

American Society of Biomechanics Newsletter

Vol. 6

May, 1993

No. 1

From the President

Ron Zernicke

I trust that everyone was able to send off an abstract (or two) to the Program Committee for the 17th Annual ASB Meeting in Iowa City. At the mid-year meeting of the ASB Executive Board (14 February 1993, San Francisco), Andy Biewener (1993 Program Chairperson) reminded the Executive Board that the 1993 meeting will be held on a Thursday through Saturday to take advantage of lower airfares that include a Saturday night. On Thursday, there will be tutorials, lab tours, and a wine/cheese reception coupled with the exhibitors' sessions. For Friday and Saturday, three keynote presentations and six parallel podium sessions are planned. Poster sessions will have their own separate time on Friday afternoon. Vijay Goel (1993 Meeting Chairperson) reported that there has been an excellent response from exhibitors for the Iowa meeting, and he indicated that the Whitaker Foundation was interested in supporting student-related activities at the meeting.

Among the many items discussed at the mid-year meeting, the Executive Board unanimously voted to change the position of the Student Representative from an Education Committee member to a nonvoting member of the Executive Board. This action will ensure a direct voice for ASB Student Members on the Executive Board at all its regular meetings. Look for Rosemary's column in this Newsletter and let her know your ideas and suggestions for greater student-member involvement in ASB.

The ASB received a full accounting of the NACOB II conference from Lou Draganich (1992 Meeting Chairperson). We knew it was a scientific success, and we now know it was a financial success. The proceeds from the meeting were split evenly between ASB and CSB and will be used to support each society's education and research programs. Speaking of "NACOB", both the ASB and CSB have agreed that 1998 will be the next best time for a combined meeting (NACOB III), which will be held in Canada.

As a final bit of news from the Executive Board meeting, I relay the information that the *Journal of Biomechanics* is planning a policy change on the publication of the "short abstracts" from conferences and scholarly societies. Page limitations from Pergamon Press and the burgeoning number of abstracts at meetings preclude

the "status quo" printing of all short abstracts—note that the 1993 ASB abstracts will still be printed in the *Journal of Biomechanics* as usual, but in 1994, the procedure will change. The Editorial Board of the *Journal of Biomechanics* asked each of the affiliated societies (ASB, ESB, and ISB) to propose alternative plans. The ASB Executive Board discussed numerous alternatives at the mid-year meeting, but finally reached a consensus on the suggestion that the *Journal of Biomechanics* publish the meeting program, including the names and topics of the keynote speakers, and also the titles/authors/keywords of all papers presented at the meeting. In this way, people will still be able to see what was presented, who was presenting, and contact the individual researcher if more information is needed about the project. We'll keep you informed of developments in this area; we have sent our suggestions to Rik Huiskes, Dick Brand, and the *Journal of Biomechanics* Editorial Board who will review our suggestions, as well as ESB and ISB suggestions.

Contact me via e-mail (zernicke@acs.ucalgary.ca), mail, or phone (403-220-8666) if you have suggestions or ideas of how your ASB Executive Board can better serve you as an ASB member, or if there is an issue that you think should be addressed at our next Board meeting.

I wish you the best and I hope to hear from you.

Ron

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Philip E. Martin, Ph.D.

Arizona State University, Tempe AZ

Dr. Martin received his B.S. and M.S. degrees from the University of Illinois, Urbana-Champaign and his Ph.D. from Penn State University in 1983. He is currently Associate Professor of Exercise Science and Physical Education at Arizona State University. His research interests focus on the economy and efficiency of human movement, particularly walking and running, and include research on age-related changes in gait economy and mechanics. Research efforts have generally been cross-disciplinary in design, combining biomechanical and physiological assessments of movement. Recent research has been directed toward assessing the mechanisms underlying higher metabolic demands of walking for elderly adults in comparison with young adults, particularly how age-related changes in gait pattern and declines in muscular strength may adversely affect walking mechanics and energetics.

Dr. Martin's service to biomechanics and the American Society of Biomechanics has taken many forms in the last decade. He has presented or co-authored papers at eight of the last ten ASB annual meetings and has served the Society as a member of the Program Committee in 1987, as the 1991 Meeting Chair, and as a member of the Awards Committee in 1993. He also completed four years as a member of the Editorial Board for the *International Journal of Sport Biomechanics* and is nearing completion of a three year term as Biomechanics Section Editor for *Research Quarterly for Exercise and Sport*. He is also a past member of the Scientific Advisory Committee for the U.S. Olympic Committee Sports Medicine Council and a current member of the Research Review Committee for the American College of Sports Medicine.

Clinton T. Rubin, Ph.D.

Musculo-Skeletal Research Laboratory, Stony Brook, NY

Clinton Rubin is Professor of Orthopaedics and Director of the Musculo-Skeletal Research Laboratory at the Health Sciences Center, State University of New York at Stony Brook, where he also holds adjunct appointments in Anatomy, Biophysics and Mechanical Engineering. The major research focus of the Musculo-Skeletal Research Laboratory is targeted towards understanding the biologic mechanisms responsible for the growth, healing, and homeostasis of bone and connective tissue, particularly in terms of the cell, tissue and organ response to biomechanical (mechanical/electrical) stimuli.

Dr. Rubin received his Ph.D. degree in Anatomy in 1983 from Bristol University, U.K. He is currently on the membership committee of ASB, and serves on the Committee of Space Biology and Medicine, Space Studies Board, of the National Academy of Sciences. At last year's ASB/NACOB meeting in Chicago, he organized a symposium on the physiologic consequences of space-flight and microgravity.

