



International Society of Biomechanics Newsletter

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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; Japanese Society of Biomechanics; Korean Society of Sport Biomechanics; Polish Society of Biomechanics; Russian Society of Biomechanics; Société de biomécanique (France).

ISB News

FROM THE PRESIDENT - Peter Cavanagh

ISB on the INTERNET- Your Input Please!

One of my major goals as your President the next two years is to increase the services which the Society provides to its members. I believe that The principal vehicle through which this goal can be achieved is the INTERNET. Plans are already underway on a number of fronts but your input now can have a significant impact on the eventual outcome. The hub of the ISB Information Center will be a home page on the World Wide Web. From this page, links to the following categories of information will be provided:

CATEGORY 1: ISB Information

This part of the page would have open access to any "web surfer" who wanted to visit:

- 1.1 ISB Society Business (Goals, Society Officers, Membership information, History, Constitution).
- 1.2 ISB Membership Directory.
- 1.3 ISB Newsletters (Current and past).
- 1.4 ISB Congress (information on the next ISB Congress in Tokyo 1997 and links to the Congress organizers home page).
- 1.5 ISB Technical and Working Group Information (presently includes groups on 3D Analysis of Motion, Computer Simulation, and Functional Footwear).

CATEGORY 2: Member Services

This part of the page would have password access which would be automatically linked to the ISB membership directory. Visits would only be allowed for paid up ISB members. There is considerable cost involved in preparing the information.

- 2.1 ISB Data Bank (Useful data sets that members can use for their teaching or research - see below).
- 2.2 Literature Sources (Emphasis on some of the "harder to find" literature such as dissertation and thesis abstracts).
- 2.3 Educational Materials (Notes from Tutorials at the ISB Congresses and course outlines contributed by members. Text book lists).
- 2.4 Student Services (Information on graduate programs and available assistantship and fellowship opportunities).
- 2.5 Job Opportunities (A bulletin board for job postings - including those posted to BIOMCH-L).
- 2.6 Links to Other Societies (Contact information and URL listings for other Societies interested in Biomechanics around the world).

Among the most exciting of the current plans is the ISB Data Bank. We are currently considering such data as musculoskeletal models, kinematic data from various activities, EMG data from gait of normal and abnormal patients, force platform data, plantar pressure distributions, FEM meshes, CT and MRI scans, together with anthropometric data and body segment parameters. Obviously, this is an ambitious plan and we do not expect it to happen overnight.

Two ISB Council members are playing a key role in moving us forward in this area. Ton van den Bogert of the University of Calgary has been tasked with the responsibility for Informatics and is devoting his efforts towards the complexities of information storage and delivery. He is the WebMaster for the fledgling ISB Home Page which you can visit at the URL <http://www.kin.ucalgary.ca/isb>. At the moment the page is, as you will see, in its early stages but visits over the next few months will be repaid by the discovery of new dimensions to the page. Brian Davis of the Cleveland Clinic Foundation has taken the responsibility for generating some of the information for the data bank and he will be the initial recipient of potential shared data sets.

What we need you to do is respond to the above outline and help us tailor the effort to meet the needs of as many members as possible. If you have overall suggestions for the page and comments on the initial plan then please contact me (prc@psu.edu). If you have comments on the organization of the effort then pass send them to Ton (bogert@acs.ucalgary.ca), and if you have data you would like to share then you should contact Brian (davis@bme.ri.ccf.org).

This message will arrive on many desks and screens as you are preparing for the Holiday Season. On behalf of the ISB Council, I would like to wish all our members a happy and healthy holiday. We look forward to serving you and to hearing from you in 1996.

Sincerely,

Peter R. Cavanagh
President, ISB



1997 ISB MUYBRIDGE MEDAL WINNER

Eur. Ing, Professor John P. Paul, FEng
Bioengineering Unit, University of Strathclyde,
Scotland

The Muybridge Medal is the highest award that the ISB bestows. This special honour is given every two years during the ISB Congress for outstanding contributions to biomechanics that have had significant impact on basic and applied research and methodological development. A balance is recognized between breadth, depth, theory and practice of the contributions to science by the winner. The award can be given to any outstanding scientist who is active in research in the field of biomechanics; the winner does not have to be a member of the ISB.

For 1997, the ISB Muybridge Medal winner will be Dr. John Paul of the University of Strathclyde in Scotland. Dr. Paul was selected as the winner from a pool of outstanding candidates. The Muybridge committee who evaluated the potential candidates and chose the winner, include; Drs. Aurelio Cappozzo, Peter Cavanagh, Robert Norman, Malcolm Pope and Ron Zernicke.

For 1997 we are especially pleased to have a Muybridge winner who is not only outstanding in biomechanics, but also one who is a valuable member of the ISB. Dr. Paul has had a distinguished career in engineering and biomechanics, and his selection as the 1997 Muybridge Medal winner brings reflected glory to the ISB.

The 1997 Congress of the ISB will be held in August at the University of Tokyo. That timing is fortuitous as Dr. Paul will have just recently celebrated his 70th birthday (June 1927).

Dr. Paul's first training was as a mechanical engineer, and his employment for some 20 years was as a researcher and teacher in applied mechanics in the Department of Mechanical Engineering at the University of Strathclyde. In 1949 Dr. Paul received a BSc. (Mechanical Engineering, First Class Honours) from the University of Strathclyde in collaboration with the Royal College of Science and Technology in Glasgow.

He had a gradual transition from applied mechanics to biomechanics, with a step-change at the end of 1969, when he moved from the Department of Mechanical Engineering to the newly established Bioengineering Unit at the University of Strathclyde. This step-change corresponded to a sabbatical year in West Virginia that allowed him to undertake some more than 50,000 kilometres of travelling in North America, visiting research laboratories, covering all the major centres of Canada and USA. Since 1970, he has been a member of the staff with the Bioengineering Unit, becoming Head of the Unit on the retirement of Professor Kenedi in 1980, and retiring to adopt the designation "Emeritus" in 1992.

Dr. Paul has been honoured by his profession by becoming a fellow of seven societies, as is denoted by his official title:

Professor John P. Paul, Eur Ing, BSc, PhD, FEng, FIMechE, cFBOA, FISPO, FRSA, FRSE, FBES

Those fellowships include the Royal Academy of Engineering, The Institution of Mechanical Engineers, The British Orthopaedic Association, The International Society for Prosthetics and Orthotics, The Royal Society of Arts, The Royal Society of Edinburgh, and The Biological Engineering Society.

Dr. Paul's research focuses on the mechanics of locomotion of the human. In particular he has been a pioneer and leader in the assessment of forces transmitted by anatomical structures of the upper and lower limbs for normal and disabled persons. In addition he has extensive experience and research in analysing the performance of implanted joints and analysis of patients using prosthesis and orthoses. He is currently the Chairman of the British and International Standards Committees on Bone and Joint Replacements, and as well, he is Chairman of the Working Group for the Europeans Standard Organization.

His dissertation topic was "Force Actions at the Hip Joint," and this was completed in 1967. This work led to the classic paper:

Paul JP (1967) Forces transmitted by joints in the human body. *Proc Inst Mech Eng*, V181:3J, 8-15.

This research paved the way for the continuing outstanding work that has emanated from the bioengineering unit at the University of Strathclyde. He has published more than 125 research articles in journals, books and conference proceedings and he has been an editor of seven books.

Dr. Paul is invited throughout the world to present his research, and he currently reviews research proposals for the United Kingdom, Australia, Italy and Switzerland.

Dr. Paul has made significant contributions to the International Society of Biomechanics. He not only served as a member of the Executive Board, but he also served as the President of the International Society of Biomechanics from 1987-1989.

Leading up to the Muybridge Medal, Dr. Paul has received the Medal of Honour from the Czechoslovak Society of Mechanics, The Forsheim Prize of the International Society of Prosthetics and Orthotics, the Donald Julius Groen Prize from the Institution of Mechanical Engineers, and has been given honorary membership in the Societe de Biomecanique.

We are indeed honoured that Dr. Paul has agreed to present the Muybridge Lecture and to receive the Medal at the 1997 Congress. We look forward to hearing the lecture presented by this distinguished biomechanist—also a warm and genuine human being.

