International Society of Biomechanics Newsletter

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Editorial

MESSAGE FROM THE PRESIDENT

Attempting to compose a new president's first message to the distinguished membership, past counsellors and past presidents of the ISB is a humbling experience. Our Society is now more than 650 members strong from about 35 countries. It is, indeed, a challenge to uphold the confidence of the membership expressed in electing me to this office. It is also a challenge to continue, in the tradition of all of the previous presidents, to assist the membership of the Society to advance the science of biomechanics and to improve its contribution to the solution of important societal problems. However, my task is made considerably easier than it might have been because of the strength of your Council and the sound position in which John Paul has left the ISB.

The major activity and primary, but not sole, purpose of the ISB is to make sure that a forum for communication is made available to biomechanists throughout the world in the form of our biennial Congresses. The UCLA Congress, the 12th congress of the Society, is now over. More than 500 biomechanists participated, the largest that the Society has seen since its inception in 1973.

The primary purpose of the International Society of Biomechanics is to promote and stimulate the development of all areas of biomechanics at the international level. I am sure that we would all agree that there has been a dramatic improvement, in general, in the quality of biomechanics research over the past 16 years published in journals and presented at our Congresses. This improvement has occurred partly because of advances in technology but mostly from improvements in communication with each other in the journals, at the congresses and in various other ways.

Unquestionably, biomechanics has come a long way. But there is still much work to do to advance our basic understanding of the effects and control of forces which act on and are produced by living things. There is an equally great challenge for us to effectively apply our basic science to contribute to the solution of problems in areas such as rehabilitation, orthopaedics, industry, gerontology, and sport and exercise so that people can regain, maintain or improve their quality of life. If progress is to be made you, the members of ISB, will be making it. And you will do it by means of frequent, friendly but constructively critical interaction.

I am confident for our Society and for the science of biomechanics that this interaction and consequent continued scientific advancement will occur because the Congress participants very productively communicated at UCLA, in my observation. I congratulate all participants of the Congress for your contribution whether presenting or co-authoring a paper or exclusively by participating in scientific discussion during or outside of the formal sessions.

I particularly congratulate our ISB members and other Congress participants whose first language is not English. It is extremely difficult and takes a great deal of courage and extra effort to present ones work in a language in which one is not confident.

The quality of our scientific and social experiences at our Congresses is entirely in our own hands once the Congress is open. Participants at UCLA succeeded in maximizing both of these. Some concentrated more on the scientific than on the social. Some demonstrated particular and highly developed expertise in the social component. Both are important.

The organizers of the Congress, Bob Gregor, Ron Zernicke and Bill Whiting and all of their assistants, provided the atmosphere, the framework and the time to facilitate our interaction and communication on the beautiful UCLA campus. None of us could have asked for more than they provided and a toast to the organizers is in order for their commitment to our Society and for a superb congress. We would be remiss if we did not also acknowledge the university administrati and specifically, Dr. Reggie Eggerton, Chairman of the UCLA Department of Kinesiology, for making his faculty members' time available to the Society for many weeks while they organized the Congress.

The sad thing about the closing of each of our Congresses is that the camaraderie and the communication is diluted because of distance. The happy thing is that we can all immediately look forward to meeting each other again and measuring our scientific advances in two and a half years in Perth, Australia. Start planning to attend now and bring your best work.

In the intervening time I wish you all well and continued advancements in your research.

Bob Norman

Important notice

Some of you may have seen an announcement of the VIIIth International Symposium of Biomechanics in Sports to be held in Prague, Czechoslovakia. One version of that announcement indicates that the International Society of Biomechanics is a sponsoring organization. This is not the case. The ISB has nothing to do with the organization of that Congress. A letter has been sent to the Congress organizers and to a past president of the ISBS requesting that they correct the error. A new copy of the announcement has been issued containing the correction. It is not known how widely distributed the erroneous announcement was.

R. Norman, President

ISB news

MINUTES OF MEETING OF GENERAL ASSEMBLY OF THE ISB 28TH JUNE 1989 IN LOS ANGELES

John Paul, Chairman

1. The President reported apologies for absence from Dr Schneider and Professor Clarys.
2. The meeting approved the Agenda.
3. The Minutes of the meeting of the Congress on 1st July 1987 were considered and approved.
4. There are no matters arising from the Minutes that were not already on the Agenda.
5. The President's report indicated that the Secretary of the Council had met on 1st July 1987, on 9th and 10th September 1988 and 24th and 25th July 1989. There have been long agendas in each case.

Successful results of the XI Conference at Amsterdam were noted. The good arrangements for the current XII Congress in Los Angeles were complimented. The Council was happy with the arrangements made by Wood for the XIII Conference in Perth, Australia in 1991 and Members will shortly be receiving a call for bids to host the XIV Congress in 1993.

Consideration was being given to giving financial support to a meeting on the Biomechanics of Swimming to be held in Liverpool in 1990.

A working group of the Council had prepared an operating code for Sub-Committees of the Council, particularly relating to working groups and other sections. This would involve an alteration to the Constitution and the papers for this would be circulated with the newsletter in due course.

Another paper had been prepared clarifying the position of Hon. Members and proposing the institution of an emeritus 'category' of membership.

The Council was concerned to develop the image of the Society and they looked back on the introduction of a new investigator award, a travel award for young researchers and the Muybridge medal. The register of Members would be made much more informative by a record of members interests prepared for the Council by Dr Grieve. The Council would be happy to consider new projects put to them by any Members of the Society.

Members will be aware that the status of the Society was enhanced by the opportunity to suscribe to one or another professional journal at a reduced rate. The organisation of this has been a matter of some weight at the Council meetings but there was much happiness that this system was now settling down.

Thanks are due Professor Rik Huiskes for his services as Secretary General and there was regret that the pressure of other business prevented his remaining in that post.

Particular thanks were due to Dr Morehouse on the occasion of his resignation from the post of Treasurer. The assembly gave particularly warm tribute to Dr Morehouse in the light of his known substantial contribution to the workings of the Society over many years.

