will include: detection and treatment of outliers, data transformations, uncertainty analyses in data checks and experimental design, and simple statistical tests (e.g. single factor ANOVA). The emphasis will be on practical solutions and their computer implementations rather than theory. This should be of interest to those involved in biomechanics research at all levels.

#### **Low Back Biomechanics**

Stuart McGill  
13-00 to 16-00

Low back pain results from tissue damage that occurs when an applied load exceeds the failure tolerance of the tissue. This tutorial will address three aspects of this basic tenet of injury: an analysis of the factors which modulate the tissue load-time history; an analysis of the factors which modulate the failure tolerance of the tissue; the formulation of injury avoidance strategies based on biomechanically justifiable principles noted previously. This tutorial will be of interest to those involved in musculoskeletal injury at all levels.

#### **Muscle Mechanics**

Walter Herzog  
13-00 to 16-00

The purpose of the tutorial is to discuss the active mechanical properties of skeletal muscle and relate these properties to the structure and morphology of muscle. The discussion will range from molecular consideration of force production to the mechanisms of control of multiple muscle systems. General mechanical properties of skeletal muscle will be illustrated with specific examples. Limitations of our understanding about the detailed aspects of muscular force production, the corresponding energetics, and movement control will be addressed. Differences between in-vitro and in-vivo properties of skeletal muscle will be pointed out and explained.

#### **Job Market**

- ◆ The Orthopaedic Biomechanics Division of the Maurice E. Mueller Institute for Biomechanics at the University of Bern is searching for qualified applicants to head the Basic and Clinical Biomechanics (BCB) Group. Requirements include expertise in clinical biomechanics, including mathematical, i.e. analytical and approximation methods (FEA) as well as in vitro and in vivo experimental protocols. Experience in spine and/or hip biomechanics, in particular related to implant design/evaluation and surgical techniques is highly desired. Contact: P.A. Crompton, PhD, University of Bern, Mueller Institute for Biomechanics, P. O. Box 30, Murtenstrasse 35, 3010 Bern, Switzerland, Tel:41 31 632 87 20, Fax:41 31 632 49 51, Email: [crompton@mem.unibe.ch](mailto:crompton@mem.unibe.ch), <http://cranium.unibe.ch/>
- ◆ Applications for individuals with a specialization in Biomechanics are invited for a full-time, tenure-

eligible faculty position in the Programs in Physical Therapy, Northwestern University Medical School. Post-doctoral experience is strongly preferred for junior candidates. Senior candidates should have a history as principle investigator on externally-funded grants and experience mentoring graduate students. A PT degree is desirable, but not essential. Contact: L. Deming Hedman, MS, PT, Chairperson, Search Committee, Programs in Physical Therapy, Northwestern University Medical School, 645 North Michigan Avenue, Suite 1100, Chicago, IL 60611, Tel: (312) 908-6782, Fax: (312) 908-0741, Email: l-hedman@nwu.edu

◆ The Department of Health and Human Development at Montana State University invites applications for a nine-month, academic year, adjunct appointment in Biomechanics starting **Aug 15, 1997**. This position may be advertised as a tenure-track position during AY 97-98. Contact: E. Kreighbaum, Dept Health & Human Development, Montana State University-Bozeman, Bozeman, MT 59717-0336, Tel: (406) 994-4001, Fax: (406) 994-6314, Email: ahdek@montana.edu

◆ The Programs in Physical Therapy, Northwestern University Medical School announces a 2 year research position with an anticipated starting date of September 1, 1997. The focus of the grant is the mechanisms of balance control. A PhD in biomechanics preferred with expertise in modeling and optimization, and experience with motion capture, force and EMG data acquisition systems, data processing and analysis. Contact: C. Pai, PhD, MPT, Programs in Physical Therapy, Northwestern University Medical School, 645 N. Michigan Avenue, Suite 1100, Chicago, IL 60611, Fax: (312)908-0741, Email: c-pai@nwu.edu

◆ The Department of Kinesiology at the University of Waterloo invites applications for a tenure-track faculty position, at the rank of Assistant Professor, in the field of ergonomics/human factors starting in January, 1998. Candidates should have a PhD or MD, demonstrated research and teaching ability to solve problems such as: optimization of human performance, reduction of human error, human-computer interaction, health and safety. Candidates should be Canadian Citizens and Permanent Residents. Contact: J.S. Frank, Chair, Department

of Kinesiology, University of Waterloo, Waterloo, Ontario, Canada, N2L 3G1, Fax: 519-746-6776, Email: frank@healthy.uwaterloo.ca, www.ahs.uwaterloo.ca/kin/kinhome.html.

