ISB

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; 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
Christopher L. Vaughan
To Patent or Not to Patent?
That is the Question!

In paraphrasing Shakespeare's Hamlet, I have laid the foundation to explore an issue that often places academics, and indeed industrialists as well, on the horns of a delicate dilemma. We are torn between our personal inclination to share an exciting discovery with a wide audience, and our legal obligation to secure financial benefits for our employer. While mention of the word "patent" normally conjures up images of dollar signs and intrigue, the reality is that patents fulfil an important function in society and I will be exploring some of the issues that surround the decision to secure a patent.

A patent is a document issued to an inventor by a national government, granting him or her exclusive rights to the invention for a limited time, generally 20 years . This patent then allows the inventor to prevent others from making, selling, or using the invention in the country that awarded the patent. While the historical origins of patents are obscure, it would appear that the British have the longest continuous patent tradition in the world [7]. The earliest known patent was granted by King Henry VIth to John Utynam in 1449 for a method of making stained glass windows required for the building of Eton College. In the United States, the rights to patent protection were set out in their constitution, with the first patent being issued in 1790 for a method of making potash. One of the patent examiners was Thomas Jefferson, then Secretary of State, and a creative inventor in his own right.

A necessary condition for the award of a patent is that an invention be made, although this is complicated by the fact that the term "invention" is difficult to define. An often-quoted legal opinion is that "Invention is a concept, a thing evolved from the mind. It is not a revelation of something which exists and was unknown but is the creation of something which did not exist before, possessing the elements of novelty and utility in kind and measure different and greater than what the art might expect from its skilled workers". Courts have found it easier to define what an invention is *not*. It is not mere exercise of ordinary engineering skill, or mere change in proportions, or mere omission of parts or functions. The conclusive test to decide if an invention has been made is to determine whether the device (or process or material) is *novel*, *useful*, and *nonobvious*. However, the issuance of a patent does not guarantee novelty, usefulness or nonobviousness; it merely means that the patent examiner was persuaded by the patent lawyer's argument and has concluded that an invention occurred. I have yet to encounter a patent lawyer who did not believe that he could secure a patent on my behalf; after all, that is how he makes a living! The real test will come when the patent is challenged in a court of law.

In 1956 Allan Cormack, a physics lecturer at the University of Cape Town (UCT), was seconded to the radiotherapy department at Groote Schuur Hospital. He was appalled at the crude methods then in use to deliver a dose of radiation to a malignant tumour at a particular depth. He determined that there had to be a better method to measure where the underlying structures were in three-dimensional space. Not only did he develop a suitable reconstruction algorithm, but he also successfully tested his method on an appropriate phantom. While Cormack laid the theoretical foundation for computed tomography (CT), it was the British engineer Godfrey Hounsfield, working for the Electrical and Musical Industries (EMI) company, who developed the first working CT scanner used clinically on patients. In 1979 Hounsfield and Cormack shared the Nobel Prize for Medicine for their pioneering work. Because Cormack did not patent his ideas, but chose to publish them in the scientific literature [2], neither he nor his employer UCT derived any financial benefits. These went to EMI and the other medical imaging companies that rapidly entered this lucrative market in the mid-1970s.

Two decades ago in the United States, Senators Bob Dole and Birch Bayh sponsored landmark legislation that gave blanket permission for universities to license and profit from government-sponsored research. While Dole may be the current spokesman for Viagra, providing entertaining subject material for stand-up comics and cartoonists alike, his legislation in 1980 has been characterised as the equivalent of Viagra for campus innovation. Universities have been filing for, and receiving, patents at an unprecedented

rate. The leaders include the University of California system, Massachusetts Institute of Technology, and Caltech which have each amassed veritable war chests of intellectual property across a broad range of technologies: the numbers of patents awarded to these universities in 1999 were 468, 151 and 103 respectively. While relatively few patents ultimately lead to revenue generation, the benefits to institutions have been impressive. Columbia earned over $61 million in 1998, while Florida State, with its anti-cancer drug Taxol, earned over $45 million. In the field of orthopaedics, a biomedical engineer from Clemson University, Joon Park, invented a method for precoating a metallic implant with acrylic bone cement in the early 1980s. Although some of his colleagues were skeptical that this approach would lead to improved fixation of the implant, his university supported him and paid for the patent which was subsequently licensed to an orthopaedic manufacturer. The royalty income in 1988 alone was $0.75 million, split equally between Clemson University and the inventor. We can only speculate what the royalty payouts will total when the patent expires in January 2002!

In South Africa this month, the Supreme Court is adjudicating a landmark case. Thirty nine pharmaceutical companies, including major multinationals such as Glaxo Wellcome and Bristol-Myers Squibb, are attempting to prevent the South African government, in search of cheaper medicine for its citizens, from implementing a law which will allow it to override patent rights. The stark reality is that 1 in 10 of South African citizens – over 4 million people – are carrying the human immuno-deficiency virus (HIV). The cost of anti-retroviral and other drugs is prohibitively expensive and so the government has passed a law that provides for parallel importation, compulsory licensing and the encouragement of generic substitutes. The pharmaceutical giants argue that this law undermines their intellectual property rights and their ability to finance the huge research and development budgets necessary to bring new drugs to market. The Nobel Prize-winning Medecins Sans Frontiers (that's "Doctors Without Borders" for the francophonically challenged) have sided with the government and brought the debate into sharp focus with their statement "This case is about what comes first: the commercial interests of companies or people trying to stay alive". The European Union, citing provisions in the agreements of the World Trade Organization, have aligned themselves behind our government, while the drug companies are fighting a public relations nightmare. Whatever the judgment of the South African Supreme Court, expected to be handed down in April, this case will have far-reaching implications for the primacy of patent law worldwide.

