



International Society of Biomechanics Newsletter

ISSUE Number 54, MAY / JUNE, 1994

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AFFILIATE SOCIETIES OF ISB:

American Society of Biomechanics; British Association of Sports Science; Bulgarian Society of Biomechanics; Canadian Society of Biomechanics; China Sports Biomechanics Association; Czechoslovak Committee on Biomechanics; French Société de Biomécanique; Japanese Society of Biomechanics; Korean Society of Biomechanics; Polish Society of Biomechanics; Romanian Comisia de Biomecanica, Ingineria Si Informatica.

ISB News

FROM THE PRESIDENT-ELECT

Peter R. Cavanagh

The Long Range Planning Committee of the ISB is currently considering a number of issues that are of importance to the future of the Society. If you have any opinions regarding these or other issues that you think the Committee should consider please forward them to President Elect Peter Cavanagh (PRC@ECL.PSU.EDU).

Among the issues being addressed are:

1. *Mission and Name*
We are attempting to refine the definition of the mission of the society.
2. *Relationships with Technical/Working Groups*
We are exploring the policy regarding the formation of specialist groups and their meetings.
3. *Relationship with WCB*
We are looking at the various scenarios related to the World Congress of Biomechanics meeting over the next decade.
4. *Relationship with other Societies*
A number of other international Societies share scientific interests with the ISB. What should our relationships with these societies be?
5. *Publication goals*
Historically, the ISB has sponsored a number of book series. What should our goals in this area be?
6. *Education goals*
What are our long terms goals for the ISB in this area?
7. *Fiscal goals*
What are our fiscal goals and how might these best be achieved?
8. *Membership goals*
What are our membership goals and how might these best be achieved?
9. *Officer reimbursement*
What should the policy of the Society be towards the reimbursement of expenses incurred by Officers in the performance of their duties on behalf of the ISB?
10. *Congress venue and format*
We are reviewing the policies and procedures for determining the site and form of the ISB Congresses.

Committee members are:

Bernard Landjerit (landjer@ensam-paris.fr)
Kit Vaughan (clv4r@galen.med.virginia.edu)
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Sandra Olney (olneys@qucdn.queensu.ca)
Peter Cavanagh, Chair (prc@ecl.psu.edu)

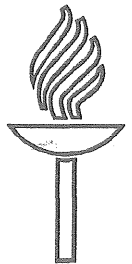
XVth CONGRESS UPDATE

XVTH Congress of ISB July 2.-6. 1995 at the University of Jyväskylä, Finland

Enclosed with this issue of your Newsletter is the **Second Announcement and Call for Papers** brochure. Further copies and related information can be obtained from those listed below.

Contact Address by Mail:

XVth ISB Congress
Jyväskylä Congresses⁶
P.O. Box 35
FIN-40351 Jyväskylä
FINLAND



Contacts by Telephone:

Secretariat (Ms. Multasuo) +358 41 603664
Secretary General (Dr. Keskinen) +358 41 602056

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Secretariat (Ms. Multasuo) +358 41 603621
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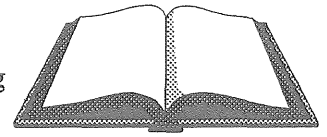
Contacts by Email:

Congress Secretariat MULTASUO@tkserver.jyu.fi
(Congress Secretariat TVANTTIN@jyu.fi)
Secretary General KESKINEN@pallo.jyu.fi



ISB PUBLICATIONS

The following Society publications can be obtained at the special rates shown by writing to the person concerned with sales and distribution.



BOOK OF ABSTRACTS, XIVth Congress of the International Society of Biomechanics.

Price: 550 FF plus postage

Supplier: Professor S. Metral
Explorations Fonctionnelles du Systeme
Nervoux
C.H. Bicetre
78 Avenue du General Leclerc
94275 Kremlin Bicetre, FRANCE
Fax: (33.1) 45.21.27.14

BIOMECHANICS XI-A and XI-B, Proceedings of the XIth Congress of the International Society of Biomechanics.

Price: 200 Dfl (includes both volumes and postage - please send cashier cheque)

Supplier: Peter Hollander
Faculty of Human Movement Sciences
Vrije Universiteit
van de Boechorststraat 9
1081 BT Amsterdam
THE NETHERLANDS
Fax: +31-20-6442043

BOOKS OF ABSTRACTS, XIIth and XIIIth Congresses of the International Society of Biomechanics.

Price: \$AUS 40 plus postage (\$AUS40 airmail) ea.

Supplier: Graeme A. Wood
Department of Human Movement
The University of Western Australia
Nedlands, WA 6009, AUSTRALIA
Fax: +61 9 380-1039

BIOLOCOMOTION: A CENTURY OF RESEARCH USING MOVING PICTURES, edited by A.Cappozzo, M.Marchetti and V.Tosi (ISB Book Series-Volume 1; Hard-bound, 356 pages, 180 b&w and 7 colour figures).

