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From the President, Sandra J. Olney

Multidisciplinary, Interdisciplinary and Transdisciplinary Research

During the last decade we have witnessed an unprecedented growth in research funding directed towards groups of people from, well, varied backgrounds. Usually the word "Multidisciplinary" is included to give the grant application the proper aura. Then someone, with a slight smile, suggests that what we are doing is Interdisciplinary or maybe Transdisciplinary. We smile back knowingly, "Yes, I guess." But I don't know the difference or whether it even matters, but it bothers me that I can't define them let alone consider their strengths and weaknesses. Well, at least I know what a multidisciplinary group is. I have always worked in such groups: engineers, biomechanists, physicians, and usually physical and occupational therapists. These must be multidisciplinary, but might they be Inter, or Trans?? Now as I write I realize that there is a whole literature written upon the nature of such working groups, and that their history and even "appropriate epistemological bases" have been dissected, but I am looking for a more pragmatic understanding to use to support the next grant, and to give myself a framework in which to evaluate them operationally.

Disciplines themselves require some kind of definition. In medieval universities the disciplines were arithmetic, geometry, astronomy and music which were distinguished from the arts, which were grammar, rhetoric and dialectic. It was not until the 16th and 17th centuries that research specialties as such developed – but in separate research academies, not universities which were the centres of teaching, not research. This posed problems for the dissemination of disciplinary knowledge and the recruitment of new members. In the 18th century the first integration between the university and the research academy in the natural sciences took place in Holland and Germany, but the modern disciplines, outside of these, are largely 19th and 20th century creations that owe their origins to Europe. The hallmarks of contemporary disciplines are that they are amalgams of disciplines that the public recognizes as branches of knowledge for the purpose of teaching and research specialties, that are organized into largely autonomous groupings with the power to disseminate their knowledge (control of journals, curriculum, etc), and with the power to regenerate themselves and control entry (PhD programs and recruitment). At the same time they have evolved to meet societies' needs for efficiently trained disciplinary graduates (including their associated professions), reliable "certification" and expert knowledge. Thus they serve societies as a kind of educational factory with inbuilt quality control. Furthermore, the disciplines are organized around a research frontier and despite their responsibility in training, teaching activities play a relatively minor role in the discipline – e.g., promotion of members is based on publication not teaching and a PhD is based largely on the ability to do research (Does this sound familiar?). Though there are many definitions, a simple and common one is "a recognized branch or segment of knowledge within rational learning with certain generally agreed upon canons and standards" (Swoboda, 1979).

So the definition of disciplinary research that follows is relatively easy: **Disciplinary Research** is carried out by one or more individuals within a single discipline. I suppose Biomechanics is really a field within the discipline of physics, but we will give it disciplinary status for the sake of the discussion. **Multidisciplinary Research,** then, would be group research whereby individuals from different disciplines work together on a common problem, but with limited interaction. So if my colleagues from orthopaedic surgery and occupational therapy join me in assessing the surgical, biomechanical and quality of life outcomes of a new prosthesis, this would be multidisciplinary research. We might each get a publication from the work, each addressed to our own discipline, co-authored by the other disciplinary leaders. Each could write the paper almost independently. However, **Interdisciplinary Research** implies the joint, coordinated, and continuously integrated research done by experts with different disciplinary backgrounds, working together and producing joint reports, papers, recommendations, and/or plans, *which are so tightly and thoroughly interwoven that the specific contributions of each researcher tend to be obscured by the joint product.* So if we members of the three disciplines wished to address the problem of "what factors give optimal performance following knee arthroplasty, the issues are so enmeshed that we would require an interdisciplinary approach. In this case it is likely that no individual would be able to write the paper alone, and it would end up being a cooperative effort.

When and why did interdisciplinary research appear? It appears that it developed along with the intense scrutiny of science teaching and research in the West, particularly in the U.S., that followed the launching of Sputnik in 1957 by the Soviet Union. It was seen that sufficient interdisciplinary integration was required within a research venue to solve highly complex problems. So interdisciplinarity was a response to complex problem solving. Interestingly, the professions such as medicine and engineering were already showing a degree of interdisciplinarity at that time, prompted by their *modus operandi*: that of problem-solving. In summary, it appears that the more problem-centred the research approach, the more likely that the research will require interdisciplinary solutions.

Analyses of interdisciplinary research note the increased complexity of the organization needed to sustain it, and the large amounts of time spent communicating and attempting to communicate that are required. I think we have all had the experience of being involved in Centres of Excellence or similar groups, and have worried about the communication time that seems to be necessary to make them as productive as independent research. Yet, at the same time, we can see the increased breadth of problems that can be addressed – attributable to the interdisciplinary organization. Clearly though, these are factors to weigh up in the balance. Many of us have been involved in such efforts that did not "pay off" and have found it difficult to pinpoint the problems.