Mention was made of the World Congress of Biomechanics and the Council's decision that they recommended ISB Members to support this meeting in a personal capacity and thereby enhance the reputation of the Society by their active participation.

In the normal rotation of Council Members, Wood, Grieve and Huiskes step down at this time and tribute was paid to their contribution to Society's business.

The increasingly high standard of the newsletter was viewed as a consequence of the sustained effort put into it by Clarys and Cabri and members expressed their appreciation of this.

Treasurer's Report

The Treasurer showed the Balance Sheet for the past two years and his draft budget for the next two. Mention was made of the requirement to have capital in hand for unforeseen eventualities.

Subscriptions

The President outlined the financial situation and reminded Members that the present level of subscription had been $ 15 since 1981. A straw poll was conducted on whether this should be increased by $ 5 or $ 10 and the meeting was clearly in favour of the latter number. When this proposal was made there was no move for amendment and the increase of $ 10 was declared to be carried unanimously.

Membership Report

Morehouse indicated that the membership appeared now to be on a plateau at its present figure of 665 with the resignations and discontinued membership approximately matching the numbers of new recruits. Paul stated that Council proposed to have a recruiting campaign since they were of the opinion that there was a large number of people engaged in relevant biomechanics activities who could draw up membership of the Society. Members were asked to assist by utilising recruitment material to be circulated in the newsletter.

The Council

The Council proposed Affiliate Membership for the Biomechanics Section of the British Association for Sports Science and for the Polish Society of Biomechanics. These proposals were approved unanimously.

Working Group on Computer Simulation

Hubbard reported on the success of the pre-conference meeting at Davis and he hoped to be able to organize a similar meeting in conjunction with the XII Perth Congress. Congratulations were expressed to the organisers of this working group.

Election Results

Hay reported that 270 mailed ballots had been received corresponding to 41% of the total membership. Cappozzo was successful in the election for the position of President elect.

The following Members of the Executive Council were re-elected for a further two year period, Cavanagh, Komor, Schneider, Rozendal, Chaffin.

The following new members were elected:

Gagnon (Montreal), Zernicki (Los Angeles), Zatziorsky (Moscow), Kumamoto (Kyoto), Stein (Alberta).

The spread of nationality and professional interest of the new Council would be held at 06.30 on 29.06.89 in the University of California.

The meeting then adjourned.

Letter to the Editor

1 August 1989

Dear Member of ISB:

I am writing this letter as president of the International Society of Electrophysiological Kinesiology (ISEK). I would like to extend an invitation to you to attend the 8th International Congress, to be held in Baltimore, Maryland, U.S.A., on August 12-16. You will already have received a first announcement in the mail. The forthcoming Congress will celebrate ISEK's 25th Anniversary.

There are good reasons for ISB members to participate in ISEK's Congress. Members of ISB and ISEK share many common research interests. Kinesiology, biomechanics and electromyography are deeply interwoven as companion endeavors in the study and understanding of human notion. The two societies share a common history. They both took shape in the sixties, and both provided a rallying point and focus for researchers dealing with issues that related to the performance and well-being of the human neuro-musculoskeletal system. They both have dealt with, and continue to deal with, issues that concern human physical performance.

I know that many of you use surface electromyography to further your biomechanical studies. We in ISEK also use surface electromyography to understand the function and usage of muscles. Many of our members have asked for a one-day course for the specific purpose of updating them on the numerous developments which have transformed both the use and the usefulness of surface electromyography. My colleagues and I are planning to give such a course just prior to the Congress. I expect to review these new developments and methods and to discuss the physiological and biomechanical corellates of the surface EMG signal. You will receive further notice as plans materialize.

In the past two decades our memberships have been as cousins; at times distant cousins. Now I propose that we discover our brotherhood and come together to celebrate our common purpose.

With warm regards, and in anticipation of seeing you in Baltimore in August 1990, I remain,

Sincerely yours,

Carlo J. DeLuca
President, ISEK

You should know...

POSITION OPEN

A full-time research position as Assistant/Associate Professor and Director of the Bone Mechanics Section is available. Responsibilities include the development of an aggressive funded research program in the areas of bone and spine mechanics, joint replacement, mechanical testing and training of orthopaedic residents and graduate students.

A Ph.D. in mechanical or biomedical engineering and background in the above areas are required as well as demonstrated research talent.

Interested individuals should mail their complete curriculum vitae and names of three references to:

Prof. M. Solomonov, Bioengineering Unit
Department of Orthopaedic Surgery
Louisiana State University
New Orleans, Louisiana 70112

HUMAN KINETICS

Movement Science

The Faculty of Human Kinetics invites applications for a tenure track position at the level of Assistant Professor. The successful candidate will be required to teach one or more of the following: Statistics and Research Design, Exercise Physiology, Biomechanics, Motor Learning. Applicants should have a Ph.D., teaching experience and a definite research plan with current direction and focus along with potential for external funding. The position is available starting July 1, 1990. The salary will be competitive depending on qualifications.

In accordance with Canadian Immigration requirements, this advertisement is directed to Canadian citizens and permanent residents of Canada. The Department is committed to appointing a female to this tenure track position. If a suitable candidate is not found, all applicants will be considered for a one year, limited term appointment. The consideration of applications begins on February 1, 1990. Interested applicants should send their curriculum vitae and three academic letters of reference to:

Dr. G. Wayne Marino
Head, Department of Kinesiology
University of Windsor
Windsor, Ontario N9B 3P4

Phone: (519) 253-4232 Ext. 5089
Fax: (519) 973-7058

'La Société de Biomécanique'

The Société Biomécanique has been founded in '76 by a group of eleven scientists (A. Berthoz, S. Bouisset, R. comolet, L. Delhez, J. Leroy, L. Lewillie, A. Liegeois, S. Metral, E. Michaut, P. Rabishong, J. Vertut) representatives of the diverse disciplinary fields. Then the founding members invited about fourty colleagues to join the new society, as active members.

The Société is born from the necessity of scientific exchanges between researchers, having diverse background and professional activities, but sharing a common interest for a mechanical approach to biological phenomenons, in particular to movements in humans. It is original, at the international level, in as much as it covers the entire field of Biomechanics, including Muscle and body movements, Bones and Joints, Circulation, Respiration, etc...