Price: \$AUS 65 plus postage (\$AUD 20 airmail)

Supplier: Graeme A. Wood
(address as above)

FURTHER PROPOSAL FOR DEFINITION OF JOINT COORDINATE SYSTEM - THE TEMPOROMANDIBULAR JOINT (TMJ) -

Prepared by

David Dean

Its behavior makes the TMJ one of the most complex joints in the human body. The primary and stylized behavior to which the joint is adapted is chewing hard. During forceful mastication the postcanine dentition on only one side of the side of mandible (the "working side") undergoes repetitive mediolateral circular motions (the "power stroke"). The contralateral side (the "balancing side") muscles generate the necessary force. The balancing and working side alternate, unconsciously, in the vast majority of individuals. During mastication the balancing side TMJ serves as the fulcrum; more specifically, the condylar head moves anteriorly (slides) and presses against the articular eminence of the articular disc (Hylander, 1979; Walker, 1978; Dean, 1986). Proof of this model comes from individuals with unilateral damage of the TMJ; they report pain when chewing occurs on the opposite side.

Kinematic models of mastication concentrate on the position the balancing side condyle takes versus the articular tubercle during forceful occlusion. The entire

mandible undergoes the circular power stroke in this position, however during each chewing cycle the balancing side condylar head moves anteroinferiorly then medially before returning to its original position (Dubrul, 1980). The oblique and horizontal fibers of the "TMJ ligament," found lateral to the joint capsule, help prevent posterior and anterior overexcursion, respectively (Aiello and Dean, 1990). Most commonly, the mandibular foramen has been chosen as the center of rotation during the anterior excursion that occurs during chewing (Rees, 1954; Smith, 1985).

Geometrically, the axis of mastication at the mandibular foramen (point 4) could be best modeled as the perpendicular intersecting a plane created from three dimensional coordinates at points 1, 3, and 5 in figure 1. The other points offered may be useful for specimens or patients viewed either radiologically or in surgeries requiring tactile location. Most of these landmarks are curvature extrema the others are intersections of various tissues and/or bone.

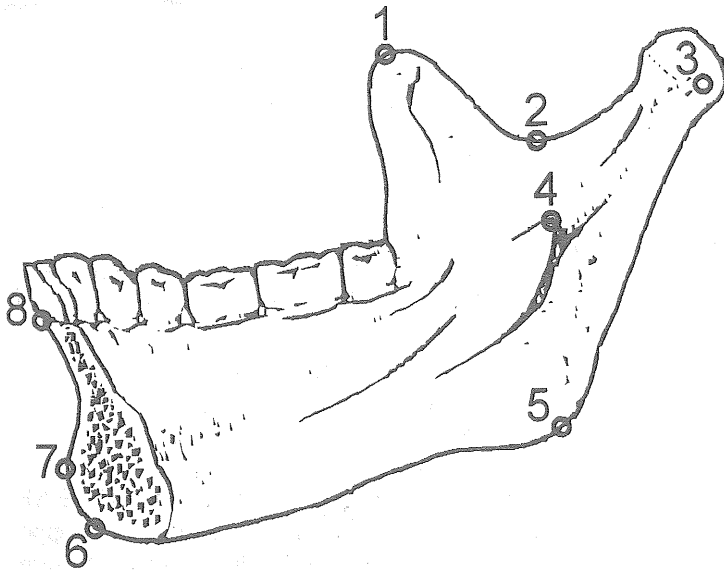


Figure 1: Lateral view of a hemimandible (modified from Aiello and Dean, 1990). Locations of landmarks: point 1: coronoid tip; point 2: bottom of the mandibular notch; point 3: internal-most condylar head; point 4: mandibular foramen as represented by tip of lingula; point 5: angle of mandible (gonion); point 6: inferoanterior-most point (menton); point 7: anterior most point on corpus (pogonion); point 8: midpoint on alveolar margin between lower central incisors.