In answer to the question posed in the title to this editorial, I believe that an inventor *should* patent his or her ideas, particularly if a patent search through a readily available web database reveals no prior art and the invention is thought to have some commercial potential. Although patent law varies slightly between countries, it is possible to file for a patent first and then publish at a later stage. After all, a patent is nothing more than a bargain between the inventor and society, where in exchange for sharing the idea, protection is offered for a limited time. While I think it is appropriate that the inventor's employer derive financial benefit from the intellectual property, it also stands to reason that when large numbers of human lives are at stake, there should be room to compromise on the extent of the monopoly.

From the Past-President
Günter Rau
ISB 2001 Elections

Enclosed with this Newsletter is your voting form for the election of the Society's next President-Elect and ten Council members. Some current Council members are able (and willing!) to stand for re-election (our Constitution allows a Council member to be re-elected twice, which is good for reasons of contuity) One candidate is standing for both President-Elect and re-election to Conucil. If this person is elected as President-Elect, then the eleventh highest ranked candidtate will become the tenth Council member, so please vote for both positions independently.

Please return your ballot form sealed in the envelope provided (to ensure "secrecy"). That envelope can be enclosed in your regular envelope stationery insofar as only the latter will be opened initially. The counting of ballots will be performed by non-interested parties prior to

the Zurich Congress, and the results announced during the General Assembly. To be counted, your voting form must reach me by May 15. I strongly urge all members to engage in this very democratic process, and with the best intentions for the future well-being of the Society.

From the Editor: Mark D. Grabiner

Y-C Fung Receives the PRESIDENT'S NATIONAL MEDAL OF SCIENCE.

In 1998, Yuan-Cheng Fung, Professor Emeritus of Bioengineering and Applied Mechanics at the University of California, San Diego, became the first bioengineer to receive the prestigious Founder's Award from the National Academy of Engineering (ISB Newsletter, November-December 1998). Recently, Professor Fung's contributions to science, in particular, biomechanics, was recognized by the government of the United States..

On December 1, 2000, Professor Fung received the President's National Medal of Science from Bill Clinton. This is the highest scientific honor that is given by the United States government. The award was established in 1959 to honor those "*deserving of special recognition by reason of their outstanding contributions to knowledge in the physical, biological, mathematical, or engineering sciences*". Congress expanded the scope in 1980 to include social and behavioral sciences. Since its inception, 374 scientists and engineers have been the recipients of this distinguished award. Professor Fung is the first bioengineer to receive this honor. Among the other honors that have been received by Professor Fung are the Founder Award from the National Academy of Engineering, the Timoshenko Medal and the Mellville Medal from the American Society of Mechanical Engineers, the Landis Award from the Microcirculatory Society and the Borelli Award from the American Society of Biomechanics.

The citation of Professor Fung's National Medal of Science reads:

For his pioneering research and leadership in the fields of bioengineering and aeroelasticity. As author, teacher, editor and leader, his work and enthusiasm have founded the rigorous study of biomechanics, particularly of the lung and arteries.

Professor Y-C Fung received a warm welcome as a Keynote speaker at the American Society of Biomechanics meeting held at the University of Pittsburgh.

ISB Technical Group on Footwear Biomechanics: Ewald Hennig

The Fifth Symposium of the Technical Group on Footwear Biomechanics will be held July 5-7, 2001 in Zuerich / Switzerland. Following successful previous meetings in Calgary, Cologne, Tokyo, and Canmore the Symposium will include invited speakers, free communication and discussion forums. The symposium will directly precede the International Society of Biomechanics XVIIIth Congress being held from July 8-13, in Zurich. Three awards (each US$ 1000) are sponsored by Adidas (Applied Research Award), Mizuno (Young Investigator Award), and Nike (Basic Research Award). Each presenter will automatically take part in the competition, and the winners will be announced during the banquet dinner, July 7th.
http://www.uni-essen.de/~qpd800/FW2001.html

ISB Candidates for President-Elect 2001-2003

Brian L. Davis, PhD

Dr. Davis has been a Staff Scientist in the Department of Biomedical Engineering, Cleveland Clinic Foundation, since 1992. He obtained a B.Sc. in Mechanical Engineering in 1981, and a Master of Science in Biomedical Engineering in 1984, both from the University of Cape Town and his Ph.D. from Penn State in 1991. He has been active at all ISB meetings since 1987, and is currently serving on the ISB Council as Secretary-General. His research is currently funded by the Juvenile Diabetes Foundation, the Howard Hughes Medical Institute, the United States Department of Defense, NIH, the National Space Biomedical Research Institute and the Aircast Foundation. He has contributed 37 publications in peer reviewed journals, and has co-authored a book on gait analysis. His five most recent publications are:

Borden LS,. Perry JE, Davis BL, Owings TM, Grabiner MD: A biomechanical evaluation of one-stage vs. two-stage bilateral knee arthroplasty patients. *Gait and Posture*, 9:24-30, 1999.

Kao P, Davis BL, Hardy PA: Characterization of the calcaneal fat pad in diabetic and non-diabetic patients using magnetic resonance imaging. *Magnetic Resonance Imaging*. 17:851-7, 1999.

Syed I, Davis BL: Obesity and osteoarthritis of the knee: hypotheses concerning the relationship between ground reaction forces and quadriceps fatigue in long duration walking.*Medical Hypotheses*, 54:182-185, 2000.

Perusek GP, Davis BL, Courtney AC, D'Andrea SE, Sferra J: An extensometer for global measurement of bone strain suitable for use in vivo in humans. *Journal of Biomechanics*, 34:385-391, 2001.

Perry JE, Davis BL, Luciano MG: Quantifying muscle activity in non-ambulatory children with spastic cerebral palsy before and after selective dorsal rhizotomy. *Journal of Electromyography and Kinesiology*, 11:31-37, 2001.

What do you think are ISB's greatest strengths and what unique role(s) do you think that ISB plays in the international biomechanics community?

The primary strength of our society is its membership. As a group we make the ISB congresses a viable financial undertaking; we undertake initiatives such as the "student awards program" to encourage those entering our field; we create new "Technical and Working Groups" in different areas related to biomechanics; and we communicate with each other either through Biomch-L or in the newsletter.