The membership of the Société de Biomécanique is presently about 200. The Society organizes an annual congress which is held usualy in September in France or in a french speaking country (Belgium, Switserland,...) as well as specialized meetings. The abstracts are published by an international journal (Archives internationales de Physiologie) and a Newsletter is edited. The Société de Biomécanique is an I.S.B. collective member.

The 14th Congress has been held in Marseille (France), on the invitation of Professor R. Pelissier.

S. Bouisset
President of the Société de Biomécanique

Note from the editors: the first president of 'La Société de Biomécanique' was Leon Lewillie (1976-1980), followed by Simon Bouisset (1981-1982), S. Metral (1983); Cl. Bortolussi (1984-1985); J.P. Renaudeaux (1986) and again Simon Bouisset since 1987.

VIBRATION ANALYSIS OF FEMUR AND TIBIA

R. Willinger-F. Bouslama-D. Cesari

INRETS LCB case 24 69675 (France)
ENSAIS, 24 Bd Victoire Strasbourg (France)

In the research field of car occupant and pedestrian protection, we need to establish the flexion tolerance of the lower leg bones. In order to calculate the latter in vivo, we developped a method, based on the modal analysis of the femur and tibia.

This study proposes a mathematical relation between the maximum flexion moment of a bone and its first resonance frequency in flexion vibration condition. The test procedure consists of the force and the acceleration measurement for a bone submitted to an impact.

A signal processing system calculates the Fourier transform of force and acceleration signals and gives the studied structure transfer function.

The first results give values close to the in vitro determined maximum flexion resistance, i.e. 230 N.m. and 180 N.m. respectively for the femur and the tibia in a anterior-posterior loading configuration. This study also shows that the femur is 1.4 time stronger in the sagittal plane, than in the frontal one, and that this ratio reaches two for the tibia.

MECHANICAL ANALYSIS OF WALK IN CLINICAL PRACTICE

D. Geiger (1); F. Pelisse (2); F. Marie (2)

(1) Laboratoire de mécanique physique, Université Paris XII, 94010 Creteil - France
(2) Ceraval, 2 rue du Parc, 94460 Valenton - France

A complete system, easy to use in clinical practice, is available to compute forces and moments applied to the ankle, knee and hip joints during the human gait:

— in a 10 meters long walking test track, is included a .8 m long by .3 m wide force place with four three-component force transducers. It allows accurate measurements of the position and of the value (in magnitude and direction) of the foot-ground reaction during the stance phase of the gait;

— six contact-less position analyzers (based on C.C.D. cameras) are used to monitor the displacements of three small incandescent lamps located on the virtual axis of the hip, knee and ankle joints (one frontal and one lateral camera for each joint);

— the 8 analogical signals from the force plate and the 6 numeric data from the C.C.D. cameras are sampled, each at the rate of 100 per second by mean of an Intel 80386 based micro computer.

The use of a model of the three joints enables us to calculate and graphically present the motion of all the segments of the limb as well as forces and moments at each joint.

This equipment requires no special preparation of the patient (exept the attachment of the small lamps on the axis of his limb's articulations) and the entire test process takes less than a quarter of an hour including the edition of results and curves.

(also in: abstractbook XII Int. Congress on Biomechanics - UCLA - June 1989

OSTEOTOMY SOFTWARE SIMULATION SUR ORDINATEUR ET CALCUL D'OSTEOTOMIE PAR DES METHODES MATHEMATIQUES SIMPLES

H. Razian, B. Mauduit, F. Lavaste

(ENSAM - Labo de Biomécanique, 151 Bd. de l'Hopital, 75013 Paris)

This software allows the simulation of the osteotomy and the calculus of every characteristic of the operation using simple mathematical methods.

After digitalisation of a frontal or sagital radiography we can see on the screen the leg before and after operation. This software helps the surgeon to find the best level to cut, the best type of osteotomy, the best fixation. At the end of the simulation a paper is printed with every osteotomy caracteristics.

The aim of this software is:

— increase the precision
— minimise the length difference of the leg
— knee stability.

MODELLING OF THE CARDIOVASCULAR SYSTEM AND THE HEART PUMP

M. Boulos, M. Zidi, C. Oddou
Laboratoire de mécanique physique. Université Paris XII
94010 Créteil, France

A simple mathematical model is proposed to simulate the interaction between the left ventricle (LV) and the arterial system (AS).
In this model, the ventricular pressure, during the ejection phase, is expressed as a function of the volume in the LV cavity and the volumetric strain rate.
A three-element Windkessel model is adopted to represente the hydraulic properties of the vascular system.
During the ejection phase the pressure gradient existing between the LV and the AS, is determined by the effects of the inertia of blood in the segment that connects the ventricle to the aorta.
The time variations of aortic pressure, ventricular pressure and ventricular flow predicted by the model, for the ejection phase, compared well with the experimental results.

HIGH SPEED LOCOMOTOR CONTROL IN SPRINTING AND THE LONG-JUMP RUN-UP

D. Glize, M. Laurent
Centre de Recherche de l'UFR STAPS
Case Postale 910, 13288 Marseille Cedex (France)

Comparisons were made between the spatio-temporal locomotor patterns (acceleration phase) of beginners and trained subjets performing two different tasks: the run-up in long-jumping, and sprinting. The results are discussed from the point of view of a) learning the run-up parameters on which the motor program is based, in expert long-jumpers, for instance, one absolute invariant was found to emerge, namely the stride suspension time; and b) the differences observed between the two activities, which may involve separate motor programs: long-jumping may be based on a more flexible type of organisation than sprinting.