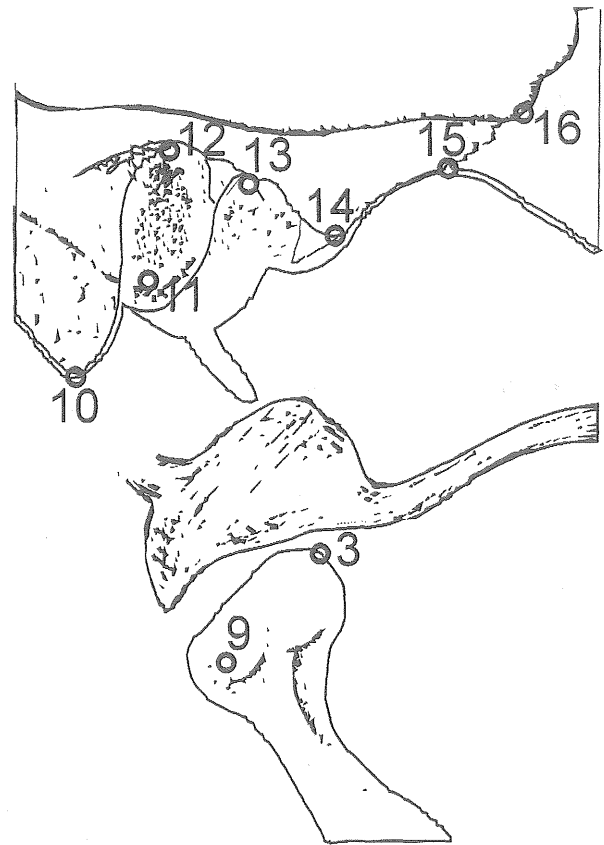


Figure 2: Lateral view of temporomandibular joint (modified from Aiello and Dean, 1990). Locations of landmarks: point 9: external-most condylar head (condylion); point 10: inferior-most mastoid process (mastoidale); point 11: inferior-most external auditory meatus; point 12: superior-most external auditory meatus (porion); point 13: superolateral-most point glenoid fossa; point 14: inferolateral-most point articular eminence (articulare); point 15: superolateral-most point on arc between articular eminence and anterior masseteric tubercle; point 16: anteroinferior-most point along superior edge of zygoma.

Literature Cited

Aiello L and Dean MC (1990) *Human Evolutionary Anatomy*. London: Academic Press.

Dean D (1986) *Covariation between craniofacial form and chewing*. M.A. thesis: Temple Univ. Ann Arbor: University Microfilms.

Dubrul EL (1980) *Sicher's Oral Anatomy*. St. Louis: Mosby.

Hylander, WL (1979) *An experimental analysis of temporomandibular joint reaction force in macaques*. *Am. J. Phys. Anthropol.* 51:433-456.

Walker AC (1978) *Functional anatomy of oral tissues: Mastication and deglutination*. In (JH Shaw, EA Sweeney, CC Cappuccino, and SM Meller, eds.): *Textbook of Oral Biology*.

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Special feature article

IMPORTANCE OF STATISTICS IN SOLVING A BIOMECHANICAL PROBLEM: WHY DOES A FLAMINGO STAND ON ONE LEG?

by

Brian L. Davis, Ph.D.

Department of Biomedical Engineering (Wb3)
Cleveland Clinic Foundation
9500 Euclid Avenue
Cleveland, Ohio 44195

Developing a hypothesis and then designing an experiment to test it are two critical aspects of scientific research. For instance, if a person wanted to examine why a flamingo spends countless hours standing on one leg, it may be difficult to formulate a reasonable theory, let alone test it. One could spend one's entire life tracking birds, making notes in logbooks, and collecting data and still not be able to answer the question. This example, while not being in the mainstream of biomechanical research, does serve to illustrate experimental designs. Let's examine two possible hypotheses:

Hypothesis #1. Energy expenditure is minimized.

Although this may seem like an odd hypothesis, it is possible that the extra energy needed to balance precariously on a support that is little more than a thin wooden dowel is offset by the fact that a flamingo might lose less energy if it only exposes one leg to the environment--particularly cold water which is often where these birds choose to stand. (Why a bird elects to do this is another question for which we do not have a definitive answer!) One way to investigate this hypothesis is to collect two sets of data; (i) extra energy needed to balance on one leg (E1), and (ii) heat lost by a fully extended leg (E2) that is placed in pond water. If one then does a paired t-test for each bird recruited for the study, and show that E1 is significantly less than E2, then one can claim support for this theory. Exactly how one goes about collecting these data is another topic best left to the imagination of biologists more familiar with flamingos.

A second way of addressing the issue might be to put a group of flamingos in a room that is filled with water to a depth of six inches and then control

the temperatures of water and room air. If the flamingos put both feet in cool water, when the air was warm, and then stood on one leg as the air temperature was lowered below some threshold, one could also claim support for the theory. In this case one would have a two-factor study (air and water temperature), and each factor could have different levels. With this example it is also possible to understand why interactions are important--a water temperature of 20 deg C may cause the bird to stand on one leg when the room air is at one temperature, but not at another.

Hypothesis #2. Skin problems are minimized.

It is well known that certain species of lizards that live in the Namid Desert of Southern Africa cannot stand on all four legs all the time, due to the fact that the sand is so hot it would singe any foot that is in contact with the ground for an extended period of time. For this reason lizards tend to alternate the pairs of limbs used for support. It could happen that flamingos do something similar. Spanoghe, Devos and Viaene (1976) report that *Geotrichum Candidum* was found in lesions in the legs of three dead flamingos and that the presence of this fungus could have been due to excessive contact with pondwater. So, if a bird wanted to reduce the risk of being infected (besides getting out the water), it would alternate the legs it stood on.

An experiment could be conducted to see if a bird alternates the support leg. All that is needed is for an observer to keep track of the time a bird spends on the left leg (T1) and right leg (T2), and then show that T1-T2 is not significantly different from zero (i.e., there is symmetry between left and right sides). However, this design does not address

the specific hypothesis, since a bird could alternate the support limb for other reasons besides trying to prevent skin breakdown. Perhaps a better method would be to vary the salinity or pH of the water and see if the birds changes the support limb more frequently. In this case one could perform a regression analysis, with the dependent variable (frequency of limb changes) being a function of water salinity or acidity.