◆ The Engineering Mechanics program, jointly with the Biomedical Engineering program at the University of Wisconsin, Madison, invites applications for a faculty position in biomechanics starting in the fall of 1997. The preference is for candidates at the Associate Professor or Professor level, but outstanding candidates at the Assistant Professor level will also be considered. Candidates must have a Ph.D. in an appropriate engineering discipline or applied physics. Contact: G.A. Emmert, PhD, Dept. Engineering Physics, 1500 Engineering Drive, Madison, WI 53706 Tel: (608) 263-1648, Fax:(608) 263-7451, Email: emmert@engr.wisc.edu).

◆ A 4-6 month sabbatical replacement appointment in biomechanics will be available at Pepperdine University for the winter semester of the 1997/98 academic year and possibly opportunity to teach course(s) during the summer term(s) of the 1998 academic year. Preference will be given to applicants who have completed the Ph.D. degree in biomechanics. Contact: M. Feltner, Ph.D. Email: mfeltner@pepperdine.edu

#### *Postdoctoral Positions*

◆ The Biomechanics Section at the Technical University of Hamburg-Harburg has an 18 month position for a postdoctoral research fellow. The position can also be awarded to individuals with a Masters Degree and exceptional professional or research experience. The project concerns the micro-motion between cup and acetabulum in non cemented hip endoprostheses during patient activities. Knowledge of the German language is required to a certain extent, fluency is not expected. Contact: M. Morlock PhD, Biomechanics Section, TU Hamburg-Harburg, Harburger Schloss-Strasse 36, D-21079 Hamburg, Germany, Tel: +49-40-7718-3175, Fax:+49-40-7718-2996, Email: Morlock@tu-harburg.d400.de, http://www.tu-harburg.de/bim/

◆ The Motor Control Laboratory at the NeuroMuscular Research Center of Boston University has a post-doctoral position available for an individual with emphasis in experimental and theoretical questions about the control of human

movement. Contact: G. Gottlieb, PhD, Email: [glg@bu.edu](mailto:glg@bu.edu) <http://nmrc.bu.edu/MCL/glg.html> |

- ◆ The Department of Kinesiology, University of Colorado at Boulder, announces a 2 year position for a person to teach in the undergraduate curriculum beginning August 18, 1997.

Preference will be given to individuals holding a PhD. Although the primary responsibilities will be in teaching, this individual will have an opportunity to participate in the research activities of the Neural Control of Movement Laboratory. This person will be required to teach 2 classes each semester. The primary responsibility will be a core class in neuromuscular kinesiology. Contact: R.M. Enoka, Ph.D., Department of Kinesiology, University of Colorado, Boulder, CO 80309-0354, Tel: 303-492-7232, FAX: 303-492-4009, [www.colorado.edu/kines/Faculty/Roger.html](http://www.colorado.edu/kines/Faculty/Roger.html)

- ◆ The Department of Orthopaedic Research and Biomechanics at the University of Ulm has an opening for a 3 year postdoctoral research fellow working in the area proprioceptive deficiency after inversion injury. Knowledge of the German language is not necessarily required but foreigners are expected to learn German during their stay. Contact: Dr. Lutes Duerselen Abteilung, Unfallchirurgische Forschung und Biomechanik, University of Ulm, Helmholtzstrasse 14, 89081 Ulm, Germany, Tel: +49.731.502.3494, Fax: +49.731.502.3498, Email: [duda@sirius.medizin.uni-ulm.de](mailto:duda@sirius.medizin.uni-ulm.de)

#### *Graduate Assistantships*

- ◆ Graduate Assistantships are available in the Biomechanics Lab of the Department of Exercise and Sport Science at East Carolina University, Greenville, NC. Qualified applicants will pursue an MA degree over 2 years. Areas of research include gait analysis in health and disease in young and aged populations; neuromechanical adaptations to exercise in aging; neuromuscular mechanisms of muscle strength development in aging, and sensory-motor integration of exercise responses in aging. Contact: T Hortobagyi, PhD, Tel: 919 328-4564 or P. DeVita Tel: 919 328-4563.
- ◆ The BioMedical Engineering Group in the Department of Mechanical Engineering has a number of PhD studentships available. Applications should normally have a 1st class honours degree or equivalent and must be UK

citizens to receive the full award. Contact : SC Hughes, PhD, Director of BioMedical Engineering, Department of Mechanical Engineering, University of Surrey, Guildford, Surrey GU2 5XH, Email: [S.Hughes@surrey.ac.uk](mailto:S.Hughes@surrey.ac.uk), Tel: 01483 259671, Fax: 01483 306039