So what is transdisciplinary research? In **Transdisciplinary Research** individuals from different disciplines work as a team within a mutually accepted organization with an overall set of systems goals but they are seeking a unity of knowledge that abolishes or transcends individual disciplines. Although it has taken a number of forms, there is always some common ideological framework such as structuralism or general systems theory. Examples that we are familiar with are Women's Studies and Native Studies. Interestingly, these kinds of research, unlike the other types discussed above, usually attempt to alter in a basic way the nature of the knowledge involved, and the methodologies that are accepted as means of acquiring the knowledge. I am unaware of any transdisciplinary research in which biomechanists play any substantial role.

With this brief sketch, I think it is possible to consider to what extent the disciplinary, multidisciplinary, or interdisciplinary approach we are involved in satisfies the research objectives we have, and with a bit more understanding, we may be able to understand their strengths and weaknesses in ways that can be used to improve the organizations that support them.

Sources:

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Response to Sandra Olney's "From the President" column. (October 2002 ISB Newsletter)

Drs. Rob Herbert and Adrienne Hunt
Centre of Evidence-Based Physiotherapy and School of Physiotherapy
The University of Sydney

We read Dr Olney's "From the President" article in the last ISB Newsletter with interest. Dr. Olney asked "why [after 30 years of debate] are we still discussing the worth of biomechanical gait analysis?" We believe that the irony of the question being posed to this scientific community is that the worth of clinical gait analysis in informing conservative and surgical intervention has not yet been demonstrated by any acceptable scientific standard.

The provision of clinical gait analysis services is resource intensive, requiring as it does expensive technology and highly trained staff. As a consequence, resources are diverted from other health care services. We should be able to demonstrate that clinical gait analysis services provide greater increases in quality of life than do alternative services.

Discussion is ongoing regarding the validity of the current models used in gait analysis and the possible need for more complex models. At the same time, there is insufficient understanding of biomechanical data generated by gait analysis and their incorporation into clinical practice. It is not sufficient for a new diagnostic technology to be accurate, reliable and valid. To be useful in the clinical context, it must also provide information that changes clinical interventions, and those changed interventions must produce better clinical outcomes, i.e. reduced mortality or improved quality of life. A new technology might not be useful if there are inadequacies in either the quality of information provided by biomechanists or in the way in which clinicians use that information.

Undoubtedly, analysis of pathological gait has advanced our understanding of many clinical problems (Graham 2002). However, rigorous studies of the clinical value of clinical gait analysis have not been conducted (Hailey and Tomie 2000). We are aware of a plethora of case series describing the outcomes of interventions based on clinical gait analyses, and studies that have examined the level of agreement between clinical decision-making with and without clinical gait assessment (Cook et al 2000). Unfortunately these studies do not constitute evidence of the usefulness of clinical gait analysis.

We need to know if outcomes are better when clinical decisions are based on instrumented gait analysis than when they are not. Methodologies have been developed for specifically this purpose. The strongest design is the randomised trial (Lijmer and Bossuyt 2002). In diagnostic randomised trials, subjects are randomised to groups that either receive or do not receive the benefits of the diagnostic procedure. This could be achieved by divulging the findings of a clinical gait analysis for one group, while withholding the findings for a control group. In such studies, differences in outcomes between experimental and control groups provide unbiased estimates of the utility of the technology. Weaker designs such as before-after studies (Guyatt et al 1986) may also be appropriate in some circumstances, although these are more prone to bias.

The worth of clinical gait analysis will remain unproven until properly designed randomised trials are performed. No doubt the call for randomised trials will be met by protests that such a trial would be too difficult or unethical; as has always been the response when a trial is proposed for an established health service. Can the providers of clinical gait analysis services rise to the challenge and apply the degree of rigorous self-scrutiny that is expected in other areas of health care? If not, and if rigorous tests of the usefulness of clinical gait analysis are not conducted, we will still be discussing the worth of biomechanical gait analysis in another 30 years time.

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STUDENT REMINDER!!!!

ISB Student Grant Applications for 2003 are to be received by January 24, 2003. Further details and application forms can be found under:

http://www.isbweb.org/

Interview with Dr. Clint Rubin,
Professor and Chair,
Department of Biomedical Engineering
Director, Center for Biotechnology
State University of New York, Stony Brook

Editor's note: Dr. Rubin's research into non-invasive, non-pharmacological intervention to control osteoporosis was referenced in National Geographic's January 2001 article about surviving space travel. See: http://073-054.psy.sunysb.edu/bme/people/faculty/c_rubin.html

BD: You have become very well known for your "turkey ulna" experiments. Could you explain why you chose the turkey model?

CR: Famous for turkeys, eh? infamous, would be more like it...and given that our bone experiments have evolved to the use of sheep, you may rest assured that I have heard just about every barnyard joke there is!
Turkeys have proven to be an extremely useful model to use in identifying and quantifying the specific mechanical parameters that control the adaptive response in bone. First and foremost, the advantage of the ulna experiments, where the bone is isoloated from functional stimuli by epiphyseal osteotomies, is that the "only" mechanical information that the bone is subject to is that which the investigator inputs into the system. Therefore, any adaptive data (or lack there-of) is not confounded by different levels of activity during the other 23 hours and 50 minutes that may follow a 10 minute loading session. That the turkey is a biped means that we can isolate the bone without neccesarily disrupting the animal's lifestyle. I might add that turkey bone, most likely looked at as a wishbone at Thanksgiving, is very similar to human bone, in that it normally undergoes Haversian remodeling, and as an adult (a turkey over 9 months of age), their skeleton goes into a balance of formation and resorption similar to humans. This is a distinct advantage over rats or mice, which continue to grow (albeit more slowly) with aging.