MECHANICAL HAEMOLYSIS IN CARDIAC PROSTHESIS 'CORA': ANALYSIS AND PROPOSITION OF AMELIORATION

S. Colin and D. Bellet

Institut de Mécanique des Fluides de Toulouse, Avenue du Pr. Camille Soula, 31400 Toulouse Cedex

The purpose of this experimental study concerns the assessment of blood circulation in a valveless rotary heart prosthesis. The test system is centered around a computer-controlled laser velocitymeter. Turbulent and vicious shearing stress at different locations in the artificial heart during operation can be calculated using the velocities recorded by this system. These results lead to a better understanding of the relationship between the geometry of the prosthesis and the maximum stresses. Design changes are proposed to minimize mechanical haemolysis that might otherwise limit long term use of this artificial heart.

VALIDATION OF THE RSPD WITH CADAVER TESTS METHODOLOGY FOR DETERMINATION OF THE SHEAR FORCE IN THE KNEE JOINT

J. Kajzer (1), C. Cavallero (2), S. Ghanouchi (2), J. Bonnoit (2), D. Cesari (2), H. Roche (2), J.L. Russo (2)
(1) Chalmers University, Department of Injury Prevention Gothenburg Sweden. (2) Laboratoire de Biomécanique Appliquée associé à l'INRETS (LCB), Faculté de Médecine Nord, Marseille, France.

The study contains the preliminary results from a joint project between the Department of Injury Prevention, Chalmers University of Technology in Gothenburg and the Laboratory of Applicate Biomechanics in Marseille, associated with INRETS.
The purpose of our experiments is to verify the physiological value for the shear force over the knee joint. To determine the physiological values for the bending moment or the shear force for human cadavers, it is desirable to make separate experiments, where only one of these two parameters affects the biological material at the time.
Experimental method for determination of the physiological value of the shear force in the knee region have been developed. The tests with human cadaver legs and new design of impactor and device for cadaver stabilisation was performed.
The preliminary results after a few tests with cadavers show that:
— Under dynamic condition the magnitude and the time history of the impact force are different than the shear force in the knee.
— The shear force with magnitude less than 4 KN genera first injury near the knee joint.

FINITE ELEMENT TRIDIMENSIONAL MODEL OF NORMAL AND PATHOLOGICAL INTERVERTEBRAL LUMBAR DISC

F. Mosora (1), Ph. Demoulin (2), E. Coulon (3), P. Beckers (4), S. Stan (5)

(1) Institut de Physique de l'Université de Liège, (2) SAMTECH, Bd. Frère Orban, 25, Liège, (3) Institut Montefiore et (4) Institut de Mécanique de l'Université de Liège, (5) Clinique J. Wauters, Waremme, Belgique.

The model was created based on L2-L3 intervertebral disc considering it to be subjected to a longitudinal load of 400 N. The finite element program S.A.M.C.E.F. was utilized to obtain the vertical deflection and radial displacement of the nodal points and also the deformation diagram and stress distribution (Von Mises comparison) of the three regions studied: nucleus pulposus, annulus fibrosus and end plate. This model was applied to study the normal disc uniformly loaded, in anterior and dorsal flexion and two pathological cases: fissuring of the annulus and nucleus herniation and simulation of an enucleation. The comparison of the results of normal and pathological states facilitates the understanding of some aspects of disc biomechanics.

THE SHORT-TERM ADAPTATION OF THE VESTIBULO-OCULAR REFLEX IS DEPENDENT OF THE COMMISSURAL COUPLING IN THE BRAINSTEM

G. Cheron
Université de Mons, Faculté de Médecine
Service de Neurophysiologie

This study tests the short-term vestibulo-ocular adaptation of the cat before and after either a midsagittal or parasagittal incision in the brainstem.
Eye movements were measured by the electromagnetic search coïl technique during the vestibulo-ocular reflex (VOR) in the dark, the optokinetic reflex (OKN) and the visuo-vestibular adaptative training procedure. Two types of visual combined stimulation were applied by means of low frequency oscillation (0.05-0.10 Hz). In order to increase or decrease the VOR gain the optokinetic drum has been oscillated respectively 180 deg out of phase or in phase with the turntable. The training procedure was applied during 4 hours.
The initial measurements of the VOR were normal with a mean gain value of 0.92 + /- 0.08. After four hours of training in the outphase combination the VOR gain reached a mean value of 1.33 + /- 0.11 (n = 6).
A midsagittal or parasagittal pontomedullary brainstem incision was performed in four cats.
After the stabilization of the recovery, the lesioned cats were trained with the same adaptation procedure. The VOR gain control was still operative in all lesioned cats. The immediate effect of the visuo-vestibular combined stimulation during the training was not altered by the lesion. But in all these cats the short-term adaptation performance was completely abolished by the lesion.
These results suggest that the commissural brainstem network may play a crucial role in the acquisition of the forces VOR adaptation.

LASER DOPPLER VELOCIMETRY ON THE OPTICAL NERVE HEAD. CORRELATION WITH RED BLOOD CELLS AGGREGATION

J. Dufaux (1), A. Arhaliass (1), J.L. Counord (1), P. Hamard (1), H. Hamard (2)
(1) LB.H.P. URA 343 CNRS Université Paris 7, 2 place Jussieu, 75251 Paris Cedex 05, (2) Hôpital des zunize Vingts, Paris 75012

A Laser Doppler Velocimeter added to a fundus camera allows to measure the maximum velocity of Red Blood Cells on the optical nerve microcirculatory network. The laser beam lights a limited volume (surface $\simeq$ (50 pm)^2, depth = 200 à 300 pm). Testing of the system on healthy patients and on patients suffering from glaucoma shows that the blood velocity is lower for the second group. Blood rheological properties are simultaneously determined by Couette viscometry and by aggregometry.

THE ILIZAROV FIXATIVE STIFFNESS STUDY BY FINITE ELEMENT METHOD

J.P. Chaomleffel, G. Lhermet and C. Garin
Laboratoire de mécanique des solides, I.U.T.B., 69100 Villeurbanne

In this paper, the Ilizarov fixative stiffness is studied. Displacements between the bone splinters are computed under traction, flexion and torsion loads. Modelisation is achieved by finite element method. All the fixative geometric parameters are successively and independently modified. The most important results as for the fixative stiffness increase are:
— the increase of broaches diameter,
— the increase of broaches tension,
— the increase of the rings diameter in flexion and torsion,
— the increase of the union rods diameter in flexion and torsion.
Because of an elasticity numerical program used, the given results can not be extrapolated over the elastic limit. In this work, the effect of the tissue on the stiffness and the eventual bone splinters contact are never taken into account.

