ISB

International Society of Biomechanics Newsletter

ISSUE Number 85
October, 2002

TABLE OF CONTENTS

From the President — 2
Sandra Olney, Ph.D.

Interview with Dr Vladimir Zatsiorsky — 3

ISB Student Travel Grant Report — 4
Daina Sturnieks

ISB Congress Travel Report
Mukul Talaty, Ph.D. — 5

ISB Congress Travel Report
Ben Patritti — 6

Remembering one of our founding fathers
Richard Hinrichs — 8

Bulgarian Society of Biomechanics
Yuli Toshev, Ph.D., D.Sc. — 10

Collaborative Projects with Central and Eastern European Scientists — 11

Upcoming Meetings, Workshops, Etc — 12

Puzzle: Why is the stiffness of a viscoelastic model independent of loading rate?
Praveen Solomon & Brian Davis — 13

Engineering and Management — 14

Meditech
John Middleton, Ph.D. — 15

Editor's Notes and Requests — 15

Obituary: Prof Herbert Hatze
Arnold Baca — 15

ISB Membership News — 16

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

From the President, Sandra J. Olney

Why Are We Still Discussing the Worth of Biomechanical Gait Analysis?

A few recent events lead me to write a few words on this topic, and to invite your responses. Just last weekend I asked a colleague who I had not seen for some time how the Gait Lab in her city was going. I knew it had been developed carefully and that there were the usual problems with the selection of the appropriate system and how to finance the laboratory. I was astonished to hear that it was barely functioning, and that seemingly the hope and enthusiasm that had supported the funding drive, development and staffing had all but died. We hope that the situation is a temporary one, but must ask - what has gone wrong? What is the worth of gait analysis?

At the World Congress this summer the Canadian Society for Biomechanics discussed this issue, evaluating the worth of locomotor research in the fields of rehabilitation, neurology and orthopaedics. Two of us evaluated the field with respect to the contributions in normal and pathological conditions: to providing a basic understanding of locomotion; assisting in movement diagnosis; informing treatment selection, and evaluating effectiveness of treatments.

BASIC UNDERSTANDING. Speaking from the point of view of rehabilitation, I concluded that kinetics, which can be influenced by therapeutic methods, has provided much more useful information than spatio-temporal or kinematic methods. A number of investigators have made landmark contributions by establishing methodologies for understanding locomotion in cerebral palsy, stroke and other specific conditions.

ASSIST MOVEMENT DIAGNOSIS. Direct application of gait analysis, usually including kinematic, kinetic and frequently EMG data, requires the investment of a skilled team with technical and clinical expertise to interpret findings. I wonder how many laboratories fail because of this deficiency.

INFORM TREATMENT SELECTION. One area that has made a very large contribution is the use of power analyses to assist with surgical selection in cerebral palsy. This seems to me to be the brightest star shining in the clinical sphere - in fact I am not sure there are many others. Readers, would you like to comment?

EVALUATE EFFECTIVENESS OF TREATMENT
We have been limited in our abilities to detect change by the imprecision of our methods. Recent technical and procedural innovations such as improved methods of determining joint centers and minimizing the effects of skin motion artifact are promising. However, we need further development of clinically applicable analytic methods, routine use of power analysis for treatment of cerebral palsy and stroke and computer modeling to evaluate the effectiveness of training interventions.

So what should be our directions now? We certainly have been discussing seriously the question of the worth of gait analysis for at least three decades. Interestingly we still don't know anything much about walking on sloped, rough, and other natural surfaces. Is that saying something about the application of our science?

Interview with Dr. Vladimir Zatsiorsky, Director, Biomechanics Laboratory, Penn State University

Brian L. Davis

BD: You are in the unusual situation of having worked as a biomechanist for extended periods in two countries. Could you contrast your career before and after moving to the USA?"
VZ: Any comparison here is not accurate: we are comparing not only different countries but also different time periods. Back in Soviet Union I was younger and biomechanics was different. In the 1970's the number of publications was limited and I was able to read almost everything that appeared in press (mainly the Journal of Biomechanics, Eastern European journals on sport science and the publications based on the ISB conferences, such as Biomechanics V, VI etc.). I am not able to do this now, the number of publications in the field exceeds my abilities to digest them.

BD: Were there technological differences?
VZ: Personal computers did not exist. Necessary experimental equipment was either constructed and manufactured in the labs (videofilming was invented later) or borrowed from other scientific fields and modified (e.g. in our lab we used optical equipment produced for astronomy research); all the software codes ranging for smoothing the data to the inverse problem of dynamics should be written in the lab, etc. Until approximately 1980 we were able to do that. In the 1980's the situation changed: companies started producing biomechanical equipment and software. The biomechanical research became an expensive enterprise. We were not able to buy the new equipment; the maintaining of a high quality of research became almost impossible.

With regard to the research itself, I do not see a big difference between what I did previously and what I am doing now. The science is international and it does not depend on the borders. The most important difference is in the freedom. In the Soviet Union, the freedom was limited. Somebody (I do not know who exactly, KGB or the Central Committee of the Communist Party) decided whether I can go to a scientific conference or not (once I was invited by Paavo Komi to give an invited talk at the International Conference in Finland; several days before the conference I was told that I was not allowed to go there; a letter was sent to Paavo that I was seriously ill and could not take part); to publish a paper abroad one had to go through a multi-stage process of obtaining a special permission; access to new scientific literature was limited (e.g. Journal of Biomechanics was only in one copy in the National Library), etc. In the US, such freedoms are taken for granted.

BD: What is your most interesting or surprising research finding?

VZ: As a rule, the most interesting findings are the latest ones. I frequently lose interest to my previous studies and publications.
The most referenced are the publications on the mass-inertial characteristics of human body segments (the gamma-scanner method, in co-authorship with V. Seluyanov).
The most surprising was a discovered robustness of the interfinger connection matrices: the matrices computed on one group of subjects worked well with other groups. The finding was used to predict finger forces in prehension tasks (published in Biological Cybernetics, 2002, v. 87, pp. 40-49 and 50-57, in co-authorship with R. Gregory and M. Latash).

BD: It seems you have gone to great lengths to synthesize relevant information and publish books rather than separate journal articles. What criteria do you use when deciding to publish a book? Are you working on any new books?