I see the ISB as a catalyst, bringing people with different skills, training and philosophies together, in order to better tackle problems in the fields of sports biomechanics, orthopedics, muscle mechanics, human movement and ergonomics. In my department in Cleveland at least twenty countries are represented. In many cases, skills that have been developed around the world are brought together to tackle a complex research question. I see the same spirit of international cooperation every two years when the ISB hosts one of its congresses. Although these meetings only last 5 days, the internet allows us remain in contact long after the closing ceremony.

The ISB has the ability to address issues that are common to everyone in our field. While the topic of "standards and terminology" is always controversial, having uniformity in the way we report data will often reduce confusion. This is

especially true when we need to compare one journal article with another. Similarly, having a common data repository that includes medical images, finite element meshes, filtering algorithms and software, benefits many of us who would rather not "re-invent the wheel" every time we start another project.

What organizational issues do you see as most pressing for ISB?

The next council's first objective should be to take care of some "housekeeping" issues. There are some areas of our Constitution that need to be addressed. Of primary importance is ensuring our financial well being. For instance, there is a clause that requires us to continue to send newsletters to members who have not paid their dues for 2 years! The result is a drain on our finances. I also think the ISB should share in the profits (if any) at the end of a successful congress. Many societies rely almost exclusively on this source of revenue. These issues will not require major changes to the constitution and should be easy to implement. I anticipate that the next President-elect will work closely with Sandra Olney to update our Constitution and Codes.

Another key issue is our student education initiative. When Peter Cavanagh embarked on this bold plan, it was with the understanding that the ISB Council would seek corporate support. Both Mary Rodgers and I have each written proposals to get such funding, but up until now we are still operating "in the red". It would be a pity to curtail the student education initiative; therefore securing corporate funding should be a priority to ensure that we are fiscally sound.

Among the responsibilities that you will assume as President-elect, do you anticipate creating new initiatives or programs?

Once the issues of our constitution and finances have been addressed, I would like to see our society become actively involved in what is called the "Bone and Joint Decade". This undertaking had its origins in 2000 in Sweden, and has been endorsed by the World Health Organization. The rationale for its creation is the fact that musculoskeletal disorders are the most common causes of severe long-term pain and physical disability, affecting hundreds of millions of people around the world. A study in Germany found that in 1995, musculoskeletal conditions accounted for 40 % of all lost working days, 40% of all disabilities and 40 % of all early retirements. Among the objectives for the 2001 - 2010 decade are to advance understanding of musculoskeletal disorders and improve prevention, diagnosis, treatment and rehabilitation through research. Clearly, these objectives are closely aligned with those of the ISB.

I would like to end off by describing a general paradigm concerning international cooperation that I would like to see. Just as silicon chip technology revolutionized the computer industry, so may micro-electromechanical systems change medical devices. I foresee staggering opportunities for designing smart footwear for diabetic patients, implantable stimulators for paralyzed patients, and even prosthetic limbs that attach directly to bone. With the skill set that exists within the ISB and our traditional focus on human movement, I see no reason why some of these areas cannot be tackled by teams spanning one or more countries. Is it a dream to think that polymer chemists in Malaysia can team up with electronic engineers in Japan, neurophysiologists in a Scandinavian country and those who develop computer models of human movement in the USA, to design a new prosthetic limb for landmine victims? If the world can collaborate on the International Space Station or contribute to the Human Genome project, I think the biomechanics community can meet challenges and opportunities that have no borders.

Mary Rodgers, PhD, PT

Dr. Rodgers is Professor and Chair in the Department of Physical Therapy at the University of Maryland School of Medicine, Baltimore, USA. She received her B.Sc. in Physical Therapy and M.Sc. in Biomechanics (Medical Allied Health) from the University of North Carolina at Chapel Hill in 1976 and 1981, respectively. Her Ph.D. in Biomechanics (Exercise Science) was from the Pennsylvania State University in 1985. Her major areas of teaching and research include wheelchair propulsion biomechanics, gait analysis, pathokinesiology, and rehabilitation. She has authored 28 refereed articles and a number of book chapters on rehabilitation biomechanics in the areas of wheelchair propulsion and injury prevention, gait analysis in cerebral palsy children and multiple sclerosis patients, bone density changes following stroke and spinal cord injury, and functional electrical stimulation exercise for paralyzed muscle. She has served on the editorial board for two professional journals, including the Journal of Applied Biomechanics. She is a member of seven professional societies, reviews grants for four national agencies, and is principal investigator on a VA Rehabilitation R&D Merit Review grant on Wheelchair Propulsion. She has been a member of ISB since 1985, and has served on the ISB Executive Council since 1997, and is currently Chair of the Student Initiatives and Education Committee.

Rodgers MM, Tummarakota S, Lieh J: Three-dimensional analysis of wheelchair propulsion. *Journal of Applied Biomechanics,* 14: 80-92, 1998.

Keyser RE, Rodgers MM, Gardner ER, Russell PR: Oxygen uptake during peak graded exercise and single stage fatigue tests of wheelchair propulsion in manual wheelchair users and the non-disabled. *Archives Physical Medicine and Rehabilitation,* 80:1288-92, 1999.

Rodgers MM, Mulcare JA, King DL, Mathews T, Gupta SC: Effect of an Aerobic Exercise Program on Gait Characteristics in Patients with Multiple Sclerosis. *Journal of Rehabilitation Research and Development,* 36:183-188, 1999.

Rodgers MM, Keyser RE, Gardner ER, Russell PR, Gorman PH: Influence of trunk flexion on biomechanics of wheelchair propulsion. *Journal of Rehabilitation Research and Development,* 37:283-295, 2000.

Rodgers MM, Keyser RE, Gardner ER, Gorman PH, Russell PR: Influence of training on biomechanics of wheelchair propulsion. *Journal of Rehabilitation Research and Development,* 38: 2001.