- ◆ The Sobell Department of Neurophysiology at the Institute of Neurology is seeking a PhD student to fill an MRC studentship which starts September 1997. The project will investigate sensorimotor integration and planning in human motor control involving both psychophysical and computational approaches. As the funding is from the MRC only British citizens are eligible for the stipend. Contact: D. Wolpert, PhD, Sobell Dept. of Neurophysiology, Institute of Neurology, Queen Square, London WC1N 3BG, United Kingdom Tel: +44 (171) 837-3611 x4183, Fax +44 (171) 813-3107, Email [wolpert@hera.ucl.ac.uk](mailto:wolpert@hera.ucl.ac.uk)
- ◆ The Center for Locomotion Studies at Penn State University invites applications for a graduate assistantship to support doctoral study in the field of Kinesiology beginning in the Fall of 1997. Applications are encouraged from individuals holding an MS degree in Physical Therapy with an undergraduate degree in any related Science or Engineering discipline. Contact L. Mulfinger, PhD, 29 Recreation Building, Penn State University, University Park, PA 16802; Tel: 814-865-1972; Email: [lxm14@psu.edu](mailto:lxm14@psu.edu), [www.celos.psu.edu](http://www.celos.psu.edu)

#### *Master's or Bachelor's Level*

- ◆ The Department of Health and Exercise Science and the Claude D. Pepper Older Americans Independence Center at Wake Forest University invites applications for a full time position as a Biomechanics research technician beginning Aug 30, 1997. Contact: S. Messier, Ph.D, Dept Health & Exercise Science, Wake Forest University, Winston-Salem, NC 27109, Fax: 910 759-4680, Email: [messier@wfu.edu](mailto:messier@wfu.edu)
- ◆ The Motor Control Laboratory at the NeuroMuscular Research Center of Boston University has a research associate position available for a person with with a BS or MS in an appropriate area. We are studying experimental and theoretical questions about the control of human movement. Contact: G. Gottlieb, PhD,

Email: [glg@bu.edu](mailto:glg@bu.edu)  
<http://nmrc.bu.edu/MCL/glg.html> |

◆ Two full-time research positions are immediately available at the Orthopedic Biomechanics laboratory, Beth Israel Deaconess Medical Center (Boston, MA). Responsibilities will include experimental design, mechanical testing, and computational and statistical analysis. Current projects include: 1) Non-invasive fracture risk prediction of whole bones with simulated defects. 2) Biomechanical evaluation of pediatric femoral fixation methods. 3) Evaluation of spinal fixation methods. A BS or MS in mechanical or biomedical engineering is required. Contact: BD Snyder, MD PhD, Children's Hospital, Hunnewell 2, 300 Longwood Ave, Boston, MA 02215, Tel: 617-355-8361, Fax: 617-730-0227, <http://rncc.bih.harvard.edu:80/labs/obl/obl.html>

◆ A research assistantship is available for an individual to support ongoing laboratory and clinical investigations at the Spinal Disorders Research Laboratory in the Baylor College of Medicine, Department of Orthopedics. Responsibilities will include: image processing; data analysis; design, construction and use of mechanical testing systems; maintaining laboratory notebooks; writing technical reports; and communicating with academic, clinical and industrial collaborators. A Master's degree in a biomedical engineering, mechanical engineering, computer science or related field is preferred. A Bachelor's degree with at least 3 years experience is acceptable. Contact: JA Hipp, PhD, Suite 1900, 6560 Fannin, Houston, Texas, 77030, Tel: (713) 790-3496, Fax:

◆ *Industry, Health care, et al.*

◆ The Biodynamics Laboratory in the New York Chiropractic College has an opening for a research assistant. A BS in biological science and 2 years human physiology laboratory/research experience required. Computer programming skills with virtual instruments (Labview) desired. Contact: R. Bulbulian, PhD, Director of Research, New York Chiropractic College, 2360 State Route 89, Seneca Falls, New York 13148

◆ Lockheed Martin at NASA Johnson Space Center is searching for a full-time PhD (or MS) Bioengineer/Biomechanist/Mechanical to assist in the biomechanical modeling of space suited and unsuited astronauts at NASA's Graphics

Research and Analysis Facility, Houston Texas. The start date is August 30, 1997. A Masters' Degree or PhD in Bioengineering, Biomechanics, or Mechanical Engineer is required and the candidate must be a Permanent Resident/US Citizen. Contact: E. Khouri, PhD, 2400 NASA Road 1, Houston, Tx. 77058, Tel: (281) 483-3616, Fax: (281) 483-1847, Email: [edmond.khouri@spmail.jsc.nasa.gov](mailto:edmond.khouri@spmail.jsc.nasa.gov)

◆ The Center for Human Kinetic Studies (CHKS), Mary Free Bed Hospital/Grand Valley State University, Grand Rapids, Michigan has an opening for a full-time kinesiologist or physical therapist. a master's degree and minimum of three years experience with three-dimensional motion analysis is required. Preference will be given to candidates with pediatric experience. Contact: Mary Free Bed Recruiting Department, 235 Wealthy SE, Grand Rapids, Michigan, 49503.