VZ: I do believe that review papers and books are indispensable for the progress of science. A new field of research develops typically in three stages: (1) experimental research, (2) review papers and (3) books and monographs. Publication of scientific books on biomechanics of human motion is necessary for the field maturation. Compare a situation in biomechanics with the situation in

neighboring fields such as exercise physiology (where the books are numerous) and motor control (almost none). Personally, I like knowledge to be systematized and presented in a well structured form. I also like writing books. The choice of the topic depends on my current interests. It is the same as writing research papers; some people like bone biomechanics while others prefer studying gait. Both directions of research are important and interesting and the choice mainly depends on personal bias. My latest two books are Kinematics of Human Motion (1998) and Kinetics of Human Motion (2002) for graduate students and young professionals. Human movements involve motion of multi-link kinematic chains in three dimensions. Future researchers should know this stuff. The third volume of the series will address muscle biomechanics and internal forces, e.g. intra-abdominal pressure.

As an aside, I should mention that writing books is a demanding enterprise. It is difficult to combine book writing with publishing research papers. My present interests utilize biomechanics for studying motor control issues. As a result, the papers are mainly published in non-biomechanical journals. In 2000-2002, papers that I co-authored have been published in such journals as Experimental Brain Research, Brain Research, Human Movement Science, Journal of Physiology (London), Ergonomics, Motor Control, Clinical Biomechanics, Biological Cybernetics, Exercise and Sport Sciences Reviews, Medicine and Science in Sports, Neurocomputing, Gait & Posture, Spine, Journal of Biomechanics, and Journal of Applied Biomechanics.

BD: You are obviously a busy person! Many thanks for taking the time to be interviewed.

ISB Student Travel Report

Daina Sturnieks
Dept of Human Movement & Exercise Science
University of Western Australia

Attending international conferences and visiting biomechanics laboratories abroad is not often feasible for an Australian student. My sincere gratitude goes to the ISB, for an International Student Travel Grant which enabled me to travel to North America to attend the World Congress on Biomechanics in Calgary and spend time visiting the Mayo Clinic, Minnesota and the Cleveland Clinic, Ohio.

As a Ph.D. student, I have been researching the contribution of joint loading during gait to the development of knee osteoarthritis. I am interested in understanding mechanical factors contributing to the development of osteoarthritis, as well as the effects of this disease on physical functioning. The purpose of my trip to North America was to: 1) attend the World Congress on Biomechanics; 2) observe and get involved in other research related to osteoarthritis and bone and joint loading; and 3) seek out potential post-doctoral job opportunities.

I was particularly appreciative of the award for affording my attendance and the opportunity to present my research findings at the World Congress on Biomechanics. The volume of quality research presented was impressive as I found my interest engaged by a great number of invited and free papers. The conference was also a good opportunity to meet and interact with the scientists who's work I admire and frequently reference. My time in Calgary was made more enjoyable by making new friends and acquaintances, and catching up with those made at previous meetings.

Following the conference, I spent a few days at the Mayo Clinic in Rochester, Minnesota. Thanks to Prof. Kenton Kaufman for arranging meetings with a variety of scientists that lead to rousing discussions about my research interests. I was invited to give a talk at the Orthopedic Biomechanics Group meeting which provided a good opportunity to present a summary of my work in a stimulating and pleasant environment. I learnt, in deeper detail, of the wide variety of research being undertaken in the biomechanics and motion analysis laboratories.

From Minnesota, I traveled to Cleveland and spent 10 days with the Musculoskeletal Biomechanics group in the Department of Biomedical Engineering at the Cleveland Clinic's Lerner Research Institute. During my time at the Cleveland Clinic, I was involved in a study

investigating exercise countermeasures for astronauts, I observed knee surgery and I improved my understanding of the response of bone to mechanical loading. Thanks to Prof. Brian Davis and Dr. Susan D'Andrea for organising these activities and for showing me plenty of fun times in Cleveland.

I had many wonderful experiences throughout my travel in North America, enriching my Ph.D. programme, and was successful in returning with post-doctoral employment prospects. I am grateful to the ISB for granting myself and other student members the opportunity to travel and benefit from such ventures. My appreciation also goes to Prof. Brian Davis and Prof. Kenton Kaufman for their support with my application. Finally, thank you to all the wonderful people from the Mayo Clinic and the Cleveland Clinic, who spared their time to make my trip a thoroughly enjoyable and rewarding one.

ISB Congress Travel Report

Mukul Talaty, Ph.D.
Gait & Motion Analysis Laboratory
Moss Rehab/Albert Einstein Medical Center
Philadelphia, Pennsylvania, USA

The ISB Congress offers opportunities far exceeding the obvious scientific exchange. I returned from Zurich with broadened perspectives, a rekindled the sense of unity with the larger biomechanics community, and just generally feeling revitalized. The biennial congress is a significant way the ISB strives to achieve one of its main goals - to "promote and stimulate the development of biomechanics at the international level." The congress travel grant is a smaller but also important way the ISB contributes to developing international collaboration among biomechanists. It is my pleasure to share through this brief note a few personal sentiments from last year's meeting. The XVIIIth ISB Congress (Zurich, 2001) was a professional experience unlike any I have had to date in my biomechanics career.

One great value of the ISB congress is the exposure to the ideas, perspectives, and priorities that delegates of other countries bring. The congress provides this exposure through the diverse presentations and tutorials. It provides this through the interaction it promotes and facilitates. It provides this through the feedback we get on our presentations. It allows this through the immersion in an entirely new culture to which we are subject as we attend (ZuriFest was certainly an excellent way to take in some of the Swiss culture). This exposure helps us to form a more complete "big picture" view of the world we are striving to improve and in which we work. As scientists, leaders, and as people, we are well served to strive to see this view.

Attending the congress helped to enriched my perspective and broaden my horizons. It was just as fascinating to learn about biomechanics itself as it was to experience how the rest of the world views, approaches and evaluates it. Take Dr. Winter's reflections on a career, Dr. Simon's discussion on technology, and Dr. Gruber's excellent tutorial on simulation as examples. New perspectives helped me to think how we, as scientist, can prepare to meet the research needs of the coming decades. For example I had an opportunity over lunch to learn first hand about the German health care system and then compared and contrasted that with the current US healthcare models.

The Technical Group on Computer Simulation satellite event was another great opportunity. This was a much more intimate forum (several hundred delegates only) that immediately preceded the main ISB congress. Delegates could network and experience first hand, in the adjacent university computer lab, authors' own computer simulation programs. The "hands on" approach enabled more interaction and discussion than would be possible in a larger meeting. The special dinner - despite the relatively small size of the event - still very much resembled the ethnic diversity of a United Nations meeting. Once again, this was a great chance to gain some perspective. One memorable discussion was about the egocentrism or perhaps more plainly the relative ignorance of the USA to "international" events - starting with those involving its own neighbor, Canada. This was yet another way to be stimulated and to grow.

