International Society of Biomechanics Newsletter

ISSUE Number 46, MAY / JUNE, 1992

PRESIDENT
Dr. Aurelio Cappozzo
Istituto Di Fisiologia Umana
Università Degli Studi 'La Sapienza'
00185 Roma
Italy
Tel: 39-6-490673
Fax: 39-6-445-2303

PRESIDENT-ELECT
Dr. Ronald Zernicke
University of Calgary
Department of Surgery
3330 Hospital Drive N.W.
Calgary AB T2N 4N1
Canada
Tel: (403) 220-8666
Fax: (403) 283-4740

PAST PRESIDENT
Dr. Robert W.K. Norman
Dept. of Kinesiology
University of Waterloo
Waterloo, Ontario
Canada N2L 3G1
Tel: (519) 885-1211 ext. 2205
Fax: (519) 746-6776

SECRETARY-GENERAL
Dr. Peter R. Cavanagh
The Centre for Locomotion Studies
The Pennsylvania State University
University Park, Pennsylvania
USA 16802
Tel: (814) 865-1972
Fax: (814) 8634755

TREASURER and
NEWSLETTER EDITOR
Dr. Graeme A. Wood
Department of Human Movement
The University of Western Australia
Nedlands, WA 6009
Australia
Tel: +61-9-380-2361
Fax: +61-9-380-1039
E-Mail: g_wood@fennel.cc.uwa.oz.au

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AFFILIATE SOCIETIES OF ISB:
American Society of Biomechanics; British Association of Sports Science; Canadian Society of Biomechanics; China Sports Biomechanics Association; Czechoslovak Committee on Biomechanics; French Société de Biomécanique; Korean Society of Biomechanics; Polish Society of Biomechanics; Sports Commission of the Soviet Union.

ISB news

The Society's Logo

For some time it has been recognised that the Society's logo, whilst distinctive, contains some fine-line art work which often does not reproduce well. What appears on the front cover page of this edition is a 'new-look' logo which we hope appeals to you.

The Society's Constitution

The Society's *Constitution* is printed on pages x - y of this Newsletter and includes those amendments proposed last year (Newsletter No. 42) and subsequently accepted by majority vote.

IJSB Journal Subscriptions

Members who subscribe to the International Journal of Sports Biomechanics may have experienced some problems with delivery of recent issues, and perhaps even received a letter form Human Kinetics Publishers stating that their subscription had expired. The problem we understand has been traced to a loss of subscriber records when new software was installed, and HK have apologised for any confusion and inconvenience caused.

Availability of the XIIIth Congress Book of Abstracts

This volume contains over 600 pages of the extended (two-page) abstracts of all free communications given at the XIIIth International Congress on Biomechanics held in Perth, Dec. 9-13, 1991.

Summary of Contents:

Muscle Mechanics - 25 papers
Sports Biomechanics - 77 papers
Special Populations - 26 papers
Occupational Biomechanics - 27 papers
EMG & Motor Control - 44 papers
Instrumentation & Methods - 50 papers
Computer Modelling - 17 papers
Gait Analysis - 21 papers
Anthropometry - 10 papers
Orthopaedics & Tissues - 69 papers

Purchase Details:

Price: **$40.00** (Australian) plus postage and handling as follows:
$25 surface mail (8-10 weeks)
$40 air mail (10-20 days)

Payment must be in Australian dollars by Bank Draft drawn on an Australian Bank, and made payable to the **XIIIth Congress on Biomechanics**.

Ordering Form:

To:
XIIIth ISB Congress Secretariat
c/. Department of Human Movement Studies
The University of Western Australia
Nedlands, WA 6009
AUSTRALIA

Please send me one copy of the **Book of Abstracts** of the XIIIth International Congress on Biomechanics.

I enclose payment in Australian dollars of $AUS ____ for purchase and delivery by air/surface mail (delete which does not apply).

Name:_____

Address:_____

_____

Country:_____ Postcode:_____

Minutes of the ISB General Assembly held in Perth, December 11, 1991.

(These minutes will be formally approved at the next AGM to be held during the XIVth Congress in France, and members are asked to prepare their amendments for that occasion).

1. President Norman called the meeting to order at 11:05 am.
2. Minutes of meeting in Los Angeles, June 28, 1989 were approved.
3. Report of Pres. Norman:
   a) Stated major goals; (i) to improve communication among ISB membership, and (ii) to forward scientific basis for biomechanics research and applications.
   b) Three meetings of Council have been held in two years.
   c) Activities reviewed as follows:
      - Assist Perth organisers of Congress
      - Approved French proposal for next Congress in Paris ('93).
      - Requested proposals for 1995 Congress

- Awarded first Promising Young Scientist Travel Grant
- Assisted in selection of Muybridge Award
- Organised paper competition at Congress
- Negotiated special issue of J. Biomechanics to contain Abstracts and Keynote papers.
- Began monograph series
- Planned Pre-Congress Educational Sessions for 1993
- Assisted in developing terminology standardisation on 3D Kinematics document
- Enhanced relationships with Affiliate Societies
- Assisted Working Groups (WCSB) and Computer Simulation to hold satellite meetings
- Organised archives at Penn State University.
- Improved organisation through (i) membership list distribution, (ii) constitution changes, (iii) application procedure improvements.
- Representation on World Congress Board.

d. Acknowledged assistance of those Council members who were retiring from the Council.

4. Treasurer's Report and Membership report given by Peter Cavanagh on behalf of Richard Nelson:

a. 507 paid members (current) of 706 on cumulative membership list.

b. A question from the floor of whether to affiliate with Clinical Biomechanics was acknowledged by President Norman for future consideration by Council.

c. Treasurer's Summary of Income and Expenses was reviewed. Question of sales of mailing list was raised from floor. President Norman stated that Council will discuss ways to restrict in future.

d. Dr. H. Woltring confirmed with confidence that the Treasurer's Report was in order.

e. President Norman presented proposed budget for 1993. Issues presented were: (i) that we needed to increase advertising rates in Newsletter, (ii) find corporate sponsors for special functions, and (iii) raise fees from $22.00 to $35.00 for 1993. The expenses in the last two years have increased due to:
- UCLA Meeting Council costs;
- Travelling Scientist costs (first time);
- $3000 in bad loan several years ago;
- Proceedings from UCLA did not sell well;
- Pres. Norman had to make special trip to handle World Congress negotiations;
- Treasurer's office costs are new.

Improved fee handling will be provided by credit card in future to make it easier for people to pay dues.

If dues increase not approved, Newsletter will need to be reduced in scope. It was agreed that next Treasurer's report must reflect real expenses for each item rather than estimates. A motion was made, seconded and passed unanimously to increase 1993 dues to $US 35.00.