◆ A position is available immediately for a research assistant in the Orthopaedic Biomechanics Laboratory at Boston's Beth Israel Deaconess Medical Center. An MS in engineering and practical experience with finite element modeling is required and experience with modeling biological systems is preferred. Contact: M. Oden, Ph.D., Orthopaedic Biomechanics Laboratory, Beth Israel Deaconess Medical Center, 330 Brookline Ave, RN 115, Boston, MA 02215, Email: [zmo@obl.bidmc.harvard.edu](mailto:zmo@obl.bidmc.harvard.edu)

◆ Oxford Metrics, the British based manufacturer of the Vicon motion analysis system, is establishing a new subsidiary operation in Southern California that will provide support for existing customers, installation and training for new customers and a sales & marketing operation to develop new customers and new markets. Positions are available for individuals with technical experience in human movement sciences, a good academic background and excellent communication skills to work in the fields of Customer Support and Sales & Marketing. Contact: P. Meddings Director of Sales & Marketing, Oxford Metrics Ltd., Email: [peter.meddings@metrics.co.uk](mailto:peter.meddings@metrics.co.uk).

◆ MTS Systems GmbH, a manufacturer of mechanical testing and simulation equipment has an opening for an Applications Engineer Biomechanics/Biomaterials. A BS in electrical or mechanical engineering and / or Biomechanics / Biomaterials is required and at least German and English language skills. Contact Dr.-Ing. Erhard

Bauerfeind Tel: +49-30-81002118, Email erhard.bauerfeind@mts.com, or Dipl.-Ing. Andrej Mahr Tel: +49-30-81002211, Email andrej.mahr@mts.com ).

- ◆ Four positions are offered by AMTI, a technology based instrument manufacturer of biomechanics gait/balance equipment, force vector analysis software, multi-component force/torque sensors, tribology test equipment, and artificial hip/knee implant component test equipment. The positions are: Summer Intern (Immediate Opening), Sales/Marketing, Sensor Design Engineer, Software Engineer, Contact: Ms. S. Beattie, Fax: (617) 926-5045, Email: bsandy@amtimail.com), www.amtiweb.com.
- ◆ The Reebok Human Performance Engineering Lab has immediate openings for Functional Product Testing Research Assistants to conduct mechanical and subjective tests on athletic footwear, apparel and equipment. A B.S. Biomechanics, Biomedical Engineering or Mechanical Engineering, M.S. is preferred. A minimum of two years experience with human subject data collection, instrumentation (hardware and software), research protocols, experimental design and statistical analysis is required. Contact P. Manfra, Tel: (617) 297-4965, Fax: (617) 341-7402, Email: employment@reebok.com.
- ◆ Nike, Inc announces an available position for a Senior R&D Reseacher. Candidates must hold a Ph.D. in one of the following areas: biomechanics mechanical engineering, or human factors engineering with a minimum of three years research experience in an RD&D or accredited environment. Contact: NSRL Recruiter, NIKE, Inc., HR/RD&D, One Bowerman Drive, Beaverton, OR 97005-6453, Fax 503 671-6066

#### Upcoming Meetings, Workshops, Etc.

##### July

1st Smith & Nephew International Symposium on Tissue Engineering and Biomaterials, 20-23 July 1997 University of York, Contact: IFAB Communications, PO Box 373, York YO1 5YW, UK, Tel:44 (0) 1904 432940, Fax:44 (0) 1904 433029, Email:biocomms@york.ac.uk

##### August

Joint Meeting of The Second Annual Conference of the International Functional Electrical Stimulation Society and the Fifth Triennial Conference for Neural Prostheses:

Motor Systems V 16-21 Aug 1997, Simon Fraser University, Burnaby, British Columbia, Canada, Contact: D. Popovic, Professor , Faculty of Electrical Engineering, University of Belgrade, Bulevar revolucije 73, 11000 Belgrade, Yugoslavia, Tel: 381-11-3248464, Fax: 381-11-3248681, E-mail: IFESS97@ETF.BG.AC.YU

Symposium on Footwear Biomechanics, International Society of Biomechanics Working group on Functional Footwear, 21-23 Aug 1997, Tokyo Metropolitan University, Tokyo, Japan. Detailed information and a call for papers can be found at

<http://www.teleport.com/~biomech/tokyo97.html> or contact: M. Shorten, PhD, Email: biomech@teleport.com)

XVIth Congress of the International Society of Biomechanics, 25-29 Aug 1997, Tokyo, Japan. Contact Dr. S. Fukashiro, General Secretary, XVIth ISB, Tokyo Congress, Dept. Life Sciences, University of Tokyo, Komaba 3-8-1, Meguro 153, Japan. Tel & Fax: +81-3-5454-9494, E-mail:ISB97@idaten.c.u-tokyo.ac.jp.

