ISB

International Society of Biomechanics Newsletter

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Editor
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Assistent Editor
Jan CABRI

Experimental Anatomy
Vrije Universiteit Brussel
Laarbeeklaan 103
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TABLE OF CONTENTS

"You should know..."

The IOC Medical Commission's Subcommittee «BIOMECHANIS AND SPORTS PHYSIOLOGY»

decided to organize and coordinate biomechanical research during the 1988 Winter Olympics in Calgary in the sports

— Skijumping (Chair: Komi & Baumann)
— Cross-country Skiing (Chair: Nelson)
— Bobsledding (Chair: Zatsiorsky)
— Speedskating (Chair: van Ingen Schenau)

This project is a continuation of the activities this committee started during the Los Angeles Olympics in 1984. The activities in which research projects are planned are:

Skijumping:
(a) force measurement during take-off;
(b) three-dimensional film analysis of take-off, flight and landing.

Cross-country Skiing:
3 dimensional film analysis of various parts of different races.

Bobsledding:
measurement of entrance and exit speeds for each curve.

Speedskating:
3 dimensional film analysis and instantaneous velocity analysis.

The commission decided to invite researchers who are interested to contribute to these research projects to cooperate. There are two possibilities to be part of the project:
(a) to propose and submit research proposals to be carried out in the framework and boundary conditions of these projects
(b) to take part in data collection and/or data analysis in one of the projects

The number of projects and therefore the number of participants is certainly limited. However, the commission wants to make sure that the best ideas are incorporated in this study and that the best qualified researchers are given the opportunity to be part of this unique possibility.

PROCEDURE

(a) application for projects
Anybody who wants to propose (and later execute) a research project in connection with this Olympic project is invited to submit a project proposal:
— content of a normal projet proposal (goal, methodology, analysis, relevance) with main emphasis on the new idea of the proposed project
— indication about financial support if available. (Note: financial support is not a necessary condition to apply.)
— maximum length 4 pages (single spaced).

(b) application to provide support in data collection and/or analysis
Colleagues who are interested in providing support for data collection and/or analysis in general projects are invited to submit an application including:
— short cv
— description of type of support that could be provided (e.g., film analysis, statistical analysis...)
— type of equipment available for this support (e.g., analysis in your laboratory or at another place...)
— maximum 2 pages total.

(c) deadline and time frame
Applications must be submitted to

Benno M. Nigg, Dr. sc. nat
Biomechanics Laboratory
University of Calgary
2500 University Drive N.W.
Calgary, Alberta, Canada T2N 1N4

not later than December 1, 1986 (post marked). The IOC Medical Commission, Subcommittee "Biomechanics and Sports Physiology" will discuss the applications at its meeting in February 1987 and inform all the applicants about the outcome of this competition. Please keep in mind that only a very limited number of researchers can participate due to limitations of the Olympic organizers.

For further information please contact B.M. Nigg (403) 220-3435 or one of the chairpersons (Nelson, Komi, Baumann, Zatsiorsky, van Ingen Schenau).

29 June - 3 July 1987

under the auspices of the International Society of Biomechanics

Thesis Abstract Corner

THE PENNSYLVANIA STATE UNIVERSITY
THE GRADUATE SCHOOL
COLLEGE OF HEALTH,
PHYSICAL EDUCATION AND RECREATION

THE USE OF INTRA-CORTICAL PINS TO MEASURE THE MOTION OF THE KNEE JOINT DURING WALKING

A Thesis in Physical Education
by
Mario Angelbert Lafortune
(Peter R. Cavanagh, Advisor)

Submitted in Partial Fulfillment
of the Requirements
for the Degree of
Doctor of Philosophy

August 1984

ABSTRACT

The three-dinemsional kinematics of the tibio-femoral and patello-femoral joints were examined during walking. Steinmann traction pins were inserted into the cortices of the femur, the patella and the tibia of five symptom-free subjects. The subjects walked three times with four different types of footwear: barefoot, regular running shoes, running shoes with a 10 degree varus wedge and running shoes with a 10 degree valgus wedge. Each trial was filmed simultaneaously by four high-speed cameras operating at 100 frames per second. Three-dimensional spatial coordinates of the target markers were determined using cinematographical photogrammetry and three-dimensional anatomical coordinates of the target markers were determined using X-ray photogrammetry. The transformation matrices required to express the location of target markers from on frame of reference to another frame of reference were computed using an exact method combined with kinematic vectors.

Six components of motion fot both tibio-femoral joint (TFJ) and patello-femoral joint (PFJ) were determined for the whole duration of the gait cycle when the subjects walked with regular shoes. The spatial orientation of the tibia and femur were also computed during the gait cycle. The angular kinematics of the TFJ and PFJ were resolved into components around the axes of specific joint coordinate systems: two angular components were measured around axes fixed to the bones and one perpendicular to the two bone fixed axes. The translational components of motion were measured along these same axes. The changes of kinematic pattern brought about by the different types of footwear were investigated during the stance phase of the gait cycle with the use of a trend approach.