5. Secretary-General's Report

The procedures for changes to Constitution were reviewed by Dr. Chaffin.

A. Number of ballots received was 90, of which more than 90% approved proposed changes.

B. Full Constitution will appear in future issue of Newsletter.

6. Dr. Hubbard informed the Assembly that the Working Group on Computer Simulation will become a Technical Group within ISB, with formal officers and committee.

7. Council Election Results were presented by Dr. Paul:

233 ballots were received

Ron Zernicke was elected President-Elect

Of 15 Candidates, the following were elected:

P. Cavanagh	M. Gagnon
M. Hubbard	M. Kumamoto
K. Oberg	S. Olney
R. Rozendal	R. Stein
K. Vaughan	S. Woo

6. New President's Comments - Aurelio Cappozzo:

a. He thanked both John Paul and Bob Norman for their leadership.

b. Asked that members contribute to Newsletters, monographs, Study Institutes and Award nominations.

c. Asked for assistance of all in strengthening ISB membership and vitality.

Meeting adjourned at 12:15 pm.

Don B. Chaffin
Secretary-General
December, 1991

Erratum

In the last issue of the Newsletter Dr Krzysztof Kedzior was incorrectly listed as an elected member of the ISB Council. In fact Dr Kedzior attends the Council meetings as the representative of the Polish Society of Biomechanics.

The Constitution of International Society of Biomechanics

First Approved: 29 August, 1973
First Revision: 15 August, 1983
(IVth ISB Meeting, Penn. State University)
Second Revision: 16 December, 1991
(XIIIth ISB Meeting, University of West. Austr.)

Organisation of Constitution

Article 1: Name and Headquarters

The International Society of Biomechanics (ISB) is an international organization with headquarters in the locality where the Treasurer resides.

Article 2: Purpose

2.1 The International Society of Biomechanics has the purpose of promoting the study of biomechanics of movement with special emphasis on human beings.

2.2 It shall encourage international contacts among scientists in this field, promote knowledge of biomechanics on an international level, and cooperate with related organizations.

Article 3: Membership

The Society shall consist of five categories of members:

3.1 Honorary members shall be a restricted number of individuals with particular merit in the development of biomechanics.

3.2 Charter and full members shall be individuals with a professional and scientific interest in biomechanics.

3.2.1 Charter members will be recorded as those who were included in the first list of full members by the ad hoc organizing committee.

3.2.2 Other full members shall be accepted upon receipt of a completed application form and annual dues for the first year of membership. The Treasurer shall notify the Executive Council of new membership at its annual meetings.

3.3 Affiliate members shall be national associations on biomechanics or related organizations with approved and effective by-laws.

3.3.1 The use of membership for any kind of political, sales or public relations promotion is prohibited.

3.4 Emeritus Members shall be retired, due to age or illness, from professional employment in biomechanics, and have made outstanding contributions to the field of biomechanics and the Society for at least five years.

3.5 Student Members shall be full time students in an academic program related to biomechanics.

Article 4: Concerning Boards

The Boards of the International Society of Biomechanics shall be:

a. The Executive Council
b. The General Assembly of Members
c. Technical Groups approved by Executive Council

Article 5: Executive Council

5.1 A President, President-Elect and Past-President and Council Members representing various disciplines in biomechanics shall constitute the Executive Council. A Treasurer, Secretary-General, and Newsletter Editor are appointed officers with approval of the Council.

5.2 The Executive Council shall be elected from among the full members by the General Assembly for a term of two years. Each can be re-elected twice.

5.3 The first Executive Council shall be proposed by the ad hoc Organizing Committee and confirmed by the charter members at the organizing meeting that ratifies this constitution.

5.4 The Executive Council shall exclude those members who do not fulfil their responsibilities towards the Society under Art. 3.

5.5 The Executive Council shall appoint all subcommittees as considered desirable.

5.6 The Executive Council shall delegate to a local committee or other appropriate body the powers necessary to organize each international congress or symposium.

5.7 The Executive Council shall sponsor and coordinate smaller regional meetings.

5.8 Decisions of the Council shall be made by simple majority of the council members present at a meeting, or if voting by mail, by simple majority of the

respondents. A quorum shall consist of at least 3/4 of its members.

5.9 The Council shall meet at least once a year.

5.10 To the fullest extent permitted by the law of the State or Nation in which the Society is headquartered, as the same now exists or may hereafter be amended, an Executive Council member or any member of the Society appointed by the Council to undertake a specific task shall not be liable to the Society or its members or any of them for monetary damages for breach of fiduciary duty as a Council member or for any other cause excepting only wilful misconduct.

Article 6: General Assembly

6.1 All members of the Society may attend the General Assembly.

6.2 The General Assembly is presided over by the President of the Council, or in his absence, by the President-Elect.

6.2.1 The General Assembly shall receive the President's and the Treasurer's report, as well as those of the Council Members, and shall discharge them from responsibility of the past tenure of office.

6.3 The membership shall elect by mail ballot at two year intervals, the President-Elect and the Council Members. The Past-President is responsible for soliciting nominations and preparing the official ballot.

6.3.1 Nominations shall be made by the members and the election shall be by mail ballot.

6.4 Honorary members may be nominated by three full members through correspondence to the Executive Council, who shall award this status by two-thirds majority vote of the Executive Council.

6.5 The General Assembly shall approve and grant affiliate memberships upon recommendations by the Executive Council. Approval of affiliate memberships shall be by open vote.

6.6 The General Assembly shall transact any additional business as may arise.

6.5 The General Assembly shall approve and grant affiliate memberships upon recommendations by the Executive Council. Approval of affiliate memberships shall be by open vote.

6.7 The General Assembly shall determine the dues following a recommendation made by the Treasurer.

6.8 The General Assembly normally shall be held every second year during a designated international congress organized by the Society or by related organizations.

6.9 Either the President or a majority of the Executive Council may convene an extraordinary General Assembly meeting of the Society. They must convene an extraordinary General Assembly at the request of at least 10% of all members.

6.10 Honorary members, student members, emeritus members and full members shall have one vote each.

6.11 For ordinary motions at meetings, except ones concerning constitutional amendments, a simple majority of eligible voters present shall rule.

6.12 Written motions to amend the Constitution shall be submitted to the Council and distributed by a mail ballot to all members for decision which shall require a simple majority of all ballots returned to the Secretary-General. Notice of the results shall be given to all members, where upon the amendment will become effective.

6.13 Emeritus members shall be nominated by the Awards Committee and approved by two thirds majority vote of the Executive Council.