Ron Zernicke
Past-President, ISB

CALL FOR PROPOSALS TO HOST THE XVII CONGRESS OF THE INTERNATIONAL SOCIETY OF BIOMECHANICS, 1999

Have you ever considered hosting an ISB Congress? 1999 may be the year for you and your colleagues to organize the ISB Congress. The ISB has had a history of well organized Congresses at interesting and varied locations.

The ISB Executive Council plans to review the proposals for the 1999 ISB Congress at its meeting in August 1996. Proposals for the 1999 Congress should be sent directly to Dr. Guenter Rau at the following address:

Dr. Guenter Rau, President-Elect, ISB
Helmoltz-Institute for Biomedical Engineering
Pauwelsster 20
D-52074, Aachen
GERMANY
Tel: 49 241 8071111; Fax: 49 241 8888418
Email: rau@hia.rwth-aachen.de

Dr. Rau is the President-Elect of the ISB, and as such is in charge of the review process for future congresses.

Anyone interested in preparing such a proposal, may be interested in contacting the Secretary General of the ISB, Dr. Kit Vaughan at the following address:

Dr. Kit Vaughan, Secretary General, ISB
Department of Biomedical Engineering
University of Cape Town
Observatory, Cape 7925
SOUTH AFRICA
Tel: 27 21 406 6238; Fax: 27 21 448 3291
Email: kvaughan@anat.uct.ac.za

He will be able to send you samples of past proposals and a document that has been prepared as a guideline for organizers of ISB Congresses.

As past congress organizers can attest, there is certainly work, time, and effort that go into organizing a congress, but at the same time there are substantial personal and professional rewards and satisfaction to be gained from organizing a successful congress. Please, seriously think about this.

CALL FOR NOMINATIONS ISB EXECUTIVE COUNCIL CANDIDATES 1997 PRESIDENT-ELECT OF THE ISB

The ISB Nominating Committee, herein, officially, solicits nominations of candidates who will stand for election for the 1997 ISB Executive Council. In addition, the committee asks for nominations for President-Elect of the ISB 1997.

Nominations should be sent directly to Dr. Ron Zernicke, Chair of the Nominating Committee:

Dr. Ronald F. Zernicke, Past-President, ISB
Department of Surgery, University of Calgary
3330 Hospital Drive N.W.
Calgary, Alberta CANADA T2N 4N1
Tel: 403-220-8666; Fax: 403-270-0617
Email: zernicke@acs.ucalgary.ca

Individuals nominated for the Executive Council must be members of the ISB, in good standing, and be willing to serve on the Council; thus if you wish to nominate someone, please contact him or her in advance to be sure that your nominee is willing to run. When the nomination is sent to Dr. Zernicke, please include a short cover letter and a copy of the nominee's curriculum vitae.

Nominations can also be made for ISB President-Elect. This individual must have served or be currently serving on the ISB Executive Council. Again, please contact your nominee in advance to be sure that he or she will allow his or her name to be placed in nomination. Send a brief cover letter along with the curriculum vitae of the nominee to Dr. Zernicke.

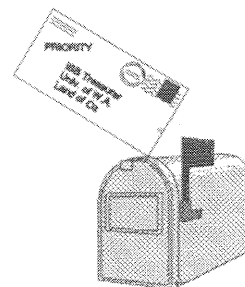
These are important leaders in the ISB, and input from the membership is vital for helping forge the future directions of the Society. Please take some time to think about these nominations, and then act.

FROM THE TREASURER - Graeme A. Wood

Enclosed with this Newsletter is your 1996 ISB Membership Dues and Journal Subscription renewal form. Please return this form to the Treasurer as *quickly as possible* so as to avoid disruption to Newsletter and journal mailings.

Please note that there has been a small increase in *Journal of Biomechanics* and *Clinical Biomechanics* subscription rates for 1996, but that ISB Membership fees have not been changed. The increase in journal rates are accompanied by an increase in the total number of pages to be printed - the cost:benefit ratio staying unchanged.

Finally, **NO CHEQUES IN \$US** please! Payment should be in Australian dollars (\$AUS) - otherwise your Society incurs significant expense in renegotiating foreign currency amounts. Credit card payments are our preferred method, but any cheque drawn on an Australian bank (preferably WestPac) is quite acceptable.



CALLING ALL BIOMECHANICS STUDENTS

After the 1995 Annual General Meeting of the International Society of Biomechanics, a group of students met to discuss the student's role in the ISB, and common concerns of students worldwide. A decision was made that it was appropriate to form a student chapter of the ISB. The first priority of this chapter is to improve communications amongst students.

As a consequence of this, a student's list has been set up on the internet. This group list can be used to deal with biomechanically related research, as in the case of biomch-1. Additionally, it may be used as a forum to find out more about graduate/post-doctoral programs, grant and scholarship application procedures, etc... It is also intended to provide a means for the exchange of ideas and solutions to other concerns faced by students, such as supervision, intellectual property, and basic research queries. Finally it is hoped that it will be useful in the development of lasting personal and academic friendship amongst us.

To subscribe to the list, send mail to:

listproc@liverpool.ac.uk

Omit the subject, and send a one line message of the form:

SUBSCRIBE BIOMECH-STU your name.

Please direct the attention of any student colleagues to the existence of this new list.

The second priority of the student discussion group was to place a student on the ISB council, as a result of a need for greater interaction between full members of the ISB and student members. It would then be possible for the needs of the student members to be addressed and dealt with, thereby increasing student involvement and participation.

We welcome all students (both ISB members and non-members) to the group. Suggestions and questions will be best answered on the student list.

Rachel Skoss	rskoss@uniwa.uwa.edu.au
Patricia Turnbull	pturnbul@healthy.uwaterloo.ca
Giannis Giakis	biomechanics@bbcnc.org.uk
Andrew Mahar	mahar@ecs.umass.edu

ANDRZEJ KOMOR NEW INVESTIGATOR AWARD WINNER

During the 4th International Symposium on Computer Simulation in Biomechanics the *Andrzej Komor New Investigator Award* was instituted, to be presented at each succeeding meeting to the best paper by a new investigator. The computer simulation symposia are a continuation of the meeting that Andrzej Komor began in Warsaw (Poland) in 1985.

We are pleased to inform the biomechanics community that, at the 5th International Symposium on Computer Simulation in Biomechanics held in Jyväskylä (Finland) last June, the Andrzej Komor New Investigator Award and a check for \$500 US were presented to Mr Marwan Sati, a Ph.D. student in the Department of Biomedical Engineering at the Ecole Polytechnique in Montreal, Canada. Mr Sati's paper, entitled "Predicting Prosthetic Ligament Deformations: Accuracy Valuation", was recognized as the paper of highest quality presented by a young scientist during this symposium.

This award continues to fund a new young researcher and to keep alive the memory of Andrzej's research activity and contributions in the area of biomechanics.

PROMISING SCIENTIST AWARD

This award, sponsored by Peak Performance Technologies, is made in recognition of superior research indicative of future promise in a single area of biomechanics. While there are no age or educational limitations, the award is intended for ISB members at a relatively early stage of their scientific careers.

The award winner will be expected to make a 15 minute oral presentation on this research at the 1997 ISB Congress in Japan. The award certificate together with a cheque for \$US 1,500 will be presented to the recipient at this congress.

Applicants should identify at least two first author scientific journal articles that they have written in a single area of biomechanics and should provide interpretative summaries describing the contribution of each article. Five copies of each article and brief curriculum vitae should be sent to:

Dr Savio L-Y. Woo
Department of Orthopaedic Surgery
Musculoskeletal Research Laboratories
University of Pittsburgh, M272 Scaife Hall
Pittsburgh, PA. 15261
U.S.A.