BD: I've heard that your family is pretty scientific....at Thanksgiving, do you discuss turkeys or ask your sister about grant deadlines?

CR: My sister's priority scores on NIH grants are only achievable in my dreams... so we wonder about metabolic bone disease in poultry and just fight over who gets to break the wishbone!

In terms of scientific collaboration, my sister (Janet Rubin, an endocrinologist at Emory University) works on osteoclastogenesis. Through a display of family loyalty, she finally started examining the molecular mechanisms by which physical factors (e.g., strain, pressure, electric fields) could inhibit the formation of osteoclasts. Actually, we have published several papers and chapters together... although the kingpin "family affair" paper is one which Janet, my father (a cancer biologist) and I wrote, overviewing models to study aging... Rubin, Rubin & Rubin.... sounds like a law firm!

BD. Back to animal models...you have switched to other animal experiments. What are the advantages of these that are not offered with the turkey model?

CR: We have turned to rats and mice as nobody has yet bothered to sequency the turkey genome, so as we look to the genes that regulate the adaptive response, using rats and mice has proven very useful.
The turkey ulna experiments were valuable, to me at least, in getting a grasp of those general mechanical parameters that are important in defining bone mass and morphology... things like amplitude, rate, cycle number, dynamic vs. static loads, etc. Of course, when considering how to use this information to actually prevent or treat a disease such as osteoporosis, it is difficult to envision placing pins in peoples limbs such that they can be loaded.
Extrapolating some of the data derived from the turkey ulna, we have since been working on ways to induce anabolic (osteogenic) signals into the

weightbearing skeleton. Our work has led us to the hypothesis that extremely low magnitude, high frequency stimuli are critical to the regulation of bone quantity and quality, and represent the mechanical signals derived from the omnipresent activity of muscle contractions (which may decline with age, microgravity or bedrest). So, rather than loading up turkey ulnas, strange in its own way, we are now bouncing everything from mice to post-menopausal women.

BD: That leads to my next question. In your 2001 publication in Nature, you showed that low level mechanical stimulations had an anabolic effect that was *specific* to the region experiencing the vibration. Does this mean that the proximal and distal hindlimb bones showed similar changes in morphology? Were there regions that did not adapt to the vibratory stimulus?

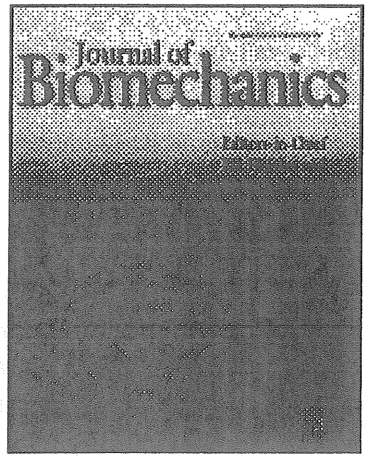
CR: The Nature paper used dynamic and static histomorphometry to evaluate the bone tissue's response at the proximal femur, and demonstrated an anabolic response in the trabeculae, but very little adaptive response in the cortical bone. In the distal femur, the medial condyles to be exact, we have used micro-CT, FEM, and materials testing to evaluate if these low-level signals could also influence the "quality" of the bone. The non-invasive signal increased bone stiffness by approximately 12%, and the bone strength by 27% (published in JBMR in 2002). Thus, in giving a long answer to your short question, it appears that the bones that are weight-bearing actually adapt to the signal. In bones not subject to the signal (in the case of the sheep, the radius and ulna were not subject to the vibration), the bone's remained at a low level of bone turnover, and no new bone formation could be detected.
We have seen a similar response in preliminary results in three clinical trials. The first, performed in collaboration with Zulf Mughal, Kate Ward and Judith Adams at the University of Manchester, the data indicate that trabecular bone volume of the proximal tibia, as assayed by CT, increases in children with disabling conditions (e.g., cerebral palsy). Over six months, children on the active device increased 11%, while those on an inactive device, decreased by 6%.
The second, in a study on young girls (ages 10-13) in the lowest quartile of BMD, in collaboration with Drs. Pitukcheewanont and Gilsanz at the Children's Hospital at USC, we have shown that trabecular and cortical bone density will increase with this stimulus, as well as muscle mass... supporting the idea that it is the musculoskeletal system that is adapting. In three months, trabecular bone increased by 5%, cortical bone by 1.2%, and muscle mass by 4%. Finally, in a study with women 3-8 years past the menopause, collaborating with Drs. Recker and Cullen, DXA indicates that these low level signals prevent the bone loss which normally occurs in this period. The influence of treatment was approximately 1.5% in the femur and spine, but with no effect in the distal radius.