In conclusion, it can be stated that the problem of why a flamingo spends an extended period of time on a single leg seems to be unresolved. If any readers can give any further insight into the solution (statistical or biomechanical), the newsletter would like to hear from you!

Reference

Spanoghe, L., Devos, A., Viaene, N. (1976). Cutaneous geotrichosis in the red flamingo (*Phoenicopterus ruber*). *Sabouraudia* 14(1) 37-42.

EDITOR'S NOTE

This 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 early in the second named month.

Members can submit *Letters, Special Articles, Affiliate Society News, Laboratory Features, Reports, or Announcements of Meetings, Conferences, and Jobs Available*. Also, *Short Abstracts* from biomechanics society meetings and *Thesis Abstracts* can be published. In special circumstances a complete edition of the Newsletter can be devoted to the publishing of a Society's "Proceedings".

Submitted material must be in letter-quality print and computer scannable, or on a computer disk as a text-only file, and in English. Graphics or complex equations must be in camera-ready art form, and photographs must be black and white.

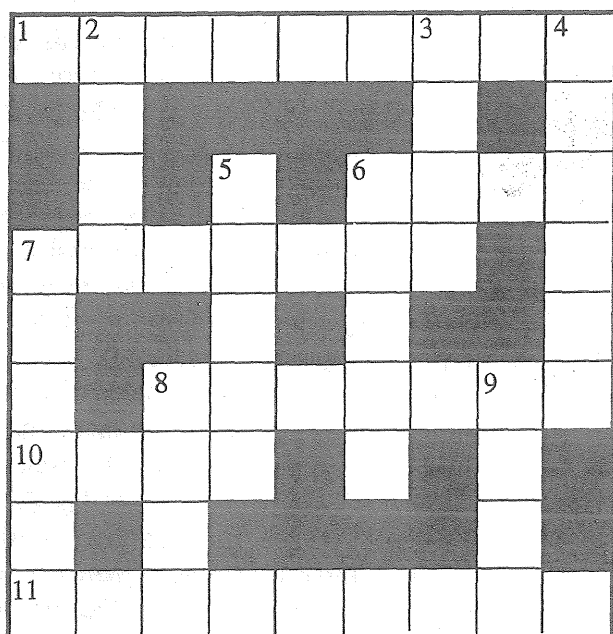
Society abstracts should not be more than 250 words in length. They should be submitted with full details of the conference, and accompanied by any conference or society logos which could be printed as well.

Thesis abstracts should be submitted with full details of: Title, Student's Name, Department, Name of Degree and Conferring Institution, together with Supervisor's Name.

Thesis abstracts should not be more than one Newsletter page in length.

CROSSWORD PUZZLE

(Submitted by Brian Davis and Julie E. Perry)



Across:

1. When a muscle was _____ it may produce greater tension than if it was shortened.
6. An important term in Newton's equation relating force and acceleration of a body.
7. Cut off or amputated.
8. Opposite of dorsal.
10. One layer among many (as in the hierarchy of the Nervous System).
11. An older term for capacitor.

Down:

2. A basic dimension.
3. A segment of your body that needs to be considered when analyzing the mechanics of a whiplash injury.
4. Furthest away from the body center.
5. Instrument or means for measuring.
6. "Fleshy".
7. Not dynamic.
8. A blood vessel leading to the heart.
9. A dull pain.

Announcements

SECOND INTERNATIONAL SYMPOSIUM ON COMPUTER METHODS IN BIOMECHANICS & BIOMEDICAL ENGINEERING

21- 24 SEPTEMBER 1994
MARRIOTT HOTEL, SWANSEA, WALES, UK

in collaboration with

University College of Swansea, Swansea, UK
University of Wales College of Medicine, Cardiff, UK

Information and Call for Abstracts

Over sixty abstracts from 23 different countries have now been received for the symposium in September. This is a second call for abstracts on the following topics. A list of abstracts received may be obtained from the address given below, (or by e-mail).

Submission of Abstracts

Abstracts should be submitted in English and are not to exceed 300 words (with one page of figures if appropriate). Abstracts are acceptable by e-mail. Deadline for submission is 20 July 1994.

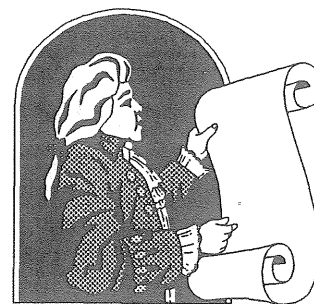
Symposium Topics

Suggested topics for presentation are as follows:

- o Material modelling, characterisation, response and mechanical behaviour of bone structures.
- o Theoretical and numerical approaches for adaptive bone/tissue remodelling including cell mechanics.
- o Implant/bone response and interaction, surface coatings, corrosion, resorption and lubrication.
- o Design, assessment and performance of implants and fixation devices including metal/ceramic and cemented/non-cemented systems.
- o Hard/soft tissue analysis and response, joint/ligament mechanics and replacement systems.
- o Dental and orthodontic mechanics, modelling of dental materials, cements, ceramics, plastics and metals.
- o Computer methods for the assessment of prosthesis design and response.
- o Mesh generation/adaption, geometrical modelling of surfaces, image analysis and software interfaces.
- o Modelling of human body impact, damage, fracture and fracture repair.
- o Validation and accuracy of numerical/experimental models, testing procedures, experimental methods and material identification.