UPDATE ON XVIth CONGRESS OF ISB

Welcome to XVIth ISB Tokyo Congress

Organizing Committee of the XVIth ISB Congress:

Congress Chair: M. Mitumasa & T. Fukunaga
Congress Vice-Chair: K. Kobayashi & T. Ohtsuki
Secretary General: Y. Hirano & S. Fukashiro

We, the organizers of the XVIth ISB Congress, take great pleasure in inviting you to Tokyo, our colleagues and friends in the field of biomechanics throughout the world. We understand that the ISB, by authorizing us to organize the ISB Congress, will take another step towards new biomechanical researches with a global vision. Reading through the details of the Congress as follows, you will know our positive attitude for enlarging the field of biomechanics to cover broader aspects of life sciences from cellular to total body levels.

This is the 2nd Congress held in Asia. Since the VIIIth ISB Congress held in 1981 in Nagoya, young biomechanics researchers have been growing up not only in Japan but also in other Asian countries. Therefore, it is our additional hope that these young Asian researchers of biomechanics shall be given a chance to present their researches and to make contact with biomechanists in various countries.

Although we will do our best, we certainly need your help and cooperation for the great success of the Congress. Again, we give you a warm welcome to an energetic city, Tokyo, in 1997.

Dates: August 25-29, 1997
Place: The University of Tokyo, Komaba, Japan
Information: XVIth ISB Tokyo Congress Secretariat
Fukashiro
Lab. Dept. Life Sci.
The Univ. Tokyo, Komaba 3-8-1
Meguro 153
JAPAN
Fax: +81-3-5454-9494
E-mail: ISB97@idaten.c.u-tokyo.ac.jp

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Komaba 3-8-1, Meguro 153, Japan
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E-mail: fukashiro@idaten.c.u-tokyo.ac.jp

XVIth ISB Tokyo Congress Secretariat
Tel & Fax: +81-3-5454-9494
E-mail: ISB97@idaten.c.u-tokyo.ac.jp

ISB PUBLICATIONS

The following Society publications can be obtained at the special member rates by writing to the supplier shown.

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

Price: 450 FIM (includes postage)
Supplier: University of Jyväskylä
Payment: Pay to the account of the University of Jyväskylä
Account No. 800013-10171
Banker POSTIPANKKI, 00007 Helsinki,
FINLAND, SWIFT PSPBFIHH
Telex 121 698 pgiro sf.
Refer to "ISB Congress book 5620"
(NB: No cheques, foreign currency or credit cards will be accepted)

Then fax a copy of the receipt to:
Minna Korhonen at the University of Jyväskylä
Fax: +358 41 602 071
Tel: +358 41 602 070
E-mail: minnakori@maila.jyu.fi

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

Price: 550 FF plus postage
Supplier: Professor S. Metral
Explorations Fonction. du Systeme Nervuux
C.H. Bicetre, 78 Avenue du General Leclerc
94275 Kremlin Bicetre, FRANCE
Fax: (33.1) 45.21.27.14

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

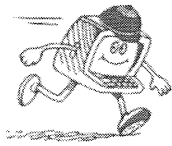
Price: \$AUS 40 plus postage (\$AUS40 airmail) ea.
Supplier: Graeme A. Wood
Department of Human Movement
The University of Western Australia
Nedlands, WA 6009, AUSTRALIA
Fax: +61 9 380-1039

BIOMECHANICS XI-A and XI-B, Proceedings of the XIth Congress of the Intn'l. Society of Biomechanics.

Price: 200 Dfl (includes both volumes and postage)
Supplier: Peter Hollander
Faculty of Human Movement Sciences
Vrije Universiteit
van de Boechorststraat 9
1081 BT Amsterdam
THE NETHERLANDS
Fax: +31-20-6442043

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

Price: \$AUS 65 plus postage (\$AUD 20 airmail)
Supplier: Graeme A. Wood (address as above)



Birdy's Corner

RDA—A Little Objectivity

The term "robust" was first used in the context of time-series analysis by G.E.P. Box in 1953. He defined RDA (robust data analysis) methods as those methods which were little influenced by large residuals. Later, in the sixties, Professor Peter Huber from Harvard University laid a solid theoretical foundation for the future development of RDA. This branch of statistics has experienced an extremely rapid growth as demonstrated from the numerous and diverse applications of RDA. Interestingly, a scan of the methodologies used in biomechanics shows that RDA methods are seldom employed—why not? Perhaps because RDA has only recently been legitimized or ... ? Here, I will deal with only one aspect of this important area of data analysis—the detection and removal of outliers.

What is an outlier? Data of poor quality can of course give large residuals even when the mathematical model is adequate. However, there are some residuals which are so large that no matter what the quality of the data they can not occur by chance — it is these large residuals or glitches which are called outliers. Occasionally, large residuals may come from an unaccountable property or structural change in the physical model; but, they are almost always the result of experimental blunders or equipment failures (e.g. a glitch in an EMG amplifier). Remember, the probability of a 5σ residual occurring is less than 10^{-6} for a Gaussian distribution. It should be clear that an outlier can cause havoc with the least-squares approach — if you need convincing drop an outlier in one of your linear regression fits.

Well QB, how do you deal with outliers? "Simple, I just look at my data and throw away those values which are unreasonable". But, what is an unreasonable value? Few of us would object to the elimination of a 10σ residual; but suppose that you have a 4σ residual (probability of occurrence less than 10^{-4}) — is this a real data value or an outlier QB?

Professor Benjamin Pierce (also from Harvard) apparently was the first to give an answer to this question when he proposed an objective outlier detection method in 1852. Pierce's keen awareness of data glitches and their consequences is well reflected in the following (paraphrasing)

In almost every set of measurements there are some which differ so much from others that they suggest an abnormal source of error not accounted for in the theoretical model, and their inclusion into the analysis can only serve to confuse and mislead.

Pierce's approach to processing outliers was based on some rather subtle arguments which were apparently not well understood by his contemporaries. However, a re-examination of his fundamental work on outliers has shown that some of his ideas are indeed quite useful.

Detect and Remove

The approach used here is to search for the sample which gives the largest residual and then determine if it exceeds a threshold. If it does, we remove it and go through the data again (until the largest residual does not exceed the threshold). An important feature of this algorithm is the adaptive estimation of the threshold which is based largely on Pierce's work.

Let $Z = \{z_1, z_2, \dots, z_N\}$ be the set of measured time-series data and $I = \{1, 2, \dots, N\}$ the set of indices corresponding to these samples. We start by defining two new sets, $\tilde{Z} = Z, \tilde{I} = I$. Note, that \tilde{Z} and \tilde{I} will always contain the current set of samples and their corresponding indices, respectively.

Step 1.0 Fit Model to Data

Fit an M-parameter mathematical model to \tilde{Z} to give model based estimates \hat{Z} .

Step 2.0 Find Maximum Residual-To-Sigma Ratio

Compute the residuals and their variance

$$r_k = \hat{z}_k - \tilde{z}_k \quad \forall k \in \tilde{I}$$

$$\hat{\sigma}^2 = \frac{1}{N} \sum_k r_k^2$$

the maximum residual-to-sigma ratio

$$\lambda_{max} = \max_k \{|r_k|/\hat{\sigma}\}$$

and save the index of λ_{max} in $kmax$.

Step 3.0 Estimate Threshold

Initialize the threshold, $T = 3$

Repeat

$$u = (N - 1) \ln(N - 1) - N \ln N$$

$$v = \exp(u)$$

$$w = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^T \exp(-t^2/2) dt$$

$$x = 2(1 - w) \exp((T^2 - 1)/2)$$

$$y^2 = \left(\frac{v}{x}\right)^{\frac{2}{N-1}}$$

$$T^2 = 1 + (N - 1 - M)(1 - y^2)$$

Until T converges

Step 4.0 Check for Outlier

if $\lambda_{max} > T$ then remove it

$$\tilde{Z} = \tilde{Z} - \{\tilde{z}_{kmax}\}$$

$$\tilde{I} = \tilde{I} - \{kmax\}$$

$$N = N - 1$$

Go to step 1.0

else, finished

In general, M (the number of parameters in the model), can change as outliers are removed and convergence of T (outlier threshold according to Pierce's criterion) is not guaranteed for the iterative method used in step 3.0. However, extensive simulations have shown that it will almost surely converge and rapidly (usually less than 10 iterations). Note, this algorithm assumes a *Gaussian distribution for the outlier-free residuals* (look at the equation for w in step 3.0) — an underlying assumption which is shared by nearly all outlier detectors. However, it should also be clear that the *Gaussian distribution is not applicable when outliers are present*.