##### September

5th International Scientific Congress of the International Association of Sport Kinetics. 3-6 September 1997, Magdeburg, Germany. Contact: K. Witte, PhD, Institute of Sport Science, otto-von-Guericke-University Magdeburg, Stresemannstr. 23, 39104 Magdeburg, Germany, Fax: (0)391-6714705. XIV-th School of Biomechanics, the annual seminar of the Polish Society of Biomechanics, 10-12 September, 1997, Olimpic Center in Spala (near Tomaszow Mazowiecki, Central Poland) Contact: Czeslaw Urbanik, PhD, Academy of Physical Education in Warsaw, ul. Marymoncka 34, 01-813 Warsaw, POLAND, Tel: +48-22-342713, Fax: +48-22-340813 or +48-22-346081, Email: awf@warman.com.pl

Xth International Biomechanics Seminar, 12-13 September 1997, Chalmers University of Technology, Goeteborg, Sweden. Contact: M. Hedfors, PhD. Biomechanics, Dpt Pol. Mat., Chalmers, S-412 96 Goeteborg, Sweden, Tel:+46-31-772 1300, Fax: +46-31-772 1313, Email: mhed@polymm.chalmers.se

74th Annual Conference of the American Congress of Rehabilitation Medicine, 12-14 Sep 1997, Boston, MA, Contact: American Congress of Rehabilitation Medicine, 4700 W. Lake Avenue, Glenview, IL 60025-1485, Tel:(847)



375-4725, Fax:(847) 375-4777, Email:  
info@acrm.org, <http://www.acrm.org/>  
**World Congress on Medical Physics and  
Biomedical Engineering:** 14-19 September, 1997  
Nice (French Riviera, [very nice]), France.  
Contact Didier Geiger, Conference Co-Chair  
(GEIGER@UNIV-PARIS12.FR), Pierre Aletti,  
Conference Co-Chair  
(ALETTI@NANCY.FNCLCC.FR), GENERAL  
SECRETARY :48, rue de la Procession, F 75724  
PARIS CEDEX 15 (FRANCE), Tel : +33 1 44 49  
60 60, Fax : +33 1 44 49 60 44, E-mail :  
NICE97@UNIV-PARIS12.FR.

**21st Annual Meeting of the American Society of  
Biomechanics,** 17-20 Sep 1997, Clemson  
University, Clemson, South Carolina, Contact  
V.M.Gharpuray, PhD or R.L. Dooley, PhD,  
Department of Bioengineering, Clemson University,  
501 Rhodes Research Center, Clemson, SC 29634-  
0905, Tel: (864) 656-3051, Fax: (864) 656-4466,  
Email: vasanti@ces.clemson.edu

(1) **International Congress on Motion Systems,**  
(2) **Biomechanic Workshop of the Studygroup  
"Morphology" of the Deutschen Zoologischen  
Gesellschaft,** (3) **Workshop of the Society for  
Technical Biology and Bionics (GTBB)**  
29-30 September 1997, Jena, Germany, Contact:  
Marion Gerhardt, Prof. Dr. R. Blickan Friedrich-  
Schiller Universitat, Jena, Institut fuer  
Sportwissenschaft, Seidelstr. 20, 07749 Jena,  
Germany, Tel: +49 3641 630100, Fax: +49 3641  
630109, Email: Marion.Gerhard@uni.jena.de,  
<http://www.uni.jena.de/bewsys/start.html>,

#### November

**Symposium on Dynamics, Control, and Design of  
Biomechanical Systems,** 16-21 Nov 1997.  
Contact: Y. Hurmuzlu, PhD, Dept. Mechanical  
Engineering, Southern Methodist University, Dallas,  
Texas 75275 USA, Tel: (214)768-3498,  
Fax:(214)768-1473, Email:hurmuzlu@seas.smu.edu

#### December

**People Health: Traumatology, Orthopaedics,  
Prosthetics, Biomechanics, Rehabilitation of  
Disabled,** 2-5 Dec 1997, Saint-Petersburg, Russia,  
Contact: Organising Committee of the Congress:  
Postal address: 191025, Russia, Saint-Petersburg,  
P.O. Box 204, Tel: 7-812-2796082; 7-812-  
5442266; Fax: 7-812-2797664; E-mail :  
ph@smit.spb.su

1998

**2nd Australasian Biomechanics Conference,** 28-  
30 Jan 1998, The University of Auckland,  
Auckland, New Zealand, Contact: P.A. Hume,  
PhD, Sport & Exercise Science Department,  
University of Auckland - Tamaki Campus, Private  
Bag 92019, Auckland, New Zealand, Phone  
(649)373 7599 ext 6859, Fax (649)373 7043,  
Email: p.hume@auckland.ac.nz

**6th European Congress on Research in  
Rehabilitation,** 31 May-4 June, 1998, Berlin,  
Germany, Contact: Congress Secretary ECRR-98,  
H. Kirsten, c/o BAR, Walter-Kolb Str. 9-11, D-  
60594 Frankfurt/M, Germany, Tel: + +49-69-  
605018, Fax: + +49-69-605018-37.