Attending the ISB congress offered the opportunity to feel connected to the biomechanics world. I had the opportunity to share my graduate school experiences with another PhD student from Ireland. The student was more or less just getting started and benefited (or at least listened courteously?) from some of my experiences. There was a sense of comfort and unity knowing that we all are in pretty much the same boat - regardless of geography. It was rewarding to be able to give back a little - albeit just a humble few pieces of advice - to a fellow student. The biomechanics community (academics in general) is so unselfish in making time and effort to teach the junior members that it is difficult to not be excited to have the opportunity to give back. It helps us to grow as mentors and leaders. Last but not least, the congress offered the opportunity to grow as scientist.

I would like to sincerely thank the ISB as an organization and the individual members who select students for travel grants, dissertation grants, and congress grants. Attending the congress is inspiring, educational, and stimulates a type and level of intellectual and personal growth that may be difficult to obtain by other means. I encourage faculty and supervisors everywhere to strive to let every junior scientist attend a well organized international congress, like that of the ISB, at least once every few years. In this difficult post "9-11" political climate, academia is fortunately an environment that transcends national borders to help provide some sense of unity. One of the best - and certainly easiest - way we can help the ISB continue to foster international interaction is by attending the congresses. I hope to see many biomechanists (familiar and new) in New Zealand.

ISB Congress Travel Report

Ben Patritti
Boston University, USA
(formerly Liverpool John Moores University, United Kingdom)

I wish to thank the committee for the opportunity to attend successive ISB congresses. The chance to attend the Zurich congress allowed me to consolidate contacts I had made at the Calgary congress and provided me with the best forum to disseminate the findings of my doctoral research. I budgeted the funds accordingly so I could attend both the main congress and satellite symposium on footwear biomechanics. I also managed to attend two of the ISB tutorials (simulation and locomotor dynamics). I found the tutorials very useful in broadening my understanding of these areas, particularly as little simulation work is undertaken in our laboratory.

The presentation of my research at the footwear symposium provided me with one of the most positive experiences of my doctoral studies. I received many compliments for my work on characterising discrimination thresholds of impact perception. It was also heartening to hear that I was among the short listed candidates for the Young Investigator Award. This feedback underlined to me that my work was appreciated by the others and encouraged me greatly. I have the ISB to thank for this experience.

The ISB Congress was another rewarding experience. I presented a poster of some earlier work from my doctoral research relating to the perceived intensity of lower limb impact loads. This again was well received and attracted the attention of some researchers who had done related work. Through my work on the perception of loads to the body I have become increasingly interested in the sensory and neuromuscular aspects of locomotor biomechanics. The diversity of the congress program allowed me to see an overview of the current work in these areas and let me start thinking about future directions.

In summary, I thoroughly enjoyed this experience and I thank the ISB again for this opportunity.

Journal of Biomechanics

The **Journal of Biomechanics** is the leading forum for the publication of articles describing the principles of mechanics to explore biological problems. Papers published in the journal cover a wide range of topics in biomechanics including, but not limited to:

- **Fundamental Topics**
- **Cardiovascular & Respiratory Biomechanics**
- **Dental Biomechanics**
- **Injury Biomechanics**
- **Orthopaedic Biomechanics**
- **Rehabilitation Biomechanics**
- **Sports Biomechanics**
- **Cell Biomechanics**

ALSO CURRENTLY FREELY AVAILABLE ONLINE

- FREE full-text access to *Journal of Biomechanics* articles
- Supplementary data area for additional material complementing the printed journal
- Further information on the journal and its affiliated societies

Please visit http://www.jbiomech.com

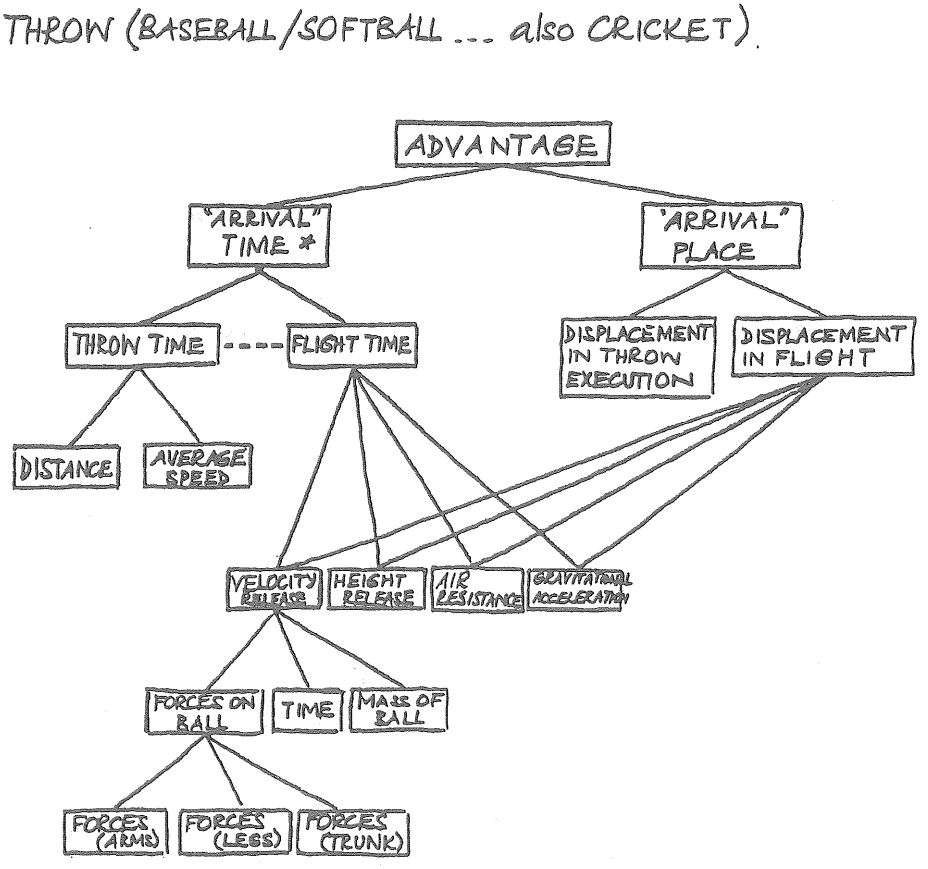
- Should you wish to subscribe to the journal at the ISB discounted member rate, please contact the society directly.
- If you would like to discuss informally a submission to the journal, or have an idea for a focused journal issue, please feel free to talk to one of the journal Editors-in-Chief: Professor R. Huiskes (E-mail: Biomechanics.BMT@tue.nl) or Professor R. Brand (E-mail: dick-brand@uiowa.edu).