A METHOD OF CALCULATION OF ENERGY ABSORBED BY THE INTERVERTEBRAL DISC DURING A VIBRATORY EXPOSURE

F. Guillon, A. Ortuno, G. Somenzi, F. Pignolet, C. Tarrière, J. Proteau
R. Poincaré Hospital, 104 bd. R. Poincaré, 92380 Garches, France, Laboratory of Physiology and Biomechanics Associated with Peugeot S.A./Renault, 132 rue des Suisses, 9200 Nanterre, France

The lumbar intranuclear pressure (PID) is measured on non-embalmed cadavers who are seated on cars seats and exposed to vertical sinusoid vibrations (Amplitude from 1 to 5 mm, frequency from 3 to 15 Hz).
The instantaneous PID value is used for the calculation of instantaneous perpendicular load applied to the disc (force (Fi) = Pressure (Pi) x surface of the disc).
At the same time the instantaneous discal collapse value (Ei) is obtained from the double integration and substraction of perpendicular accelerations values of the underlying and above vertebral bodies.
The limited areas of the Fi/Ei curve provides us with the value of the energy absorbed by the disc per cycle (E abs).
This parameter is a good physiological indicator of good spine protection against vibration risks. Accordingly we use it to test various seats and their damping performances.
The Eabs value is about 0.5 joule per cycle with a maximal collapse of the disc near to 0.5 mm and a maximal variation of PID around 0.15 MPa.

DISPLACEMENTS OF THE AXILLARY PEDICLE DURING THE SHOULDER MOVEMENTS

Ch. Brunet, S. Ghannouchi, V. Di Marino, S. Nazarian, C. Cavallero, H. Roche, J.L. Russo, J. Bonnoit
Laboratoire de Biomécanique Appliquée, Faculté de Médecine de Marseille Secteur Nord, Boulevard P. Dramard, 13326 Marseille Cedex 15, Laboratoire associé à l'INRETS (L.C.B., 69500 BRON).

Axillary pedicle passes through a fossa which get out of shape during shoulder movements. Axillary vein progresses inside; axillary artery outside, bordered by a neuro-fascial sheath, formed by the terminal branches of the brachial plexus linked together by a fibrous lamina. Axillary vein is fixed to the walls of the costo-clavicularis channel; axillary artery is more mobile, even in his sheath. Artery, vein and nerves have different possibilities of elongation and stretching; axillary artery have, on one hand, possibility of elongation and, on the other hand, specific faculty of stretching. These possibilities are conditionned by position of the neuro-fascial sheath, the segment itself, and its place in relations with walls of axillary fossa, which will be deformed when the thoracic girdle moves. Mobility of the axillary pedicle is limited by its neighbourhood. Beyond certain degree of movements, axillary pedicle does not move in physiological conditions, which explains some derangements even for normal subjects.

AUTOMATIC DETERMINATION OF INNER AND OUTER CONTOURS OF FEMUR IN CAD CUSTOM-MADE HIP PROSTHESIS

F. Dujardin, C. Jacob, A. Coblentz, R. Mollard
Laboratoire d'Anthropologie Appliquée des St. Pères, 45 rue des St. Pères, 75270 Paris Cedex 06

In a program of CAD Custom Made Hip Prosthesis, the authors study specially three parts:
1. Data acquisition by CT Scan.
2. Extraction of inner bone's contour by an automatic method. This software analyses each CT Scan Slice by 36 radius born of a central point. On each radius, the software determines the optimal inner cortical point. The 36 points provide the inner bone's contour within the transitional zone between cortical bone an cancellous bone.
3. Automatic modification of the Femoral Stem. This stem until then assimilated to the inner bone's contour. The 2nd software changes the stem's design in order the stem can enter in the Femur.

FREQUENCY RESPONSE OF PNEUMOTACHOGRAPHS DURING FORCED OSCILLATION MEASUREMENT OF RESPIRATORY IMPEDANCE

B. Louis, A. Harf, H. Lorino, D. Isabey
Institut National de la Santé et de la Recherche Médicale, Unité de Recherches de Physiologie Respiratoire (U. 296), Faculté de Médecine, Université Paris-Val-de-Marne, Paris XII, C.H.U. Henri Mondor

Screen and capillary pneumotachographs (flowmeters) are usually described by resistive elements in series when they are callibrated by referring to the compliance resulting from adiabatic gas compression in a closed box, i.e., a reference impedance which strongly differs from respiratory impedance (Z).
We studied up to 250 Hz the frequency response of pneumotachographs used in forced oscillation techniques by reference to the impedance of a compressible gas oscillating in a long tube. We found that resistive models fail to describe the frequency response. However, when compressible effects in the pneumotachographs are taken into account by adding to resistive models a compliance (C_{PN}) corresponding to the compression in the half volume of the pneumotachograph, the agreement with experiment becomes satisfactory. These results demonstrate that gas compression phenomena become significant when the condition $Z.C_{PN}.\ \omega \ll 1$ (ω pulsation) is not verified any more.
Present analysis suggests that compressible effects should become especially important and thus appropriatly corrected as proposed above when large respiratory impedances are measured (e.g., babies, small animals, disease subjects,...).

EFFECTS OF SHOCK ON THE POSTURE AND MOVEMENT OF THE TEMPOROMANDIBULAR JOINT

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Road accidents (whiplash effect) are often responsible for internal derangement of the temporo-mandibular joint. When a vehicle is hit from behind, its occupants' bodies are flung forwards and their heads backwards. It should be remembered however that the head consists of two jointed but separate bone structures, the mandible and the skull. Although the skull is thrown backwards, the mandible is pulled forwards because of its inertia. The posterior bilaminar region is stretched and torn. When the head is then thrown forwards again, the posterior bilaminar region is crushed under the mandibular condyle. In addition, Weinberg and Lapointe have shown that contraction of the upper head of the lateral pterygoid muscle accentuates this stretching, tearing and compression.
Two kinds of radiological techiques are appropriate here:
1. Tomography can be used to detect any mandibular condyle displacement in the glenoid cavities, small fractures and restriction of the condyle movement.
2. Arthographic techniques can be used to detect any meniscal displacements, to determine their reducibility and to check for perforation of the meniscus-ligament complex.
The treatment consists of local myoresolution by endobuccal injection (anaesthetic substances excluding vaso-constrictors) into the lateral pterygoid muscles, in addition to GENERAL reticular myoresolution, and in all cases, occlusal therapy.