**International Society of Electrophysiology and  
Kinesiology (ISEK),** 27-20 Jun 1998 Montreal,  
Canada. Contact: ISEK Secretariat, Conference  
Office, McGill University, 550 Sherbrooke St.  
West, West Tower, Suite 490, Montreal, QC,  
Canada H3A 1B9, Tel: (514) 398-3770, Fax: (514)  
398-4854, Email: isek@UMS1.Lan.McGill.CA,  
[www.mcgill.ca/mco/isek](http://www.mcgill.ca/mco/isek)

**International Research Society of Spinal  
Deformities,** 28 Jun - 1 Jul 1998, Burlington,  
Vermont, Contact: I.A. Stokes, PhD, University of  
Vermont, Department of Orthopaedics and  
Rehabilitation, Burlington, VT 05405-0084, USA,  
e-mail: irssd@med.uvm.edu,  
<http://salus.med.uvm.edu/~irssd/1998.htm>

**8th International Symposium of Biomechanics  
and Medicine in Swimming,** 28 Jun-2 Jul, 1998,  
Jyväskylä, Finland, Contact the Symposium  
secretariat, Email: pitkanen@jyu.fi. to get  
**Fifth International Symposium on the 3-D  
analysis of Human Motion,** 2-5 Jul 1998,  
Chattanooga, Tennessee, Contact: M. Whittle, PhD,  
The University of Tennessee at Chattanooga,  
Michael-Whittle@utc.edu,  
<http://www.utc.edu/Human-Movement>

**11th Conference of the European Society of  
Biomechanics,** 8-11 July 1998, Toulouse, France,  
Contact: ESB'98, BP 3103, 31026 Toulouse,  
Cedex, France, Email:  
ESB98.Toulouse@purpan.inserm.fr,  
<http://esb.purpan.inserm.fr>

**Symposium of the International Society of  
Biomechanics in Sports.** 21-25 July, 1998.  
University of Konstanz (Germany). Contact  
ISBS'98 Secretariat, Department of Sports Science,  
Lehrstuhl Riehle, P.O.Box 5560 D30, 78434

Konstanz / Germany, Tel:+49-7531-883565, Fax:  
+49-7531-884221, Email: [isbs98@uni-konstanz.de](mailto:isbs98@uni-konstanz.de),  
**The Third World Congress of Biomechanics: 2-8**  
Aug 1998, Hokkaido University, Sapporo, Japan;  
Contact K. Hayashi, PhD, Biomechanics  
Laboratory, Department of Mechanical Engineering,  
Faculty of Engineering Science, Osaka University,  
Toyonaka, Osaka 560, Japan; Tel: +81-8-850-6170,  
Fax:+81-8-850-6171

**The Third North American Congress on  
Biomechanics:**, 14-18 Aug 1998, University of  
Waterloo, Waterloo, Ontario, Canada. Contact: S.  
McGill, Ph.D., host chair,  
[mcgill@healthy.uwaterloo.ca](mailto:mcgill@healthy.uwaterloo.ca).

**Global Ergonomics Conference**, 9-11 Sep 1998,  
Cape Town, South Africa, Contact: D. McTeer,  
Postgraduate Conference Centre, University of  
Cape Town Medical School, Observatory 7925,  
Cape Town, South Africa,  
[deborah@medicine.uct.ac.za](mailto:deborah@medicine.uct.ac.za)

**International Conference on Weightlifting and  
Strength Training** (in conjunction with the World  
Weightlifting Championships), November 10-12,  
1998, Lahti, Finland, Contact: Ms Pirjo-Leena  
Pitkanen, Conference Coordinator, ConFinnia Ltd,  
P.O. Box 35, FIN-40351 Jyvaskyla, Finland, Tel:  
+358-14-603662, Fax +358-14-603727, Email:  
[pitkanen@jyu.fi](mailto:pitkanen@jyu.fi), <http://www.jyu.fi/wlconference/>  
**3rd Combined Meeting of Orthopaedic Research  
Societies of USA, Canada, Europe and Japan**,  
28-30 Sep 1998, Contact: Hayato Hirotsu, MD,  
Shigetomi Health Care Group, 1-1521, Shikenyu,  
Moriyamaku, Nagoya, Japan 463. Tel: +81-52 -776-  
2501, Fax: +81-52-776-2508.