Candidates for Program Chair

Zvi Ladin, Ph.D.

Boston University, Boston, MA

Zvi Ladin is presently Assistant Professor of Biomedical Engineering in the College of Engineering at Boston University. He received his Ph.D. degree in Medical Engineering from MIT in the Joint Harvard Medical School - MIT Division of Health Sciences and Technology in 1985. He joined the ASB in 1986 and has been an active participant in all the annual meetings since then. Dr. Ladin served on the Nominating Committee of the society in 1991 and taught a tutorial on Quantitative Kinesiology during the Second North American Congress in Biomechanics in Chicago (1992). He currently serves as the Program Chairman of the Second International Symposium on 3-D Analysis of Human Movement. Dr. Ladin's research on the biomechanics of the lower back was honored by the 1989 International Volvo Award in Biomechanics for Low Back Research. His current research interests include the biomechanics of the back, the development of non-invasive methods of estimating joint loads and the biomechanical analysis of footwear.

Keith R. Williams, Ph.D.

University of California, Davis, CA

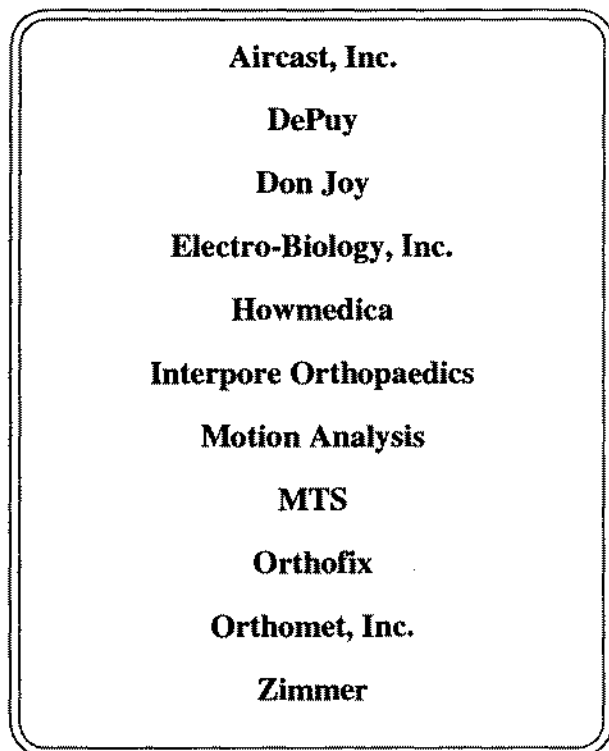
Keith R. Williams received his Ph.D. in Biomechanics from Penn State University in 1980. He is currently an Associate Professor and Chair in the Department of Physical Education at the University of California, Davis. He was the Newsletter Editor for ASB from 1987-1992 and was on the editorial board of the *International Journal of Sport Biomechanics* from 1987-1991. He is active in the American College of Sports Medicine and the International Society of Biomechanics, and has worked extensively with elite distance runners through the USOC and TAC. His research has recently focused on the optimization of running mechanics in relation to energy expenditure and injury, including investigations into the use of real-time feedback training.

ASB Newsletter on E-Mail

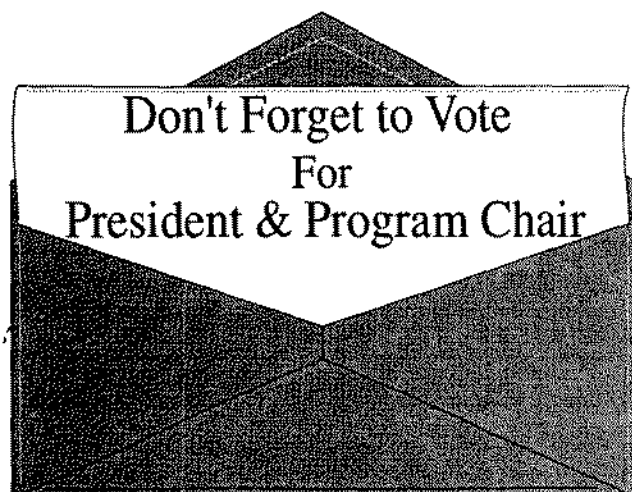
In addition to the hard copy version of this newsletter, we will also be distributing it across the Internet. This will be as a text file, just to the BIOMCH-L bulletin board and to ASB student members who have registered their e-mail addresses with Rosemary Speers. As promised in the last issue we have an Encapsulated PostScript (EPS) file that you will be able to retrieve using the "ftp" facility from our mainframe computer here in Charlottesville, and print out on your PostScript printer. If you would like to receive this newsletter and other information from the ASB make sure that you contact Melissa Gross (see her details of page 4) and apply for membership.

Sustaining Members

The sustaining membership category is aimed at encouraging affiliation by commercial organizations that market products which are used by the biomechanics research community, or companies that are otherwise engaged in activities that fall within the Society's general interest areas. Each member contributes \$500 per annum to the Society. We are happy to acknowledge and thank the following companies for their support as Sustaining Members:



We invite all members of the Society to suggest names of potential sustaining members. Please send your suggestions to Melissa Gross (Membership Committee Chairperson) at the address indicated on page four of this newsletter. If you have a particular contact person at the company, please make sure to include his/her name.