The 3σ rule-of-thumb ($T = 3$) is often used as the threshold in outlier detection (independent of N and M). The outlier thresholds obtained using Pierce's criterion (in table) show that adherence to this rule could cause the rejection of too many (few) outliers when N is large (small).

T - Outlier Threshold (single outlier)						
M	N					
	50	100	500	1000	5000	10000
1	2.59	2.85	3.36	3.55	3.96	4.12
5	2.51	2.80	3.35	3.55	3.96	4.12
10	2.40	2.74	3.33	3.54	3.96	4.12

T increases as N increases which fits well with the idea that the larger the data set the greater the probability of large residuals. However, T decreases as M increases (when N is not too large), which follows immediately from the last equation of step 3.0. Again, this seems reasonable, since the more parameters we use in a model the more variance it explains and thus the smaller the probability of large residuals.

Epilogue

Here, I have only touched on the processing of outliers. There many other aspects of outliers which also deserve consideration. For example: 1) What part of the measured outlier is real data (replacement of the outlier with some adjusted value)? 2) What caused the outlier (possibility of a structural change in the model)? 3) How is weighted-least-squares related to outlier processing? I invite you to further investigate these questions and the fascinating world of RDA (and for the more curious, take a look at "intervention analysis"). Of course, the detection and removal of outliers is only the tip of the RDA iceberg. Ignore this iceberg and it just might sink your methodology (at least in some journals). I have written a rather simple PASCAL procedure for determining the outlier threshold according to Pierce's criterion which is available via FTP ([ftp.ki.se/pub/outgoing/birdy/ISB04.ZIP](ftp://ftp.ki.se/pub/outgoing/birdy/ISB04.ZIP)). Please note, there was a reorganization of the directory structure at <ftp.ki.se> and the birdy software packages have all been moved to this new directory. A final message

• Beware of large residuals with least-squares

or as the English statistician F. Y. Edgeworth said it so beautifully over 100 years ago

The Method of Least Squares is seen to be our best course when we have thrown overboard a certain portion of our data—a sort of sacrifice which has often to be made by those who sail upon the stormy seas of probability.

This is particularly interesting since Edgeworth was the inventor of the least absolute value method (L_1 criterion), an extremely robust method. *Th-th-tha-that's all folks!*

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Anton J. (Ton) van den Bogert
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Announcements of forthcoming events

1ST ANNUAL NORTH AMERICAN SOCIETY OF GAIT AND CLINICAL MOVEMENT ANALYSIS CONFERENCE

The Gait Analysis Center and the Department of Pediatric Orthopaedics at The Children's Hospital of Alabama in Birmingham are privileged to host the 1st Annual North American Society of Gait and Clinical Movement Analysis Conference, to be held April 20-23, 1996. The inaugural meeting of the newly formed Society will feature presentations of original investigations addressing a wide variety of topics in clinical and research oriented human motion analysis. Free papers, poster presentations, keynote lectures, and closed-circuit television broadcast of clinical demonstrations will highlight the proceedings. Vendor exhibits will also be available to showcase the latest movement analysis instrumentation and technology. The conference is intended for all professionals involved in the scientific study of gait and movement disorders, including physicians, physical therapists, and engineers. For more information, please consult our homepage at <http://www.ortho.uab.edu/gait96.html>, which will be periodically updated from now until the conference.

Abstracts must be received by December 19, 1995.

For conference registration and abstract submission forms contact:

Terry S. Horn, Ph.D
Program Chairman
Gait Analysis Center
1600 7th Avenue South
ACC Suite 418
Birmingham, Alabama 35233, USA

205-939-6051 (phone)
205-939-6057 (FAX)
medt030@uabdp0.Dpo.Uab.Edu (e-mail)

INTERNATIONAL CONFERENCE ON PELVIC AND LOWER EXTREMITY INJURIES (PLEI)

December 4-6, 1995
Washington, D.C.

The objective of this three-day conference is to review the state-of-the-art knowledge on the biomechanics, epidemiology, diagnosis, treatment, and prevention of lower extremity injuries, including the various experimental techniques utilized to study them. The strength of the symposium is derived from its multidisciplinary nature; thus, another objective is to

stimulate discussion between disciplines in order to come up with valid scientific interventions to prevent or ameliorate these disabling, frequent injuries. It is anticipated that there will be attendees from government, industry, and academic research institutions.

PROGRAM SCHEDULE

Monday, December 4, 1995

- 7:30 A.M. Registration and Continental Breakfast
- 8:15 A.M. Welcoming Remarks
- * Socio-economic & Epidemiologic aspects of Pelvic & Lower Extremity Injuries (PLEI)
- * Pelvis/Acetabulum/Femur Injuries

Tuesday, December 5, 1995

- * Knee/Tibia/Fibula Injuries
- * Foot/Ankle Injuries

Wednesday, December 6, 1995

- * Where to Now?
- * Offset Testing Options
- * Panel Discussion: Future Research

TOURS: Tours of the University of Virginia's Automobile Safety Laboratory and the Insurance Institute for Highway Safety's Vehicle Research Center will be held Sunday, December 3, 1995, from 9:00 a.m. - 6:00 p.m. A minimal fee of \$25 will be charged to cover the cost of transportation to and from these facilities.

Conference Location: ANA Hotel
2401 M Street N.W.
Washington, DC 20037
Tel: 202-429-2400

FEE: \$350.00

Checks should be made payable to the UMAB Fund 3039 and forwarded to the International Conference on Pelvic and Lower Extremity Injuries (PLEI), Office of Program Development and Public Affairs, R Adams Cowley Shock Trauma Center, University of Maryland Medical Center, 22 South Greene Street, T3R26, Baltimore, Maryland 21201-1595, USA.

FOR FURTHER INFORMATION, CALL (410)328-2399 or FAX (410)328-0501 or contact Walt Pilkey at wdp@virginia.edu

THE 1996 INTERNATIONAL PRE-OLYMPIC SCIENTIFIC CONGRESS

Dallas, Texas, USA

10-14 July 1996

The Cooper Institute for Aerobics Research (CIAR) is organizing and hosting a scientific congress prior to the Atlanta Olympic games in 1996. The meeting will be organized under the auspices of the International Council of Sport Science and Physical Education (ICSSPE), a scientific organization that has sponsored similar congresses since 1964. The Congress will be under the patronage of the International Olympic Committee (IOC) and His Excellency Juan A. Samaranch, and UNESCO. Mr. Samaranch will attend the meeting and will give an opening address to the delegates. The Congress will be held in Dallas during July 10-14, 1996, and will be organized around the theme of "Physical Activity, Sport, and Health." We expect approximately 2,000 delegates from around the world to attend. A local organizing committee and a scientific program committee have been working diligently. We have secured agreements from some of the world's most distinguished exercise scientists to serve on our International Advisory Committee.

We have agreements for involvement in the Congress from the American College of Sports Medicine (ACSM) and the American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), and preliminary agreement from the Federation Internationale de Medecine Sportive (FIMS). The Texas affiliate of AAHPERD and the Texas Regional Chapter of ACSM have given us their support. We will seek the cooperation of other organizations, and preliminary discussions are underway with the World Health Organization and several other North American scientific societies with an interest in sports medicine and exercise science.

We are committed to organizing an outstanding scientific congress, and attracting a large audience from around the world. The Congress opening ceremony will be held on Wednesday afternoon. Highlights of the opening ceremony will include a welcome talk by Dr Kenneth H. Cooper, founder of The Cooper Institute for Aerobics Research, and an address to the delegates by Mr. Samaranch. We hope that the Director General of the World Health Organization (WHO) and the President of FIMS also will attend. This will be followed by a private Sousa concert by the renowned Dallas Wind Symphony at the Meyerson Concert Hall and an opening reception.

The scientific program will begin on July 11. The timeliness of the Congress theme is indicated by recent pronouncements on physical activity and health by organizations such as the U.S. Centers for Disease Control and Prevention, ACSM, WHO, FIMS, and American Heart Association; and by the forthcoming first report of the U.S. Surgeon General on physical activity and health. The topic and outstanding scientists who will

present lectures will help insure a high level of interest in the Congress, which is expected to lead to public attention and a large group of international delegates.