**3rd Interdisciplinary World Congress on Low  
Back- and Pelvic Pain**, 19-21 Nov, 1998, Vienna,  
Austria, Contact: in Europe: European Conference  
Organizers, P.O.Box 4334, 3006 AH Rotterdam,  
The Netherlands. Phone +31 - 10- 4133287. Telefax  
+ 31 - 10 - 4148059. Email:

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◆ **MusculoGraphics: Software products for  
musculoskeletal modeling.**

[www.musculographics.com](http://www.musculographics.com)

◆ **American Sports Medicine Institute**

[www.asmi.org/biomecha.htm](http://www.asmi.org/biomecha.htm)

#### Places to "Go"

◆ **NACOB 98**

[www.ahs.uwaterloo.ca/nacob98/](http://www.ahs.uwaterloo.ca/nacob98/)

◆ **Biomechanics Lab. at Rizzoli Orthopaedics  
Institute, Bologna, Italy.**

## The Thesis Exchange

Editor's note: This newsletter component provides a vehicle through which graduate students can disseminate, reasonably rapidly, the results of their Masters and Doctoral studies to the biomechanics community (see detailed instructions on next page). These abstracts are intended also to provide impetus for interactive discussions on these topics among members and, thus, may provide valuable feedback to the author. Comments may be directed to the newsletter Editor for inclusion in future issues. The Newsletter Editor assumes no responsibility for being unilingual.

### Geometric and Mechanical Modelling of the Human Locomotor System

Tung-Wu Lu

Thesis for the degree of Doctor of Philosophy (D.Phil).

Supervisor: Prof. JJ O'Connor

University: University of Oxford, May 1997.

A critical review of studies related to the modelling of the human locomotor system is given. Kinematic and dynamic modelling and analysis of the pelvis-leg apparatus as an ensemble of four rigid body segments are described. Experiments were performed on two patients with custom-made instrumented massive proximal femoral prostheses implanted after tumour resection. Telemetered axial forces transmitted along the prostheses, together with kinematic, force plate and electromyographic data, were recorded synchronously during level walking, single and double leg stance, and isometric tests of the hip muscles. A sagittal plane model of the locomotor system, with an anatomical model of the knee joint, was developed from an existing model and used for a comparative study of methods for the calculation of the internal forces. A three-dimensional computer graphics-based animated model of the locomotor system was developed, with the hip as a ball-and-socket joint, the knee as a parallel spatial mechanism and the ankle as a two-hinge complex. Thirty-four muscles or muscle groups were included. A method for the determination of the orientation of multi-joint systems from surface markers was developed to take account of measurement errors including skin movement artefacts. Both the 2D and 3D models of the locomotor system were evaluated and validated quantitatively with the telemetered femoral axial forces. It is concluded that (a) a significant part of the bending moments along limbs are transmitted by a combination of tensile forces in muscles and compressive forces in bones so that moments transmitted by the bones are much less than the limb moments, (b) bi-articular muscles play a major role in modulating forces in bones, (c) appropriate simulation of muscle forces is important in experimental or theoretical studies of load transmission along bones, (d) computer graphics-based modelling and animation are important tools in bridging the gap between clinical users and biomechanists.

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### EDITOR'S NOTE

The ISB Newsletter is published quarterly: February-March (Spring); May-June (Summer); August-September (Autumn), and November-December (Winter). Deadlines for material and articles are the first day of each first named month, and the Newsletter is mailed to members whenever we can. Members are encouraged to submit just about anything they would like to relate to the biomechanics community. The content of the Newsletter does not necessarily reflect the philosophy and opinions of the ISB but may reflect the mood of the Editor. Naturally, serious items such as *Letters*, *Special Articles*, *Affiliate Society News*, *Laboratory Features*, *Reports*, or *Announcements of Meetings, Conferences, and Jobs Available*, *Reviews* of relevant conferences and other serious biomechanics-related information is desirable. *Thesis Abstracts* can be published. Thesis abstracts should provide an Introduction that includes the rationale and hypotheses of the study, description of the methods, the key results, and important conclusions. The title of the work student's name, department and institution, the degree earned and the conferring institution and supervisor's name should also be provided. Clearly though, no one actually does this but its important to have guidelines nevertheless. Material may be submitted electronically or on a computer disk as a text-only file, and in English.