6.14 Student members shall be accepted upon receipt of a completed application form, annual dues, and a letter from their academic institution attesting to their status as a fulltime student.

Article 7 Fiscal Year

The fiscal year of the Society shall begin each January 1st and end December 31st of the same year.

Article 8 Annual Subscription

8.1 Annual dues for individual members are payable to the Treasurer on January 1st of each year. Student membership dues will be lower than those of full membership.

8.2 Honorary, Emeritus and Affiliate members shall be exempt from annual dues.

8.3 Honorary members shall be invited to attend the biennial Meeting of the Society, and shall have the registration fee waived.

8.4 Individual members who fail to remit annual dues for three successive years shall be automatically placed on the inactive list and shall forfeit all privileges of the Society.

8.4.1 Members placed on an inactive status for non-payment of dues may be reinstated to full membership upon payment of an amount equivalent to three years of annual dues.

8.4.2 Members who resign from active membership and are not in arrears in dues may be reinstated to active membership upon payment of one year's annual dues.

Article 9 Technical Groups

9.1 Technical groups of ISB shall be created from time to time for the purpose of advancing knowledge in a specialized area, or on a specific topic within the field of biomechanics.

9.2 Members of ISB who have worked together informally to advance knowledge in a specialized

area, or on a specific topic, for a period of at least four years (during which time they may be referred to as a Working Group) may submit an application to the Executive Council for their group to be designated as a Technical Group of ISB.

9.3 Applications for designation as a Technical Group of ISB shall be decided on a majority vote of those members of the Executive council present at the meeting for which the formation of the group has been proposed as part of the circulated agenda.

9.4 The activities of Technical Groups shall be administered by an Executive Board consisting of a Chairperson, a Secretary-General, and five to seven Members.

9.5 The officers and members of the Executive Board shall serve for a maximum of two terms, each of four years duration.

9.6 An election of officers and members of the Executive Board shall be conducted by postal ballot of Group members every four years.

9.7 The Executive Board shall appoint a Nominating Committee, chaired by a member of the Board, to develop a slate of candidates. At least two candidates shall be nominated for each post and the number of candidates for membership of the Committee shall exceed the number of vacancies.

9.8 The results of each election shall be announced at a general meeting of the Technical Group held in conjunction with a biennial Congress of the ISB.

9.9 The Board of each Technical Group shall meet at least once every two years.

9.10 Technical Groups shall plan and conduct professional meetings, provided that prior approval for such meetings is obtained from a committee consisting of the President Elect, President (Chairperson) and Past-President of ISB (hereinafter referred to as the Committee of Presidents).

9.11 Technical groups shall enter into agreements with other organizations only after obtaining approval of the Committee of Presidents.

9.12 The Chairperson of each Technical Group, or a person designated by him or her, shall present in person a written report of the activities of the Technical Group to the Executive Council of I.S.B., at the time of each biennial Congress of ISB.

9.13 Technical Groups may be disbanded by the Executive Council of ISB when, through failure to meet the obligations of any of the clauses of this Article, or for other reasons, they cease to serve the best interests of ISB.

AFFILIATE SOCIETY NEWS

Czechoslovak National Committee for Biomechanics

The Czechoslovak Committee for Biomechanics co-operates closely with the Czechoslovak Society for Biomechanics. The chairman of the Committee is vice-chairman of the Society, the function of the scientific secretary is common. The current chairman of the Society for Biomechanics is Prof. PhDr V. Karas, DrSc., the past president of the Committee as well as of the Society was Prof. Ing. J. Valenta, DrSc. The Czechoslovak Society for Biomechanics has about 120 members and its activity is divided into the following sections:

* Musculoskeletal system and its replacements (J.Jírová, R.Čihák)
* Cardiovascular system and its replacements (F.Klimeś, O.Kittnar)
* Biomaterials and biotolerance (V.Květ, J.Ort)
* Biomechanics in dentistry (J.Mazánek, M.Čenský)
* Biothermodynamics (F.Maršík)
* Interaction man-surrounding, prevention, rehabilitation (S.Otáhal, V.Karas)
* Forensic engineering, medical and criminalistic applications (A.Bradáč, M.Mego, V.Porada)

There are organized regular seminars with two or three lectures on similar themes. A Bulletin of the Society is also issued regularly - with a scientific part and an informative part about conferences, and publications.

The members of the committee take part in the specialized and postgraduate biomechanical studies, including preparation of doctorands. The Committee tries also to gain sponsors for perspective scientific projects and scholarships and fellowships for young scientists. Any recommendations in these lines would be appreciated.

A very important activity is a regular organizing of the conferences "Biomechanics of Man" with the interval of two years. This year (1992) the conference will take place at Smilovice (near to Prague) Sept. 30 - Oct. 2, and the official language is English. Interested persons are welcome to write for further information to the scientific secretary of the conference:

Ing. Jitka Jírová, CSc. (Ms.)
ITAM CAS, Vyšehradská 49
12849 Prague 2
Czechoslovakia
Tel: 42-2-294920; Fax: 42-2-295903

Ing. Václav Květ, CSc
Scientific Secretary

Ing. Vratislav Kafka, DrSc
Chairman of the Committee

Korean Society of Biomechanics

The Korean Society of Biomechanics was founded in 1984 and presently has 82 members. Meetings are held four times each year, and an annual Proceedings is published. The focus of the Society is toward the theoretical development and application of biomechanics to sports.

Past Presidents of the Society have been:
Keung Seh Lee, PhD (1984-1988)
Sung Sun Park, PhD (1989-1991)

The current President of the Society is:
Dong Young Yang, PhD

The Secretary and Newsletter Editor is:
Gye San Lee
Korea Sport Science Institute
223-19 Kongneung 2-dong
Nowon-gu 139-242
Seoul, KOREA

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 photgraphs 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.

Laboratory feature

BIOMECHANICS AT THE UNIVERSITY OF NEW SOUTH WALES' DEPARTMENT OF SAFETY SCIENCE

The Biomechanics research in the Department of Safety Science developed from work on slips and falls being carried out by the ergonomics group under Professor Mike Stevenson and from Professor Noel Svensson's Interest in spinal modelling and in prosthetic devices. Seeding money for the laboratory was supplied by Worksafe Australia in 1986 and a Research Assistant was appointed to develop a gait analysis facility.

The Biomechanics and Gait laboratory is now equipped with an instrumented walkway which allows measurement of temporal- spatial gait parameters, (i,e, walking speed, cadence and stride length), without any special instrumentation worn by the subject. Telemetry based EMG has also been purchased. A Kistler load platform is centrally located in the walkway which enables the measurement of the foot to ground reaction forces. With the subject wearing special light weight reflective markers, sagittal plane segmental motion is measured by means of high speed video camera. The data from the load platform is synchronised to the video camera and the video recordings are digitised by specially developed computer hardware and software. All the data from the walkway instrumentation are collected by a NEC486 PC computer in a rapid and simple manner requiring a minimal amount of the subject's time.