The program will include plenary lectures each morning by individuals who have made unique and lasting contributions to sports medicine and exercise science. In addition to the plenary lectures, there will be invited tutorial lectures, symposia, and workshops by leading authorities.

The chair of the editorial committee has arranged for AAHPERD to publish the plenary and invited lectures as a supplement to The Research Quarterly for Exercise and Sport. This supplement and a program abstract book will be available at the time of the Congress, and will include abstracts of all invited programs and all free communications abstracts.

Call For Abstracts

DEADLINE: Abstract must be received by the Congress Secretariat by 31st December, 1995.

Abstract Categories:

- Physical Activity and Health
- Exercise and the Environment
- Physical Training and Elite Athletes
- Methods, Pedagogy, Humanities
- Psychosocial Aspects of Physical Activity and Exercise

A \$1000 prize will be awarded to the best poster in each category.

Registration FEE SCHEDULE

Regular: (includes Opening and Closing Ceremonies, Scientific sessions, coffee breaks, Sousa Concert, and Saturday banquet)

By December 31, 1995 \$295

After December 31, 1995 \$345

Student:

By December 31, 1995 \$150

After December 31, 1995 \$200

The Congress have a World Wide Web home page which contains all the relevant information to date. The URL is:

<http://www-lan.unt.edu.khpr/iposc/index.html>

From this site you also may obtain official forms for registrations and abstract preparation.

Leo PAVICIC

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University of Zagreb

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Tel: (+385) 41 33 68 22

E-mail: leo@aris.ffk.hr

10TH CONFERENCE OF THE EUROPEAN SOCIETY OF BIOMECHANICS

Leuven, August 28-31, 1996

Conference chairman: Prof. G. Van der Perre

We invite you to attend the 10th Conference of the European Society of Biomechanics, held at Leuven (Belgium), August 28-31, 1996. In this conference, the twentieth anniversary of the European Society of Biomechanics will be celebrated.

The Conference will cover research on the biomechanics field including following topics:

- bone structure and regeneration
- orthopaedic implants
- dental and maxillofacial implants
- biofluid mechanics
- respiratory and cardiovascular mechanics
- cellular biomechanics
- prosthetics and orthotics
- rehabilitation engineering
- sports biomechanics
- locomotion
- biomechanics of trauma
- computer modelling in biomechanics
- soft tissue biomechanics

Two Conference pre-courses are organised

- Cellular Biomechanics (chair Prof. D. Jones)
- Cardiovascular Fluid Dynamics (chair Dr. P. Verdonck)

Conference Highlights:

*** Symposia on: ***

Implantable Telemetry (chair Dr. G. Bergmann)
Ultrasound research in bone (chair Prof. A. Meunier)
Advances in artificial limbs (chair Prof. L. Peeraer)
Validation of computer simulations of bone adaptation (chair Dr. H. Weinans)
Bone architecture and the competence of bone (chair Prof. P. Ruesgsegger)
Preconference symposium "Sports Biomechanics" (chair Prof. M. Martens and Prof. E. Willems)

*** Keynotes by ***

Prof. K. De Groot: "The interface between Biomechanics and Biomaterials"
Prof. N. Westerhof: "Cardiovascular Biomechanics"
Prof. P. Walker: "Mechanical Engineering Aspects of Bone-Implant Structures"
Prof. R. Kenwright: "Bone-fracture Healing"

*** Open Forum ***

"THE BIOMECHANICS CHALLENGE"

A panel discussion, with live interventions from specialists in the USA and Japan, will be broadcasted by satellite over Europe. The participants will reflect on the

clinical relevance of biomechanics research, its impact on medical practice and rehabilitation, and will derive prospects for the future.

Further, conventional oral and poster sessions will be organised, together with some innovations such as commented poster sessions and multi-media presentations.

Conference Information

Updated information, including details on registration, grants, awards, organizing and programme committee, is available on internet at:

<http://www.kuleuven.ac.be/bmgo/esb.html>

The second announcement and the author's kit can be obtained from:

J. Vander Sloten, executive secretary
Division of Biomechanics and Engineering
Design
Celestijnenlaan 200A
3001 Heverlee
BELGIUM
Tel: ++ 32 16 32 7096
Fax: ++ 32 16 32 7994
Email: Jos.vandersloten@mech.kuleuven.ac.be

Important deadlines

January 1st:	Submission of abstracts
April 15th 1996:	Notification of acceptance of abstracts
May 15th 1996:	Last date for early registration fees
August 28th 1996:	Start of the Conference

Biomechanics positions available

ENGINEER/TECHNICIAN

Biomechanics Laboratory, Department of Orthopedic Surgery, University of California at San Francisco

The Department of Orthopedic Surgery at the University of California at San Francisco has an immediate opening for a developmental engineer/technician with knowledge and experience in experimental orthopedic biomechanics or related areas. The major responsibility of the position is to assist in the set-up, execution, and analysis of experiments related to both human movement analysis and orthopedic materials testing. Specific responsibilities include design and construction of mechanical fixtures and installation of transducers for these experiments, programming of data acquisition software, and analysis of experimental data. The position requires close interaction with engineering and medical faculty and students.

Candidates should have a Master's degree in Mechanical or Biomedical Engineering, or a related area. Individuals with a Bachelor's degree will be considered if they have substantial (2 years minimum) research experience. Major areas of laboratory research are materials testing, movement analysis, and injury biomechanics; direct research experience in one of these areas is highly preferable. Candidates should have knowledge of basic engineering mechanics, and computer-assisted data acquisition (knowledge of LabView is an asset). Experience in computer programming (C, Pascal, or FORTRAN), knowledge of basic statistics, and strong communication skills are additional assets.

The salary for the position is very competitive, with an excellent benefits package from the University of California. Interested applicants should mail resumes to:

Stephen Robinovitch, Ph.D.,
Biomechanics Laboratory
Division of Orthopedic Surgery
San Francisco General Hospital
Room 3A36, 1001 Potrero Avenue
San Francisco, CA 94110, USA

The University of California is an equal opportunity employer. Minority groups, women, and handicapped individuals are encouraged to apply.

DIRECTOR OF SPORTS BIOMECHANICS RESEARCH

Minneapolis Sports Medicine Center

The Minneapolis Sports Medicine Center is seeking an outstanding individual to head its newly constructed 3000 square foot sports biomechanics research laboratory. The Minneapolis Sports Medicine Center serves the central Minnesota area including professional sports teams. The successful applicant will work with the physicians and therapists associated with the Minneapolis Sports Medicine Center to specify, develop, supervise, and participate in research in the areas of: 1) Mechanism of sports-related injuries, 2) Prevention of injury, 3) Injury treatment, 4) Injury Rehabilitation, 5) Functional outcome evaluation. The director will oversee the initiation of operations and the hiring of research staff. Funding will be provided through foundation support as well as private and public grants for which the director must successfully compete at the national level.

Qualification include a Ph.D. in engineering (preferably mechanical or biomedical with extensive course work in biomechanics) as well as demonstrated technical, managerial, and entrepreneurial skills. The applicant must also have biomechanics research skills proven through experience, publications in peer reviewed journals, and conference participation. Salary commensurate with qualifications and experience.

Interested applicants should forward curriculum vitae to:

Robert Finke, Executive Director
Minneapolis Sports Medicine Center
701 25th Avenue South, #150
Minneapolis, MN 55454, USA

POST-DOCTORAL POSITION IN EXPERIMENTAL ORTHOPAEDIC BIOMECHANICS

A post-doctoral position is available immediately in the Musculoskeletal Systems Section at the Palo Alto VA Rehabilitation Research & Development (RR&D) Center. The Musculoskeletal Systems Section at the RR&D Center is well known for theoretical and computational studies on the adaptation of skeletal tissue to mechanical stimuli. Areas of current research activity include bone and cartilage adaptation and mechanics, bone loss after spinal cord injury, skeletal adaptation to unloading and growth factors, and tissue differentiation as it applies to the cementless fixation of joint replacements.