The results have indicated that intra-cortical pins were a succesful and accurate technique to measure the kinematics of the TFJ, but less succesful to measure the kinematics of the PFJ due to poor pin fixation into the patella. It was found that, in general, the subjects exhibited fairly similar patterns of motion of the TFJ and PFJ during the gait cycle, and that good relationships existed between the linear motions of the tibia with respect to the femur and the flexion-extension of the TFJ. Similar good relationships existed between the angular and linear motions of the PFJ and the flexion-extension of the TFJ. A major finding of this study sugested that the "screw home" mechanism of the TFJ did not take place during the walking gait cycle.

Concerning the different conditions of footwear, the results have indicated that they induced numerous changes in the kinematic patterns of the TFJ and PFJ. Yet, those changes were relatively small considering the radical differences that existed between the footwear conditions and, in general, the linear changes were more important than the angular changes. During the middle part of the stance phase, the valgus shoe condition caused the tibia to rotate internally 3.5 degrees more than the varus shoe condition, while the rotation of the TFJ was similar under both conditions of footwear. The valgus shoe condition also increased the medial tibial shift by 1.5 millimeters during the whole stance phase as compared to the varus shoe condition. However, both shoe conditions led to similar motion of the patella along the medio-lateral axis of the femur. When compared to the other conditions of footwear, the regular shoes limited the contact of the femur to a more constant portion of the tibial plateau in the frontal plane. Finally, the barefoot condition induced less motion of the patella in the sagittal than the other footwear conditions.

In view of the successes obtained in podiatric practice with the use of in-shoe orthotic devices, the present results on the effects of the footwear conditions imply that the knee joints (TFJ and PFJ) are highly sensitive to minor intrinsic derangements caused by the footwear conditions.

The editors would like to encourage scientists in Biomechanics to submit their thesis' Abstracts (Msc. Phd...) for publication in the Newsletter.
Please, forward your abstract typewritten in the following structure:

1. INSTITUTION
2. TITLE OF THE ABSTRACT
3. NAME
4. NAME OF SUPERVISOR
5. DEGREE (Msc., Phd)
6. DATE
7. ABSTRACT

THE PENNSYLVANIA STATE UNIVERSITY
THE GRADUATE SCHOOL
DEPARTMENT OF PHYSICAL EDUCATION

PRESSURE DISTRIBUTION UNDER THE IMPACTING HUMAN FOOT DURING EXPECTED AND UNEXPECTED FALLS

A Thesis in Physical Education
by
Ewald Max Hennig
(Peter R. Cavanagh, Advisor)

Submitted in Partial Fulfillment
of the Requirements
for the Degree of
Doctor of Philosophy
December 1984

ABSTRACT

Pressure distribution under the right foot of 30 male subjects was determined for expected and unexpeted falls from a heigt of 20 cm. A piezoelectric pressure distribution platform with 1000 separate force transducers (resolution 7.6 mm times 7.6 mm) was used for the measurements and an Apple II + microcomputer and a PDP 11/34 minicomputer were used for data collection and evaluation. A megatek graphics computer was employed for the visual representation of the pressure data. The thirty feet were divided into the groups cavus, normal, and planus by means of midfoot area measurements from foot contact imprints. Each group contained ten feet. Foot contact imprints from standing and falling were also analyzed by using linear and area measurements of forefoot, midfoot, and rearfoot. A displacement transducer was employed to determine the height of the foot dorsum and its deflection during load bearing. For regional kinetic analyses all feet were divided into ten anatomical regions: two rearfoot, two midfoot, three metatarsal head, and three toe regions. For the statistical evaluation of all kinetic measures, a two factor Analysis of Variance was used.

Between foot groups, statistically significant differences were found between all midfoot parameters, dorsal arch heigt, and the dorsal arch deflection ratio. The vertical peak force analysis revealed increased values during unexpected falls, however, no differences between foot groups were found. Statistically significant differences between falling conditions were found for the regional peak pressures in five out of ten anatomical regions and for the normalized regional impulse in six out of ten regions. During unexpected falls the rearfoot exhibits the largest loads whereas during the expected falls increased laod bearing was seen in the lateral fore- and midfoot regions. Planus feet showed greatly increased midfoot pressures and reduced loads in the first metatarsal head regions. In the rearfoot and the first metatarsal head regions the cavus feet exhibited higher pressures than the normal and planus feet. The relationships between normalized midfoot impulses and foot descriptor measures were established and good correlations were found between midfoot impulse and some of the foot descriptors.

The analysis of the foot dimensions, peak pressures and regional impulses resulted in findings which help in the understanding of foot function and can be useful for the design of footwear.

THE LOUGHBOROUGH UNIVERSITY
OF TECHNOLOGY (U.K.)

MECHANICAL ENERGY TRANSFORMATIONS AND ENERGY EXPENDITURE IN RUNNING MAN

M.R. Shorten; 1984

ABSTRACT

It has been suggested that the lower oxygen consumption of some running athletes may be caused by differences in "running style".

In an initial study of treadmill running, segmental potential and kinetic energy changes were determined using a three-dimensional fifteen-segment rigid body model of the human body. Energy expenditure was determined by expired air analysis. The more economic running patterns were characterised by variations in total body energy of lower amplitude and greater exchange of energy within and between body segments.

The analytical procedures were developed in several ways. An automated system for the breath by monitoring of respiratory functiona and energy expenditure was developed. Since expired air analysis only enables the direct measurement of the aerobic component of energy expenditure, the validity of a commonly used method for the detection of the "anaerobic threshold" from respiratory responses was investigated. The validity of this indirect method was not supported.