MODELISATION MECANIQUE TRIDIMENSIONALE DU RACHIS LOMBAIRE
TRIDIMENSIONAL MECHANICAL MODELLING OF THE LUMBAR SPINE

F. LAVASTE, W. SKALLI, S. ROBIN

(ENSAM - Labo de Biomécanique, 151 Bd. de l'Hôpital, 75013 Paris)

The main objective of this study has been to design a tridimensional geometrical and mechanical model of a lumbar segment. A specific programm has been realized to construct a finite element model from two X-Rays. Currently, the geometrical reconstruction has been achieved, and the first results have been obtained by the finite element model. Once validated, this personnalized model will constitute a powerful simulation tool for the mechanical analysis of the spine behaviour in different situations: healthy spine when subjected to sollicitations, influence of lesions, influence of restorations by osteosynthesis devices; this validation phase is in progress.

EXPERIMENTAL STUDY OF THE TRIDIMENSIONAL BEHAVIOR OF THE LUMBAR SPINE

F. Lavaste, W. Skalli, A. Asselineau, L. Depinoy, A. Diop, J.L. Grandjean

(ENSAM - Labo de Biomécanique, 151 Bd. de l'Hopital, 75013 Paris)

Our experiment has been developped in order to study the tridimensional behavior of the healthy, injured and restaured lumbar spine. Specimens were subjected to different kinds of sollicitations: bending, backward bending, lateral bending and axial torque. Then, we have measured the resulting displacements. So we could draw the load-displacement curves. After, we have determined the stiffness of each specimen which allowed us to make a comparative study between the healthy and the restaured lumbar spine.

INSTATIONNARY WALL SHEAR STRESS EVALUATION IN HUMAN ARTERIES

P. Flaud, A. Simon, J. Levenson

(ENSAM, 151 Bd. de l'Hôpital, 75013 Paris)

The instationnary wall shear stress in human arteries is computed either ¡) using instantaneous velocity profiles ii) or centerline axial velocity. In this case a mathematical model of arterial pulsatile flow in viscoelastic is required which enable this computation. The clinical study of normotensive or hypertensive subjects shows the decrease of the wall shear stress as a function of arterial pressure.

PROPAGATION OF VIBRATIONS IN THE HIP FIRST ATTEMPT AT MODELISATION

Liebaert, Quandieu, Leclercq, Pellieux, Piedecocq, Aubriot

(Médecine Aérospatiale, 5bis Av. de la Porte de Sèvres, 75996 Paris Armées)

After experimentation on the transmission of vibrations in the articulation of the hip (protocol described in pages C60-C61 acts of the 13th congress of the Société de Biomécanique), a numerical model has been studied. The model uses the equations describing the behaviour of visco-elastic beams in longitudinal and transversal deformations under sinusoïdal excitations.
A two dimensional version of the model consists in 30 linear equations with complex coefficients, implemented on PC computers. The resolution of these equations for 300 different frequences takes around 3 minutes, and can take place during experimentation. Simulation of the experimental results are fairly accurate. Improvements of the model are being studied.

POISEUILLE'S LAW IN NON CIRCULAR CYLINDRICAL DUCTS SIMILAR TO VEINS

A. Langlet, S. Naili, C. Ribreau

Laboratoire de mécanique physique, Université Paris XII, 94010 Créteil, France

Bonis et al. showed that the mechanical behaviour of veins can be described by the flatness of a collapsible tube. The cross-sectional shape of ducts are defined by their computations.
For a given boundary geometry, according to the equation of Poiseuille, the resistance coefficient λ takes the form: $\lambda = f(A)/Re$, where f(A) and Re are respectively a shape factor and the Reynolds number.
In this work the shape factor is determined for each cross-section and each ellipticity k_o, k^o = 1 to 10. We state that f(A) is an increasing linear function between A_1 and A_p, a decreasing linear function between A_p and A_o, a more complex function which depends upon specific similarity solutions describing the cross-sections smaller than A_1. A_o is the initial elliptical cross-section, A_p the cross-section where contact of the opposite sides of the wall occurs along a line. Here, $f(A_p)$ is calculated according to ZARLING's results related to the oval cross-section, $f(A_1)$ is numerically calculated.
As an example, if $k_o = 10$: $f(A_o) = 90.26$, $f(A_1) = 28.60$.

Calendar of world wide scientific events

Oct. 4-6, 1989
Lyon, XXVe Congrès de la Société d'Ergonomie de Langue Française Self, Evolutions technologiques et ergonomie, Palais des Congrès de Lyon, Quai Achille Lignon, 69006 Lyon, Secrétariat: Congrès Self, Inrets Lesco 109, av. S. Allende, Case 24 - 69675 Bron Cédex-F, Tel.: 78.26.90.93

Oct. 9-13, 1989
Cargese, "Euromech 259. Biomechanical Transport processes", Nato, Workshop, Secretary: Prof. F. Mosora, Université de Liège, Institut de Physique, B, B-4000 Sart-Tilman, Belgique.

Oct. 28-Nov. 3, 1989
Colorado Springs, Colorado, U.S.A., World Congress on Sport Sciences. Promoted by the International Olympic Committee, Medical Commission. Organized by the United States Olympic Committee, c/o M.M. Newsom, U.S. Olympic Committee, 1750 East Boulder Street, Colorado Springs, CO 80909 U.S.A.

Dec. 13-15, 1989
Bordeaux, "BIOMAT 89 (Calcified Tissues and Biomateriaux)", Secretary: BIOMAT, Comité d'Expansion Aquitaine, 2 place de la Bourse, 33076 Bordeaux Cedex, France.