We are looking for a individual with an interest in orthopaedic implants (particularly joint replacements) and experience in: experimental testing; implant design and function; and animal models.

The candidate should be a recent PhD and must be a US citizen. The position is initially for one year. The salary is \$24,000 per year. Qualified candidates should send a cover letter, CV and the names of three references to:

Gary S. Beaupre, PhD
Rehabilitation R&D Center (153)
Palo Alto VA
3801 Miranda Avenue
Palo Alto, CA 94304, USA
Tel: (415) 493-5000 ext. 62472
Fax: (415) 493-4919
beaupre@bones.stanford.edu

RESEARCH ASSISTANT PROFESSOR

Division of Orthopaedic Surgery
UAB School of Medicine
Birmingham, AL, USA
medt030@uabdp.dpo.uab.edu

The University of Vermont Department of Physical Therapy invites applications for a 9-month tenure-track faculty position at the Assistant Professor level or commensurate with experience. The University of Vermont Department of Physical Therapy currently offers baccalaureate entry-level and advanced masters degrees in physical therapy. Applicants must have expertise in the areas of biomechanics, kinesiology and the musculo-skeletal bases of physical therapy practice. Responsibilities include teaching biomechanics and co-teaching musculo-skeletal bases of physical therapy practice in the baccalaureate program; teaching and thesis advising in the graduate program; research and scholarly work; advising and service responsibilities; curricular responsibilities in biomechanics, instrumentation and measurements and musculo-skeletal outcomes assessment. A doctoral degree in physical therapy or related field is required, as well as research experience and plans for continued investigations.

Candidates must have clinical and/or academic teaching experience and be philosophically supportive of the problem-based learning approach to professional education. A competitive salary and benefits package is offered. Applications deadline is December 31, 1995.

The University of Vermont is an equal opportunity/affirmative action employer. Women and individuals of diverse racial, social and ethnic cultural backgrounds and/or disabled status are especially encouraged to apply.

Submit curriculum vitae, names of three references and letter of intent to:

Ann Pond, Administrative Assistant
University of Vermont
Department of Physical Therapy
305 Rowell Building
Burlington, VT 05405-0068, USA

GRADUATE RESEARCH SCHOLARSHIP SOFT TISSUE MECHANICS

Department of Mechanical and Mechatronic Engineering
The University of Sydney

A postgraduate scholarship (or possibly two) (PhD) is available for 3 years in the area of soft tissue mechanics. The research project will include both mechanical testing and rheological modelling of the mechanical behaviour of a variety of soft biological tissues. The project is part of a research program in soft tissue mechanics and injury biomechanics, and involves staff from both biomedical engineering and rheology groups within the department. The scholarship is being funded from an Australian Research Council grant (Rheological properties of soft biological tissues) and is available starting January 1 1996.

Applicants should have (or complete in 1995) a bachelors degree in mechanical or biomedical engineering with honours, or equivalent.

Further information is available from:

Dr Lynne Bilston
Department of Mechanical and Mechatronic
Engineering
Building J07, University of Sydney
NSW, 2006, AUSTRALIA
Tel (02) 351-2344
E-mail: bilston@tiny.me.su.oz.au

Applications should include a curriculum vitae, a copy of your undergraduate transcript, a description of your research interests, and an indications of visa status if not an Australian citizen or permanent resident. They may be sent to the above address.

ASSISTIVE TECHNOLOGY/ REHABILITATION ENGINEERING SPECIALIST

National Rehabilitation Hospital
Washington DC

Program at the National Rehabilitation Hospital (NRH) has a position for an Assistive Technology Specialist. The appointee will be required to provide assistive technology services and expertise to NRH clinical staff, patients, and grant personnel, and to assist with the design, development, repair and troubleshooting of assistive devices and home and worksite environments. Qualifications include a Master's degree in either

industrial, mechanical, electrical or biomedical engineering, with emphasis on human factors, ergonomics or rehabilitation engineering. The applicant should also have experience in applications of assistive technology services or biomedical engineering or rehabilitation engineering. Salary commensurate with qualifications and experience.

Interested applicants should forward curriculum vitae to:

Tom Dang, Manager of PDL
Assistive Technology/Rehabilitation
Engineering Program
National Rehabilitation Hospital
102 Irving Street, N.W.
Washington, D.C. 20010-2949, USA
Tel: 202.877.1498
TDD: 202.726.3996
Fax: 202.723.0628
E-mail: tdd1@mhg.edu

GRADUATE RESEARCH ASSISTANT

Los Alamos National Laboratory
New Mexico

The Bioscience and Biotechnology Group, CST-4, at Los Alamos National Laboratory is seeking applications for a Graduate Research Assistant (GRA) position that we wish to fill within the next few months. Applicants should have a background and/or interest in biomechanics with expertise in implicit and explicit finite element analysis. Familiarity with UNIX-based workstations (Silicon Graphics), I-DEAS and DYNA3D is desirable.

The successful candidate will work on an internally and externally funded project involving occupant safety in automobiles. The position includes an opportunity to conduct thesis research toward a Ph.D. in Mechanical or Biomedical Engineering if desired. Students who have completed their Master's degree are preferred.

Send resumes directly to me via e-mail, fax or regular mail to the following address:

William O. Wray
Los Alamos National Laboratory
Bioscience and Biotechnology Group,
CST-4
Mail Stop J586
Los Alamos, New Mexico 87545
Voice: (505) 667-4496
Fax: (505) 665-2137
E-mail: wray@lanl.gov

FACULTY POSITION

Department of Biokinesiology & Physical Therapy
University of Southern California

The Department of Biokinesiology & Physical Therapy invites physical therapists or biomechanists with Ph.D. training and experience in teaching human gross anatomy to apply for a tenure-track position available as of July 1996. Evidence of potential to establish an independent research program is also required.

Tenure-track appointments are on a 12-month basis. Responsibilities include teaching anatomy in our various graduate degree programs, conducting independent research, and sponsoring graduate student research. The department offers 4 degree programs: D.P.T. (entry level for non-PTs and an advance-standing track for PTs with a masters degree); M.S. with clinical specialization, as well as the academic M.S. and Ph.D. The department is located in a new facility and has 8 research labs to support these programs. Clinical resources on the university campus include an outpatient faculty practice and hospital practice. In addition, collaborative opportunities are available at USC hospitals, Rancho Los Amigos Medical Center and other research institutions in the Los Angeles area.

Inquires may be addressed to:

Nina S. Bradley, Ph.D., P.T.
Search Committee Chair
Biokinesiology & Physical Therapy
University of Southern California
1540 E. Alcazar Street, CHP155
Los Angeles, CA 90033
email: NBradley@HSC.USC.EDU

BIOMATERIALS FACULTY POSITION

University of Michigan
School of Dentistry

A tenure-track position at the assistant professor level is available in the Department of Biologic & Materials Sciences. The successful candidate will likely interact in an appropriate department in the College of Engineering, and will have the opportunity to become an integral faculty member in established Ph.D. programs in Dental Biomaterials, Bioengineering, and Oral Health Sciences. The individual may interact with participants in the Specialized Materials Science Center. Applicants should hold a Ph.D. or equivalent degree in Biomaterials, Bioengineering, Materials Engineering or related field. Qualified applicants should possess a commitment to teaching dental biomaterials and training doctoral students, and offer the ability to establish an independent and extramurally funded research program. Research areas of interest include, but are not limited to: biomaterials, surface science, cell-surface interactions, tissue engineering, implants and/or biomechanics. The

University of Michigan is a non-discriminatory, affirmative action employer. Applications, including curriculum vitae, 2-3 page research plan, and names of at least three references should be sent to:

Walter Loesche, D.M.D., Ph.D.
Chair, Biomaterials Search Committee
University of Michigan, School of Dentistry
Ann Arbor, MI 48109-1078, USA

The deadline for applications is February 1, 1996.