The synchronisation of the motion data with the ground reaction forces allows the forces to be visualised, superimposed on digitised motion of the person walking. Analysis of the ground reaction forces, segmental motion, temporal-spatial data is also possible. Incorporating the ground reaction forces and the segmental motion into a reverse dynamic model of walking the reaction forces and net muscle forces can be estimated.

The laboratory also has instrumentation for physiological measurements, including visual acuity, vestibular function, touch perception, proprioceptive capability, and lower limb isometric strength measurement. Two video cameras and VCRs have been purchased to enable the kinematic analysis to be extended to three dimensions. A new walkway with a variable incline is in the process of being built.

The two NEC486 PC's have numerous software packages (some developed in house) which provide the computing needs for data analysis and report production.

Current work being carried out in the gait laboratory includes:

a) A study into the gait of elderly women, including dynamic control of balance while walking, physical demands placed on the walking surface in regard of friction

requirements and floor flatness.

b) A study into the factors that cause falls while walking.
c) A study of friction demands while walking on level and inclined surfaces.
d) A study of posture and its effect on gait.
e) Design of footwear for the elderly for safety stability and comfort.
f) The study of arthritic gait.

In 1991 the group was joined by Dr Kamal Kothiyal who was trained and worked at the Centre for Biomedical Engineering at the Indian Institute of Technology in Delhi, whose interest is in spinal modelling and in looking at the stresses on the spine caused by work practices and postures.

Announcements

BIOMECHANICS POSITIONS

DEPARTMENT OF SAFETY SCIENCE UNIVERSITY OF NSW, SYDNEY, AUSTRALIA

Lecturer/Senior Lecturer Biomechanics

The Department of Safety Science is seeking a lecturer Grade B or C in Biomechanics. The Department teaches students enrolled in courses in Occupational Health and Safety and Ergonomics in the Faculty of Applied Science, in Biomedical Engineering in the Faculty of Engineering and in Sport and Leisure Studies in the Faculty of Professional Studies. The majority of this teaching is at post-graduate level.

Applicants should have a good research record and preferably a PhD in Biomechanics. A specialty which can be related to gait analysis or to occupational problems would be preferred.

An important role of the successful applicant will be to improve the collaboration between the different groups in the University who are carrying out research related to Biomechanics.

Salary range: $39,463 - $ 57,913

Biomechanics Research Position

The Department of Safety Science has a vacancy for an experimental Biomechanist to manage the Biomechanics Laboratory and undertake research into human gait. Current research focuses on gait as it relates to falls and a person who is interested in continuing research in this area is preferred. The position could suit a recent PhD graduate who is seeking a postdoctoral position or someone with significant experience in gait analysis who wishes to undertake a research degree. It is essential that the person has the experimental background to further develop this relatively new facility.

The salary will be in the range $27,000 - $45,000 depending on experience and qualifications.

Expressions of interest including a current CV should be submitted to Professor Jean Cross from whom further information can be obtained.

Professor Jean Cross
Department of Safety Science
PO Box 1, Kensington, NSW
Australia 2033
Fax: +61-2-399 7197

RESEARCH POSITIONS IN BIOLOGICAL ANTHROPOLOGY

The U.S. ARMY NATICK RD&E CENTER invites applications for two positions in biological anthropology (GS-11) beginning 1 Jun and 1 Oct 92. Individuals will serve as project officers for research programs in human engineering of protective clothing and equipment and will conduct basic morphometric research. Candidates must have PhD completed by starting dates of appointments. Background in anatomy/osteology, morphometry, and biostatistics strongly desired. Must be U.S. Citizen. Send letter and CV with references to:

Dr. Kenneth R. Parham
U.S. Army Natick RD&E Center
ATTN: STRNC-YBA
Natick, MA 07160-5020, USA
Tel: (508) 651-4974
E-Mail: kparham@natick-emhl.army.mil.

BIOMECHANICS LABORATORY, CONVERSE INC., NORTH READING, MA, USA

Two positions are available in the Biomechanics Laboratory of the R&D Division at Converse Inc.

Summaries:

(1) Product Evaluation Specialist

Purpose: to plan, execute, analyze, and report results of product evaluation under minimal supervision. Scope of evaluation would be determined by the Laboratory Manager and would generally involve the testing of functional aspects of athletic shoes. Listed qualifications are: B.S. or M.S. in Biomechanics, Exercise Science, or related engineering field; 1 - 3 years experience in research-related field, preferably athletic footwear. Experience with electronics instrumentation and computer programming preferred.

(2) Biomechanics Product Representative

Purpose: meeting with Converse endorsement athletes on a proactive basis to discuss any special footwear needs and soliciting feedback on the quality and performance on Converse athletic footwear. Listed qualifications are: B.S. or M.S. in Biomechanics, Exercise Science, or Sports Medicine related fields preferred.

Further details are available from:

Christopher J. Edington
Manager, Biomechanics Laboratory
Converse Inc., One Fordham Road
North Reading, MA 01864-2680, U.S.A.
Tel. +1(508) 664-1100; Telex 940-700

Conference news

International Ergonomics Association World Conference '93
ERGONOMICS OF MATERIALS HANDLING

An Interdisciplinary Forum to Review Human and Technical Aspects of Repetitive Manual and Automated Handling of Loads and Hand Tool Manipulation.

Place: 14-18 June 1993, Warsaw, POLAND

Organized by:

Industrial Ergonomics Technical Group of the Science & Technology Committee, International Ergonomics Association, in cooperation with Polish Ergonomics Society and Central Institute for Labour Protection, Warsaw, Poland.

Objectives:

The main objective of this comprehensive Conference is to provide an international forum to advance scientific knowledge about the impact of repetitive manual and automated load handling and tool manipulation on human health, comfort and safety. The consequences of the above for health care costs, prevention needs, and quality of working life around the world will be addressed.