What do you think are ISB's greatest strengths and what unique role(s) do you think that ISB plays in the international biomechanics community?

ISB's international membership and collaborations are its greatest strengths. International collaborations in biomechanical research are facilitated through the ISB conferences. Between 1987 and 2003, these conferences have been and will be held in nine different countries, providing the opportunity to interact with people from all over the world about common interests in biomechanics. The Officers and Council members since 1997 are from eight different countries. The Society encourages international contacts amongst scientists, promotes the dissemination of knowledge all over the world, and forms liaisons with over 12 different national organizations. Compared to national biomechanics organizations, ISB can facilitate more global collaborations, which expands the scope of biomechanics research.

The initiatives in providing standardization of a variety of methods and reporting have demonstrated one example of the vital role ISB plays in the international biomechanics community. Another strength of ISB is the involvement and support of students through its student initiatives. Over the past four years, 63 students from seven different countries will be assisted in their biomechanics research and

international collaborations through the ISB student grant program. These initiatives over a ten-year period will enable the ISB to provide an important influence on the research development of over 200 future biomechanists.

The breadth of biomechanics areas addressed by ISB is also impressive. Technical groups of ISB have advanced knowledge specialized areas within the field of Biomechanics. The ISB website and the archives are another important contribution to the biomechanics community. BIOMCH-L is one of the most active discussion groups in existence, and has facilitated international dialog on a wide range of biomechanical issues.

What organizational issues do you see as most pressing for ISB?

The organization of ISB has traditionally been "relaxed". Although this approach has worked in the past, the growth of the organization requires somewhat more structure in order to avoid confusion and facilitate communication. A strategic plan for ISB is essential to its continued existence. Financial and member issues are two of the most pressing for ISB to address in its strategic plan. As an example, corporate sponsorship is required for the sustenance of the vital ISB student grant program. Without a strategic plan for recruiting this support on a regular basis, the program is in jeopardy. The function of the ISB in regards to member needs is also a pressing issue. We have seen public discussion on BIOMCH-L, regarding the role/actions of other societies. We need to have this dialog in advance in order to ensure that we are addressing member needs.

Among the responsibilities that you will assume as President-elect, do you anticipate creating new initiatives or programs?

My first initiative would be to facilitate ISB member involvement in the organization. I would establish a committee to address the work involved with a needs assessment and a strategic plan for ISB that addresses members' needs and financial support for addressing those needs. I would expand the current grant program to include opportunities for both students and new investigators as a way to facilitate the research development of ISB members. I would establish another committee to approach corporations about providing a standing scholarship in their name.

I would work to formalize the role of ISB in setting standards and encouraging their use in publications. This could be done in a number of ways. I would foster the development of new working groups since this is where much of the intellectual activity occurs in ISB.

I would establish a regular annual consensus group meeting that would bring together experts in a focused content area. The content could be decided annually by either the Executive Council of ISB or by the expert group. Group composition would likely change from year to year based on the content area. The outcome of such a meeting would be a consensus statement on the content topic that could be published in an appropriate biomechanics journal. If major players are included on the consensus panel, standards could then be established for use in Biomechanics research.

I would continue to support BIOMCH-L and work for a truly comprehensive web resource in biomechanics. Finally, I would extend the focus of ISB to include more clinicians who have an interest in Biomechanics.

Biosketches of the Candidates standing for the ISB Council are printed on separate sheets enclosed with this Newsletter. Mary Rodger's name is included amongst those standing for Council as well, insofar as she is also eligible for another term as a general Council member.

ISB Student Grant Update
Mary Rodgers

The 2001 ISB student grants have been awarded to 25 ISB student members. The grant categories and recipients are listed below. Congratulations to the awardees, and good luck with your biomechanics research work!

Study Abroad Grants ($2,000)
- Janet Tapper
- Sonja de Groot
- Shuping Li
- Maxwell Donelan

Matching Dissertation Grants ($2,000)
- Wen-Zu Tang
- Carl Imhauser
- Michael Madigan
- Ann Mundermann
- Chris Organ
- Brandi Row

Congress Travel Grants ($1,000)
- Jodi Cochrane
- Rene Ferdinands
- Vicki Pittenger
- Alexander Adam
- Annaliesse Dowling
- Rachel Skoss
- Suzanne Halliday
- Mukul Talaty
- Takayuki Nakamura
- Nicole Baker
- Karen Rae Lucas
- Ben Patritti
- Stephen Brigido
- Sian Jenkins
- Rachel Schachar

ISB Student Travel Report
Margaret Finley, MA, PT

I would like to begin by thanking the ISB Council for affording me this fantastic opportunity. My adventure began in September 2000 with four weeks at The Hong Kong Polytechnic University under the mentorship of Dr. Raymond Lee (formerly of the University of Sydney). After discussing my future research goals, Dr Lee guided me in discussions and reviews of literature on Euler and Joint Coordinate System methods for reporting kinematic data. A pilot research project on "The Effect of Trunk Posture on Scapular Kinematics" was designed and initiated. This project provided me with experience in using the Polhemus Fastrak as well as using and writing Matlab programs and investigating the different methods of reporting kinematic data. All data collection and analysis was completed during my four weeks at The Hong Kong Polytechnic University. An abstract on the research has been submitted for presentation at the International Society of Biomechanics XVIIIth Congress in Zurich as well as a manuscript is currently in progress. Additionally, I was fortunate to attend a presentation by Mark Pearcy, Ph.D. on the ongoing biomedical research at the Queensland University of Technology.

The next phase of my trip took me to Sydney, Australia where I attended the 5th Scientific Congress of the 2000 Paralympic Games Oct 11-13. While at the Congress I presented a poster on "The Prevalence of Shoulder Pathology in Wheelchair Athletes" and was able to attend presentations of research by other professionals, with focus on athletes with disabilities.

Following the Congress, I spent several days observing at the University of Sydney, Rehabilitation Research Center. Under the supervision of Dr. Glen Davis, I was exposed to their ongoing research on functional electrical stimulation lower extremity cycling and walking programs. Discussions of research ideas ensued with the physiologists, physical therapists and biomedical engineering staff.