BD: Speaking of collaborations with researchers overseas, I should ask you about why you chose to do your PhD overseas. Do you have family connections in England, or were you interested the the kind of research being performed there?

CR: I was made an offer I couldn't refuse! I met Lance Lanyon, the godfather of bone adaptation, while he was on sabbatical at Harvard's Concord field station. We were able to work together, taking strain measurements from horse and dog tibiae and radii, as well as instrumenting femoral components to measure strain following total hip replacement... it was great fun. When Lance returned to England, he called and offered me a studentship......having just broken up with my girlfriend, and needing a good pint of ale, it seemed like a good idea at the time.

BD: Well, it certainly led to a very productive career! Many thanks for taking time off for this interview.

Journal of Biomechanics



Editors-in-Chief
R. Huiskes and F. Guilak
ISSN: 0021 9290

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Seventh IOC Olympic World Congress on Sport Sciences

The Seventh IOC Olympic World Congress on Sport Sciences will be held at the Athens Hilton Hotel from 7 to 11 October 2003 in Athens, Greece, in conjunction with EFSMA, with the participation of FIMS and endowed by Pfizer.

The theme of the Congress will be "Physical, Nutritional and Psychological Care of the Athlete in the 21st Century". It will allow for an exchange of information on sport and the practice of sport beyond the traditional barriers of the disciplines and will provide the world's leading sports medicine experts with an opportunity to present their work to an international audience made up of physicians, therapists, scientists and coaches.

Abstract Submission Deadline: 1st APRIL 2003. The web site www.iocworldcongress.com will be updated as from November 2002 with more information.

WORLD CONGRESS ON SPORT SCIENCES

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Is stiffness independent of loading rate?
Reply to Solomon and Davis, ISB Newsletter 85

At Hof, Ph.D.
Institute of Human Movement Science, University of Groningen, The Netherlands.

The reply is, that it is not!
As I have occupied myself a good deal with stiffness measurement, I had a solution ready at hand.
The solution of the Laplace transform (4) is correct, however, I will rewrite it slightly :

$$P(t) = \frac{H^2 N m}{(H+G)^2}(1 - e^{-t/\tau}) + \frac{HG}{H+G} mt$$

with

$$\tau = \frac{N}{H+G}$$

When you divide this expression by Q(t) = mt, only the second term returns a constant, namely the equivalent stiffness of the serial connection of H and G; $K = (H^{-1} + G^{-1})^{-1}$. This means that for large *t* the slope of the curve is indeed constant, and equals the stiffness K. The first part, however is dependent on the loading function, since "m" multiplied by the exponential function between brackets and then divided by "mt" is not just a constant.

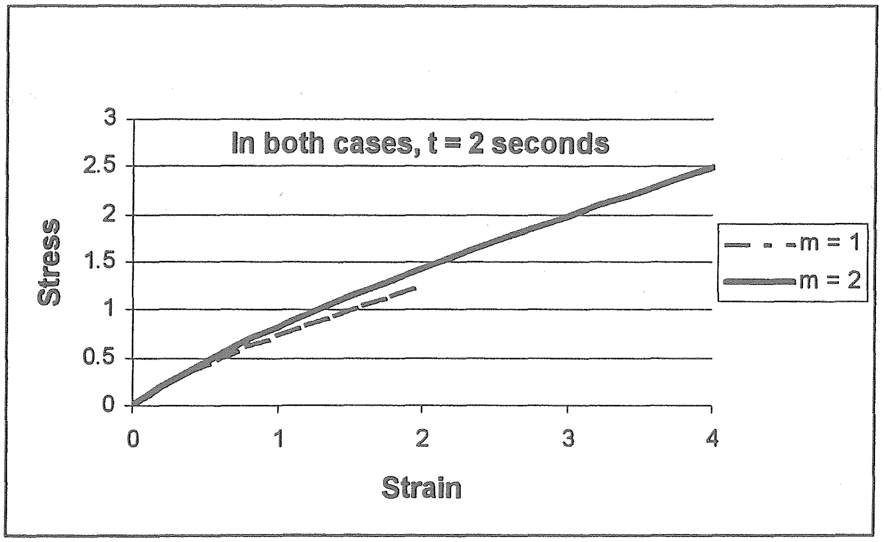
In fact the slope at the very beginning of the curve is also linear and independent of m. For $t \leq \tau$, the term between brackets can be approximated by t/τ, and the complete first term becomes:

$$\frac{H^2}{H+G} mt$$

This should be combined with the second term to give: $P(t) = Hmt \quad (t \leq \tau)$.
We already saw that $P(t) = Kmt \quad (t \geq \tau)$.

This is just what we would expect from inspecting Figure 1 in the last issue of the newsletter. Initially only the serial spring H is stretched and after the dashpot has been released the serial connection of G and H is measured. This means that when P(t) is plotted against Q(t) both the initial slope (equal to H) and the final slope (equal to K) are constant, but the place of the 'bend' in the function depends on strain rate "m". In fact, if you want to measure the serial spring H (e.g. a muscle's series elasticity), you should take a strain rate as high as possible, while if you want to measure the spring G (e.g. a muscle's force-length relation) you should use a very slow speed.