CONFERENCE LEADERSHIP

Honorary Co-Chairman	Prof. M.M. Ayoub, U.S.A Dr. I. Kuorinka, Finland
General Chairman	Prof. W. Karwowski, U.S.A.
National Co-Chairman	Prof. J.L.Smith, U.S.A. Prof. L. Pacholski, Poland
Technical Program Chairman	Prof. W.S. Marras, U.S.A.
Local Coordinators in Poland	Prof.D.Koradecka, Warsaw Prof. T. Marek, Krakow

SCOPE

The Conference will aim to stimulate an interdisciplinary review of current research and applications, and future directions in three main areas of concern to the world society:

1. Manual Materials Handling & Occupational Injuries
2. Prevention of Cumulative Trauma Disorders at Work
3. Human Factors Aspects of Automated Materials Handling

PROPOSALS FOR PARTICIPATION

All proposals submitted for consideration by the Program Committee should conform to the following general requirement. The first page should provide a title, names, mailing addresses, telephone and telefax numbers and electronic mail information (if available) for all authors. Prospective authors should consider the three different modes of presentation, such as oral presentation, poster or panel discussion, when submitting their proposals for review.

1. Technical Presentations
   An abstract of 300-500 words should include objectives, methods, results and their significance, and conclusions.
2. Poster Sessions
   Poster sessions are aimed to present the latest developments and state-of-art in Conference topics through direct interaction between the authors and participants. An abstract of 300-words is required.
3. Panel discussions, workshops and tutorials
   An abstract of 500 words should state the objective, educational content, intended target audience, and include a biosketch of the presenter(s).

SUBMISSION DEADLINES

Latest receipt of proposals for:

* Technical papers	August 15, 1992
* Workshops, tutorials & posters	October 1, 1992
Latest notification of review outcome	October 1, 1992
Receipt of accepted papers:	December 15, 1992

Proposals for Technical Papers should be submitted to:

Prof. W.S. Marras,
Technical Program Chair,
Industrial and Systems Engineering department,
Ohio State University,
Columbus, OH 43210 , USA
Tel. +1 (614) 292-6670
Fax +1 (614) 292-7852
Email: marras@CCL2.Ohio-state.edu

All other proposals, including those Special Sessions, Workshops, Tutorials & Posters should be submitted to Prof. Karwowski at the address given below.

CONFERENCE SECRETARIAT

Prof.W.Karwowski,
General Conference Chair,
Center for Industrial Ergonomics ,
University of Louisville,
Louisville, KY 40292, USA
Tel: +1(502) 588-7173; Fax: +1 (502) 588-7397
Email: wokarwo3@ulkyvm.bitnet

REQUEST FOR COOPERATION

The Conference organizers welcome inquiries and offers of cooperation and help in organizing efforts from industry, labour organizations, and safety and health regulatory agencies worldwide. For further information please contact:

Prof. J.L.Smith,
Conference Co-Chair,
Department of Industrial Engineering,
Mail Stop 3061,
Texas Tech. University,
Lubbock, TX 79409, USA
Tel: +1(806) 742-3543
Fax: +1(806) 742-3411
E-mail: xujls@ttacs1.ttu.edu

SOCIÉTÉ DE BIOMÉCANIQUE, 17th Annual Congress

17 - 18 September 1992, Toulouse / France
Faculty of Medicine at RANGUEIL

Organised by:
- Le Service Orthopaedie-Traumatologie
- Le Laboratoire de Recherche en Orthopaedie et Traumatologie

Congress Secretariate:
Prof. J. Puget
Service Orthopaedie Traumatologie
Secretariat du XVIIe Congres de Biomecanique
Centre Hospitaliere Universitaire Rangueil
1, Avenue Jean Poulhes
F - 31054 TOULOUSE Cedex, FRANCE
Tel: +33.61.322 711; Fax: +33.61.322 232

Main Topics:
- Biomechanics of bones, muscles and joints
- Biomechanics of posture and movement
- Sports biomechanics
- Rehabilitation and handicaps; ergonomics
- Circulatory, cardiac and respiratory biomechanics
- Visceral and digestive biomechanics
- Biomaterials and instrumentation
- Impact and vibration biomechanics
- Modelling

Scientific Committee:
D. Geiger (Pres.), D. Bellet, P. Bessou, Y. Breniere, D. Cesari, J. Duchateau, D. Isabey, M. Jaffrin, C. Kenesi, F. Lavaste, J. Puget, H. Vandewalle

Organisation Committee:
Ph. Chiron, R. Darmana, P. Flaud, D. Geiger, Ch. Perot, J. Puget, J.L. Tricoire, M. Zagzoule

Paper Submission Deadline: May 30, 1992

Notification of Acceptance: July 15, 1992

Presentation Modes:
- Oral presentation: 10 min. + 6 min. discussion
- Poster presentation

Final Programme: 31 July 1992

Congress papers will be made available in the Congress Proceedings during the Meeting; they may be retained for publication in a special issue of the Archives Internationales de Physiologie, de Biomchimie et Biophysique.

Participation Costs:

	Before 1 July 1992	After 1 July 1992
SB/ISB members	800 F	900 F
Non-members	1000 F	1100 F
Student	500 F	600 F
Banquet (17 Sep)	300 F	300 F

NB: Principal Language: French

SECOND INTERNATIONAL SYMPOSIUM ON 3-D ANALYSIS OF HUMAN MOVEMENT

A satellite event to the XIVth Congress of the International Society of Biomechanics.

Under the patronage of the ISB.

Time: July 1st - 4th, 1993
Venue: Parc du Futuroscope, Poitiers, FRANCE

The International Symposium of 3-D Analysis of Human Movement will be a scientific and technical forum for investigators of human motion, whether their work is applied to the study of musculo-skeletal disability or disease, sport and elite performance, or basic studies of biomechanics. By generating further communication and contact between investigators in diverse areas, this meeting encourages discussion to cross the boundaries between scientific disciplines and specialities. This Symposium will be directed at sharing information and results relating to philosophies for solving problems of

measurement and analysis, rather than only delivering recent research and study findings.

SCIENTIFIC PROGRAM

The conference is spanned over nearly three days. There will be five keynote speakers in addition to oral presentations to be paired with discussion paper. Additional papers will accepted in the form of poster presentation. A Round Table as well as a Hyde Park Speakers' Corner are also planned.

1. Themes Data Capture: New intrumentations, and specific hardware, accuracy and precision of various reconstruction techniques, interpolation and calibration, lens distortion correction, etc. Joint Motion: Location of markers, relation between external reference markers and joint movements, definition of local and global coordinate systems. Mechanical Models: 3-D kinematic and kinetic/dynamic joint models, finite element techniques, estimation of internal forces, model validation and sensitivity analysis. 3-D Representation: Computer-aided-graphics techniques and animations. 3-D Applications and Interpretations: 3-D variables used in the analysis of human movement and their relation to conventional 2-D parameters.

2. Submission: Those wishing to submit an abstract are asked to fill out the Request Form for an author's kit and fax, mail or E-mail it to the Permanent Secretariat.