My research interests include overuse injuries in wheelchair athletes. The final phase of my experience was attending six days of the 2000 Paralympic Games. This was truly one of the most inspirational experiences I have ever witnessed. I observed many elite wheelchair athletes, overcoming physical challenges and performing astounding biomechanical wonders! The travel was exciting and provided me with exposure to different cultures, invaluable educational and research experiences, new friends and colleagues and many great memories! I am truly grateful to the ISB.

ISB Matching Dissertation Student Grant Report
Eliana Lucchinetti

First, I would like to thank the members of the Student Grant Committee of the International Society of Biomechanics for awarding me a Matching Dissertation Grant. This Grant allowed me to realize the first steps for my challenging PhD project, which involves the implementation of a micromechanical testing protocol for single trabeculae in cancellous bone. The ultimate goal of the proposed project is to improve the structural and mechanical characterization of trabecular bone material. Ultimately, we would like to test the hypothesis that bone fragility is not only the result of a reduced bone mass but also of altered mechanical properties. The mechanical properties of bone depend on the mechanical properties of bone tissue and on the arrangement of its structural elements such as trabeculae.

Consequently, the mechanical testing of macroscopic bone specimens does not necessarily reflect the properties of microscopic samples. In order to understand the material bone from an integral perspective it is necessary to accurately determine its properties at the different hierarchical levels from the macro-scale (i.e. bone samples of several millimeters in each dimension) to the microscale (i.e. mineralized collagen fibrils). In my research, I focus my effort on a level intermediate between the two extremes mentioned before, namely the single trabecula in cancellous bone.

As cancellous bone trabeculae are typically 1-1.5 mm long and 200 microns in diameter, the main difficulties in achieving the envisaged goals are - as the reader might guess - in the preparation and handling of the test trabeculae in situ. Additionally, in order to get reproducible results, very accurate devices for measuring forces and displacements are required. Several micro-bending experiments of single trabeculae inside the cancellous bone lattice are performed under direct visual control using a light microscope. In particular, the light microscope allows to accurately measure the sample geometry and deflection. We will combine structural models with a constitutive law for the trabecular material in order to relate the flexural rigidity of the trabeculae to the measured strain field.

I am looking forward to the XVIII ISB Congress in Zurich, where I am going to present some preliminary results from my experiments. Once again, I would like to thank the ISB for the financial support of this project and in general for their commitment to support students and young researchers at the beginning of their careers in biomechanics.

ISB Matching Dissertation Grant Report
Stacie I. Ringleb, M.S.E.

The purpose of my research is to develop a quasi-static structural model of the human rearfoot, including bones, cartilage, and ligaments, using the finite element method. Ultimately, a model of the rearfoot in a patient with ligament damage will be developed using data from magnetic resonance imaging (MRI). This model will lead to a comprehensive quantitative understanding of how the joints of the foot and ankle function. It is postulated that this understanding will lead to the optimization of conservative and surgical treatments to stabilize the joints of the foot and ankle that have become chronically unstable due to soft tissue injuries. Over the past year, I have: (1) developed a basic finite element model with simple geometry, (2) collected preliminary anatomically accurate data to input into the first generation model, and (3) investigated MRI data collection and processing techniques to obtain the necessary input into a patient specific finite element model.

A finite element model with simple geometry was implemented in ABAQUS 5.8.14 (Hibbitt, Karlsson & Sorensen, Inc., Pawtucket, RI). It was constructed to simulate compressive and rotational forces between two deformable bodies modeled with a linear elastic representation of cartilage (1). Each deformable body was attached to a rigid body, representing a bone. Finally, four wire elements connected the two rigid bodies to simulate linear elastic ligaments. The objective of this first phase of the project was to become familiar with building such a model in ABAQUS. This model has yielded satisfactory results. Additional work has commenced to define the properties of the ligaments and cartilage in a more physiologically appropriate manner.

Before obtaining input from MRI data, a preliminary model will be constructed using

digitized data describing the articular surfaces of the joints and ligament attachment sights. A probe with two infrared light emitting diodes (LED), each a known distance from its tip, was constructed. The Optotrak system (Northern Digital, Waterloo, ON), viewed the LEDs and the location of the probe tip was calculated. The probe was used to outline the attachment sight of each ligament involved in the rearfoot. Additionally a grid was drawn on the surface of the cartilage, and the data were collected at each intersection and along the perimeter of the articulating surface. The cartilage was then punctured along the grid, which determines the cartilage thickness and simultaneously locates the surface of the bone. Triads, attached to each bone, converted the data into a global reference frame. When the post-processing of this data is complete, each digitized point will be implemented as a node in ABAQUS.

There are several main tasks that have been addressed with the MRI data collection and analysis. A method to view the ankle and subtalar joints under stress has been developed (2). This will identify the location and extent of an injured ligament. Additionally, appropriate protocols have been ascertained to image the ligaments and the cartilage. The remaining challenges that must be addressed to obtain the input for a patient specific model are: (1) to investigate segmentation techniques for the cartilage and ligaments, (2) to extract the segmented data from 3DVIEWNIX, the image processing software, and (3) to import that data into the finite element model.

In the past year, several tasks involving the finite element method and imaging techniques have been addressed as preliminary steps toward completing a patient specific structural model of the human ankle.

Take the time to visit...

For a discourse of Newton's laws applied to graduate study

http://esu1.auckland.ac.nz/~norris/tmp/phd.html

Thanks to Rachel Skoss for sending in this site.

Upcoming Meetings, Workshops, Etc.

June

Fourth Combined Meeting of the Orthopaedic Research Societies of the USA, Canada, Europe and Japan, 1 Jun – 3 Jun 2001, Rhodes, Greece. Contact: Orthopaedic Research Society, 6300 N. River Road, Suite 727, Rosemont, IL, 60018-4226 USA; Tel: 847.698.1625; FAX: 847.823.4921; Email: ors@aaos.org.