Symposium Proceedings

Abstracts will be reviewed by the advisory panel for acceptance and these will be published in the Symposium Proceedings which will be available 4-6 months after the Symposium. Manuscripts will be prepared as camera-



ready copy, to formatted instructions, and are to be returned by 9th SEPTEMBER 1994. Final papers will be a maximum length of 10 pages and authors will be required to sign a copyright release form. Abstracts of papers will be available to participants at the meeting.

1994 INTERNATIONAL IRCOBI CONFERENCE ON THE BIOMECHANICS OF IMPACTS

September 21-23, 1994
Lyon, France

Since 1971, the International Research Council on the Biomechanics of Impacts (IRCOBI) has convened an annual scientific conference with peer-reviewed Proceedings that has become an international forum for presentation, discussion and publication of research on impact biomechanics and motor vehicle crash protection.

The conference this year has added appeal because it is organized in parallel with the 38th annual Association for the Advancement of Automotive Medicine Conference at the same venue.

The two conferences will have a jointly sponsored full day session September 22 on Advanced Occupant Restraint Technologies with refereed papers to address current and future issues in this area. Beside this session, the scientific programme of the IRCOBI Conference includes highly relevant topics in the field of biomechanics of head and neck injuries, pedestrians, motorcyclists and car occupant protection and vehicle crashworthiness.

For further information contact:

IRCOBI
INRETS, 109 Avenue Salvador Allende
Case 24, 69675 Bron Cedex
FRANCE
Fax: (+33) 72 36 24 37

AAAM
2340 Des Plaines Avenue - Suite 106
Des Plaines, IL 60018
USA
Fax: (+1) 708 390 9962

Biomechanics positions available

ASSISTANT PROFESSOR

The University of Vienna

A full-time position at the University Assistant (Assistant Professor) level is available at the Department of Biomechanics, IfS, University of Vienna as from 1 September 1994. Applicants should be qualified in Biomechanics (Ph.D. preferred), should possess a strong interest in, and proven ability for, biomechanics research (neuromusculoskeletal systems modeling), and must be citizens of a EU country. A working knowledge of the German language (speaking, reading, and writing) is also required.

The commencing salary is fixed at ATS 23.784 per month, fourteen times a year. The new 800 m² laboratory is equipped with three Kistler force plates, a new 1000 fps video motion analysis system, a modern computer center, video graphics system, muscle dynamometer, etc.

Interested persons should send a curriculum vitae (including a publication list) by fax (Int.+43 -1-9822661-131) to:

Ms Karin Wayssmaier, Secretary to Prof.Hatze
IfS, Dept. of Biomechanics
Auf der Schmelz 6, A-1150 Vienna
AUSTRIA
Tel: Int. +43-1-9822661-194.

RESEARCH STUDENTSHIPS IN BIOMECHANICS

University of Newcastle, UK

The Dept of Mechanical, Materials and Manufacturing at University of Newcastle UK we have available TWO PhD studentships to commence in October 1994. They are as follows:

- (1) SERC studentship to study 3D solid modelling of structures of the shoulder. Available to UK students (Fees and Living Grant) or EU students (Fees only). Academic requirement: Upper Second Degree or better in relevant subject.
- (2) University Internal Studentship to study design of dental bridges. Available to all students with same qualifications as above.

Those interested in either position should contact the following:

Garth Johnson
Dept of Mechanical, Materials and
Manufacturing Engineering
University of Newcastle
Newcastle upon Tyne NE1 7RU
UK
Tel: 091-222-6196; Fax: 091-222-8600

FACULTY POSITION (Biomechanics)

The School of Physical Education, Nanyang Technological University, Singapore.

A vacancy exists for a biomechanics specialist to be responsible for the undergraduate and graduate programmes in the School of Physical Education. A Ph.D. with a proven record of research and experience in the development and maintenance of a new biomechanics laboratory is desirable although other candidates will be considered. The School of Physical Education offers a range of teaching Diploma programmes in Physical Education, Undergraduate teacher education degrees (BA/BSc) and a range of graduate programmes (MA/MSc/M.Ed./Ph.D.). Candidates with teachers certificates and school based experience who can offer at least one practical teaching area will be given priority. Excellent salary and benefit package is provided for expatriate staff appointments. Contact:

Professor Ian R. Haslam, Vice Dean

PHD RESEARCH SCHOLARSHIPS (2)

Queensland University of Technology

The Biomedical Science and Engineering Unit at QUT is offering 2 PhD Scholarships in research projects related to (1) orthotics design and evaluation; and (2) micro computed tomography. The Scholarships are for one year and carry an annual tax free stipend of \$14,619.