TECHNICAL PROGRAM

As a complement to the scientific program, manufacturers of data capture systems will be given time during the meeting to inform the participants about their products. There is a possibility for commercial exhibition if there is a marked interest from the manufacturers. Those wishing to participate in the Technical Program are asked to fill out the Request Form and fax, mail or E-mail it to the Permanent Secretariat.

SOCIAL PROGRAM

There is also a very attractive social program consisting of a welcoming reception on the evening prior to the meeting (July 1st) and a tour of the Cognac region to be followed by a gastronomic dinner in one of the neighboring castles. Throughout the meeting, the participants will have access to the Parc du Futuroscope site featuring amazing cinematographic facilities including IMAX, OMNIMAX, double IMAX, dynamic, 360 degree and 3-D movie theaters to name but a few!

TRAVEL INFORMATION

Poitiers, a town of 83 000 inhabitants, is about 430 km south-west of Paris. It is a 90 minute non-stop ride on the TGV (Train a Grande Vitesse) train, having a cruising speed of 300 km/hr (187 mph)! It can be taken at the Montparnasse train station in Paris. For those driving, there is a direct entry from Autoroute A10. There is a number of hotels on site and a 100 room bloc has been set aside for the Symposium.

REGISTRATION FEE

The fee for the Second International Symposium on 3-D Analysis of Human Movement is 380 US$ prior to May 1st, 1993 and 450 US$ afterwards. The registration fees includes meeting material and all scientific, commercial and social activities. Registration for the Social Program only is 90 US$.

Checks, money orders or bank drafts drawn in US$ (no credit cards) are made payable to the International Symposium on 3-D Analysis of Human Movement and mailed to the Permanent Secretariat.

CANCELLATION POLICY

All cancellations received by June 1st, 1993 will be assessed a 75 US$ non-refundable charge. After this date, there will be NO REFUNDS.

LANGUAGE

The official language of the Symposium is English. Simultaneous translation will not be available.

DEADLINES

Abstract submission:	February 1st, 1993
Notification to the authors:	April 1st, 1993
Selection of discussors:	April 1st, 1993
Submission od discussors' paper:	May 1st, 1993
Early bird registration:	May 1st, 1993

ORGANIZATION COMMITTEE

President	Alain Junqua, FR
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Round Table	Hans Furnee, NL

FOR FURTHER INFORMATION AND AUTHOR'S KIT WRITE TO:

Dr. Paul ALLARD
Permanent Secretariat
International Symposium on 3-D Analysis of Human Movement
Centre de recherche Hopital
Sainte-Justine 3175
Cote Ste-Catherine Montreal
PQ,H3T 1C5 CANADA
Tel: 1 (514) 345 - 4740; Fax: 1 (514) 345 - 4801
E-mail: AISSAOUI@ERE.UMONTREAL.CA

Thesis abstract corner

Adaptation to Change in Surface Compliance in a Drop Jumping Task

by

Ross H. Sanders

School of Physical Education
University of Otago
Dunedin, New Zealand
Degree: Doctor of Philosophy.
Conferring Institution: University of Queensland.

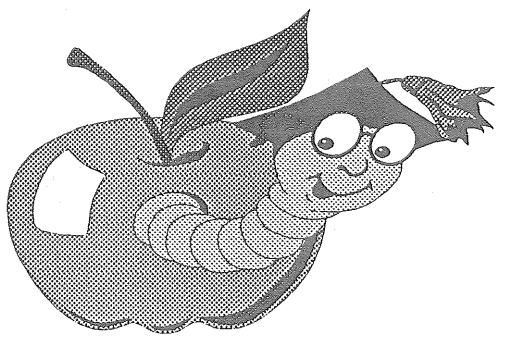
Supervisor: Barry D. Wilson, Ph.D.

This study comprised two parts. The purpose of the first part (Part 1) was to investigate whether the human sensorimotor control system specifies the task of drop jumping (jumping from a height onto a surface and rebounding for maximum height) as a particular pattern of forces, or a particular spatial pattern. It was hypothesised that when subjects performing drop jumps for maximum height transfer from a hard surface to an unfamiliar (sprung) surface there would be evidence of invariance across surfaces in patterns of acceleration of the CG, acceleration of the CG relative to the surface, segmental contributions to CG acceleration relative to the surface, or angular relationships among segments. Six subjects were trained in the drop jumping task for 200 trials over a two week period to ensure that the motor control system had specified a movement pattern for the task of drop jumping. It was anticipated that this organisation would then be applied to the initial trials on the unfamiliar sprung surface and produce invariances in one of the patterns across surfaces. The last five trials on the hard surface and the first five trials on the sprung surface were compared. Accelerations and relative accelerations were compared in real time across surfaces. Then, time and magnitude normalised accelerations (force patterns) and accelerations relative to the surface (acceleration patterns) were compared across surfaces to establish whether adaptation to the unfamiliar surface was achieved merely by altering scaling and phasing parameters to retain established acceleration or relative acceleration topologies. Segmental contributions to acceleration of the CG relative to the surface and the angular relationships among joints were also compared across surfaces.

During the first five trials on the sprung surface there was an adjustment to the unfamiliar task by five of the six subjects manifested by increasing heights attained and a change in the acceleration pattern to one which was more appropriate for jumping from the sprung surface. There was little evidence to suggest that the task was specified in terms of a temporal pattern of external force or in terms of spatial orientation .

The second part (Part 2) investigated the manner in which the same six subjects adjusted to the sprung surface over a series of 190 trials following the 200 trials from the hard surface. It was hypothesised that when subjects skilled in performing drop jumps for maximum height from a hard surface change to a sprung surface they would adopt a pattern of accelerations relative to the surface which approached the optimum pattern and that this change in accelerations relative to the surface would be reflected in systematic changes in the kinetics and kinematics of the jump.

There was considerable improvement in height achieved during the sprung surface trials and for five of the six subjects improvement was still occurring towards the end of the practice period. A gradual change in the angular kinematics away from those of the hard surface was associated with this improvement. In particular, there was a reduction in flexion of the ankle, knee, and hip following first contact. This had the effect of producing a faster loading of the sprung surface and an increase in maximum reaction force. Three trends were observed in the relative acceleration patterns over the practice period: 1) an increase in the loading rate and peak magnitude of the relative acceleration in the period immediately following first contact; 2) a decrease in the magnitude of relative acceleration in the middle of the period of contact; 3) an increase in the relative acceleration during the latter half of the contact period. These trends were reflected in changes in the Fourier spectrum of the relative accelerations and were significantly related to height achieved. Simulations were conducted to determine the pattern of relative acceleration that produces an optimum result within the subject's ability to generate force, and within the available range of motion. A comparison of the spectra of the relative acceleration of the actual jumps and the optimal relative acceleration function indicated that subjects were systematically modifying their pattern of relative accelerations towards this optimum pattern.