Jan. 28-Feb. 02, 1990
Auckland, New Zealand, IXth Commonwealth and International Conference (c/o Conference Convenor 1990, Ms. Rosalie King, Auckland College of Education, Private Bage, Symonds St., Auckland, New Zealand).

March 24-27, 1990
The Computerized Cytology and Histology Laboratory, An International Conference featuring: automated techniques in Cytology and Histopathology; tutorial workshops on cell image analyses & computer applications in the routine laboratory; applications of artificial intelligence & neural nets in cytologic and histologic diagnoses, at the Knickerbocker Hotel, Chicago, IL, USA. For information write or call: The International Academy of Cytology, 5841 Maryland Avenue, HM n° 449, Chicago, IL, 60615, USA, tel. 702-6569, Fax (312)947-8873, telex: 4972334

April 26-27, 1990
1990 Biomechanics Seminar Centre for Biomechanics Göteborg, Sweden, International Biomechanics Seminar, Centre for Biomechanics, Chalmers University of Technology, S-41296 Göteborg, Sweden.

May 21-25, 1990
Brussels, Belgium, International Congress on 'Youth, Leisure and Physical Activity'. Vrije Universiteit Brussel, HILOK, P. De Knop, secretary general, Pleinlaan 2, B-1050 Brussels, Belgium.

May 21-25, 1990
Brussels, Belgium, International ISAK-congress 'Kinanthropometry IV) incorporated in the international congress on 'Youth, Leisure and Physical Activity' (c/o Dr. P. De Knop, Vrije Universiteit Brussel, HILOK, VTBP, Pleinlaan 2, 1050 Brussel, Belgium). Tel.: (02)641 27 44, Telex: 61.051 VUBCO-B, Fax: (02)641.22.82.

May 27-June 01, 1990
Amsterdam, The Netherlands, XXIV FIMS World Congress of Sports Medicine (c/o Organisatie Bureau Amsterdam b.v., Europaplein 12, 1078 GZ Amsterdam, The Netherlands, Tel.: 31/2044087. Telex: 13499 raico nl.).

June 18-22, 1990
3rd International Physiotherapy Congress 'Joining Hands-Sharing Skills'. The congress is held in Hong Kong. Information: Miss Doreen Bauer, Scientific Convenor, Third International Physiotherapy Congress, P.O. Box 1226, Collingwood, Australia 3066.

July 8-11, 1990
Seventh meeting of the European Society of Biomechanics, in cooperation with the European Society for Biomaterials, Aarhus, Denmark, Congress Secretariat: Aarhus Convention Bureau, Raadhuset, 8000 Aarhus C, Denmark, phone: +45 8612 1177

July 9-13, 1990
St. Andrews, "First World Scientific Congress of Golf", University of St. Andrews, Secretary: Dr. M.R. Farrally, Director of Physical Education, University of St. Andrews, Sports Centre, St. Leonarads Road, St. Andrews, Fife. KY16 9DY (under the auspices of the World Committee of Sport Biomechanics).

July 15-19, 1990
Uppsala, Sweden, 'Third International Conference on Equine Exercise Physiology', c/o Uppsala Turist och Kongress AB, 'ICEEP III', Box 216, S-751 04 Uppsala, Sweden.

Aug. 30-Sept. 4, 1990
La Jolla, "First World Congress of Biomechanics", Secretary: Prof. G.W. Schmid-Schönbein First World Congress Biom. AMES, Bioengineering M - 005 University of California, San Diego, La Jolla, CA 92093, USA.

Sep. 7-11, 1990
The VIth Symposium on Biomechanics and Medicine in Swimming (of ISB and the World Commission of Sport Biomechanics - WCSB) organised by the Liverpool Polytechnic (U.K.) School of Health Sciences. Information: Dr. T. Reilly, Dr. A. Lees, Dr. T. Maclaren, Liverpool Polytechnic, Byronstreet, Liverpool L3 3AF, tel.: 051 207 3581, fax: 051 7090172

Nov. 5-8, 1990
ECART, European Conference on the Advancement of Rehabilitation Technology, organized in cooperation with ISPO (International Society for Prosthetics and Orthotics), ISAAC (International Society for Augmentative and Alternative Communication) and ISEK (International Society for Electrophysiological Kinesiology) in the MECC, the Maastricht Exhibition and Congress Centre. Info: ECART, Congress Organization Services, Van Namen & Westerlaken, P.O. Box 1558, 6501 BN Nijmegen, The Netherlands.

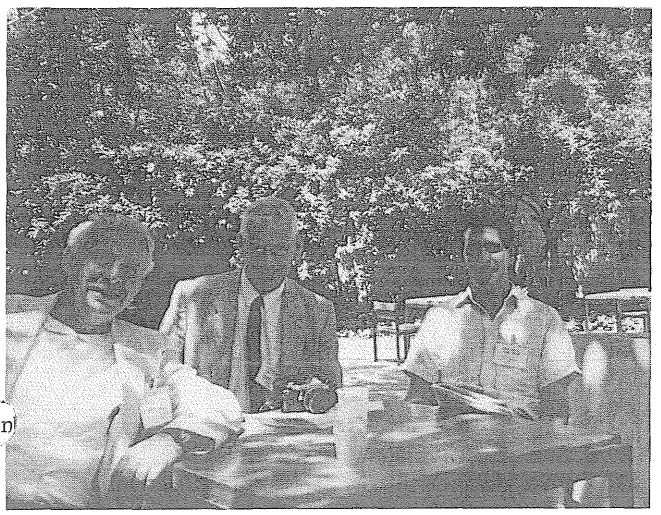
Nov. 19-22, 1990
University of Antwerp, Belgium, North Sea Conference Biomedical Engineering 90, Regional meeting of the IFMBE, International Federation for Medical and Biological Engineering. University of Antwerp, Universiteitsplein 1, B-2610 Wilrijk (Antwerp), Belgium.