Footnote (provided by Ton van den Bogert). The dependence of stiffness (slope of a stress/strain graph) on the value of "m" is shown below (for a case where N=G=H=1). Note that the duration of the "experiment" is the same (i.e., 2 seconds) but that "m" is set at either 1 or 2. The initial slope is the same for both cases, but at strain = 1, the stiffness for each case is clearly different.



Biomechanics booktitles to look out for

Difficult tasks for the elderly.	Neil Downe and Stan Dup
Unusual materials for implants.	Polly Ester
Electrode skin preparation.	Nick Shaving and Rosie Cheeks
Bioelectricity.	Alec Troad
Intra abdominal pressure.	Tommy Ake
Occupational injuries.	Manuel Labor.
Impact measurements.	Lotta Noyze
End of the road for students.	Anita Job
Energy Depletion in Runners.	M.T. Tank
Rotating space stations:	Ann. T. Gravity
Youth and the elderly.	P. D. Atrics and Jerry Atrics
Stress tests.	Yin Pain.

Is this the end of the road for biomechanics (and every other discipline for that matter)?

(Taken from NASA RELEASE: 02-222: "NEVER BEFORE SEEN: TWO SUPERMASSIVE BLACK HOLES IN SAME GALAXY")

"For the first time, scientists have proof two supermassive black holes exist together in the same galaxy, thanks to data from NASA's Chandra X-ray Observatory. These black holes are orbiting each other and will merge several hundred million years from now, to create an even larger black hole resulting in a catastrophic event that will unleash intense radiation and gravitational waves."

If this was not bad enough, the report goes on to say:

"Over the course of the next few hundred million years, the two black holes in NGC 6240, which are about 3000 light-years apart, will drift toward one another and merge to form an even larger supermassive black hole. Toward the end of this process an enormous burst of gravitational waves will be produced several hundred million years from now. These gravitational waves will spread through the universe and produce ripples in the fabric of space, which would appear as minute changes in the distance between any two points."

Footnote: How this will affect 3D calibration of cameras was not mentioned.

Puzzle: Why does the force (needed for a wheelchair lift) reach a maximum at 54.7°?
Submitted by Abby Walters (University of Toledo) and Brian L. Davis (Cleveland Clinic)

When friction is neglected, a mechanism is in equilibrium in any position when the (positive) work of driving forces balances the (negative) work of resistance. Often we know what the resistance is and need to find the driving force needed to keep the mechanism in equilibrium. We can use the principle of "Virtual Work" to analyze these mechanisms.
The use of this principle will be illustrated in the following example: A patient in a wheelchair needs to be lifted into a van. The lifting mechanism is shown below. What force (F) must be applied to the mechanism in order that this can be accomplished?

Assume:
1. Light rods
2. Frictionless hinges
3. The height of the actuator (h) is a constant.

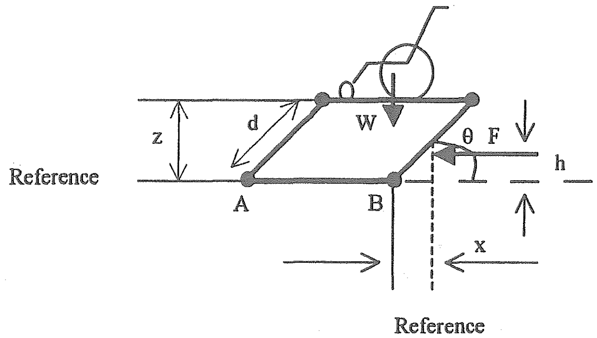


Figure 1. Wheelchair lifting mechanism. Hinge "B" is the reference point and link AB rests on the ground. The actuator creates a force "F" at a height "h" above the ground. Both "z" and "x" vary as the wheelchair is raised, but length "d" is constant. Weight of wheelchair is given by "W".

Solution (using principle of virtual work)
The reactions at A & B are not included since they do no work (A & B are stationary).
W & F do some work, hence:

$-W*dz - F*dx = 0$ (Now we need to get expressions for "dz" and "dx")

$z = d*\sin\theta$

$dz = d*\cos\theta*d\theta$

$x = h*\cot\theta$

$dx = (-h*d\theta)/\sin^2\theta$

Therefore,

$-W*d*\cos\theta*d\theta + (F*h*d\theta)/\sin^2\theta = 0$

$d\theta \neq 0$, hence

$W*d*\cos\theta = (F*h)/\sin^2\theta$ or

$F = (W*d*\cos\theta*\sin^2\theta)/h$ **Equation I**

__To find maximum force needed to raise wheelchair;__

Derivative of $(\cos\theta*\sin^2\theta)$ is;

$\cos\theta\,(2*\sin\theta*\cos\theta) + \sin^2\theta\,(-\sin\theta)$

$=2*\sin\theta*\cos^2\theta - \sin^3\theta = 0$ (at maximum force)

Since, $\sin\theta \neq 0$ this can be written;