Performance Considerations in Optimising the Effectiveness of the Stretch-Shorten Cycle in Human Muscle

by

Gregory J. Wilson

Department of Human Movement
The University of Western Australia
Nedlands, WA 6009, Australia

A thesis presented in the fulfilment of the requirements for the degree of Doctor of Philosophy

Co-Supervisors: A/Prof. Bruce C. Elliott
A/Prof. Graeme A. Wood

Two experiments were conducted to examine a variety of aspects of a stretch shorten cycle (SSC) movement from a performance enhancement perspective. The initial study involved twelve experienced male weight lifters performing a series of bench press movements at 95% of maximum. These lifts included a rebound bench press, which was performed without a delay between the eccentric and concentric components of the lift, a purely concentric bench press, which was performed without an eccentric phase, and two bench press movements performed with various pause periods imposed between the eccentric and concentric phases of the lift. Force, electromyographic and cinematographic data were recorded during these activities. These data were analysed to determine: (1) the performance benefits associated with prior stretch, both when a delay was imposed between the stretch and shorten phases and when no such delay was evident; (2) The eccentric load; (3) The movement frequency of the SSC; and (4) The muscular activity recorded during the lifts. The subjects also performed a series of isometric muscular actions in a position specific to the SSC portion of the rebound bench press lift. A brief force was applied to the bar while these isometric efforts were maintained and from the resulting damped oscillations the stiffness and natural frequency of the musculo-tendinous system were determined.

The dominant experimental findings from study one were: (1) prior stretch resulted in a higher and greater rate of work production over the initial portion of concentric motion as compared to the purely concentric movement; (2) A significant negative linear relationship was observed between maximal musculo-tendinous stiffness and the augmentation to performance derived from prior stretch. Further the five most compliant subjects produced on average significantly more work derived from prior stretch as compared to the five stiffest subjects; (3) Subjects were observed to perform the SSC portion of the rebound bench press lift at a frequency equivalent to the natural frequency of the musculo-tendinous unit; (4) A significant concave downwards quadratic relationship was observed between the eccentric load and prior stretch performance augmentation; (5) A significant negative exponential relationship was observed between the time of pause and prior stretch performance augmentation.

The second experiment was based on the highly significant relationship observed between augmentation to performance derived from prior stretch and musculo-tendinous stiffness. These results indicated that by reducing the stiffness of the musculo-tendinous system rebound bench pressing performance was likely to be enhanced. Consequently a training study was performed using nine experimental and seven control subjects, all of whom were experienced male weight lifters. Both subjects groups maintained their current level of weight training; however, the experimental group additionally participated in two sessions of flexibility training per week for an eight week period.

Pre-training and post-training testing sessions were conducted with the subjects performing a test of static flexibility, a series of isometric actions, a rebound and purely concentric bench press. Data were collected pertaining to the following variables: (1) Static flexibility; (2) Stiffness and natural frequency of the musculo-tendinous system; (3) Performance characteristics of the bench press movements; (4) The movement frequency of the SSC portion of the rebound bench press lift; and (5) The effect of a stretch on the neuromuscular system.

The flexibility training programme had the effect of significantly reducing the maximal musculo-tendinous stiffness of the experimental group by 7.2%. The work produced by the these subjects during the initial portion of the rebound bench press lift increased by 20.1% as a consequence of flexibility training. This statistically significant increase in work produced was only apparent during the initial 250 ms of the concentric phase. The brief increase in work enabled a significantly greater load to be lifted in the rebound bench press lift on the post-training occasion. The training induced improvements in purely concentric bench press performance were of much smaller magnitude than those realised in the rebound bench press lift, while the control groups bench press performances were unaltered between testing occasions. Such observations implied that the rebound bench press performance enhancement observed in consequence to flexibility training was directly caused by a reduction in musculo-tendinous stiffness increasing the utilisation of elastic strain energy during the SSC movement.

Neuromuscular Adaptations Associated with Anterior Cruciate Ligament Deficiency

by

Peter J. McNair

Department of Human Movement
The University of Western Australia
Nedlands, WA 6009, Australia

A thesis presented in the fulfilment of the requirements for the degree of Doctor of Philosophy

Co-Supervisors: A/Prof. Graeme A. Wood
Dr. Robert N. Marshall

While considerable research has been conducted on the anatomical and clinical manifestations associated with anterior cruciate ligament (ACL) deficiency, few studies have examined the neuromuscular mechanisms that may determine an individual's successful return to activity following injury to the ACL. Research of this nature would provide insights into some of the neuromuscular mechanisms controlling the knee joint, and allow a detailed assessment of some of the kinetic and kinematic adaptations which occur as a result of joint instability.

Eighteen subjects with arthroscopically confirmed rupture of the ACL participated in this study. All subjects had grade III pivot shift and Lachman tests and no other clinically determined ligamentous laxity. The functional ability of the subjects was assessed by the Noyes knee rating system. The results showed that ACL deficiency led to a wide range of functional ability levels, with the majority of subjects decreasing their level of sports participation, and being particularly limited in sports that involved pivoting, sudden stops and jumping activities.

A number of strength parameters were investigated in these subjects. A bilateral comparison of the peak torque generated by the quadriceps muscles during isokinetic muscle action at a joint angular velocity of 180 deg/sec was undertaken. The results allowed subjects to be separated into minimal and maximal deficit groups. A frequency analysis of the electromyographic signals of the vasti lateralis obtained during the peak torque tests was then undertaken. The results showed that the median frequency of the ACL deficient limb in the maximal deficit group was significantly ($p < 0.05$) decreased compared to the median frequency of the uninvolved limb and both limbs of the minimal deficit group. These results suggested that type II muscle fibre atrophy had occurred. The frequency analysis of EMG may provide a noninvasive technique for measuring relative fibre atrophy differences between legs.

The ratio of hamstring to quadriceps peak torque and that recorded at 30 degrees flexion during isokinetic muscle work at 180 deg/sec was also investigated. No significant relationship was observed between these ratios and functional ability. These findings indicated that factors other than peak hamstring muscle torque may be important to the level of functional ability attained by anterior cruciate ligament deficient individuals.

The response of subjects' hamstring muscles to a stretching perturbation on an isokinetic dynamometer was fractionated into premotor and motor times. Rate of force development in the 75 ms following the perturbation was also measured. The results showed that the motor time was significantly ($p < 0.05$) correlated with rate of force development ($r = 0.69$) and the functional ability of the subjects ($r = -0.75$). As a major component of motor time is associated with the stretching of series elastic tissue, the results suggested that the elasticity of this tissue may be important to functional ability levels in the ACL deficient subjects.