The successful applicants will join the multi-disciplinary research team within the Unit which includes staff from the Schools of Human Movement Studies, Mechanical and Manufacturing Engineering, and the Centre for Medical Physics.

Existing projects are in the areas of prosthetic design and manufacture, tribology, and orthopaedic biomechanics. Applicants should: (i) hold a first or IIA honours degree or equivalent in a relevant field, (ii) be self directed in research, (iii) demonstrate a preparedness to work in a multi-disciplinary team, (iv) have sound research skills, and have a background in biomechanics (project 1) or basic knowledge of medical image processing (project 2), and (v) have relevant industry or professional experience.

Applicants should forward a curriculum vitae with the names and addresses of two (2) referees to:

The Convenor
Biomedical Science and Engineering Unit
QUT, School of Human Movement Studies
Kelvin Grove Campus, Locked Bag No 2, Red Hill
Queensland 4059, AUSTRALIA

Tel: +61-7-864 3512; Fax: +61-7-864 3980

POSTDOCTORAL RESEARCH POSITIONS (3)

The Lawrence Livermore National Laboratory is a federal research and development laboratory administered by the University of California for the Department of Energy. Recently, LLNL brought its history of excellence in engineering development, computational modeling, and human factors research to focus on the prevention and treatment of occupational hand injuries and the modeling of upper extremity movement.

We are currently seeking excellent candidates for the following 3 positions. In all positions, there will be opportunities for interaction and collaboration with interdisciplinary scientists in the academic community and with private industry. All appointees are expected to perform research resulting in publications in leading journals. Candidates must have a demonstrated ability to (1) identify complex problems and solve them in a creative and timely manner, (2) carry out independent research and (3) communicate clearly in both oral and written form.

For further information, candidates may contact:

Dr. S. Burastero or Raj Denhoy
Tel: (510) 424-4511
Fax: (510) 422-2234

or send a CV to:

Health Services
Mail Stop L-723
Lawrence Livermore National Laboratory
PO Box 808
Livermore, CA 94550, USA

Postdoctoral Research Position A

Description:

The Ergonomics Research Program at the Lawrence Livermore National Laboratory is seeking postdoctoral scientists with strong backgrounds in ergonomics, computational biology, biomechanical engineering or motion analysis. Appointees will be expected to perform independent research in occupational biomechanics, 3D motion analysis, and product evaluation and design, related to hand tools and computer input devices.

Preferred Skills/Background:

1. Recent Ph.D. in engineering or computational biology, with a strong research background.
2. Knowledge of Macintosh systems and software including LabView.
3. Experience in development of sensors and data acquisition systems for motion and/or force analysis.

Postdoctoral Research Position B

Description:

We are seeking postdoctoral scientists with strong backgrounds in computational biology and medicine, image processing, or computer vision. Appointees will be expected to continue development of a computational model of the human hand. There will be opportunities for interactions with the Institute for Scientific Computing Research.

Preferred Skills/Background:

1. Recent PhD in physics, mathematics, computer science, or engineering, with a research background in one of these areas.
2. Experience in computational modeling of complex systems.

Postdoctoral Research Position C

Description:

We are seeking a postdoctoral research candidate to participate in an interdisciplinary project involving the development of improved prototypes for endoscopic surgeries of the extremities. Appointees will work closely with leading orthopedic surgeons and will have access to LLNL expertise in sensors and engineering development.

Preferred Skills/Background:

1. Recent PhD in engineering, with a strong research background.
2. Experience in mechanical design.
3. Experience in micro-tool development.

RESEARCH ASSOCIATE

Arizona State University

The Motor Control Laboratory of Arizona State University (head Prof. G.E. Stelmach), is looking for an entry level Research Associate (PHD or Masters) with affinity for motor control studies, and, in particular, conducting handwriting experiments in elderly and Parkinson's patients. Handwriting data will be collected and analysed using an available PC-based automatized system and a digitizer.

Please, send a curriculum vita and three letters of recommendation. Interested persons are invited to contact:

Professor George E. Stelmach or
Dr. Hans-Leo Teulings
Exercise Science & Physical Education
Arizona State University
Box 870404
Tempe, AZ 85287-0404, USA
Tel: +1 (602) 965 9081 or 965 3913
Fax: +1 (602) 965 8108
E-mail: hlt@espe1.la.asu.edu or
Stelmach@espe1.la.asu.edu

Calendar of scientific events

July 16-19, 1994

Third International Symposium on Biofluid Mechanics, Institut für Biotechnik, e.V. München, Munich, Germany. Contact: Prof. Dr. Dieter Liepsch, FB05, Fachhochschule München, Lothstr. 34, 80335 München, Germany. Tel: 0049-89-1265-1533; Fax: 0049-89-1265-1502.