4th Triennial international hand and wrist Biomechanics Symposium, 10-14 June, Izmir, Turkey. Contact: M. Garcia-Elias, PhD. Institut Kaplan, Hand and Upper Extremity. Passeig de la Bonanova, 9, 2nd floor, 2nd door. 08022 Barcelona, Spain. Phone: 34.93.417.8484, Fax: 34.93.211.0402. E-mail: garciaelias@retemail.es

Great Lakes Muscle Symposium, 15 June, Amherst, NY, Contact: http://www.movementscience.org/meetings

July

VIII Symposium on Computer Simulation in Biomechanics, 4-6 July, Milan, Italy. Contact: F. Casolo, DSTM Politecnico di Milano, P.za Leonardo da Vinci 32, 25133 Milano. Italy. Tel: 39.02.23996706, Fax: 39.02.73671646casolo@mech.polimi.it; http://mech.polimi.it/convegni; http://isb.ri.ccf.org/tgcs.

XVIIIth Congress of the International Society of Biomechanics, 8-13 July 2001, Zurich, Switzerland, Contact: ISB2001, Wagistr. 4, CH-8952 Schlieren, Switzerland, Tel: +41 (0)1 633 6117, Fax: +41 (0)1 633 1124, Email: isb2001@biomech.mat.ethz.ch, www.isb2001.ethz.ch

2nd International Conference on Motion Systems, 17-19 July, Friedrich Schiller-University of Jena. Contact: gerlinde.hofmann@uni-jena.de, http://www.uni-jena.de/~beb/

August

Third World Congress for Science and Racket Sports, 2-5 August 2-5, Huntington, WV. **Contact: J. Chandler, EdD,** Marshall University; Exercise Science, Sport, & Recreation; 400 Hal Greer Blvd.; Huntington, WV, 25755; Tel: 304.696.2924; FAX: 304.696.2928; Email: chandler@marshall.edu, http://www.marshall.edu/icsspe/index.html

American Society of Biomechanics, 8-11 Aug, San Diego, California. Contact: www.asb-biomech.org

3rd International Symposium on Progress in Motor Control : From Basic Science to Application. University of Montreal 15-18 August. Contact: Secretariat, Tel: 514.340.2078 or 340.2780, FAX: 514.340.2154, Email levinm@ere.umontreal.ca, http://ireadapt.qc.ca

September

MOVEMENT AND SENSATION International Symposium,3-6 September, Cairns Australia Contact: M Sweet,Prince of Wales Medical Research Institute, Barker Street, Randwick NSW 2031, Sydney, Australia, Tel: 612.9382.2677, Fax: 612.9382.2724, Email: M.Sweet@unsw.edu.au, http://www.cairns2001.unsw.edu.au

Motor Control 2001 FROM BASIC MOTOR CONTROL TO FUNCTIONAL RECOVERY, 9-14 September, Varna, BULGARIA. Contact: http://biblio.cnrs-mrs.fr/varnaMCC2001

Biomechanics of the Lower Limb in Health, Disease and Rehabilitation, 10-12 September 2001, University of Salford, England. Contact: J. Fletcher, University of Salford, Allerton Building A117, Frederick Road, Salford, M6 6PU, United Kingdom, Tel: 44.0161.295.7014 or 2211, Fax: 44.0161.295.2432, Email: j.fletcher@salford.ac.uk, http://www.healthcare.salford.ac.uk/biomechanics2001

6th IOC World Congress on Sport Sciences, 16-21 September, Salt Lake City, Utah Contact: Tel: 801.212.3472, Fax: 801.212.2440, Email: ioc.worldcongress@saltlake2002.com, www.iocworldcongress.org

IMEKO/SICE/IEEE, The International Symposium on Measurement, Analysis and Modeling of Human Functions. 21-23 September, Sapporo, Japan, http://www.ito.dis.titech.ac.jp/ISHF2001

Biomechanica IV, Davos, Switzerland, 23-25 September, 2001, Contact: http://www.ao-asif.ch/events/ao/biomechanica/index.shtml

October

XIIIth International Biomechanics Seminar, Wroclaw, Poland, 5-6 October 2001. Contact: http://netra.awf.wroc.pl/~as/biosem

5th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering, 31 Oct - 3 Nov, Rome, http://www.uwcm.ac.uk/biorome/

2002

3rd International Workshop on Musculoskeletal and Neuronal Interactions, Corfu, Greece, 24-27 May. Contact: M.Katsiri, PO Box 51 081, 145 10 Kifissia, Greece. Tel: 30.1.6280659, Fax: 30.1.8085462, Email:info@ismni.org, www.ismni.org.

3rd World Congress of Biomechanics, University of Calgary, Calgary, Alberta, Canada.

Get out of your office once in a while...

Worker dead at desk for 5 days:

Bosses of a publishing firm are trying to work out why no one noticed that one of their employees had been sitting dead at his desk for FIVEDAYS before anyone asked if he was feeling okay. George Turklebaum, 51, who had been employed as a proof-reader at a NewYork firm for 30 years, had a heart attack in the open-plan office he shared with 23 other workers. He quietly passed away on Monday, but nobody noticed until Saturday morning when an office cleaner asked why he was still working during the weekend. His boss Elliot Wachiaski said: "George was always the first guy in each morning and the last to leave at night, so no one found it unusual that he was in the same position all that time and didn't say anything. He was always absorbed in his work and kept much to himself." A post mortem examination revealed that he had been dead for five days after suffering a coronary. Ironically, George was proofreading manuscripts of medical textbooks when he died.

This was published in the Birmingham Sunday Mercury (7th Jan 2001):

Thanks to Kim Burton, Editor of Clinical Biomechanics, for this item.