1993 ASB Annual Meeting

The American Society of Biomechanics was founded in 1977 at the University of Iowa to foster interaction among various disciplines in biomechanics research. The 17th Annual Meeting of the ASB returns to Iowa City, Iowa on Thursday, October 21 - Saturday, October 23. All sessions will be held in The Iowa Memorial Union, located on The University of Iowa campus. A home-style dinner is planned for Friday evening at one of Iowa's leading tourist attractions, the Amana Colonies.

Tutorials

Segment and Joint Orientations in 3D Space
James G. Andrews

Finite Element Methods in Biomechanics: Theory, Implementation, Clinical Applications and Results
Richard T. Hart and Thomas D. Brown

Lab Tours

Orthopaedic Biomechanics Laboratory, College of Medicine
Biomechanics Laboratory, Department of Exercise Science
Biomedical Engineering Department
Iowa Driving Simulator, College of Engineering

Keynote Symposia

A Biomimetic Approach to Materials Design
Prof. Arthur Heuer

Shear Transduction by Arterial Endothelial Cells and Their Cellular Response in Relation to Cardiovascular Disease
Prof. Peter Davies

Biomechanics of Speech
Prof. Ingo Titze

Registration Fees	before 10/1	after 10/1
member	\$ 110	\$ 130
non-member	\$ 130	\$ 150
student	\$ 25	\$ 35

For more information, contact:

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Iowa City, Iowa 52242-1317
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Education Chair's Report

Mary M. Rodgers

I. Tutorials

Two tutorials will be presented at the annual conference on topics of interest to many in ASB. James Andrews will present "Segment and Joint Orientations in 3D Space", and Richard Hart and Thomas Brown will present "Finite Element Methods in Biomechanics: Theory, Implementation, and Clinical Applications and Results". Tutorials will be held Thursday afternoon, October 21. Sign up when you send in your registration to insure your space.

II. ASB database

Thanks to all who have sent in forms for the ASB Referral Database. Over 40 members returned their forms. The ed committee recommends that future additions to the database be made through the membership mailing (i.e. membership renewals) where individuals can indicate whether or not they wish to be included in the database. Now that the database is available, the committee will be able to more effectively direct and answer ASB inquiries.

III. Student member

The Education Committee congratulates the student representative move from committee member to a non-voting member of the Board.

ASB Tutorial Presentations

Segment and Joint Orientations in 3D Space

James G. Andrews, University of Iowa

This tutorial will describe and illustrate the use of four common methods for specifying the 3D orientation (angular position) of one rigid body B (or embedded dextral reference frame $R_B: x_B, y_B, z_B$), relative to another rigid body A (or embedded dextral reference frame $R_A: x_A, y_A, z_A$). These four methods involve the use of: (1) direction cosines, (2) projection angles, (3) Euler or Cardan/Bryant angles, and (4) Euler parameters.

The definitions of these orientation parameters, together with any constraints they must satisfy, will be presented. Procedures for determining any set of orientation parameters from digitized point location data will also be discussed and illustrated. Finally the transformation equations that relate to the orientation parameters in one set to those in another will be presented, as well as the advantages and disadvantages associated with the use of each method.

The tutorial will presuppose only limited knowledge of analytic geometry, vector algebra, and matrix methods.

Finite Element Methods in Biomechanics: Theory, Implementation, Clinical Applications and Results

Richard T. Hart, Tulane University and
Thomas D. Brown, University of Iowa

The finite element method has become an important numerical approximation technique in a variety of engineering fields when the problem to be solved is complex in terms of geometry, materials, boundary conditions, or loading. This tutorial is intended as an introduction to the Finite Element Method as used in Biomechanics.

Included will be a discussion of the theory as derived from a generalization of the Rayleigh-Ritz method and including the implications upon the accuracy of finite element methods. Implementation issues to be discussed include appropriate hardware and software -- including a discussion of commercial programs and user-written special purpose codes -- as well as the need for bench testing to assure validity of the finite element analyses.

Also, there will be a discussion of examples of clinical applications and results for finite element analyses in the field of orthopaedic biomechanics.

Advertising in ASB Newsletter

As you may have noticed in this issue of the Newsletter we have added Advertising. The Editorial Board has extended invitations to various businesses and corporations that we feel have products that would be of interest to members of the American Society of Biomechanics.

We are interested in expanding our advertising base and would like any information you may have on North American companies that might have a product or an interest in advertising in the next issue of the Newsletter. Please contact Ms. Stephanie Goar at (804) 982-0893 or scg3q@virginia.edu if you have any information on such a company.