A generalised energy analysis procedure was developed, allowing contraints on passive energy exchange to be varied.

A method for the determination of the elastic compliance of the knee extensor muscles was devised and used to incorporate a strain energy component into the energy analysis. In a further analysis of ten athletes, energy storage in the elastic components of the knee extensors was found to be significant during the support phase of the running stride. The inclusion of the elastic components resulted in a significant reduction of the magnitude of changes in the whole body energy curve even trough the sum of the absolute changes in the partitioned energy components increased.

It was found that there is some correspondance between the magnitude of passive energy transfers and the "economy" of a running style. Also, muscle elasticity appears to act as an energy conserving mechanism during the support phase, reducing both the amount of work and the word-rate required of the extensor muscles. The additional energy transfers due to elastic energy storage may account for the unusually high efficiency values previously reported for running.

PhD Thesis

THE UNIVERSITY OF STRATHCLYDE
DPT. BIOENGINEERING

FURTHER DEVELOPMENT OF AN ELECTROMAGNETIC GONIOMETER FOR MEASURING HAND MOVEMENTS

S.A. Fielden
September 1984

ABSTRACT

Present recording methods for the clinical assessment of hand movement are widely regarded as inadequate. The aim of this project was the further development of an electromagnetic hand goniometer suitable for use in a clinical environment. This type of system will offer the advantages of rapid, accurate, on-line data acquisition and processing.

The system is based on measuring the phase angle between an external rotating magnetic field and a sensor coil. By suitable placement of sensor coils on the hand it is possible to measure the Euler angles of finger segments.

Tests have been performed to assess the feasibility of two methods of system implementation. It has been found that a time division multiplexing system is suitable for this application.

Major apsects of the system have been designed, implemented and calibrated in this project.

M Sc Thesis

A PROSPECTIVE STUDY OF POTENTIAL INJURY FROM BOUNCINE CRADLE

Ruhani Ibrahim
September 1984

ABSTRACT

All available literature on infant and child anthropometry was reviewed. It was found that very few anthropometric studies on children under the age of three existed. There was also a lack of Functional anthropometric measurements. The range of Static measurements generally used in post-natal and paediatric clinics were set out two centuries ago.

Very little information could be obtained on bouncing cradles and although widely marketed there are no standards or regulations governing manufacture or use.

In order to establish a viable programme for the investigation of bouncing cradles and the potential for cild injury, data was sought on movement patterns under near normal conditions of use.

Cinematographic techniques were used to record the movement of the bouncing cradle. Analysis was carried out by digitizing information from successive frames. The results have shown that injury would be most likely to occur if at all, during the first cycle following external forced displacement and release. The effects of repeated and/or asynchronous forced vibration become an important part of the next phase of the work.

Measurement of velocity and acceleration will require the use of special transducers with higher frequency response than the cinecamera. A series of proposals for future study are made.

M Sc Thesis

ESTIMATION OF INTERNAL FORCE ACTIONS IN THE INDEX FINGER FOR A SUSTAINED ISOMETRIC PINCH GRIP TEST

Ian Wilson McGURK

ABSTRACT

There is clinical interest in the possibilities offered by biomechanical analysis, but, at present, methods of collecting positional data require a degree of processing which makes them unsuitable for regular clinical use.

3D digitizer probe systems can offer easy processing of positional dat but require a period of perhaps 20 seconds to place the probe on the required surface points.

This investigation aims to assess likely variation in internal forces in a 20 second period.

A normal pinch activity was selected giving an essentially 2D activity, for which a 2D biomechanical model of the index finger was proposed.

Positional data was collected using a single camera and mirror at 45°. Pinch force was measured with a strain-gauge transducer.

The photogrammetric system gave a worst case, absolute inaccuracy of 2.2 mm. Because of the trend in absolute inaccuracy, relative inaccuracy was much smaller.

The biomechanical model was compared with other index finger studies. With zero collateral ligament forces the model was comparable with that of Weightman and Amis, confirming the need to include collateral ligament forces. Inclusion of dynamic collateral ligemant forces produced internal forces generally significantly higher than those form previous studies. Since previous studies quote calculated ligament forces obtain form equilibrium equations, wheras the present study introduced measured ligament forces, it was considered possible that previous studies had underestimated these forces.

Reaction force variation, around 10 % for proximal interhalangeal and metacarpophalangeal joints, was believed to indicate, tentatively, the feasibility of 3D digitizer probe systems for obtaining positional data. Since this was based on the results of only two subjects, more testing with the present set-up was recommended before making a final decision.

M Sc Thesis

Free Publicity

BIOMLIB
BIOMECHANICS SOFTWARE NEWS

Before introducing our new software products we would like to announce a recent re-organization that has taken place within BIOMLIB: a new BIOMLIB research-center has been established at the University of Vienna, Austria, while the head office of the software producer, now designated BIOMLIB-INTER, has been transferred from Munich, Germany, to Switzerland, CH-8964 Rudolfsetten, Postfach 17. The Munich office has been closed and is therefore no longer functioning.

We feel that this new configuration will enable us to operate even more efficiently than in the past and the same time profit from the close co-operation with a University research institution.

Since there has recently been a case of illegal copying of a BIOMLIB software product, the new organization has now introduced stringent measures which enable BIOMLIB-INTER to unambiguously identify the license holder of an illegal program copy.