Remembering one of our founding fathers.

Submitted by Richard N. Hinrichs, Ph.D.
Department of Kinesiology, Arizona State University

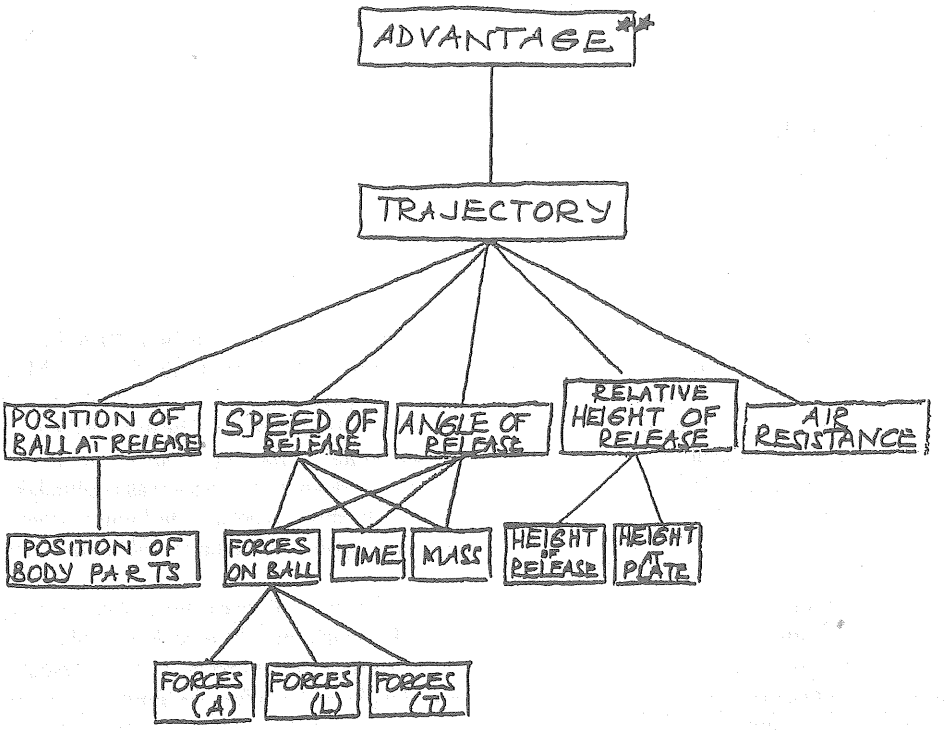
Editor's note: The text below was extracted from Dr. Hinrich's email submitted to Biomch-L on August 1st. I would like to thank him for his generosity in scanning the figures below and sharing them with the ISB membership.

I am saddened to hear that Dr. James G. (Jim) Hay died this morning at his home in New Zealand after a long battle with cancer. Jim was a dear friend and my mentor. His deterministic models of motor skills (what many of us fondly call "Hay-o-grams") have formed the basis of much of what we know about the biomechanics of sports. It all began at biomechanics seminars at Iowa, but it has continued for years at many an ASB or ISB meeting after we all graduated. Jim's graduate students at the time (Barry Wilson, Jesús Dapena, Carol Putnam, Kit Vaughan, Alex Stacoff, and I) would sit at a bar with Jim over many a beer and we would write down our ideas about deterministic models for motor skills that had not been developed yet or needed revising. Many of these early models were written down on bar napkins. I was fortunate enough to have Jim photocopy many of these models for me. For those who have seen Jim's handwriting (it looks like calligraphy), these early models will be forever treasured in my collection.



* Usually the shortest possible time is sought. Occasionally -- eg. when very short distance and receiver's reaction time is involved -- the optimum time is longer than the shortest possible time.

SOFTBALL PITCH*



---

*This applies to slow-pitch and fast-pitch.

**If result is said to be a STRIKE, problems may arise. Is a ball that is hit into fair territory a strike? If so, there are good strikes & bad strikes from a pitcher's standpoint. A good strike produces an out or a strike against the batter. A bad strike is a base hit or homerun. If a ball hit fair is not a strike, the latter is not the result. Pitcher may seek to have batter "pop-up".

Notes from Dr. Hinrichs: I believe these are circa 1984 after the Hay and Reid book was out in its first edition (1982) but before the release of the second edition (1988). I say this because Jim's models became more "deterministic" over time. At first he didn't include factors that were beyond the athlete's control (like gravitational acceleration). By 1988 Jim was including factors like "forces (other joints)" to make the models more "deterministic". These models don't include "forces (other joints)" so they are probably pre-1988.

BULGARIAN SOCIETY OF BIOMECHANICS
Post Address: BSB, P.O.Box 89, Sofia 1113, Bulgaria
Tel. +359 2 70 20 56 fax: +359 2 70 74 98
E-mail: ytoshev@imbm.bas.bg

NOTES ON BIOMECHANICS IN BULGARIA

The Beginning

The beginning of the Bulgarian biomechanics is related with sports sciences and orthopaedics. In 1960 the course "Biomechanics of physical exercises" (Prof. P. Bogdanov) was introduced in the frame of MSc education in the National Sport Academy (Sofia). In 1970, after preliminary biomechanical investigations, Prof. J. Holevich began the implantations of artificial hip joints. In 1971 Prof. G. Brankov (the father of the Bulgarian biomechanics) founded "Scientific Group of Biomechanics" at the Bulgarian Academy of Sciences. The Institute of Mechanics and Biomechanics at the Bulgarian Academy of Sciences was established in 1977. This Institute (the first in Central and East Europe) is currently the most important and internationally recognized national research centre in the field of theoretical and applied mechanics and biomechanics.

Three biomechanical departments were initially created: "Biomechanics of the cardio-vascular system" (Prof. H. Hristov), "Biomechanics of the locomotor system" (Prof. J. Holevich) and "Biomechanics of sensorimotor system" (Prof. A. Kehaiov). The First National Conference on Biomechanics (Sofia, 34 oral presentations) was organized in 1972 – one year before the foundation of the ISB and 6 years before the foundation of ESB. In 1974 the Bulgarian Academy of Sciences began publications of the scientific series "Biomechanics". Due to financial problems the last volume of the series (2 volumes per year) was published in 1993.