EMINENT SCHOLAR IN SPORTS MEDICINE Troy State University/American Sports Medicine Institute

Troy State University (TSU) in conjunction with the American Sports Medicine Institute (ASMI) invites applications for the HEALTHSOUTH Eminent Scholar in Sports Medicine. This endowed chair is funded by HEALTHSOUTH Corporation and the State of Alabama. The Eminent Scholar will teach undergraduates as well as conduct research, develop publications, and provide presentations. The selected candidate must hold a doctorate in Exercise Physiology, Biomechanics, Human Performance, Rehabilitation or a closely related field. Additional expertise in such areas as physical therapy and athletic training are desirable. Candidates must be nationally recognized and must demonstrate a broad background in area of expertise. A sustained record of achievement in teaching, research, and grant development is essential.

The Troy State University System, worldwide, has an enrollment of approximately 18,000 students. Enrollment on the main campus is approximately 5,000. The main campus is located in Troy, Alabama, on a scenic tract of 433 acres. Troy is centrally located in Alabama, approximately two hours from Birmingham, one hour south of the state capitol in Montgomery, and two hours from the Gulf Coast of Florida. ASMI, a non-profit institution located in the center of Birmingham's medical community, is interested in the understanding and prevention of sports medicine injuries through research and education.

This position offers a unique opportunity to a scholar who has outstanding leadership qualities, intra and inter-organizational skills. The ideal candidate will be innovative, creative, flexible, and versatile.

Inquiries and nominations are welcomed. Application, a curriculum vitae, five letters of professional reference, official transcripts, and certification and/or licensure should be forwarded to:

Office of Personnel Services
ATTN: Dr. Sandra Greniewicki, Chair
Search Committee for the HEALTHSOUTH
Eminent Scholar in Sports Medicine
Troy State University
Troy, AL 36082, USA

Review of applications and supportive materials will begin on January 15, 1996 and continue until a successful candidate is selected. Employment date is expected to be no later than June 1, 1996. TSU is an AA/EEO employer and encourages applications from African Americans, females and other minorities.

ASSISTANT PROFESSOR - FUNCTIONAL MORPHOLOGY/BIOMECHANICS

Wake Forest University

The Department of Biology at Wake Forest University has a tenure-track position for an Assistant Professor in Functional Morphology/Biomechanics. Responsibilities will include teaching in the lower division core sequence, an upper level course in area of specialization alternating with comparative vertebrate anatomy, and the establishment of a viable research program. Application must include names and addresses of three references, a CV, and statements regarding research plans and teaching philosophy. Wake Forest is an equal opportunity employer and is strongly committed to increasing the diversity of its faculty. Applications from women and minorities are encouraged.

Send application materials to:

Dr. Gerald W. Esch
Chairman Search Committee
Department of Biology
P.O. Box 7325, Wake Forest University
Winston-Salem, North Carolina 27109, USA

ASSISTANT PROFESSOR - BIOMECHANICS

Dept. of Exercise and Sport Science, UNC Greensboro

Tenure track position. Responsibilities include: a) conducting nationally visible research program, b) teaching undergraduate/ graduate biomechanics courses, c) supervising graduate research. Preference will be given to candidates demonstrating: a) interest in integrating biomechanics with other specializations within the department, and b) success in obtaining external funding.

Qualifications: Earned doctorate with emphasis in biomechanics; strong commitment to research, teaching, and service.

Salary: competitive/negotiable. Effective date: August, 1, 1996. EEO/AA: W/M/V/D.

Submit letter of application, vitae, sample of publications, and three letters of reference by February 15, 1996 to:

Kathleen Williams
Department of Exercise and Sport Science
UNC Greensboro
Greensboro, NC 27412, USA
Tel: (910) 334-3255
Fax: (910) 334-3238
E-mail: k_willia@hamlet.uncg.edu

FACULTY
OF HEALTH
SCIENCES
SCHOOL OF
MEDICINE

CHAIR IN ORTHOPAEDIC RESEARCH

(PROFESSOR: FIXED-TERM)
AUD \$80 176 PA

The School of Medicine is situated in the Faculty of Health Sciences of the University and is physically part of the Flinders Medical Centre. Together they form an integrated medical school and teaching hospital of 500 beds servicing the southern area of Adelaide. A close relationship is maintained between clinical care, teaching and research. The Centre is adjacent to the University, 15 km south of Adelaide's city centre. The School has a well established link with the Repatriation General Hospital (RGH) which is located 5 km away and provides clinical services in a range of medical and surgical specialties and psychiatry. The RGH is the centre for rehabilitation aged and extended care for the south of Adelaide.

REF 95170. The University seeks to appoint a Chair in Orthopaedic Research for a fixed-term of five years. The Orthopaedic Unit within the Department of Surgery provides a clinical service to the southern region of Adelaide and is involved in research and teaching undergraduate and postgraduate students. Based at the RGH, the appointee will be responsible for establishing a research laboratory and teaching in the medical course in the School of Medicine; have access to research facilities and contribute to teaching, research and postgraduate supervision in the School of Engineering; and participate in the development of new courses in both Schools. Exciting opportunities exist, and will be encouraged, for activities that cross the Faculties of Health Sciences and Science and Engineering.

Essential criteria include excellence in research and teaching in areas of orthopaedics and biomechanical engineering; the ability to provide effective academic and administrative leadership; and the ability to establish and maintain links between the discipline of orthopaedic surgery and other disciplines.

Selection criteria and conditions of appointment available from the Dean, Professor N Saunders, phone (618) 204 4160 or fax (618) 204 5845.

Applicants must address the selection criteria in the documentation. Applications, quoting the reference number, and giving qualifications, experience and the names, addresses and facsimile numbers of three referees of whom confidential enquiries may be made, should be lodged with the Manager, Human Resources, Flinders University, GPO Box 2100, Adelaide SA 5001, Australia, or fax (618) 201 3131 by 31 January 1996.

The University reserves the right not to make an appointment or to invite applications.



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EDITOR'S NOTE

This Newsletter is published quarterly: February-March (Spring); May-June (Summer); August-September (Autumn), and November-December (Winter). Deadlines for material and articles are the first day of each first named month, and the Newsletter is mailed to members early in the second named month.

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

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

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

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

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

GOODBYE, CIAO, SAYONARA, SEE YA

This is the last Newsletter to be produced by yours truly (whew!). Mark Grabiner, from the Cleveland Clinic Foundation in the USA, will take over as Newsletter Editor from the beginning of next year. My best wishes to Mark - I know he will only improve things for you, but please give him your support. I've thoroughly enjoyed my 5 year 'stint' as Editor and some of you have been very forthcoming with material which has made my job much easier. But it is *your* Newsletter after all, so please don't leave it to Mark to do all the hard work.

As for me, well Keith Hayes is visiting my lab early next year, so as one past newsletter editor to another we're going to hit a lot of tennis balls and just enjoy our editorial retirements!

Graeme

Calendar of scientific events

January 7-13, 1996

1st International Congress on Skiing and Science, St. Christoph a. Arlberg, Austria. Contact: Prof. Dr. Erich Müller, Congress-Chair, Institut für Sportwissenschaften, Der Universität Salzburg, Akademiestrasse 26, A-5020 Salzburg, Austria. Tel: 06 62-80 44-4852; Fax: 06 62-80 44-614.

February 1-2, 1996

Australian Biomechanics Conference, Sydney, Australia. Contact: Wendy Gilleard, Faculty of Health Sciences, The University of Sydney, East St., Lidcombe, NSW 2141, Australia. +61 2 646 6455.

May 20-23, 1996

Third International Workshop on Animal Locomotion. Saumur, France. Contact: INRA, SGQA, Secretariat of IWAL 3 - E. Barrey, 78352, Jouy-en-josas cedex, France. Fax: +33-1-34-65 22 10; E-mail: ugeneba@dgal.jouy.inra.fr.

June 25-29, 1996

14th International Symposium of Biomechanics in Sport, Funchal, Madeira, Portugal. Contact: ISBS'96 - Secretariat, R da Alfandega, 78-5, 9000 Funchal Portugal. Tel. 351-91-233229; Fax. 351-91-233249; E-mail: citma@dragoeiro.uma.pt

July 1-3, 1996

Fourth International Symposium on 3-D Analysis of Human Movement, Grenoble, France. Contact: Paul Allard, Secretariat, Research Center, Sainte-Justine Hospital, 3175 Cote Ste-Catherine, Montreal, PQ, H3T 1C5, Canada. Tel: +1-514-345-4740; Fax: +1-514-345-4801.