Now for our new products and the updates that have been released recently.

The first new product to be introduced is the program MORECO. It constitutes the "missing link" in the sequence of BIOMLIB biomechanics application-software: the two- or three-dimensional object-space reconstruction from optically recorded images (film, opto-electronic devices, etc.) of an observed human motion. The associated USER REFERENCE MANUAL BIOMLIB-TR-83-UM-001 provides details about the efficient use of the program and the fundamentals of recording techniques. A program description is given below.

PROGRAM M O R E C O

SPATIAL OR PLANAR MOTION RECONSTRUCTION FROM RECORDED OPTICAL IMAGES

★ PURPOSE

Two- or three-dimensional object-space reconstruction from recorded optical images (cinematography, opto-electronic devices, etc.) of successive human body configurations or of the configurations of general multi-segment systems such as robots.

★ APLLICATION AREAS

Biomechanics, bioengineering, cinematography, human motion analysis, orthopaedics, rehabilitation, robotics, photogrammetry, ergonomics, sports.

★ DESCRIPTION AND USAGE

The program enables the user to reconstruct, in two- or three-dimensional space and for each frame recorded:

1) the spatial (3D) or planar (2D) OBJECT-SPACE COORDINATES OF ALL THE MARKERS fixed to the segments of the subject

and/or

2) the CONFIGURATIONAL COORDINATES defining the configuration in object-space of the human body or multi-segment object.

CALIBRATION of the complete optical train (recording device, image carrier, projecting device) in 3D or 2D and elimination of all linear and non-linear symmetric and assymetric distortions is automatically performed by the program.

★ COMMUNICATIVE DATA FILE FACILITY

The output file of program MORECO can be used directly as input file for BIOMLIB-programs HOM2D2 (two-dimensional motion analysis) or HOM3D2 (three-dimensional motion analysis). These programs perform a complete kinetic and kinematic analysis of an observed human motion.

★ DOCUMENTATION

The USER REFERENCE MANUAL TR-83-UM-001 associated with program MORECO describes in detail not only the efficient use of the program but also the theory and fundamentals of recording techniques, image digitizing, photogrammetry, calibration of the complete optical train, and the two- and three-dimensional reconstruction of the recorded motion. In addition, the manual provides detailed information on how the calibration recordings are to be made during the recording session.

With this new program, BIOMLIB now offers a complete of INTEGRATED PROGRAM SYSTEMS (IPS) for two- or three-dimensional human motion analysis of a 17-segment body model:

Program ANSEPA is used for the accurate determination of the body segment parameters from anthropometric measurements;

Program MORECO performs automatic calibration and object-space reconstruction of an opto-electronically or cinematographically recorded motion;

An improved and updated version of program DADIF1 performs all data filtering and the computation of optimally filtered first (velocities) and second (accelarations) time derivatives of noisy experimental data sequences by automatically selecting the optimal cutoff frenquency for each derivative;

Program HOM3D2 is used for the 3D-analysis of the observed spatial motion by computing all kinetic and kinematic motion characteristics (all joint torques, the compressive and shear forces in all body joints, segmental and total angular and linear momenta, mechanical energies and powers, and the position and velocity of the body center of mass) for each point in time of the observed motion;

Programs HOM2D2 (permitting the input of noisy raw data) and HOM2D1 (permitting only the input of previousli smoothed data and derivatives) are used for the 2D-analysis of an observed planar motion by computing the same kinetic and kinematic motion characteristics as program HOM3D2;

Finally, program MOVAR permits the computation of a quantitative measure of the variability of repeated steretyped motions such as walking, running, swimming, jumping, etc.

The interconnection between these programs is illustrated schematically in the diagram depicted below.

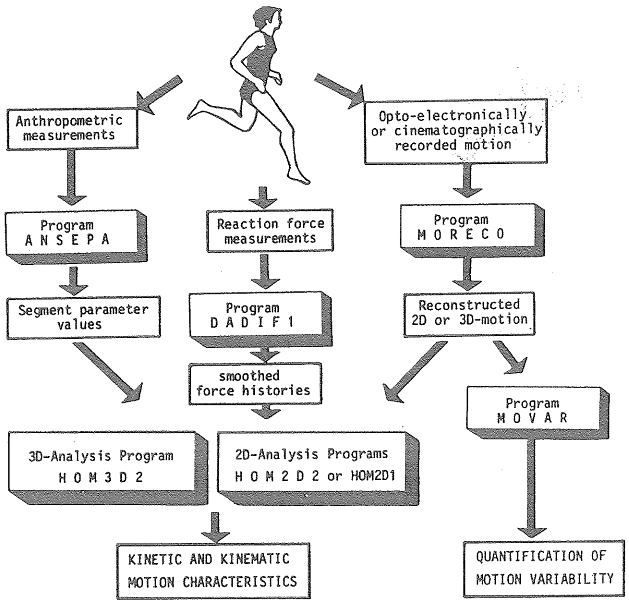
Owing to the new COMMUNICATIVE DATA FILE FACILITY, the output files of all BIOMLIB programs are now designed such that they can be used directly as input files for the subsequent programs.