$2*\cos^2\theta - \sin^2\theta = 0$

Since, $\cos\theta \neq 0$ this can be written;

$$2 - \tan^2\theta = 0$$

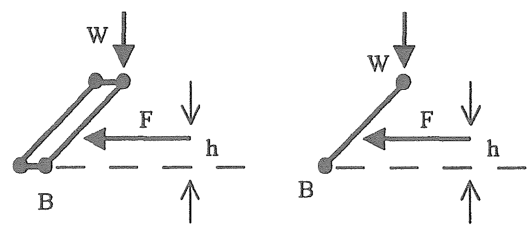
$$\text{or } \tan\theta = \sqrt{2}$$

which gives $\theta = 54.7°$, and substituting in Equation I gives;

$$F_{max} = (0.385 * W * d) / h$$

Here is the puzzle! If the mechanism is "collapsed" such that points A and B overlap, we would land up with a lever as shown on the right below. In this situation, **Fh = Wdcos θ**.
The maximum force is clearly not at 54.7°, but rather at the lowest (most acute) angle of θ.

Figure 2. The distance between "A" and "B" can be reduced –even to zero! Note that this distance is not featured in the equation for "F" (i.e., Equation I).



So, the question is, "Why does the solution given by the principle of virtual work give an angle at which F is maximum (54.7°) that is contrary to what one would expect for a simple lever?

Answers can be emailed to the editor at: davis@bme.ri.ccf.org.

In Memoriam: Tracy E. Orr, Ph.D.

Tracy Elizabeth Orr died on Tuesday November 12, 2002 due to complications associated with the birth of her two sons, Dylan Alexander Livingston and Ryan Benjamin Livingston. Those of us who knew and worked with Tracy are stunned and saddened by her passing but feel immensely fortunate to have had her touch our lives. She was a remarkable woman who made a tremendous impact in her professional and personal life. As a person she was independent, determined, and adventurous. As a colleague she was selfless, committed, and dependable. As a friend she was loyal, generous, and kind.

Tracy was born in Beruit, Lebanon in 1959 into a military family. She received her undergraduate engineering degree at Georgia Institute of Technology in 1981 and her masters degree in bioengineering at Dartmouth in 1983. She began her career as a biomedical engineer at the Palo Alto VA Rehabilitation R&D Center but soon returned to school to earn her PhD degree in Mechanical Engineering at Stanford University in 1990. Her doctoral research efforts were central to the development of new approaches for understanding how mechanical stresses influence skeletal development and bone remodeling. She continued her academic career in orthopaedic bioengineering by joining the faculty at Harvard Medical School. Over the next several years she was also associated with various outstanding research organizations including Massachusetts General Hospital, Brigham and Women's Hospital, West Roxbury VA, and Tufts University. Her intellectual curiosity and sense of adventure drew her in 1997 to a faculty position in Switzerland at the University of Bern where she led a biomechanics research group at the Maurice Müller Institute for Biomechanics. She later returned to the US to assume a position at the National Institutes of Health in Bethesda, MD and was married to Herbert L. (Buddy) Livingstone in 2001. Tracy is survived by her father and mother, Lt.Col (USMC retired) and Mrs. Arnold J. Orr, her husband, Herbert L. (Buddy) Livingstone, her two newborn twin sons, Dylan Alexander and Ryan Benjamin Livingstone, her sisters - Jamie, Becky, and Leslie, other family members and many, many close friends and professional colleagues. She continues to inspire us all.

Dennis R. Carter, PhD
Biomechanical Engineering Division, Mechanical Engineering Department
Stanford University,Stanford,

International Society of Biomechanics XVIIIth Congress Travel Grant Report Zurich, Switzerland, July 8th - 13th 2001

Karen Lucas
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I would like to thank the ISB for the opportunity to travel to the XVIIIth Congress held at the ETH in Zurich, Switzerland. Participation at this meeting was a fantastic and invaluable experience that would not have been possible without the financial support provided by the ISB.

My week began on Sunday 8th July with the Shoulder Tutorial presented by Prof Frans van der Helm and Dr Dirk Jan Veeger. Their presentation on measuring shoulder girdle movement was informal and presented in a straightforward and clear manner, for which this student was grateful! Hopefully tutorials like this will contribute towards standardising measurement protocols for the shoulder girdle in the future.

My presentation was not until the morning of Thursday 14th July. I think I was so over excited by all the people I had spoken with and presentations I had listened to that it took all my energy to get through my own paper. Even so, the feedback I received was helpful for the work I would be beginning when I got home.

I enjoyed the variety of presentations offered throughout the week. As a student who is not exposed to much biomechanical research at home (I'm the only full-time research student in our department), it was stimulating to listen to research of all sorts and be exposed to areas of biomechanics I didn't know existed.

I think the main benefit of participating in this Congress was the contact with other students and researchers. It is easy to feel isolated when you're doing hours of data analysis in a lab in Melbourne, but when other people ask about your research, and make suggestions for improvement, you begin to realise all the late nights and eye-strain were worth it! So to all those people who shared this time in Zurich, who gave me feedback on my work and made me feel like all the hard work is not in vain - thank you.