THE PHYSICS CRACKPOT INDEX

The "crackpot index" originated from mathematical physicist John Baez, formerly from MIT now a professor at UC Riverside. His Web page is http://www.math.ucr.edu/home/baez/ and the crackpot index is at http://www.math.ucr.edu/home/baez/crackpot.html. The index is a simple method for rating potentially revolutionary contributions to physics. A -5 point starting credit.

1 point for every statement that is widely agreed on to be false.

2 points for every statement that is clearly vacuous.

3 points for every statement that is logically inconsistent.

5 points for each such statement that is adhered to despite careful correction.

5 points for using a thought experiment that contradicts the results of a widely accepts).

5 points for each mention of "Einstien", "Hawking" or "Feynman".

10 points for each claim that quantum mechanics is fundamentally misguided (without good evidence).

10 points for pointing out that you have gone to school, as if this were evidence of sanity.

10 points for beginning the description of your theory by saying how long you have been working on it.

10 points for mailing your theory to someone you don't know personally and asking them not to tell anyone else about it, for fear that your ideas will be stolen.

10 points for offering prize money to anyone who proves and/or finds any flaws in your theory.

10 points for each statement along the lines of "I'm not good at math, but my theory is conceptually right, so all I need is for someone to express it in terms of equations".

10 points for arguing that a current well-established theory is "only a theory", as if this were somehow a point against it.

10 points for arguing that while a current well-established theory predicts phenomena correctly, it doesn't explain "why" they occur, or fails to provide a "mechanism".

10 points for each favorable comparison of yourself to Einstein, or claim that special or general relativity are fundamentally misguided (without good evidence).

10 points for claiming that your work is on the cutting edge of a "paradigm shift".

20 points for suggesting that you deserve a Nobel prize.

20 points for each favorable comparison of yourself to Newton or claim that classical mechanics is fundamentally misguided (without good evidence).

20 points for every use of science fiction works or myths as if they were fact.

20 points for defending yourself by bringing up (real or imagined) ridicule accorded to your past theories.

20 points for each use of the phrase "hidebound reactionary".

20 points for each use of the phrase "self-appointed defender of the orthodoxy".

30 points for suggesting that a famous figure secretly disbelieved in a theory which he or she publicly supported. (E.g., that Feynman was a closet opponent of special relativity, as deduced by reading between the lines in his freshman physics textbooks.)

30 points for suggesting that Einstein, in his later years, was groping his way towards the ideas you now advocate.

30 points for claiming that your theories were developed by an extraterrestrial civilization (without good evidence).

40 points for comparing those who argue against your ideas to Nazis, stormtroopers, or brownshirts.

40 points for claiming that the "scientific establishment" is engaged in a "conspiracy" to prevent your work from gaining its well-deserved fame, or suchlike.

40 points for comparing yourself to Galileo, suggesting that a modern-day Inquisition is hard at work on your case, and so on.

40 points for claiming that when your theory is finally appreciated, present-day science will be seen for the sham it truly is. (30 more points for fantasizing about show trials in which scientists who mocked your theories will be forced to recant.)

50 points for claiming you have a revolutionary theory but giving no concrete testable predictions.

Thanks to Martyn Shorten, BioMechanica, LLC, for submitting this item

Advancements in SI units

Ratio of an igloo's circumference to its diameter: Eskimo Pi
2000 pounds of Chinese soup: Won ton
1 millionth mouthwash: 1 microscope
Speed of a tortoise breaking the sound barrier: Mach Turtle
365.25 days of drinking low-calorie beer because it's less filling: 1 lite year
16.5 feet in the Twilight Zone: 1 Rod Sterling
Half of a large intestine: 1 semicolon
1000 aches: 1 megahurts
Weight an evangelist carries with God: 1 billigram
Basic unit of laryngitis: 1 hoarse power
Shortest distance between two jokes: A straight line
Time between slipping on a peel and smacking the pavement: bananosecond
10 cards: 1 decacards
1 kilogram of falling figs: 1 Fig Newton
1000 milliliters of wet socks: 1 literhosen
1 million microphones: 1 megaphone
1 million bicycles: 2 megacycles
500 millinaries: 1 seminary
2000 mockingbirds: 2 kilomockingbirds
1 millionth of a fish: 1 microfiche
453.6 graham crackers: 1 pound cake
1 trillion pins: 1 terrapin
1 million billion piccolos: 1 gigolo
100 rations: 1 C-ration
10 millipedes: 1 centipede
3 1/3 tridents: 1 decadent
2 monograms: 1 diagram
8 nickels: 2 paradigms

Thanks to Ivan Vesely, Department of Biomedical Engineering, The Cleveland Clinic Foundation for this item.

Would you, or would you not hire/vote for this person?

Employment Wanted

Former Marijuana Smuggler

Having successfully completed a ten year sentence, incident-free, for importing 75 tons of marijuana into the United States, I am now seeking a legal and legitimate means to support myself and my family.

Business Experience - Owned and operated a successful fishing business: mother-vessel, one airplane, one inland and processing facility. Simultaneously owned and operated a fleet of tractor-trailer trucks conducting business in the western United States. During this time I also co-owned and participated in the executive level management of 120 people worldwide in a successful pot smuggling venture with revenues in excess of US$100 million annually. I took responsibility for my own actions, and received a ten year sentence in the United States while others walked free for their cooperation.

Attributes - I am an expert in all levels of security. I have extensive computer skills, am personable, outgoing, well-educated, reliable, clean and sober. I have spoken in schools to thousands of kids and parent groups over the past ten years on "the consequences of choice", and received public recognition from the RCMP for community service. I am well-travelled and speak English, French and Spanish. References available from friends, family, the U.S. District Attorney, etc.

Please direct replies to
Box 375, National Post, Classified,
1450 Don Mills, ON, M3B 3R5

From a February issue of the (Toronto) Financial Post. Thanks to Julie Perry, Department of Biomedical Engineering, for this item.