July 31 - August 4, 1994

4th International Congress of Vertebrate Morphology, Chicago, IL, USA. Contact: Dr. Susan W. Herring, Dept. of Orthodontics, SM-46, University of Washington, Seattle, WA 98195, USA. Tel: (206) 543-3203; Fax: (206) 685-8163; E-mail: herring@u.washington.edu.

August 9-11, 1994

International Congress on Applied Research in Sports, Helsinki, Finland. Contact: The Finnish Society for Research in Sport and Physical Education, Stadion, torniporras, SF-00250 Helsinki, FINLAND.

August 18-20, 1994

VIIIth Biennial Conference of the Canadian Society of Biomechanics, The University of Calgary, Calgary, Alberta, Canada. Contact: Conference and Special Event Services, The University of Calgary, 1833 Crowchild Trail, NW, Calgary, Alberta, Canada, T2M 4S7. Tel: (403) 220-6229; Fax: (403) 284-4184.

August 21-26, 1994

World Congress on Medical Physics and Biomedical Engineering. Rio de Janeiro, Brazil. Secretariat: Congrex do Brasil S/A, 20040-030 Rio de Janeiro RJ, Brazil. Tel: +55-21-224-6080; Fax: +55-21-231-1492.

September 21-24, 1994

Second International Symposium on Computer Methods in Biomechanics & Biomedical Engineering, Marriott Hotel Swansea, U.K. Contact: John Middleton, Biomechanics & Biomedical Eng. Cntr., Engineering Building, University College of Swansea, Singleton Park, Swansea SA2 8PP, Wales, UK. Tel: (0792) 295517; Fax: (0792) 295514.

September 26-29, 1994

2nd International Symposium on Three-Dimensional Scoliotic Deformities, Pescara, Italy. Contacts: Drs. M. D'Amico & A. Merolli, CERBITEB, Fond. Paolo VI, L.re Giovanni XXIII, I-65126 Pescara, Italy. Fax: 39-85-4213969.

October 3-7, 1994

Twelfth International Symposium on Posture and Gait, Matsumoto, Japan. Symposium Secretariat: World Meeting Corporation, 1-29-16-201 Shinjuku, Shinjuku-ku, Tokyo 160, Japan. Tel: 81-3-3350-0363; Fax: 81-3-3341-1830.

October 13-15, 1994

Annual meeting of the American Society of Biomechanics (ASB), Ohio State University, Columbus, Ohio. Contact: Alan S. Litsky, M.D., Sc.D. Meeting Chairperson, American Society of Biomechanics, Orthopaedic Biomeaterials Laboratory, The Ohio State University, 834 Northbridge, Worthington, Ohio, 43235.

November 10-13, 1994

International Symposium on the Neural and Neuromuscular Aspects of Muscle Fatigue, University of Miami School of Medicine, Miami, Florida, USA. (a symposium to honour the contributions of Brenda Bigland-Ritchie to the field of muscle fatigue). Contact: Chris Thomas (cthomas@ummptcp.msmail.miami.edu).

November 22-25, 1994

Second Russian Conference on Biomechanics (in memory of N.A. Bernstein), Nijnii Novgorod, Russia. Secretariat: 603005, Russia, Nijnii Novgorod, Minin place, 10/1, Medical Institute. Tel: +7 (8312) 39 00 91; Fax: +7 (8312)365745; E-mail: bimech@hydro.nnov.su.

April 26 - 30, 1995

Second National Conference on Sports Medicine and Science in Tennis, Sonesta Beach Hotel, Key Biscane, Florida. Contact: USTA, Sports Science Department, 7310 Crandon Blvd., Key Biscane, FL 33149, USA. Tel: (305) 365-8710.

July 2-6, 1995

XVth Congress of the International Society of Biomechanics. Jyväskylä, Finland. Contact: XVth ISB Congress, Jyväskylä Congresses, P.O. Box 35, FIN-40351 Jyväskylä, FINLAND. Tel: +358 41 603621; Fax: +358 41 603 664.

November 9-12, 1995

2nd Interdisciplinary World Congress on Low Back Pain: The Integrated Function of the Lumbar Spine and Sacroiliac Joints, La Jolla, USA. Contact: UCSD, Office of Continuing Medical Education, UC San Diego School of Medicine, La Jolla, CA 92093-0617, USA.