July 1-5, 1996

9th International Conference on Mechanics in Medicine and Biology, Ljubljana, Slovenija. Contact: Mrs. A. Kregar, Cankarjev dom, Presernova 10, 61000 Ljubljana, Slovenia. Fax: +386 61 217 431.

July 2-4, 1996

The Engineering of Sport Conference, Sheffield, England. Contact: Dr S.J. Haake, Dept. of Mechanical and Process Engineering, The University of Sheffield, Mappin Street, Sheffield S1 3JD, UK. Tel: (0114) 282 5415; Fax (0114) 275 3671.

August 28-31, 1996

10th Conference of the European Society of Biomechanics, Leuven, Belgium. Contact: Dr J. Vander Sloten, Katholieke Universiteit Leuven, Division of Biomechanics and Engineering Design, Celestijnenlaan 200-A, B-3001 Heverlee, Belgium. Tel: xx.32.16.20.70.96; Fax: xx.32.16.29.27.16; E-mail: jos.vandersloten@mech.kuleuven.ac.be.

August 25-29, 1997

XVIth Congress of the International Society of Biomechanics, Tokyo, Japan. Contact: Prof. Shenshi Fukushima, General Secretary, XVIth ISB Tokyo Congress, Dept. Life. Sci., The University of Tokyo, Komaba 3-8-1, Meguro 153, Japan. Tel/Fax: +81-3-5454-9494; E-mail: ISB97@idaten.c.u-tokyo.ac.jp

August 3-8, 1998

Third World Congress of Biomechanics, Hokkaido University, Sapporo, Japan. Congress Office: Biomechanics Laboratory, Dept. of Mechanical Engineering Science, Osaka University, Toyonaka, Osaka 560, Japan. Tel: +81-8-850-8170; Fax: +81-8-850-6171.

ISB membership



International Society of Biomechanics - 1996 MEMBERSHIP APPLICATION FORM -

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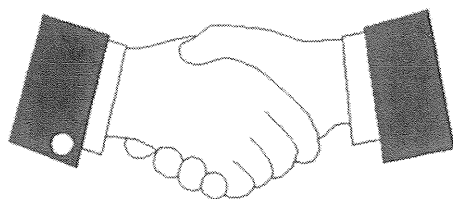
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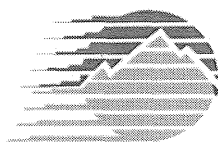
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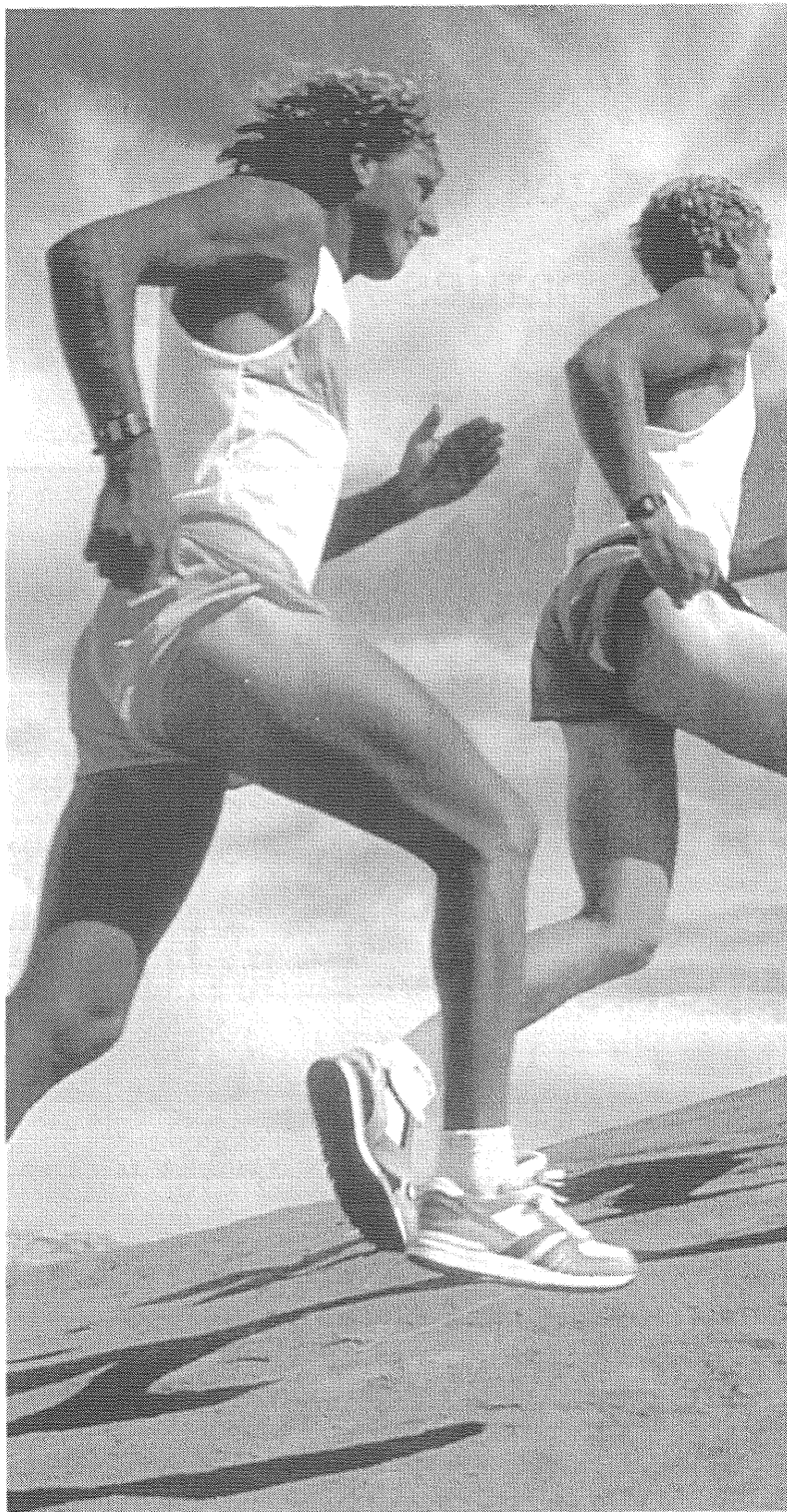
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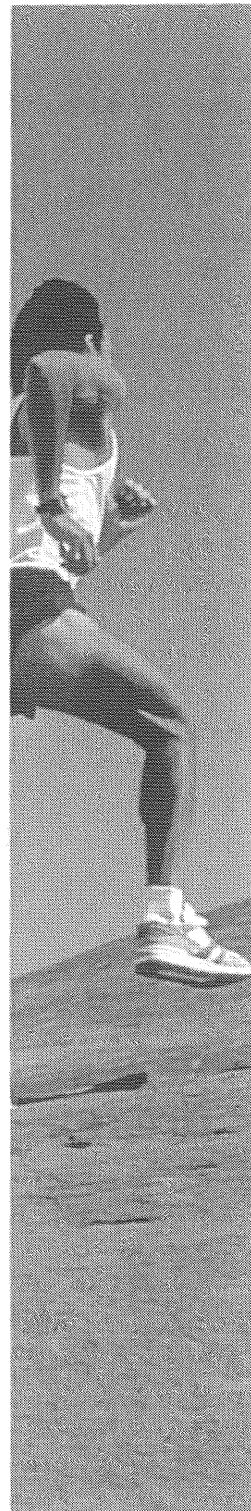
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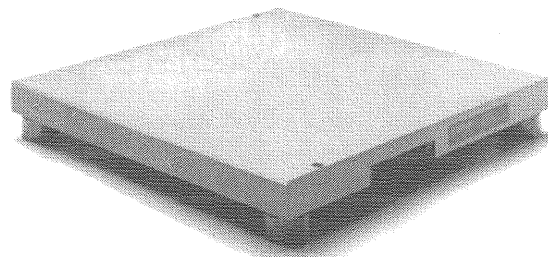
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