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A Note from the Treasurer – Graeme A. Wood

A significant number of members have not as yet paid their annual dues for 2001 (and some not even for 2000!). If you are one of these persons then an "X" appears on the address label that was affixed to the envelope that brought you this Newsletter. In that case please locate the renewal form that was sent to you with last December's Newsletter and take care of this matter promptly. If that form has got hopelessly lost on your desk, then please contact me for a replacement form.

EDITOR'S NOTE

The ISB Newsletter may be published quarterly: February-March; May-June; August-September, and November-December. There are alternative and random printing schedules that coincide with ~~unbelievable errors~~ unpredictable events. Generally, deadlines for material and articles are the first day of each first named month, which if read literally, would make everything due on January 1, but that is not correct. For the alternative schedule there are no deadlines. The Newsletter is mailed to members whenever we can get to it except, of course, on the alternative schedule which is always on time. Members are encouraged to submit anything and although members are urged to avoid legal and ethical faux pas such as piracy and plagiarism, violation of the guideline does not necessarily preclude publication. Members are urged to list newsletter items on their curriculum vitae in support of promotion consideration. The content of the Newsletter does not necessarily reflect the philosophy and opinions of the ISB but reflects somebody's philosophy and opinion at some time, the specifics are generally not important. Traditionally revered items such as *Letters, Special Articles, Affiliate Society News, Laboratory Features, Childrens' Stories, Meetings Announcements and Reviews* are desirable and may actually be considered for publication. We particularly like to receive rantings and ravings about anything. Material may be submitted electronically or on a computer disk as a text-only file, and must be in some form of English. The Editor reserves the right to translate the some forms of English to yet another form of English thus changing everything. Go ahead, roll the dice. Hard copy submissions of anything are acknowledged telepathically and placed in a recycle bin. Submission is not a guarantee of a timely or accurate appearance in the Newsletter.

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

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

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(d) *Journal of Electromyographic Kinesiology* - $AUS 190 _____

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),

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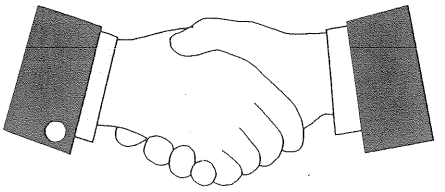

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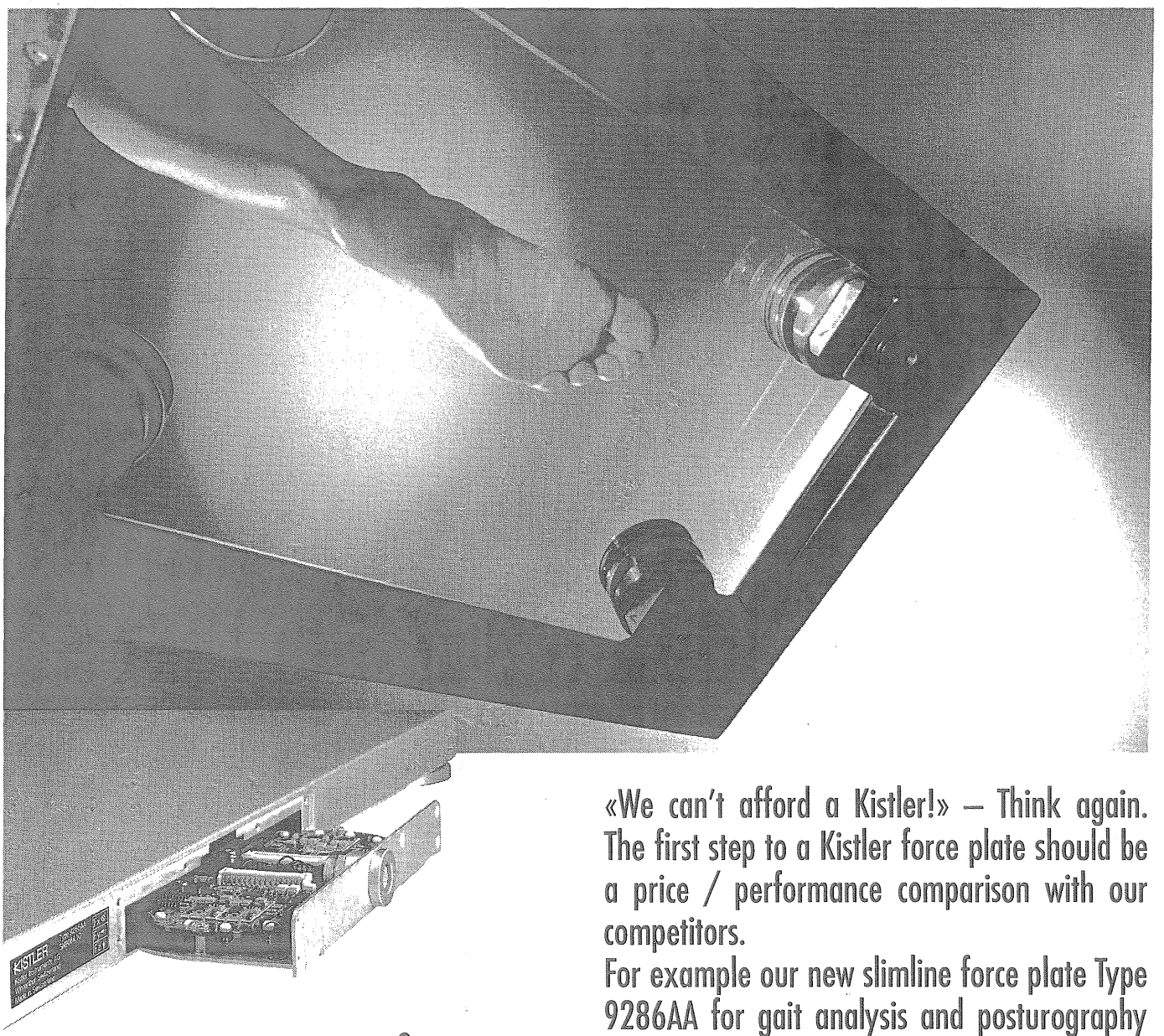

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