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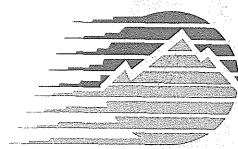
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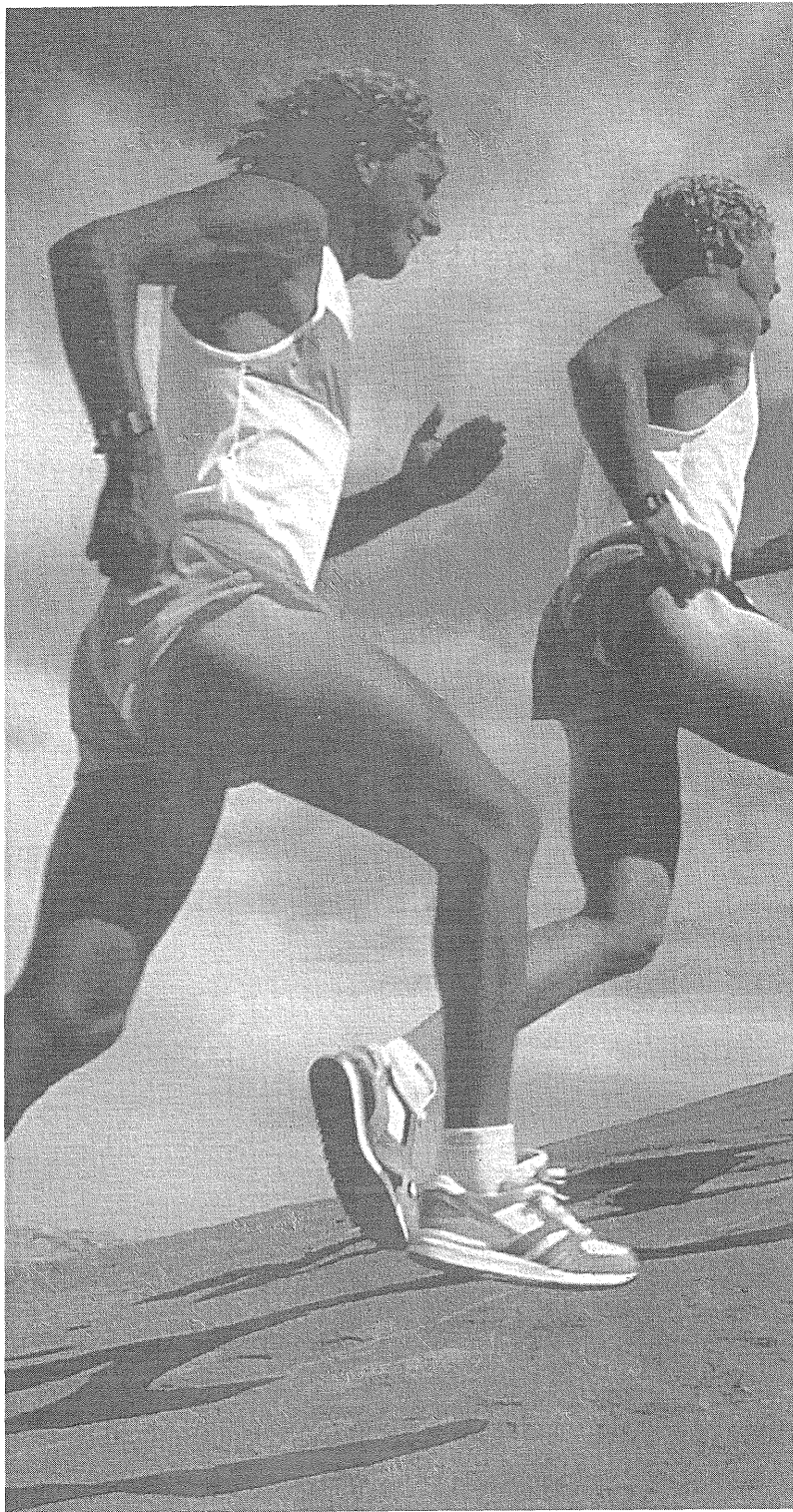
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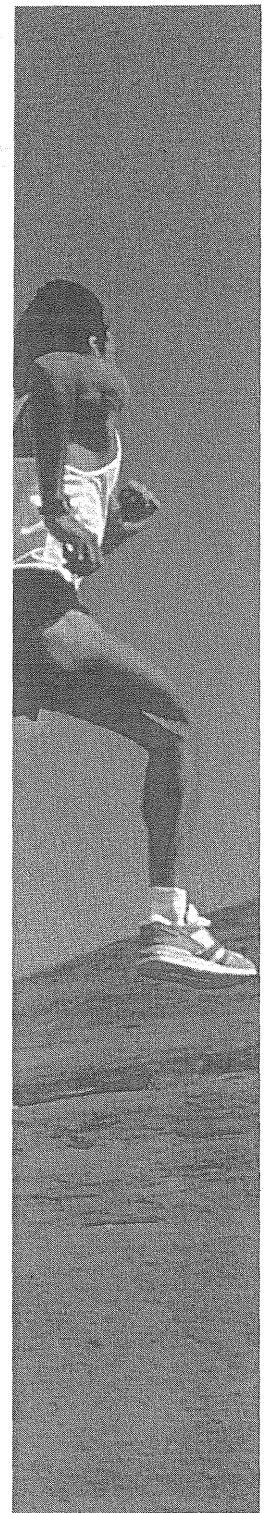


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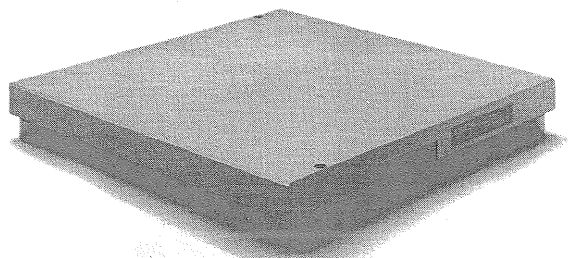
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