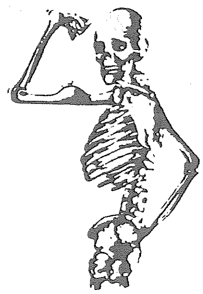
Furthermore, all BIOMLIB programs have recently been updated and further improved. The new version of program ANSEPA, for instance, now permits the user to selectively compute the body segment parameters (mass, volume, the three principal moments of inertia, the three coordinates of the segmental mass centroid, etc.) for any one of the 17 segments separately, if so required.

Detailed information on BIOMLIB biomechanics software can be obtained from

Research Center
Biomechanics, IfS
Dr. H. Hatze
Auf der Schmelz 6
A-1150 Wien, AUSTRIA

Finally, some research news from the University of Vienna. Comparisons between the kinetic and kinematic gait characteristics obtained by using a 17-segment human body model and those obtained with a fixed-torso 7-segment model (consisting of thighs, legs, feet, and a fixed trunk) revealed that the simple 7-segment model introduced errors of up to 62 % into the analysis results. This appears to indicate that the swinging arms exert a strong compensatory influence on human locomotion and that this fact has to be taken into account in gait analysis.





THE VOLVO AWARDS FOR LOW BACK PAIN RESEARCH 1987

In order to encourage research in low back pain, the Volvo Company of Göteborg, Sweden, also this year has sponsored three prizes, now increased to US$ 7.000 each. Awards will be made competitively on the basis of scientific merit in the following three areas:

1. Clinical studies
2. Bioengineering studies
3. Studies in other basic science areas

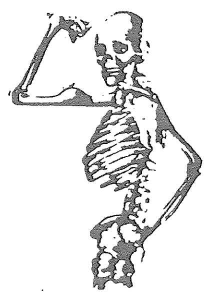
Paper submitted for the contest must contain original material, not previously published or submitted for publication. A multiple authorship is acceptable. The manuscripts should be in the form of a complete report, including original illustration, not exceeding 30 typewritten pages, double-spaced, and in a form suitable for submission to a scientific journal. Five copies of each paper submitted in full should **reach the address given below not later than December 15, 1986.**

One of the authors should be prepared, at his own expenses, to come to Rome, Italy, at the time of the meeting of the International Society for the Study of the Lumbar Spine, May 24-28, 1987, to present the paper and to receive the award.

A board of referees will be chaired by the undersigned and will contain members from the fields of clinical medicine, bioengineering, and biochemistry.

Please direct all correspondece to:

Professor Alf L. Nachemson
Department of Orthopaedic Surgery
Sahlgren Hospital
S-413 45 Göteborg
Sweden



Position Vacancy Membership news

ANTICIPATED POSITION VACANCY*

TITLE:
Associate Professor of Locomotion Studies to be situated in the Center for Locomotion Studies (CELOS): at the Pennsylvania State University (USA).

EMPHASIS:
The biomechanics of the human locomotor system with interest in both clinical application and theoretical aspects.

QUALIFICATIONS:
Ph. D. in an appropriate field such as Biomechanics, Mechanical Engineering, or Bioengineering. Post doctoral research experience and at least 5 years experience of teaching, research and clinical involvement in an area directly related to locomotion studies. A proven record of external grant support and publications in refereed journals is essential.

EXPECTATIONS:
The succesful candidate will participate in the ongoing research, clinical service, and education programs of the Center for Locomotion Studies including the supervision of graduate students. The candidate will be expected to support the activities of the center by securing extramural funds and to participate in interdisciplinary research projects.

APLLICATION PROCEDURE:
Each applicant is requested to submit the following:
1) Current curriculum vitae
2) Listing of past and present grant and contract support
3) Listing of course taught
4) Statement of research goals
5) Name and addresses of three people who can provide letters of reference
6) Transcripts

DATE POSITION IS AVAILABLE:
Screening of applications will begin May 5, 1986; the search will continue until a suitable candidate is found.

ANNUAL SALARY:
Commensurate with experience and qualifications.

CORRESPONDENCE TO:
Herberta M. Lundegren
Chairperson of Locomotion Studies Search Committee
276 Recreation Building
The Pennsylvania State University
University Park, PA 16802,
USA

*Pending budget authorization.

ISB NEW MEMBER LIST:

TAUBER, CARLOLYN A. — n° 916
2100 Linwood Avenue
Fort Lee, New Jersey 07024
USA

MCCOY, RAYMOND W. — n° 917
11606 GORHAM AVE. n° 6
Los Angeles, CA. 90040
USA

MCCLAY, IRENE S. — n° 918
200 Biomechanics Lab
Penn State University
University Park, PA 16802
USA

ARBORELIUS, ULF P. — n° 919
Dept. Anatomy,
Karolinska Institut
P.O. Box 60 400
S-104 01 Stockholm
SWEDEN

GARHAMMER, JOHN — n° 920
California State University at Long Beach
Dept. of Physical Education
1250 Bellflower Blvd.
Long Beach, CA 9084
USA

VESTERDAL, STEINAR — n° 921
Meieritunet
2830 Raufoss
Norway

TAKEI, YOSHIAKI — n° 922
3N 658 Kenwood
West Chicago, IL 60185
USA

ISB MEMBERS - CHANGE OF ADDRESS:

ISHIKO, TOSHIHIRO — n° 149
Chikyo University
Toyota City 470-03
JAPAN

HERZOG, WALTER — n° 812
L103 - 1919 University Dr., N.W.
Calgary, Alberta, CANADA
T2N 4L4