We Need Your Contribution

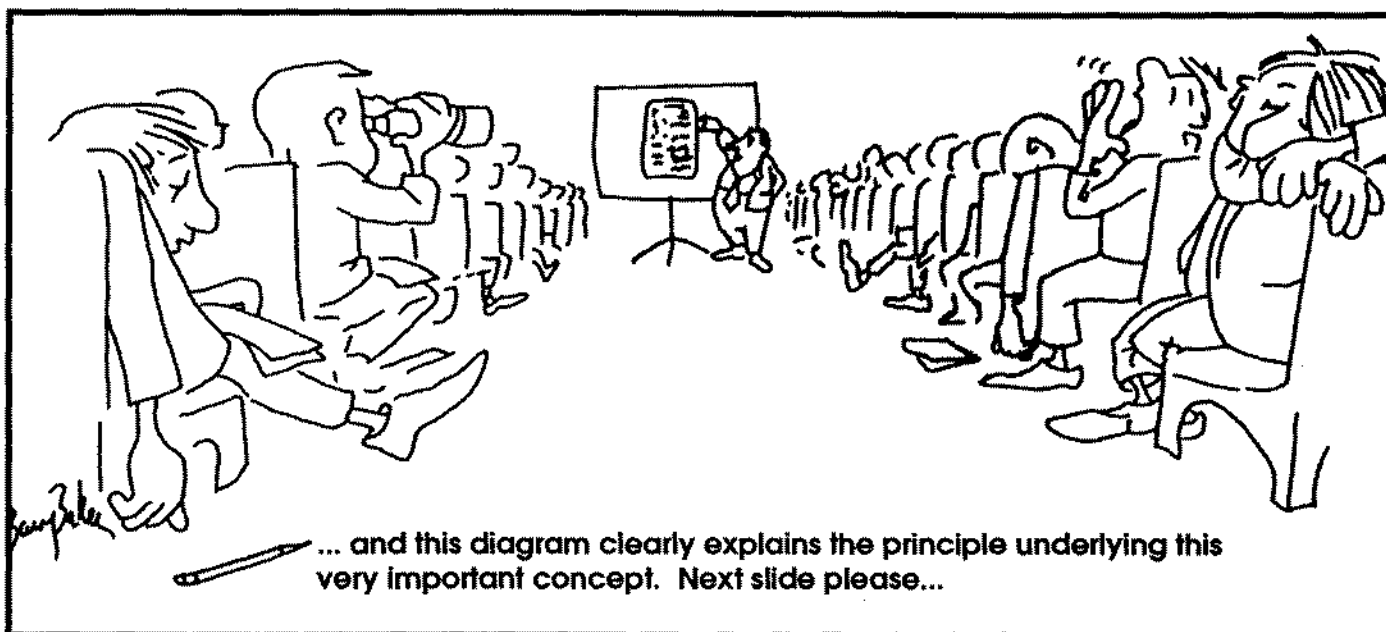
Members are encouraged to contribute to the newsletter. A note, a letter to the editor, a lead on an interesting story, information about a scientific meeting, in fact anything of interest to the ASB membership, would all be most welcome. Send information scrawled in longhand, via e-mail, or on computer diskette (5.25" or 3.5") for IBM or Macintosh. Plain ASCII text files are preferred! Next issue we would like to consider the addition of book reviews. If you have any other ideas, please get in touch. The next newsletter will be published in November 1994. Deadline for submission of material is 15 October 1994!

A View from the Academical Village

Kit Vaughan

This edition of the ASB Newsletter has the same basic layout as previously, but you will notice a few changes. First, we have persuaded a number of companies to take out advertisements. This serves two purposes: providing information to our members and generating income for the society. This brings me to the second change. We have significantly improved the quality of the printed

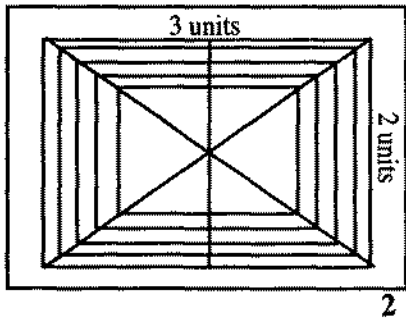
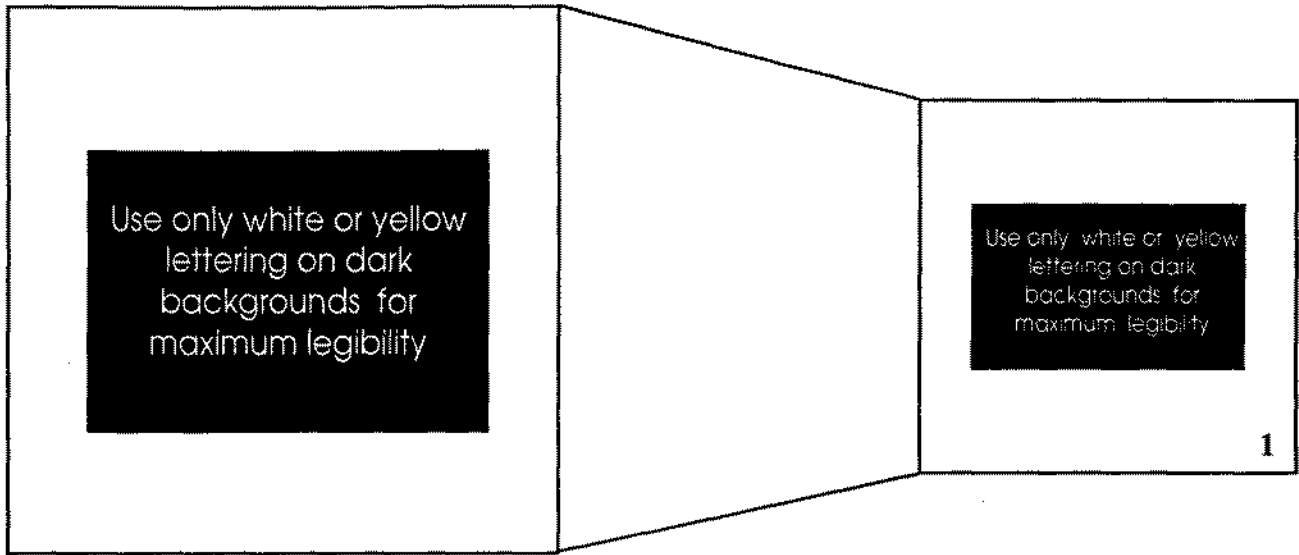
In putting these guidelines together, I have adapted some of the ideas and suggestions of the American Heart Association. The illustration on the opposite page summarize the simple rules for good slides that were proposed by the AHA, and have been adapted with permission from the Department of Medical Illustration and Audiovisual Education at Baylor College of Medicine. I would also like to acknowledge the cartoon by Barry Baker which captures the spirit of this editorial. In an effort to promote better quality slides at its annual meeting, FASEB (the Federation of American Societies of Experimental Biology) commissioned two scientists (DA Miller and SM Luria) to prepare some appropriate advice. I have also incorporated a few of their suggestions.



newsletter (I know the income from the advertisements would come in handy!) while still doing the environmentally correct thing and printing on recycled paper. So much for the changes. Let us switch our attention to the topic for this editorial: producing good quality 35 mm slides.