The Bulgarian Society of Biomechanics

The Bulgarian Society of Biomechanics (BSB) was founded on a meeting of 17 scientists in Sofia on September, 24, 1991. The statutes were approved under Bulgarian law and registered in Sofia (November, 14, 1991). The main aims of the BSB were formulated as:

a) To advance the theoretical and applied investigations in the field of biomechanics in Bulgaria;
b) To introduce and support the university education on biomechanics at BSc, MSc and PhD levels;
c) To consult and assist biomechanical researchers in their continuous education and investigations;
d) To develop and to support international contacts in the field of biomechanics;

At present the BSB consists of 52 regular members, one honorary member (Prof. A. Rachev) and 25 members of the "BSB Students Section" (created in 1996). The members of the Society are with different academic, research, medical and industrial institutions.

Serious Financial Troubles

The financial problems are very serious for education and research. In addition it is very difficult to take part in the meetings of ESB, ISB and other important events in the field. The experimental biomechanics is in a difficult situation due to the lack of new hardware and software. The students of different levels (BSc, MSc, PhD) need notebooks, computers, laboratory devices and possibilities to attend international events. We know that the financial possibilities of ESB and ISB are limited but we think that some of these problems could be regularly discussed (not only for our country). At that point we would like to thank the ESB and ISB for their past help.

Prof. Yuli Toshev, Ph.D., D.Sc.
President of the Bulgarian Society of Biomechanics
Head of Department "Biomechanics of Motion and Telemanipulators"
Institute of Mechanics and Biomechanics, Bulgarian Academy of Sciences

Post Adress: Yuli Toshev, P.O. Box 89, 1113 Sofia, Bulgaria
Tel. : +359 2 70 20 56
Fax: +359 2 70 74 98
E-mail: ytoshev@imbm.bas.bg

National Research Council Grants for Collaborative Projects with Central and Eastern European Scientists

Extracted from September Grantsnet Newsletter http://nextwave.sciencemag.org/cgi/content/full/2002/09/27/1

The Cold War is over, and the door is opening for Western scientists interested in pursuing collaborations and intellectual exchanges with their Central and Eastern European colleagues. But the lack of financial resources can often keep that door closed, restricting the flow of ideas and hindering scientific progress.

To address this problem, the National Research Council (NRC) in the United States offers grants for U.S. scientists interested in working with Central and Eastern European colleagues through its Development, Security, and Cooperation section.

I would like to collaborate with a colleague in Central Europe on a basic science project, but we must meet face-to-face to hammer out the details. Can the NRC help?

The NRC administers two programs that might be of interest: the Collaboration in Basic Science and Engineering (COBASE) program and the Twinning Program, both funded by NSF. As Kelly Robbins, senior program officer at NRC, explains, the purpose of COBASE is "to serve as a sort of catalyst or feeder program for NSF's own grants programs." The U.S. applicant and foreign collaborator [from Central or Eastern European countries (CEE) or the Newly Independent States of the former Soviet Union (NIS)] use COBASE funds to meet and discuss their collaborative project. Robbins says, "NSF hopes that after these scientists have the opportunity to work together during brief exploratory visits, they will be in a better position to produce strong proposals to NSF itself for continued long-term support."

Proposals must fall within NSF's purview of basic science and engineering. Applicants for COBASE do not need to have existing NSF funding. In fact, current NSF grantees must instead consider applying for an NSF international supplement and may apply to COBASE only if such a supplement is not available. Applicants must be U.S. principal investigators with appointments at U.S. institutions. Foreign collaborators must be citizens of a CEE country or an NIS and must have appointments at CEE or NIS institutions.

COBASE funds up to two visits for participants, either from CEE/NIS to the U.S. or from the U.S. to CEE/NIS, or in both directions, for as long as 8 weeks in total. Funding ranges from $2500 to $10,000, depending on the distance and duration of the proposed visits About 45 awards are made per year, and beginning investigators (those who have received their doctoral degrees within 10 years of applying) are given special consideration. Applications are accepted three times each year, and the next application deadline is 6 January 2003.

If your prospective colleague is in Poland or Slovakia, you may want to turn your attention to this year's NRC Twinning Program. Each year, the focus countries of the Twinning Program change, based on consultations with NSF representatives--so although applications due this fall should propose work with scientists in Poland or Slovakia, next year's call for applications will solicit proposals for collaborations with scientists in different locations. The featured countries are those for which NSF officials "feel extra encouragement is needed to promote partnerships with U.S. scientists," says Robbins.

Twinning grants support up to 4 months of visits which can be carried out over 2 years. Another feature of the Twinning Program is that both collaborators must travel. "Travel in both directions is required, as we feel it is important for the U.S. partners to visit their colleagues' labs and/or field sites to get a better understanding of what capabilities they can bring to a long-term project," says Robbins.

Upcoming Meetings, Workshops 2002

"Biomechanics of Man 2002"
Organizers:Czech Society of Biomechanics
Nov 13-15th, 2002, Czech Republic
http://biomech.ftvs.cuni.cz/csb/bmc2002/

3rd Int. Conference on Strength Training
Nov, 13-17, 2002, Budapest, Hungary
http://www.detail.hu/
Email: Laci@ice.hupe.hu

Australasian Biomechanics Conference
Nov 28 - 30, 2002, Melbourne, Australia
http://www.anzsb.asn.au/abc4.htm
E-mail: abc4@latrobe.edu.au

International Congress on Biological and Medical Engineering
4th - 7th December 2002
Raffles City Convention, Singapore
http://www.icbme.org

2nd European Medical & Biological Engineering Conference EMBEC'02
Dec. 04 - 08, Vienna, Austria
http://www.embec.org

2003

Significance of Musculo-skeletal Soft Tissue on Pre-operative Planning, Surgery and Healing
February 13th to 14th, Berlin, Germany
Email: georg.duda@charite.de
http://www.charite.de/biomechanik/symp2003_e.htm

2nd International Symposium on Adaptive Motion of Animals and Machines
4-8 March 2003, Kyoto, Japan.
http://www.kimura.is.uec.ac.jp/amam2003/index.html

International Society for Postural and Gait Research conference,
March 23-27, 2003, Sydney
http://www.powmri.unsw.edu.au/ispg2003/ISPG2003/ISPG2003.htm

3rd Southern California Conference on Biomechanics
March 28-29, 2003, Pepperdine University, Malibu, California, USA.
http://faculty.pepperdine.edu/mfeltner/sccb/
Email: sccb_2003@yahoo.com or michael.feltner@pepperdine.edu

Microdamage in Osteoporosis, Bone Quality and Remodelling
31 March 2003, Dresden, Germany
www.anat.mu-luebeck.de/anatcong.html
Tel: 353 1 402 2264
Fax: 353 1 402 2355
email: tclee@rcsi.ie

Gait and Clinical Movement Analysis Society 8th Annual Meeting
May 7-10, 2003
Wilmington, Delaware, USA.
http://www.pedsref.org/gait2003.