CURTAYNE, ANTHONY N. — n° 369
334 Lower Plateau RD.,
Bilgoal Plateau, N.S.W. 2107
AUSTRALIA

BALSEVICH, VADIM K. — n° 542
State Central Inst. Phys. Cult.
(GCOLIFI)
Problem Labarotory
Sirenevuy Bulvar 4
Moscow 105483
USSR

WINKEL, JORGEN n° 401
National Board of Occupational Safety and Health
Research Dept., Unit of Work Physiology
S-171 84 Solna
SWEDEN

LAFORTUNE, MARIO n° 638
Australian Institute of Sport
P.O. Box 176
A.C.T. 2616 Beclonnen
AUSTRALIA

WYSS, URS P. n° 98
Sulzer Brothers Ldt.
8401 Winterthur
SWITSERLAND

BOSCO, CARMELO n° 432
Sculora Naz Di Athletica Leggera
Via Appia No 175
04023 Formia (LT)
ITALY

RAU, GUENTER n° 273
Helmholtz-Institute für Biomedizinische technik
an der RWTH Aachen
Pauwelsstrasse
D-5100 Aachen
BRD

DAINTY, DAVID A. n° 67
Canadian Memorial Chiropractic College
1900 Bayview Avenue
Toronto, Ontario, CANADA
M4G 3E6

MARSHALL, R.N. n° 478
Faculty of Physical Education
University of Otago
Dunedin
NEW ZEALAND

BURBAKER, CLIFFORD E. n° 498
1732 Old Forge Road
Charlottesville, VA 22901
USA

CLARKE, DR. THOMAS E. n° 695
Nike
9000 SW Nimbus Ave.
Beavertown, OR 97005
USA

SATERN, MIRIAM N. n° 796
219 D Village Lane
Creensboro, NC 27409
USA

BRUGGEMAN, PETER n° 777
Deutsche Sporthochschüle Köln
Institut für Leichtathletik und Turnen
Carl-Diem-Weg 6
5000 Köln 41
WEST GERMANY

HENNIG, EWALD n° 452
Hornwiesenstr. 11
7750 Konstanz 18
BRD - WEST GERMANY

WHITE, SCOTT C. n° 823
Dept. of Physical Education and Dance
University of Wisconsin
1050 University Avenue
Madison, WI 53706
USA

CHOW, JOHN W. n° 810
Flat B2, 12/F
Fok on Building
90-98 Ma Tau Chung RD.
Tokwawan, Kowloon
HONG KONG

FRAZER, MARDY B. n° 857
Ability Assessment Ctr.
Dept. of Orth. & Rehab.
Vanderbilt Univ. Med. Ctr.
1161 21st Ave. S.
Nashville, TN 37232
USA

BJORKSTEN, MARIANNE T. n° 820
VASAVAGEN 13,
S-58220
Linkoping
SWEDEN

STEWART, DOUGLAS J. n° 813
Director of Research
Reebok International Ltd.
40 Norfolk Avenue
Easton, MA 02374
USA

LEVEAU, BARNEY F. n° 197
247 Valley View Trail
Lewisville, TX 75067
USA

RODGERS, MARY M. n° 715
208-C Morgan Drive
Morgantown, WV 26505
USA

ABDEL-MOTY EL-SAYAD M. n° 839
14159 SW 107 Terr.
Miami, FL 33186
USA

TERRAUDS, JURIS n° 322
Research Center for Sports
1234 Luneta Drive
Del Mar, CA 92014
USA

MCGILL, STUART M. n° 866
RR 2
Elora, Ontario, CANADA
NOB 1SO

ATWATER, ANNE E. n° 19
University of Arizona
Dept. of Exercise and Sport Sciences
McKale Center, RM 228
Tucson, AZ 85721
USA

SHORTEN, MARTYN R. n° 753
Nike Sports Research Lab
9000 S. W. Nimbus Drive
Beavertown, OR 97005
USA

Calender of scientific events

1986

August 22 - 26, 1986
Heidelberg, FRG, AIESEP World Convention "The Physical Education Teacher and Coach today"
(c/o Prof. H. Rieder, Inst. f. Sport und Sportwissenschaft, Im Neuenheimer Feld 710, 69 Heidelberg, FRG)

August 25-26-27, 1986
Montréal, Québec, Canada. Le grant Hôtel. "Nort American Congress on Biomechanics".

September 1-5, 1986
Wingate, Israel, "Outdour Education & Recreation: Sport & Tourism", Seminar. (c/o Wingate Inst. of Phys. Educ. & Sport, Wingate Post Office, Israel)

September 5 - 6, 1986
Mons, Belgium. Université de Mons Hainaut. 11ème Congres Société de Biomécanique.

September 8 - 10, 1986
Berlin (West), Germany, Fifth Meeting of the European Society of Biomechanics.

September 15 - 17, 1986
Istituto Rizzoli - Bologna, Italy, European Conference on Biomaterials.

September 16-18, 1986
Seoul, Korea, 1986 Asian Games Scientific Congress. Theme: "Better Life through Sports". (c/o Dr. Keung Seh-Lee, Director, Org. Comm. of the 1988 Olympic Scientific Congress, Korea Sports Sc. Inst., C.P.O. Box, 1106 Seoul, Korea).