Back in December 1990, Keith Williams wrote a piece in the ASB Newsletter entitled "Key factors to insuring you give a confusing presentation". Those of you who read his advice probably laughed out loud at some of his hilarious advice. Here's a sample: "Put several figures on one slide -- it's cheaper and if you forget to collect your slides at the end of the talk you only lose a few slides" or "Cram as many of the 16,000,000 colors available on computers onto a slide. The world record is only 37. Certainly we can do better than that!" Behind the humor, however, was a very serious message. People ignore all the "rules" of good slide making when they prepare for a conference. We will be meeting in Iowa City this fall for our annual meeting and I challenge all of you who present a podium presentation there to subject your slides to the following guidelines.

My graduate students know that I'm a tough person to please when it's time to critique their slide-making efforts. In putting together a presentation, I encourage them to prepare this in a manner similar to an artist creating a comic strip. Each "frame" of the strip represents one slide and you can fit two onto a single sheet of paper (which also helps for those of you who are brave enough to attempt a dual-slide presentation). You then write or sketch the details in the frame and the analogy to a comic strip is continued: try to remember you are telling story. Once the final frame is composed, you know the total number of slides. A good rule of thumb is one slide for each minute of your presentation. I always find this the toughest advice to accept. The organizers of the ISB meeting in Paris this July have taken a novel approach. The authors whose papers were accepted have been told that they may only use 5 to 6 slides for their presentation! While some may consider this approach extreme, it will certainly have the positive effect of keeping the program on time and making authors choose their slides very carefully.



No
More
than
7
Lines
in
Height

3

No More than 7 Words in Width

4

5 Words in the Title

5

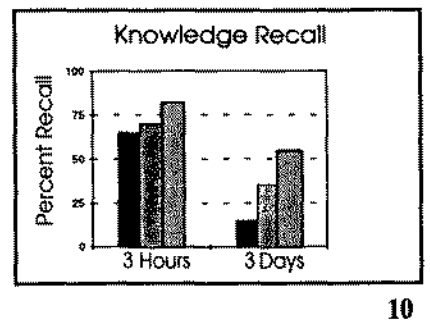
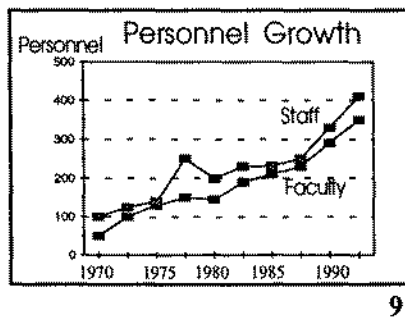
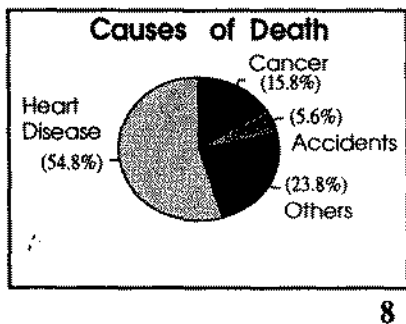
Simplify your slides

6

Use horizontally oriented slides

Vertical and square slides can reduce image area

7



Each slide that you prepare should have a clear purpose. As soon as it's projected the main point should catch the attention of the audience and be readily understood soon thereafter. If the audience takes too long to figure out what the slide's message is, they can obviously not pay appropriate attention to what the speaker is saying. Try to organize your slide around a single central theme so that it tells a unified story. Remember that information not directly supporting the main point of the slide, and not important enough to be specifically mentioned in the verbal text, should be excluded from the slide. Tabular data should rarely be used in a slide presentation. You should particularly avoid the comprehensive data table designed for another purpose (e.g. a journal article). Remember that the audience is most interested in your evidence and conclusions, not how much work you've done!