European Workshop on Movement Science (EWOMS)
May 22nd - 24th, Münster (Germany)
http://www.uni-muenster.de/EWOMS
Email: move.brain@uni-muenster.de

International Conference on Bioengineering & Biosciences
June 24 - 26, Singapore.
Email: mkmliew@ntu.edu.sg
http://www.mie.utoronto.ca/announce

Summer Bioengineering Conference June 25 - June 29, Sonesta Beach Resort Key Biscayne, Florida
Email: tskalak@virginia.edu
http://www.asme.org/divisions/bed/events/summer03.html

International Ergonomic Society (IEA). August 24-29, Seoul, Korea.
http://www.iea2003.org/

Biomechanics of the Lower Limb in Health, Disease and Rehabilitation
Sept 1-3rd 2003, Manchester, England
http://www.healthcare.salford.ac.uk/crhpr/biomech2003.htm
Email: j.fletcher@salford.ac.uk

5th Bone Fluid Flow Workshop
September 17-18, 2003, Cleveland
Email: Eleanora Voelkel, voelkee@ccf.org

Puzzle: Why is the stiffness of a viscoelastic model independent of loading rate?

Submitted by Praveen Solomon and Brian L. Davis
Cleveland Clinic Foundation

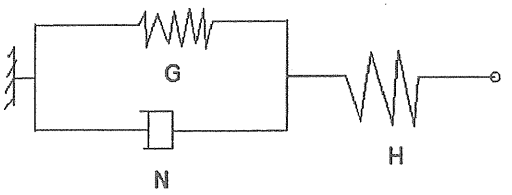


Figure 1. A simple model consisting of two springs and a dashpot.

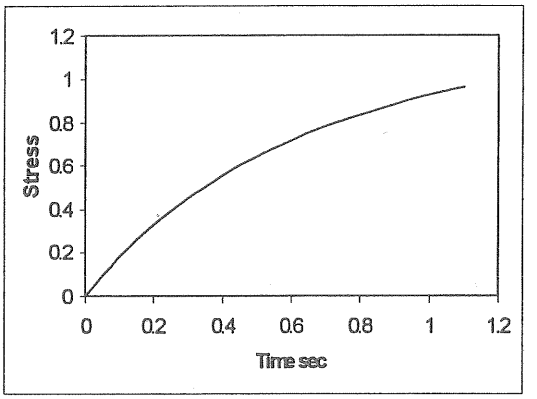


Figure 2. Predicted stress-strain relationship

The stress strain relationship for this model can be written as

Stress = stiffness*strain
or simply $P = KQ$

Since the overall stiffness, $K = [1/(Ns + G) + 1/H]^{-1}$

In the Laplace domain, the expression for stress can be written as:

$$P(s) = [1/(Ns + G) + 1/H]^{-1} * Q(s) \quad (1)$$

Where N, G, H are the values for dashpot, parallel spring stiffness and series spring stiffness

$$P(s) = [(H + Ns + G)/(Ns + G)H]^{-1} * Q(s)$$
$$= [(HNs + HG)/(H + Ns + G)] * Q(s)$$

For a ramp strain input of the form $Q(t) = mt$,
In Laplace domain, $Q(s) = m/s^2$
Substituting gives us:

$$P(s) = ((HNs + HG)/(H + Ns + G)) * (m/s^2) \quad (2)$$

Cross multiplying and rearranging Eq. 2

$$= \frac{(As + B)}{s2} + \frac{C}{(H + G + Ns)}$$

where A, B and C are arbitrary constants

$$(As + B)(H + G + Ns) + Cs^2 = (HNs + HG)m$$

Comparing like terms in "s"
s^2: $C + AN = 0$
s : $A(H + G) + BN = HNm$
$B(H + G) = HGm$

Here we have 3 unknowns (A, B and C), and 3 equations.

Solving for A, B and C gives:
$B = HGm / (H + G)$
$A = H^2Nm/(H + G)2$
$C = - (HN)^2m/(H + G)^2$

Taking inverse Laplace transform, http://mathworld.wolfram.com/LaplaceTransform.html

$$P(t) = (H^2Nm / (H + G)^2) + (HGmt/(H + G)) - H^2Nm/(H + G)^2 * (e^{-(H + G)t/N}) \quad (4)$$

This gives us the typical stress strain curve (Figure 2) seen when applying a ramp strain to the type of model shown in Figure 1. (It is non-linear, starts at zero stress when the strain is zero and if the unloading portion is plotted, there would be a hysteresis loop.)

However, here is the puzzle!!! Notice in Eq. 4, there is an "m" in each term on the right hand side of the expression. Therefore, if we calculate stiffness (Young's modulus equals stress/strain, or P/Q, where Q = mt) we find that the "m" values cancel since they are in the numerator and denominator! This leads to the conclusion that the stiffness of the model shown in Figure 1 is independent of the rate of deformation, even though there is a dashpot in the model!

Any insights into this puzzle can be sent to the editor at davis@bme.ri.ccf.org. The first person to explain this conundrum will be acknowledged in the next newsletter!

Engineering and Management

A man in a hot air balloon realized he was lost. He reduced altitude and spotted a woman below. He descended a bit more and shouted, "Excuse me, can you help me? I promised a friend I would meet him an hour ago, but I don't know where I am." The woman below replied, "You're in a hot air balloon hovering approximately 30 feet above the ground. You're between 40 and 41 degrees north latitude and between 59 and 60 degrees west longitude."

"You must be an engineer," said the balloonist.

"I am," replied the woman, "How did you know?"

"Well," answered the balloonist, "everything you told me is, technically correct, but I've no idea what to make of your information, and the fact is I'm still lost. Frankly, you've not been much help at all. If anything, you've delayed my trip."

The woman below responded, "You must be in Management."