The hamstring muscles were then modelled as a single degree of freedom mass-spring system with a damping component, and a damped oscillation technique was used to measure their active stiffness. Measurements were obtained at 30, 45 and 60 percent of a maximum voluntary effort (MVE). The results showed that stiffness increased from 314 Nm/rad at 30 percent MVE to 438 Nm/rad at 60 percent MVE in a curvilinear manner. Stiffness values for males were significantly higher ($p < 0.05$) than females at all activation levels and this was thought to reflect differences in the hamstring muscles cross sectional area. A significant correlation ($r = 0.78$, $p < 0.05$) was observed between the hamstrings MVE and body mass, and stiffness values were therefore normalised to this parameter. The results showed that males continued to have stiffer hamstring muscles than females.

The relationship between the hamstring muscles' stiffness and the functional ability level was examined. Positive correlations of 0.71, 0.72 and 0,62 at the three respective muscle loading levels were observed. These findings suggested that the hamstring muscles' stiffness may have an important role to play in the functional ability of subjects with anterior cruciate ligament deficiency.

Subjects also completed a landing task in which they hopped from a box 300 mm in height to land on their ACL deficient limb. In this study, the results of the ACL deficient group were compared to a group of subjects with normal knees. The focus of the study was to examine differences in selected kinetic, kinematic and electromyographic (EMG) variables between the two groups. An examination of how these variables changed over trials was also undertaken.

While no significant differences were observed between the ACL deficient group and the normal knee group, it was apparent that the landing strategies adopted by the subjects reflected the magnitude of their initial ground reaction forces rather than their knee joint condition. In this respect there were significant

differences in the kinematics and EMG of subjects landing with high versus low ground reaction forces. Subjects in the low force group had greater knee flexion angles at footstrike and increased knee displacement following footstrike. No kinematic differences were observed at the ankle joint. However, the mean EMG activity from the lateral hamstrings of the low force group was significantly greater than that of the high force group, and this was thought to be related to the predominance of ACL deficient subjects in the low force group.

Over trials EMG activity from the vasti lateralis and lateral hamstrings decreased, and this was thought to be related to learning processes associated with the maintenance of postural equilibrium and minimising energy expenditure.

It was concluded that the ACL deficient subjects did not take on the same strategy for dealing with their knee condition. It seemed more likely that subjects used a strategy which reflected the current status of their neuromuscular system. It was difficult to discern if those subjects who were coping well with their knee condition did so as a result of adaptations following injury, or that prior to injury they were fortunate to have a neuromuscular system which predisposed them to achieve higher levels of functional ability.

Calendar of scientific events

June 21-24, 1992
Eighth Meeting of the European Society of Biomechanics, in association with the European Society of Biomaterials. Conference Secretariat: ESB92, Istituto di Fisiologia Umana, Università 'La Sapienza', Piazzale Aldo Moro 5, 00185 Rome, Italy. Tel: 39-6-490673; Fax: 39-6-4452824.

June 28-July 2, 1992
9th International Congress of ISEK, Florence, Italy. Contact: CE.S.P.RI, Fondazione Pro Gnocchi, Via Imprunetana 124-50020 Monte Oriolo, Florence, Italy. Tel: 39-055-208322/208426; Fax: 39-055-2084428.

August, 18-21, 1992
3rd International Symposium on Sport Surfaces, University of Calgary, Canada. Conference Office: Faculty of Continuing Education, The University of Calgary, 2500 University Drive N.W., Calgary, Alberta T2N 1N4, Canada. Tel: (403) 220-5051; Fax: (403) 289-7287.

August 24-28, 1992
Second North American Congress on Biomechanics, combining the 16th Annual Meeting of the American Society of Biomechanics (ASB) and the 7th Biennial Conference of the Canadian Society for Biomechanics/Société Canadienne de Biomécanique (CSB/SCB), at the McCormick Center Hotel, Chicago, USA. Conference Co-Chairman: Dr Louis Draganich, Dept. of Surgery, University of Chicago, 5841 South Maryland Avenue, Box 421, Chicago, IL 60637, U.S.A. Tel: +1-312-702-6839.

August 31 - September 5, 1992
12th International Symposium on Biotelemetry, Contact: Secretary-General: Dr. Sandro Fioretti, Department of Electronics and Automatics Faculty of Engineering, University of Ancona Via Brecce Biance (Monte d'Ago) I - 60 131 ANCONA, Italy. Tel: +39(71)2204 843; Fax: +39(71)898 246; E-mail: ISOB@ANVAX2.CINECA.IT (EUnet/Internet) ANVAX2::ISOB (CINECA-DECnet)

September 4-5, 1992
International Conference on Experimental Mechanics: Technology Transfer Between High Tech. Engineering & Biomechanics, University of Limerick, Ireland. Conference Secretariat: BSSM'92, Dept. Mech. Eng., University of Limerick, Plassey Technological Park, Limerick, Ireland. Fax: 353-61-330316 (Ireland, Eire) or e-mail at LittleT@ul.ie

November 2-6, 1992
The Fifth International Conference on Environmental Ergonomics, Maastricht, The Netherlands. Contact: George Havenith/Wouter Lotens, Fifth Int. Conf. on Environmental Ergonomics, TNO-Institute for Perception, P.O.Box 23, 3769 ZG Soesterberg. Tel: +31-3463-56211; Fax: +31-3463-53977 E-mail: fifth-ee@izf.tno.nl

December 2-4, 1992
Seventh International Conference on Biomedical Engineering, National University of Singapore. Secretary: 7th ICBME 1992, Dept. Orthopaedic Surgery, National Hospital, Lower Kent Ridge Road, Singapore 0511. Tel: (65) 772 4424; Fax: (65) 778 0720.

June 14-18
IEA World Conference on Ergonomics of Materials Handling, Warsaw, Poland. Contact: EMH '93 Secretariat, Center for Industrial Ergonomics, University of Louisville, Louisville, KY 40292, USA. Tel: +1 (614) 292-6670; Fax: +1 (614) 292-7852; E-Mail: marras@CCL2.Ohio-state.edu

July 4-8, 1993
XIVth Congress of the International Society of Biomechanics (ISB), Faculté de Médicine Pitié-Salpêtrie, Boulevard de l'Hôpital, Paris 13e, France. Congress Office: Convergences - I.S.B. '93, 120, avenue Gambetta, 75020 Paris, France. Fax: (33-1) 40.31.01.65; Telex: 216911 F.