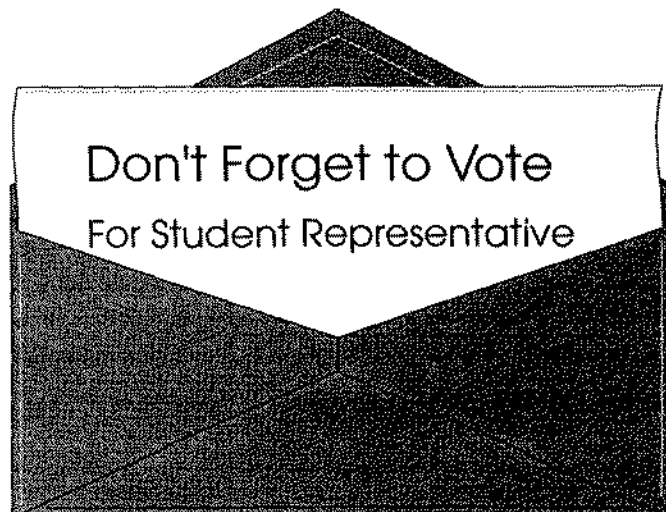
Above all else, your slides should be legible. In a study done a few years ago, measurements of apparent projected image sizes were made from the rear seats of five national scientific meetings. For those seated in the rear, the eye-to-screen distance averaged 10 times the projected image width. This applied to both large and small meeting rooms. This is a very useful ratio as it enables you to evaluate how legibly your slide will project. This may be accomplished by viewing the original figure, or the slide itself, or the projected image, from a distance 10 times its width. For example, a 35 mm slide should be viewed from 350 mm (about 14 inches in the furling system of units!). Hold your slide up to the light and you should be able to read every detail (assuming you have normal vision, of course!). An overhead transparency, where the width is about 25 cm, should be legible from a surprising 2.5 m. This means that you should never make a transparency from 12 point text, the font size used by most typewriters in the pre-computer days. When they correlated the above measurements with a standard eye chart, they calculated the minimum letter size from the rear seats (assuming visual acuity of 20/25) to be 1/57 the projected image width. Allowing for appropriate margins, this translates into a slide that has a width of 42 characters and a height of 14 single-spaced lines. When selecting a font, remember that Sans Serif is easier to read than Roman or Script.

I will conclude by briefly highlighting the rules contained in the ten accompanying illustrations. Figure 1 has two purposes. First, you will notice that the smaller image on the right has been reproduced at the real-life size of a 35 mm slide. Hold it about 35 cm from your eye and you should be able to read it easily. All other images are 50% larger and so you should check that the details can be discerned at a distance of 53 cm, which is about arm's length. The second purpose of Figure 1 is to make the point about choice of color. Bright lettering (e.g. white or yellow) works best on a dark background (e.g. royal blue). Figure 2 illustrates the normal aspect ratio for a slide is 3:2. Bear this in mind when composing both text and figures. Avoid having large blank spaces above and below the material of interest. As we discovered earlier, 14 single spaces are suggested for the height of a text slide. Figure 3 uses double-

spacing which translates into no more than 7 lines of text. Assuming an average of 6 characters per word, and with the previous guideline of 42 characters per line, Figure 4 suggests that you should aim for no more than 7 words per line. Most of the computer programs designed for composing slides (e.g. Harvard Graphics) allow you to put a heading or title. Try to limit this to 5 words (Figure 5). Figure 6 endorses the KISS philosophy: Keep it simple, stupid! Only include something on a slide if you plan to refer to it explicitly. With the artwork that appears in a journal or book you can afford to include a lot of detail. In a slide presentation, with a prescribed time limit, you should avoid extraneous detail. Because the vast majority of projection screens are set up in "landscape" mode (width greater than height), a slide that has a vertical orientation (portrait mode) will either project too small or will be chopped off at the top and bottom (Figure 7). Illustrations that are copied directly from books most often end up with a vertical orientation and invariably lead to projection problems.

As I said earlier, avoid the use of tables in a slide. Plan to use graphics instead (Figures 8,9, and 10). Pie charts can be effective, providing you limit the number of wedges to 7 or fewer, select your colors carefully, and place the labels outside the pie (Figure 8). Line graphs should be kept very simple by showing just 2 or 3 lines, avoiding excessive detail (e.g. the scales on these should be limited), and maintaining an appropriate balance between the text and the graph itself (Figure 9). Bar charts can work well so long as you avoid overcrowding and use a maximum of 7 bars (Figure 10). Remember, just because your computer program can produce 3D bars, you shouldn't feel obliged to use this feature!

The next time you attend a seminar, workshop or conference, look carefully at the presenter's slides. Compare them with the guidelines I have suggested here. You will soon learn to recognize slides that enable the speaker to communicate his/her ideas successfully. Your next challenge will be to adopt these principles in your own slide-making efforts. Good luck!



Students' Corner

Rosemary Speers

Hello again from the ASB Student Representative!

Things are looking great for the Annual Meeting in Iowa City. The cost for student registration is really low (only \$25!), and students can attend the tutorials for free. This is an outstanding commitment that ASB has made to its student participants. Also there will be a student breakfast at the meeting (included in the \$25) to better enable student discussion of pertinent issues. This meeting promises to be a valuable and fun experience. Please plan to be there for breakfast!

The biggest news since the last newsletter is that the position of Student Representative has now been included as a non-voting member of the Executive Board. This means that student representation has a much larger voice in the Society. Previously, the student representative functioned as a member of the Education Committee, and communicated with the Executive Board only through the Education Chair. Now, the student representative will attend all the Annual and Mid-Year meetings, and be able to voice his/her ideas directly to the other board members. This makes communication among the student representative and student members even more important.

The e-mail database is still being compiled, but hasn't been active lately. The database includes the names and e-mail addresses of students who are interested in biomechanics, not only ASB members. It is used by the student representative for ASB to initiate discussion and receive feedback on issues related to students and their representation in the Society. If anyone would like to be included in this listing, please send your name and e-mail address to 'rosemary@casbah.acns.nwu.edu'.

My other primary goal was to recruit more members in an effort to more fully represent the issues of biomechanics education from the student's viewpoint. The e-mail database has been especially helpful in this endeavor. I've also suggested a roommate network for students attending the conference. This will again be discussed at the student breakfast.