September 22 - 26, 1986
Brisbane, Australia, XXIIIrd FIMS World Congress of Sports Medicine
(c/o Organizing Committee, XXIII FIMS World Congress, P.O. Box 439, Fortitude Valley, Queensland, 4064, Australia)

October 3-6, 1986
Athens, Greece, "Third Intern. Course on Physiological Cemistry of Exercise and Training" (c/o Dr. J. Poortmans, ULB, ISEPK, Chimie Physiologique, 28 Av. Paul Héger, B-1050 Bruxelles, Belgique).

October 13-15, 1986
Bordeaux, France. "Biomat 86" University of Bordeaux II. Blood-Materials Interactions, Call for papers.

October 31 - November 3, 1986
Nice, France. 3ème Symposium Internation de Biologie de l'Excercie et de l'Entraînement Physique. Hôtel PLAZA, Nice.

November 24-27, 1986
Université Libre de Bruxelles, Brussels, "Adapted physical activity for disabled persons".

1987

January 29 - 31, 1987
113 Memorial Gymnasium, Virginia Tech Blacksburg, VA 24061, USA. Southeast Region Annual Meeting American College of Sports Medicine Charleston, SC. Contact: Ronald Bos.

April 13 - 17, 1987
Albert Dock, Liverpool - England. First World Congress of Science and Football.

June 26 - 18, 1987
Warsaw, Poland. Ist International Symposium on computer simulation in Biomechanics.

June 29 - July 3, 1987
Xth International Congress of Biomechanics, Vrije Universiteit Amsterdam, Amsterdam, the Netherlands.

July 6 - 10, 1987
International Seminar on Archevy, Vrije Universiteit Brussel - Experimental Anatomy; Under the auspices of Olympic Solidarity and Workinggroup Biomechanics of Sport (ISB-ICSSPE), Brussels, Information: Prof. Dr. J.P. Clarys, Belgium

September 28 - October 2, 1987
Athens, Greece, "Int. Seminar on Ergometry" (c/o Prof. Dr. V. Klissouras, Univ. of Ahtnes, Dept. of Phys. Educ. & Sport Science, 41 Olgas Street, Dafne 17237, Athens, Greece)

1988

September 11-15, 1988
Seoul, Korea, "1988 Olypic Scientific Congress" Theme: "Human Movement Science Toward 2000" (c/o Dr.Keung Seh-Lee, Director, Org. Comm. of the 1988 Olympic Scientific Congress, Korea Sports Science Inst., C.P.O. Box, 1106 Seoul, Korea).

ISB

CALL FOR PAPERS

1987 BIOMECHANICS SYMPOSIUM

Hyatt Regency Hotel
Cincinnati, Ohio
June 14-17, 1987

The 1987 Biomechanics Symposium is sponsored jointly by the Applied Mechanics, Bioengineering and Fluids Engineering Division of the American Society of Mechanical Engineers and by the International and European Societies of Biomechanics. This call is to request papers in all areas of mechanics which relate to biological phenomena and/or medical applications.

Featured at the conference will be general biomechanics sessions and two forums. The first forum, *Microstructure Related to Tissue Mechanics and Function*, will examine, in separate sessions, cartilage, ligament and tendon, bone, skin, muscle, blood vessels and organs. Each session will begin with a keynote speaker who will review tissue microstructure. This will be followed by presentations of experimental and analytical studies. Special emphasis will be placed on papers which correlate microstructure and the mechanical and functional properties for each tissue. The second forum, *Biomechanics of Locomotion and Motor Control*, will concentrate on descriptions of joint and sense organ motions and their neuromotor control.

The sectional lecturer for the Symposium will be Seymour Glagov, M.D., Professor of Pathology, University of Chicago. He will discuss the functional microarchitecture of the artery wall.

Papers are to be prepared on special mats and are limited to four pages maximum. Text must be greater than one page and is typically two pages. Accepted papers will be published in either the symposium or forum volumes which will be available at the meeting.

DEADLINES

Submission of Typed Mats	December 12, 1986
Notification of Authors	March 4, 1987

BLANK MATS AND TYPING INSTRUCTIONS MUST BE OBTAINED FROM DAVID BUTLER, PH.D. AT THE ADDRESS GIVEN BELOW. COMPLETED ABSTRACTS MUST ALSO BE RETURNED ONLY TO DR. BUTLER.

Forum on Microstructure Related to Tissue Mechanics and Function

Dr. Jack Lewis
Dept. of Orthopaedic Surgery
University of Minnesota
Mayo Memorial Building,
420 Delaware S.E.
Minneapolis, Minnesota 55455
(612) 373-8452

Dr. Roger Haut
Biomedical Sciences Department
General Motors Research Labs
Technical Center
Warren, Michigan 48090
(313) 575-3461

Forum on Biomechanics of Locomotion and Motor Control

Dr. Peter Cavanagh
Biomechanics Laboratory
College of Health & Physical Education
Penn State University
University Park, PA 16802
(814) 865-3445

Dr. Michael Manley
Dept. of Musculoskeletal Research
Cleveland Clinic Foundation
9500 Euclid Avenue
Cleveland, Ohio 44106
(216) 444-5857