And to the ISB Committee, thanks again for making the trip feasible and contributing in such a positive way to my time as a research student. After my experience in Europe, I'm looking forward to the quick trip across the Tasman Sea to be part of it again in 2003.

Upcoming Meetings, Workshops

2003

Regional Conference On Women's Health, Physical Activity, and Sport
February 7- 8, Shreveport, Louisiana, USA
Email: rbyrd@pilot.lsus.edu

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

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

3rd IEEE Symposium on Bioinformatics and Bioengineering (BIBE-2003)
March 10-12, Washington DC, USA
Email: bibe@cs.msstate.edu.
http://www.cs.msstate.edu/~bibe/

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

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

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

8th Int. Conference on Rehabilitation Robotics
April 23-25, Daejeon, Korea.
http://www.rehabrobotics.org
Email: ysyoon@kaist.ac.kr

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

Sixth Israeli Symposiumon Computer-aided Surgery, Medical Robotics, and Medical Imaging
May 15th, Tel-Aviv, Israel
Email: josko@cs.huji.ac.il
http://www.cs.huji.ac.il/~josko/isracas2003.html

European Workshop on Movement Science (EWOMS)
May 22nd - 24th, Münster (Germany)
http://www.uni-muenster.de/EWOMS Email: move.brain@uni-muenster.de
Email: bagnara@unisi.it
http://www.media.unisi.it/haamaha2003/

8th Biennial Conference on Human Aspects of Manufacturing, HAMAAHA '2003
May 27- 30, Rome, Italy

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

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

12th International Conference on Perception and Action (ICPA).
July 6-9, Kingfisher Bay Resort on Fraser Island in Queensland, Australia
Email: smc2003@hms.uq.edu.au
http://www.hms.uq.edu.au/smc2003

XIXth Congress of the International Society of Biomechanics
July 6-11, Dunedin, New Zealand.
http://www.ISB2003.otago.ac.nz

2nd ITF International Congress on Tennis Science & Technology
28-30 July, London
E-mail: tst@itftennis.com
http://www.itftennis.com/html/rule/framesettst.html

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

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

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

Motor Control Conference III
September 20 - 24, near Varna, Bulgaria
Email: nick.gantchev@wanadoo.fr
http://www.laps.univ-mrs.fr/~gantchev/

Editor's Notes and Requests:

1. Many thanks to those who responded to the puzzle in the last newsletter. I chose At Hof's response because it made the most sense to me, and it was pre-formatted! Also, thanks to Rob Herbert and Adrienne Hunt for a response to the President's column that appeared in Issue #85.
2. Usually the Newsletter is published in the spring, summer, fall and winter. There are no deadlines for newsletter material.
3. The content of the Newsletter does not necessarily reflect the philosophy and opinions of the ISB membership.
4. Newsletter items such as Opinions, Affiliate Society News, Thesis Abstracts, Reviews of Biomechanics Meetings are desirable and may be considered for publication. Material may be submitted electronically or on a computer disk as a text-only file, and must be in some form of English. Submission is not a guarantee of a timely or accurate appearance in the Newsletter.
5. Here's wishing all ISB members a Happy New Year—may your funds and research opportunities exceed your expectations!

From the Treasurer - Dr Graeme A. Wood

Membership Renewals:

Enclosed with this Newsletter is your "invoice" for 2003 membership and journal subscriptions. There are some slight changes from the 2002 journal prices, particulary with respect to the Journal of Applied Biomechanics for which there is now just a single (air) mailing rate for all international subscribers. Please attend to your renewal payment promptly in order to avoid suspension of your journal mailings, and to minimise your Society's exposure to currency exchange rate losses (we pay the publishers in USD and EUR). Payment by credit card is our preferred method, but if paying by cheque please make sure the currency is Australian dollars (AUD), and that the cheque and your renewal form are mailed in the same envelope. Please don't convert the AUD amounts to your own currency and then send us a cheque - we then just have to pay the banks again to have the money converted back to AUD !

Credit card "customers"" can now

renew on-line

at the Society's website. Just go to: www.isbweb.org and click on the "Membership" and "Online Application" buttons.

And you can also use the on-line facility to advise us of an address change, or change in professional or marital status.

Presently ISB does not place a limit on the duration of "**Student** " membership (as many other Societies do), but a "Student" must nevertheless be enrolled ***full-time*** in a program related to Biomechanics. Please be sure to advise your Treasurer if the status of "Student" no longer applies to you.

If on your renewal form your Department and Institution details include begin with an ">", those details are not included in your mailing address, it being understood that your mailing address is different to that of your Institution.