Finally, my term as student representative ends at the Annual Meeting in October. So far, this year has been productive and certainly enjoyable. I've really enjoyed the opportunity to serve in this position and to meet so many people in the field of biomechanics. Please remember to vote for the next student representative by returning the ballot enclosed with this newsletter. My best wishes to the student who is elected to the position of Student Representative for next year.

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*1 mm achieved at 2.5 m from the "camera", .45 mm achieved at 6 m from the camera (based upon a 1 mm marker on an 8 mm mount).
*OPTOTRAK is a registered trademark of Northern Digital Inc.

Job Opportunities in Biomechanics

Post-Doctoral Fellowships in the area of neural control & biomechanics of posture. Carlo J. DeLuca, Ph.D.; Boston University; Neuromuscular Research Center; 44 Cummings Street; Boston, MA 02215 Tel: 617-353-9756 Fax: 617-353-5737 Bitnet: CJD@BUENGA

Post-Doctoral Research Associate to run Biofluid Mechanics Laboratory. Richard T. Schoephoerster, Ph.D.; Mechanical Engineering Dept.; Florida International University; Miami, FL 33199

Research Engineer and Faculty Position in soft tissue biomechanics. Savio L-Y. Woo, Ph.D.; University of Pittsburgh; Dept of Orthopaedic Surgery; 1010 L. Kaufmann Bldg.; 3471 Fifth Avenue; Pittsburgh, PA 15261 Tel: 412-687-5913 Fax: 412-687-0802

Faculty position in the area of impact biomechanics. Dr. Anthony Sances, Jr.; Dept of Neurosurgery; Medical College of Wisconsin; 9200 West Wisconsin Avenue; Milwaukee, WI 53226

Research Assistant Professor to join pulmonary biomechanics group. Prof. J. B. Grotberg; Dept of Biomedical Engineering; Northwestern University; Evanston, IL 60208

Assistant Professor with research interest in biocontrols, signal & image processing or biomaterials. Search Committee Chair; Dept of Biomedical Engineering; The University of Akron; Akron, OH 44325-0302

Faculty Positions in Bioengineering at Assistant, Associate and Full Professor levels. Dr. Ward O. Winer, Director; The George W. Woodruff School of Mechanical Engineering; Georgia Institute of Technology; Atlanta, GA 30332-0405

Faculty Positions with research and teaching responsibilities in biomechanics. Dr. Kenneth A. Kline, Chair; Mechanical Engineering Department; Wayne State University; Detroit, MI 48202

Assistant Professor in Motor Learning Program. Dr. William G. Anderson; Teachers College; Columbia University; 525 West 120th Street; New York, NY 10027

Post-Doctoral Position in cartilage biomechanics and microscopy. Ernst B Hunziker, Director; ME Mueller Institute of Biomechanics; Postfach 30; 3010 Berne Switzerland E-mail replies to: mike@mem.unibe.ch

Post-Doctoral Position in Orthopaedic Biomechanics, System Analysis and FES. Prof. J. Mizrahi; Department of Biomedical Engineering; Technion, Israel Institute of Technology; Haifa

32000, ISRAEL Tel: 972-4 294218 Fax: 972-4 234131 e-mail: jm@techmax.bitnet or jm@maxc.technion.ac.il

Director of Sports Biomechanics Research Bob Finke, Executive Director; Minneapolis Sports Medicine Center; 701 25th Ave. South; Minneapolis, MN 55454

Doctoral Student for the 1993-94 academic year to study lower extremity function. Janet S. Dufek, Ph.D. email: jdufek@oregon.uoregon.edu or Barry T. Bates, Ph.D.; Department of Exercise & Movement Science; University of Oregon; Eugene, Oregon 97403-1240 Tel: 503-346-1040 Fax: 503-346-2841

Lead Biomechanist with Ph.D. to conduct basic and applied human movement research. Robert J. Woods; GEO-CENTERS, INC.; 190 N. Main St.; Natick, MA 01760-2057 or Ms. Susan Dewey Tel: 508-651-8147.

Biomechanics Research Positions to perform clinical/research assessment of normal and pathological subjects in the areas of gait and balance. Steven J. Stanhope, Ph.D.; Biomechanics Laboratory; Building 10 Room 6s235; National Institutes of Health; Bethesda, MD. 20892 Tel: 301-496-4733 ext. 11 email: stanhope%bmlvax.dnet@dxl.nih.gov

Full Research Professorship in the field of Human Movement/Exercise Science or Sport Management. Robert Newton; Centre for Human Movement Science and Sport Management; University of New England, Northern Rivers; PO BOX 157; Lismore, 2480 NSW AUSTRALIA Tel: International + 61 66 203 767 Email: rnewton@alsvid.une.edu.au

Rehabilitation Research Training Fellowship in Biomechanics. Marjorie E. Johnson, M.S., P.T. email: johnsonm@mayo.edu or Kai-Nan An, Ph.D.; Orthopedic Biomechanics Laboratory; Mayo Clinic/Mayo Foundation; Rochester, Minnesota 55905 Fax: 507-284-5392 email: an@mayo.edu

Chair in Sport and Exercise Sciences with research interests in biomechanics, biochemistry of exercise and exercise physiology. Dr. John H. Challis; School of Sport and Exercise Sciences; The University of Birmingham; Edgbaston; Birmingham B15 2TT England Fax: +44-21-414-4121 email: j.h.challis@uk.ac.bham

Post-Doctoral Research Position Responsibilities include development of instrumentation and software for Carpal Tunnel Syndrome project. Dr. John M. Agee, MD; 77 Scripps Drive - Suite 104; Sacramento, CA 95825 Tel: 916-923-5073 Fax: 916-923-2215

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Orthopaedic Engineering Positions for research in spine biomechanics, mathematical & numerical modelling, design & evaluation of implants, and computer assisted surgery. Dr. Lutz-P. Nolte; Maurice E. Mueller Institute for Biomechanics; P.O. Box 30; 3010 Berne; Switzerland OR Peter Brunner Tel: +41-31-648686 Fax: +41-31-250259 email: brunner@mem.unibe.ch

Post-Doctoral Fellowship in rehabilitation engineering at University of Virginia. Contact Dr. Milton Adams (jma@virginia.edu) or Dr. Kit Vaughan (kvaughan@virginia.edu) at (804) 982-0893.