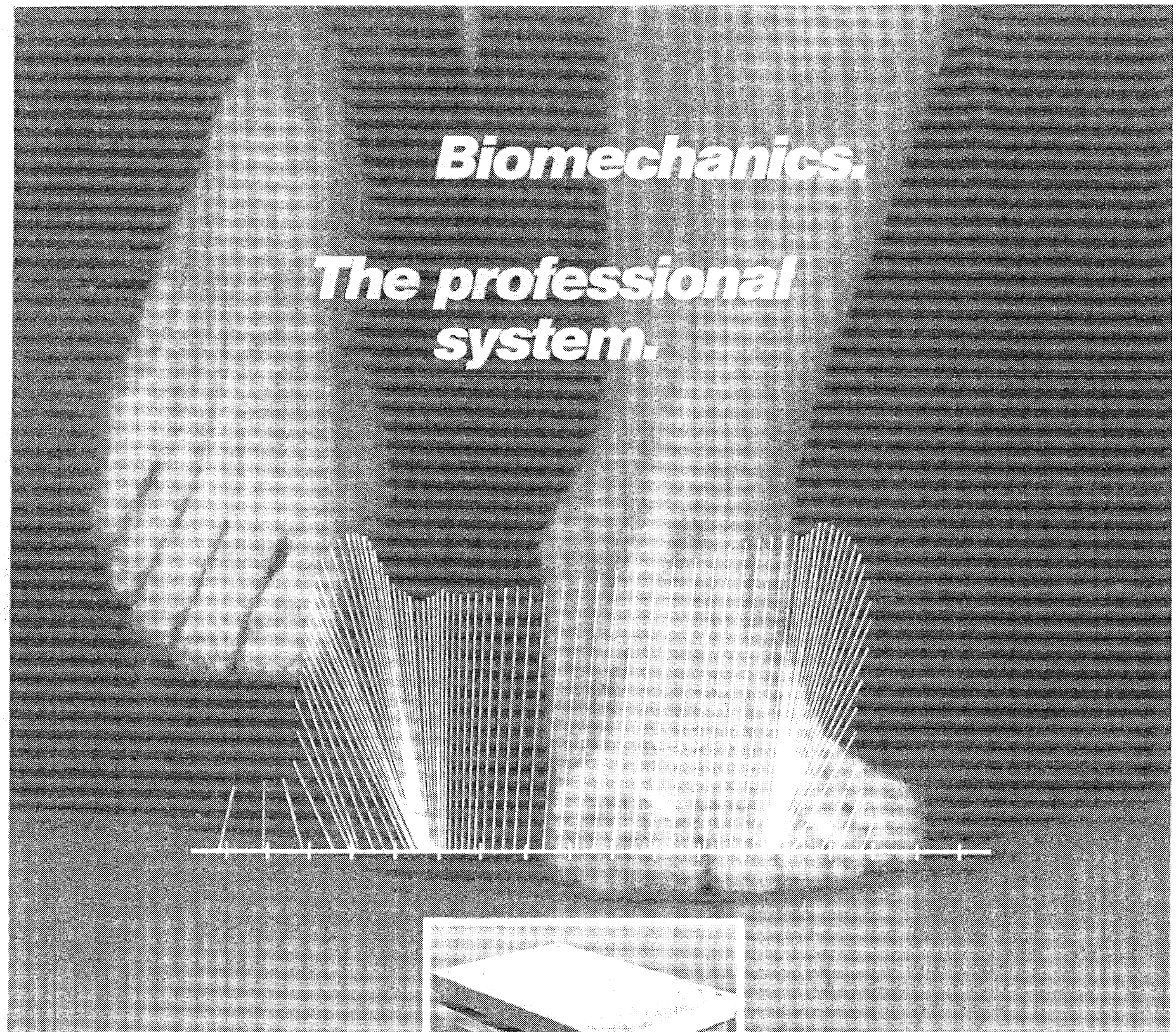
Dr. Albert Schultz
Dept. of Mechanical Eng. & Applied Mechanics
University of Michigan
Ann Arbor, Michigan 48109
(313) 764-3728

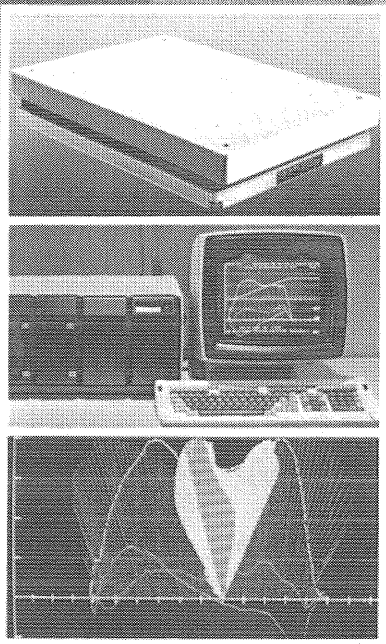
Biomechanics Symposium

Dr. David Butler
Dept. of Aero. Engr. & Engr. Mech.
University of Cincinnati
Cincinnati, Ohio 45221-070
(513) 475-3548 or 872-4171

Dr. Peter Torzilli
Dept. of Biomechanics
Hospital for Special Surgery
535 East 70th Street
New York, New York 10021
(212) 606-1424

Dr. Morton Friedman
Applied Physics Laboratory
Johns Hopkins University
Laurel, Maryland 20707
(301) 953-5259





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