ISB Membership News:

New members to ISB

STAERCK, Gillian Nicola (#2688)
The Centre for Sport & Exercise Science
Sheffield Hallam University
Collegiate Crescent Campus
Sheffield, S10 2BP
UNITED KINGDOM

JONES, Steven Frank (#2689)
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Bradford, West Yorkshire BD7 1DP
UNITED KINGDOM

BOURNE, Michael (#2690)
Dpet. of Exercise & Sport Sciences
Manchester Metropolitan University
Hassall Road, Alsager
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LEE, Nolan (#2691)
Lab. for Biomechanics & Motor Control
Karolinska Institute
Department of Neuroscience
Box 5626, Lidingovagen 1
Stockholm, 11486
SWEDEN

KEENE, Michael (#2692)
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DINIS OLIVEIRA, Antonio Manuel (#2693)
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Hospital Garcia de Orta - Almada
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>University of Northern Colorado
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USA

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Dept. of Surgery & Molecular Oncology
University of Dundee
Dundee, DD1 9SY
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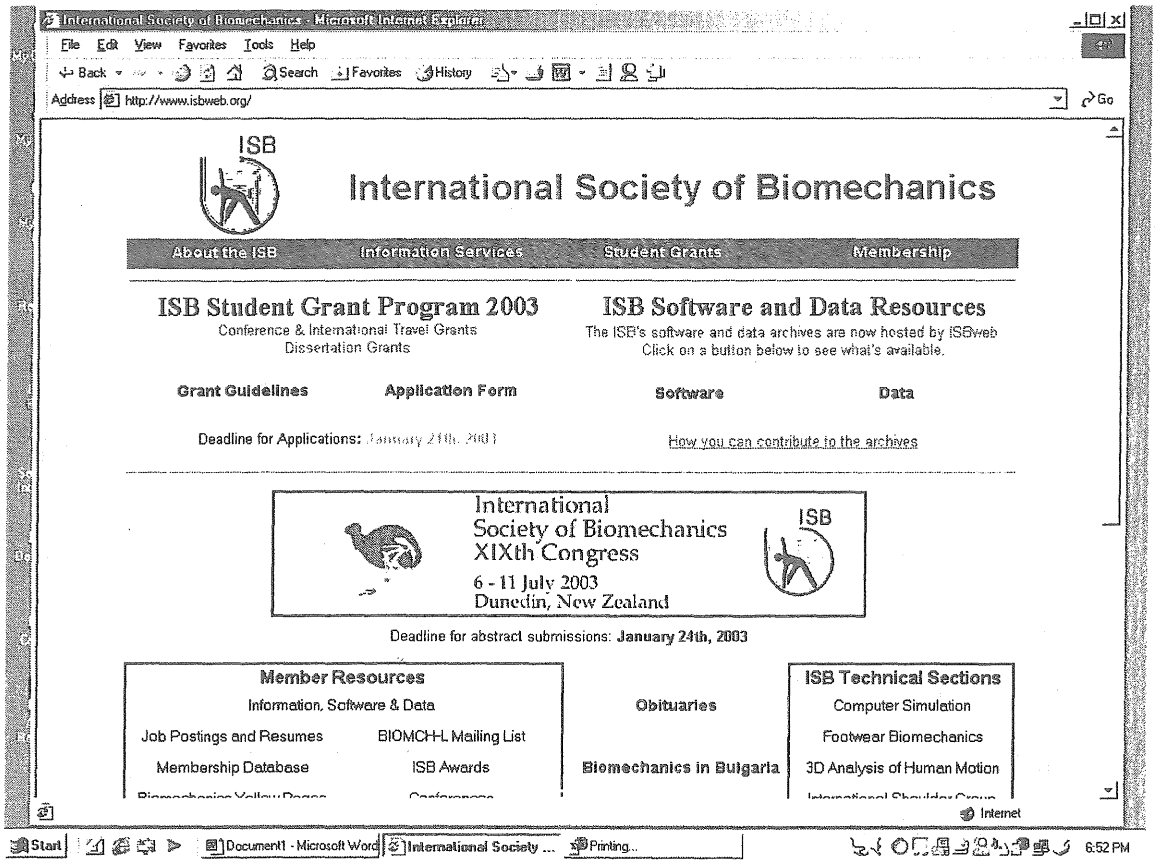
UCHIDA, Yusuke (#2703)
Graduate School in Health & Sport Sci.
Juntendo University
1-1, Hiraga-gakuendai, Inba-mura
Inba-gun, Chiba, 276-1695
JAPAN

Important Places to Visit in 2003



1. **Visit your Society's Website - it's got a whole new look !**
   http://www.isbweb.org

2. **Visit New Zealand for your Society's XIXth Congress**
   http://www.ISB2003.otago.ac.nz

International Society of Biomechanics
2003 MEMBERSHIP APPLICATION FORM

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

Family Name ______________________ Given Name(s) _____________________ Title ___

Department ____

University/Institute ____

| Street ____

Address < City _________________________________ State _______________________

| Country ______________________________________ Postcode ___________

PAYMENT DETAILS

Annual Membership

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

Optional Subscriptions

(a) *Journal of Biomechanics* - $AUS 130 ________

(b) Journal of Applied Biomechanics -
USA Resident - $AUS 95
Non-USA Resident - $AUS 115 ________
(NB: Student subs to the JAB are $25 less)

(c) *Clinical Biomechanics* - $AUS 140 ________

(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),

OR

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

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