"I am," replied the balloonist, "but how did you know?"

"Well," said the woman, "you don't know where you are or where you're going. You have risen to where you are due to a large quantity of hot air. You made a promise, which you've no idea how to keep, and you expect people beneath you to solve your problems. The fact is you are in exactly the same position you were in before we met, but now, somehow, it's my fault."

Meditech: The Research and Medical Technology Network
www.meditech.uwcm.ac.uk

Taken from Biomch-L posting on Aug 30th, 2002.

We are pleased to announce the launch of a the new National Physical Laboratory and Welsh Development Agency funded research network to focus on medical devices, bioengineering, biomaterials and biomechanics. and biophysics applied to dental and oral health.

Aims of the Network
To enhance existing links with national/ international experts, companies and research institutions within the diverse field of medical devices and materials. To extend the network to new developments in the healthcare sector with the intention of implementing advanced technologies in the fields of bioengineering, biomedical materials, biomaterials, biocomputational simulation and design and development of medical devices.

John Middleton,
Professor of Biomechanical Engineering
Biomechanics Research Unit
University of Wales College of Medicine

Editor's Notes and Requests:

1. Usually the Newsletter is published in the spring, summer, fall and winter, although if you are in the Southern Hemisphere, this may be different. There are no deadlines for newsletter material since historically they have never been taken seriously. The content of the Newsletter does not necessarily reflect the philosophy and opinions of the ISB membership.

2. Newsletter items such as Opinions, Affiliate Society News, Thesis Abstracts, Reviews of Biomechanics Meetings are desirable and may be considered for publication. Material may be submitted electronically or on a computer disk as a text-only file, and must be in some form of English. Submission is not a guarantee of a timely or accurate appearance in the Newsletter."

Obituary: Professor Herbert Hatze
Posted on Biomch-L by Arnold Baca, September 2nd, 2003

Professor Herbert Hatze has died on Monday, August 26. We are stunned by this great loss for the science of biomechanics.

Herbert Hatze was born in Vienna, Austria in 1937. He recieved the bachelor of science (Majors: Mathematics, Applied Mathematics; with first class honours in Applied Mathematics) from the University of South Africa in 1970, the honours bachelor of science (Courses: Optimal Control Theory, Ordinary Differential Equations, Calculus of Variations, Differential Geometry; with first class honours) from the University of South Africa in 1972 and the Ph.D. (Thesis: "A Control Model of Skeletal Muscle and its Application to a Time-optimal Biomotion") from the Department of Applied Mathematics, Faculty of Science, University of South Africa. in 1974. Professor Hatze was an active Member of the New York Academy of Sciences, recipient of SACAC Science Award in 1975, recipient of International Society of Biomechanics in Sports "Geoffrey Dyson Award" in 1998, and Editorial Member of several journals.

ISB Membership News

New members:

SAAB, Saad (#2658)
Saab Biomechanics Pty. Ltd.
33 Hilton St.
Greystanes, NSW 2145
AUSTRALIA

VU VIET, Bao (#2659)
Dept. of Sport Science & Technology
Vietnamese University of Phys. Ed. &
Sport II - National Sport Training Cntr.
Linh Trung Ward, Thu duc District
Ho Chi Minh, 84
VIETNAM

YAMAMOTO, Ei (#2660)
Dept. of Mechanical Engineering
School of Biology, Oriental Sci. & Tech.
Kinki University
Uchita-cho, Naga
Wakayama 649-6493
JAPAN

BUTLER, Heather (#2661)
Dept. of Industrial Engineering
Dalhousie University
3218 Agricola St.
Halifax, NS B3H 3J5
CANADA

JOHN, Emmanuel Babatunde (#2662)
Dept. of Physical Therapy & Rehab. Sci.
Kansas University Medical Center
3901 Rainbow Boulevard, 3056 Robinson
Kansas City, Kansas 66160-7601
USA

FORREST, Gail (#2663)
Human Performance Laboratory
Kessler Medical Rehab. & Education
Corporation
4805 Ravens Crest Road
Plainsboro, NJ 08536
USA

PERUMAL, Ramu (#2664)
Dept. of Mechanical Engineering
University of Delaware
126 Spencer Lab
Newark, DE 19716
USA

DOMIRE, Zachary (#2665)
Dept. of Kinesiology
Penn State University
39 Rec. Hall
State College, PA 16802
USA

GREGORY, Robert J. (#2666)
Dept. of Health, Sport & Ex. Sciences
University of Kansas
Robinson Center
1301 Sunnyside Ave., Room 101A
Lawrence, KS 66045-7567
USA

RENGASAMY SEETHARAM,
Lakshminarayanan (#2667)
Dept. of Mechanical Engineering
University of Leeds
Woodhouse
Leeds, West Yorkshire LS2 9JT
UNITED KINGDOM

HASSON, Christopher (#2668)
Human Performance Lab. - Biomechanics
Ball State University
Ball State
Muncie, IN 47306-0001
USA

MAAS, Huub (#2669)
Faculty of Human Movement Sciences
Vrije Universiteit Amsterdam
van der Boechorststraat 9
Amsterdam, 1081 BT
THE NETHERLANDS

SONG, Yuhua (#2670)
Department of Orthopaedic Surgery
University of Pittsburg
210 Lothrop Street BSTE1641
Pittsburg, PA 15213
USA

KHURANA, Vivek (#2671)
Biomechanics Division
Vector Scientific Inc.
5245 Pacific Concourse Dr.
Los Angeles, CA 90045
USA

RAYMOND, David (#2672)
Biomechanics Division
Vector Scientific, Inc.
5245 Pacific Concourse Drive
Los Angeles, CA 90054
USA

IPSER, James (#2673)
Department of Physics
University of Florida
New Physics Building
PO Box 118440
Gainesville, FL 32605
USA

BAKKE, Hilde (#2674)
>University of Hartford
200 Bloomfield Ave., Box 452
Wst Hartford, CT 06117
USA

WU, Jianping (#2675)
School of Mech. & Materials Engineering
The University of Western Australia
35 Stirling Hwy.
Crawley, WA 6024
AUSTRALIA

NUTINI, Alessandro (#2676)
via Muston 74, S. Anna
Lucca 55100
ITALY

HUNTER, Iain (#2677)
Department of Physical Education
Brigham Young University
120 D Richards Building
Provo, UT 84602
USA

CASTAGNO, Thomas (#2678)
Dept. of Mechanical Engineering
Worcester Polytechnic Institute
100 Institute Road
Worcester, MA 01609
USA