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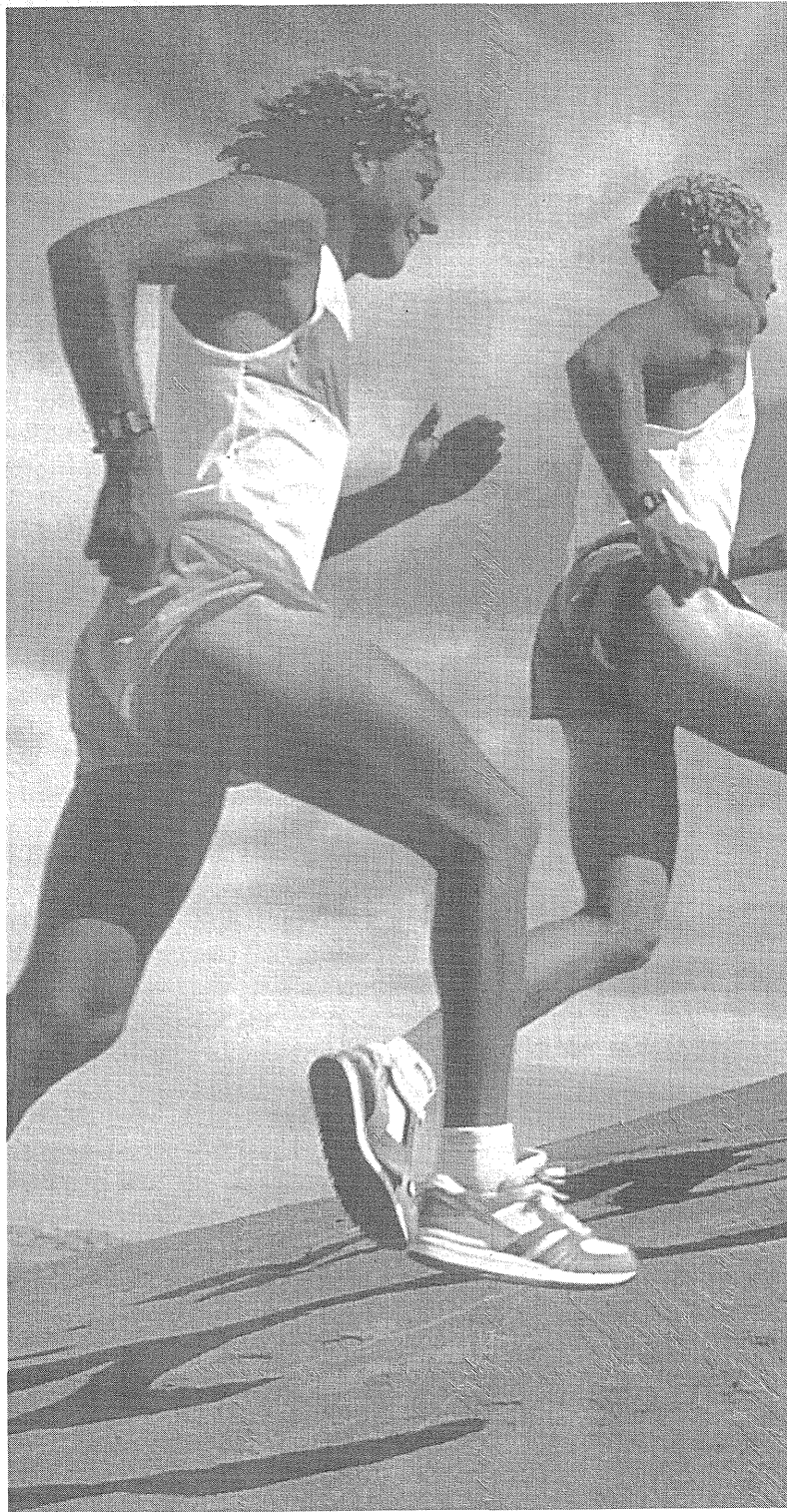
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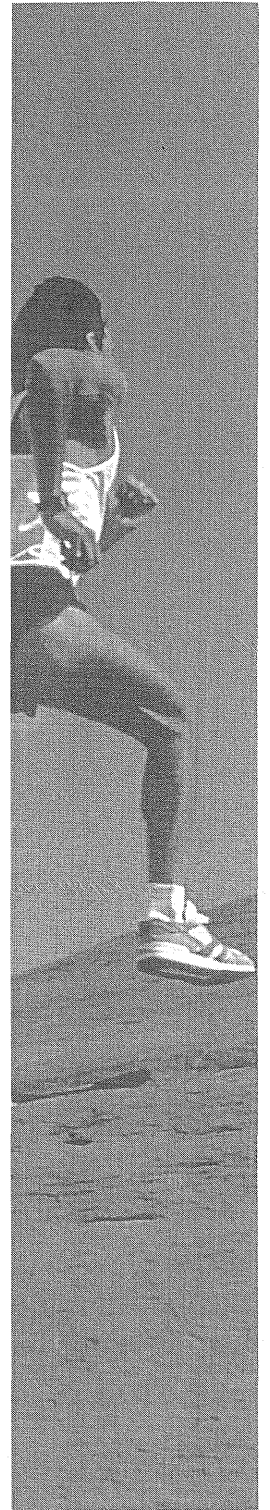
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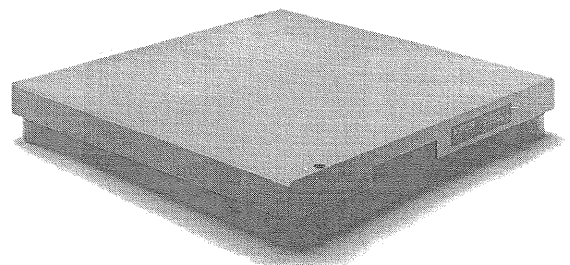
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