April 8-13, 1991
Maastricht, The Netherlands, 'Second World Congress of Science and Football' (c/o Prof. J.M. Greep, Dept. of Surgery, Academic Hospital St. Annadel, Maastricht, The Netherlands).

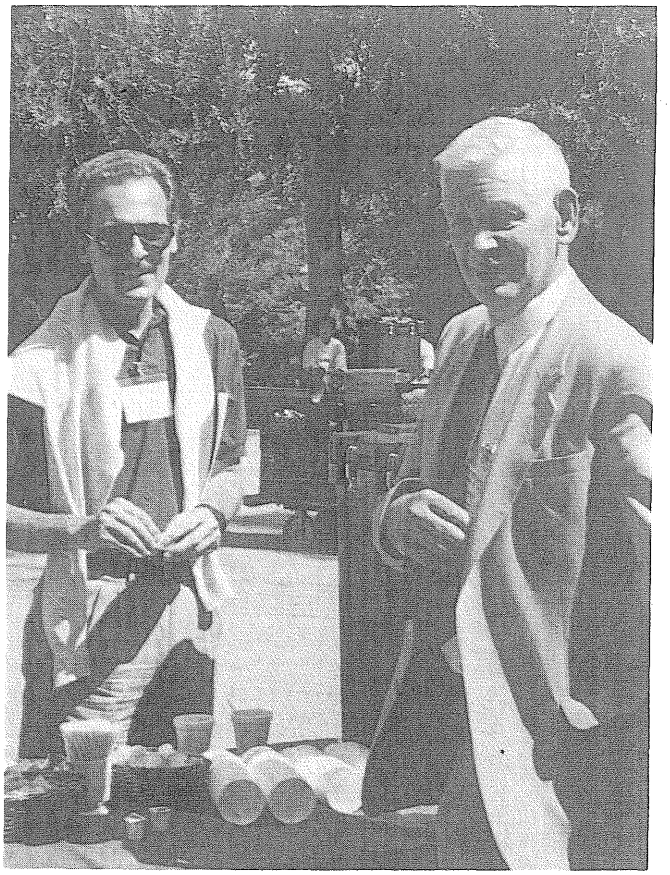
July 28-Aug. 2, 1991
World Confederation for Physical Therapy '11th International Congress', Barbican Centre for Arts and Conference, London, England. Information: Congress Secretariat, Conference Association WCPT, 27 A Medway Street, London SW1P 2BD, England, tel.: 01-222 9493.

Sep. 10-15, 1991
Cologne, FRG, '8th European Congress of Sport Psychology'. Theme: 'Movement and Sport: Psychological Fundamentals and Effects' (c/o Erwin Hahn, Bundesinstitut für Sportwissenschaft, Carl-Diem-Weg, 5000 Köln, 41, FRG). Tel.: (0221)4979-161, Telex: 8881178 bisp d.

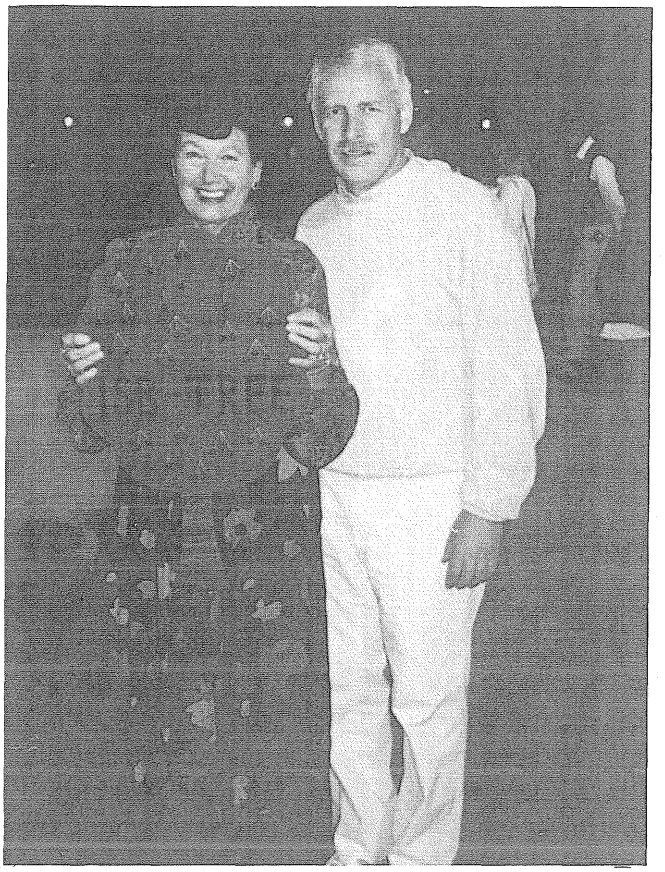
Dec. 9-14, 1991
ISB XIII Congress
University of Perth - Western Australia organisation: Dr. Graeme Wood.



Bob Norman (your new president), John Paul (your past president) and Graeme Wood (your new newsletter editor starting from the Springissue 1990).

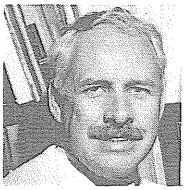


The past and the future: Aurelio Cappozzo (left-President Elect) and John Paul (right-past president)



Frau Ursula-Granny-Wartenweiler and president Bob Norman

During the 12th International Congress in Los Angeles, the New ISB Council was elected. In order to visualize who is who for the coming two years, have a look around the table. Note that new Newsletter editor Dr. G.A. Wood starts his Editorship in 1990.



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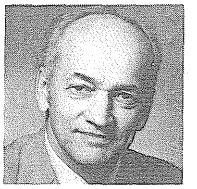

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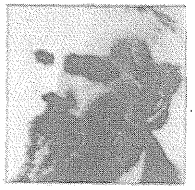

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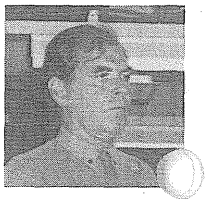

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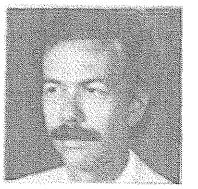

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