Interested applicants are encouraged to contact the respective institutions for additional information concerning job responsibilities, application requirements, etc.

Calendar of Events

12-17 June 1993

Rehabilitation Engineering Society of North America (RESNA) '93 Las Vegas, Nevada RESNA; Suite 700; 1101 Connecticut Ave, NW; Washington, DC 20036 Tel: 202-857-1199

25-29 June 1993

ASME/AICHE/ASCE Summer Bioengineering Conference Breckenridge, CO Noshir A. Langrana, Ph.D.; Dept. of Mechanical and Aerospace Engineering; Rutgers, The State Univ. of New Jersey; P.O. Box 909; Piscataway, NJ 08855-0909 Tel: 908-932-3618 Fax: 908-932-5313

1-4 July 1993

Second International Symposium on 3-D Analysis of Human Movement Parc du Futuroscope, Poitiers, France Dr. Paul Allard; Permanent Secretariat; Centre de recherche; Hopital Sainte-Justine; 3175 Cote Ste-Catherine; Montreal, Canada PQ H3T 1C5 Tel: 514-345-4740

4-8 July 1993

XIV Congress of the International Society of Biomechanics Paris, France Convergences - I.S.B. 93; 120, Avenue Gambetta; 75020 Paris, France Fax: (33-1) 40.31.01.65

8-9 July 1993

Symposium on the Biomechanics of Joints and Joint Replacements; Dr. J Fisher, Dept of Mechanical Engineering, University of Leeds, Leeds LS2 9JT, UK

11-15 July 1993

World Congress on Neural Networks Portland, Oregon Annual Meeting of the International Neural Network Society; WCNN'93; Talley Management Group; 875 Kings Highway, Suite 200; West Deptford, NJ 08096; Tel: 609-845-1720; Fax 609-853-0411

12-15 July 1993

American Orthopaedic Society for Sports Medicine Meeting Sun Valley, Idaho Sports Medicine 2250 East Devon; Suite 115; Des Plaines, IL 60018.

15-16 July 1993

The International Society for the Study of the Lumbar Spine Annual Meeting; Dr. J Weinstein, Sunnybrook Medical Centre, Room A 309, 2075 Bayview Avenue, Toronto M4N M5, Canada

16-20 August 1993

Myo-Electric Control Symposium; Institute of Biomedical Engineering, University of New Brunswick, PO Box 4400, Fredericton, NB E3B 5A3, Canada

28-30 August 1993

The Societe Internationale de Recherche en Orthopedique et de Traumatologie (SIROT) Seoul, South Korea Charles H. Rivard, M.D.; Ste-Justine Hospital; 3175 Cote Ste-Catherine; Montreal, Canada H3T 1C5 Tel: 514-345-4687 Fax: 514-345-4822

21-24 October 1993

Annual Fall Meeting of the Biomedical Engineering Society Memphis State University Memphis, TN U.S.A. Ms. Melanie James; Fall BMES Meeting Administrator; Dept. of Biomedical Engineering; Engineering Technology Building, Room 330; Memphis State University; Memphis, TN 38152.

21-23 October 1993

17th Annual Meeting American Society of Biomechanics, University of Iowa, Iowa City, IA USA; Vijay K. Goel, Ph.D.; Professor and Chair; Dept. of Biomedical Engineering; The University of Iowa; 1202 Engineering Building; Iowa City, IA 52242-1527

27 October 1993

Shriners Workshop on Human Motion Analysis, San Diego, CA; IEEE/EMBS Conference, Refer to IEEE/EMBS below for details

28-31 October 1993

15th Annual International Conference of the IEEE Engineering in Medicine and Biology Society San Diego, CA IEEE/EMBS Conference Management Office; Meeting Management; 5665 Oberlin Drive, Suite 110; San Diego, CA. 92121; Tel: 619-453-6222 Fax: 619-535-3880; E-mail: n.feldman@ieee.org

28 Nov - 3 Dec 1993

ASME Winter Annual Meeting New Orleans, LA American Society of Mechanical Engineers; New York, NY Tel: 212-705-7795

21-24 June 1994

Tenth Congress of International Society of Electrophysiology and Kinesiology (ISEK) Charleston, SC; Richard Shiavi, Biomedical Engineering, Vanderbilt University, Nashville, TN 37235; Tel: (615) 322-3598, Fax: (615) 343-7919, E-mail: rgs@vuse.vanderbilt.edu

10-15 July 1994

Second World Congress of Biomechanics Amsterdam, the Netherlands Biomechanics Section; Institute of Orthopaedics; University of Nijmegen; P.O. Box 9101; 6500 HB NIJMEGEN The Netherlands Tel. +31-80-613366 FAX. +31-80-540555