ANDRESON, Frank (#2679)
Dept. of Mechanical Engineering
Stanford University
BME 201 Durand Building
Stanford, CA 94305-4038
USA

TAKESHIMA, Yoshinori (#2680)
>Aerospace Company Engineering Division
>Kawasaki Heavy Industries, Ltd.
Kakamigahara Tyou 1-26-2 Parkhomes 502
Kakamigahara City, Gifuken 5090141
JAPAN

MAEDA, Akira (#2681)
Dept. of Physiology and Biomechanics
National Institute of Fitness & Sport
in Kanoya
1 shiromizu-cho
Kanoya, Kagashima 891-2393
JAPAN

COLLOUD, Floren (#2682)
Laboratoire MECAL
Universite Claude Bernard
43, Bd du 11 Novembre 1918
Villeurbanne, 69622
FRANCE

RASCHNER, Christian (#2683)
Institut for Sport Sciences
University of Innsbruck
Furstenweg 185
Innsbruck, Tirol A-6068
AUSTRIA

PRASSAS, Spiros (#2684)
Dept. of Health and Exercise Science
Colorado State University
Fort Collins, CO 80523
USA

KENTEL, Behzat Bahadir (#2685)
Dept. of Mechanical Engineering
Middle East Technical University
Orta Dogu Teknik Univ
Makina Muhendisligi Bolumu
Ankara 06531
TURKEY

CAMPBELL-KYUREGHYAN, Naira (#2686)
Dept. of Industrial Engineering
The Ohio State University
1858 Westwood Drive
Lewis Center, OH 43035
USA

HAMEL, Kate (#2687)
Dept. Physical Therapy & Rehab. Science
University of California San Francisco
Box 0625
San Francisco, CA 94143-0625
USA

International Society of Biomechanics

2002 MEMBERSHIP APPLICATION FORM

Please TYPE or PRINT clearly and SEND TO THE TREASURER, Dr Graeme A. Wood,
PO Box 3156, Broadway, Nedlands, WA 6009, AUSTRALIA

Family Name _____ Given Name(s) _____ Title ___

Department _____

University/Institute _____

| Street _____

Address < City _____ State _____

| Country _____ Postcode _____

PAYMENT DETAILS

Annual Membership

Full member - $AUS 100 Student Member - $AUS 30 _____

Optional Subscriptions

(a) *Journal of Biomechanics* - $AUS 120 _____

(b) *Journal of Applied Biomechanics* -

USA Resident - $AUS 95

Non-USA Resident - Surface $AUS 105

Airmail $AUS 145 _____

(NB: Student subs to the JAB are $25 less)

(c) *Clinical Biomechanics* - $AUS 130 _____

(d) *Journal of Electromyographic Kinesiology* - $AUS 180 _____

TOTAL PAYMENT ==========

I enclose a cheque for $AUS _____ drawn on an Australian bank and made payable to the International Society of Biomechanics (no foreign currency cheques please),

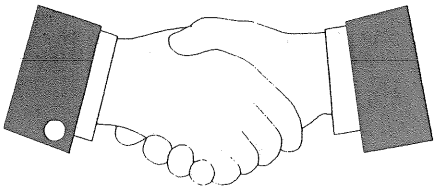
OR

Please debit ____ $AUS to my ☐ Visa ☐ MasterCard ☐ Australian Bankcard (mark one box)

Card Number ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ Expiry Date ____/____

Signature _____ Date _____

The International Society of Biomechanics Gratefully Acknowledges the Support of these Companies



MotionAnalysis™

3617 Westwind Blvd. Santa Rosa, CA, 95403 Tel: 707-579-6500 FAX 707-526-0629

PEAK PERFORMANCE TECHNOLOGIES INC.

Tel: 303-799-8686 Fax: 303-799-8690 www.peakperform.com

QUALISYS ProReflex™

Captures the motion

www.qualisys.se

QUALISYS AB (PUBL.) Göteborgsvägen 74, SE-433 63 Sävedalen, Sweden.
Tel: +46 31 36 94 00. Fax: + 46 31 36 94 20. E-mail: sales@qualisys.se

Vicon Motion Systems

Oxford Metrics Ltd, 14, Minns Estate,
West Way, Botley, Oxford OX2 0JB, UK
Tel: +44 (01865) 261800 Fax: +44 (01865) 240527
Email: sales@metrics.co.uk

OXFORD METRICS

Vicon Motion Systems, 15455 Redhill Ave, Suite B&C, Tustin, CA 92680 USA
Tel: +1 (714) 259-1232 Fax: +1 (714) 259-1509 Email: sales@vicon.com Website Address: www.metrics.co.uk

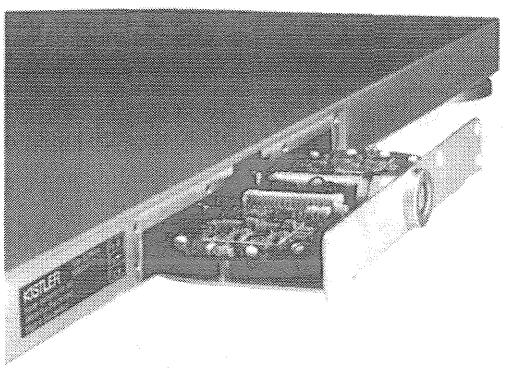
Kistler Bio-mechanics Ltd.
Mill Lane, Alton, Hampshire GU34 2QJ, GB
Tel (0 14 20) 54 44 77
Fax (0 14 20) 54 44 74

KISTLER

Kistler Instrumente AG Winterthur
PO Box 304, CH-8408 Winterthur, Switzerland
Tel + 41 - 52-224 11 11, Fax 224 14 14
www.kistler.com/biomech

1501

Strides Ahead in Gait Analysis



Innovative design together with the highest quality of manufacturing results in the outstanding performance of Kistler Force Platforms.

Kistler Force Platforms meet the needs of virtually any application from dynamic sporting activity through to the quiet-rhythm of standing balance.

Contact us for more information.

Kistler Instruments Ltd., Alresford House, Mill Lane, Alton, Hampshire GU34 2QJ, UK
Tel. +44 1420 54 44 77, Fax +44 1420 54 44 74, sales.uk@kistler.com

Kistler Instrumente AG, PO Box, CH-8408 Winterthur
Tel. +41 52-224 11 11, Fax +41 52-224 14 14, info@kistler.com

KISTLER

measure. analyze. innovate.