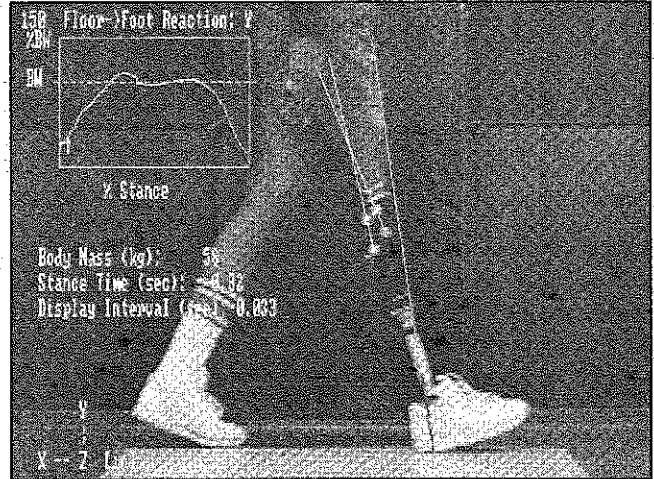
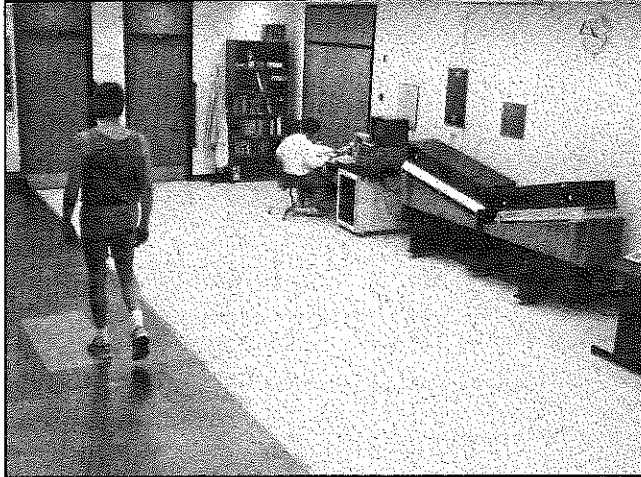




# Capabilities

Communicating the Science of Prosthetics and Orthotics

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## The Human Mechanics Measurement Laboratory

by Robert Van Vorhis, Dudley S. Childress, Piy Peng, and Chorng-Teh Lee  
Northwestern University Rehabilitation Engineering Program & Prosthetics Research Laboratory

The Human Mechanics Measurement Laboratory (HMML) was established to provide a facility for quantitative measurements during activities involving human movement. The capability exists for making measurements during a range of movement activities that include walking (as shown in the photograph).

Data collection is controlled through a 486-based ISA bus industrial computer that runs either MS-DOS or the LYNX real-time UNIX operating system. Transduction devices are synchronized using a master crystal which is connected to a timing and control generator (TCG). The TCG functions to allow programming of strobes that are routed to each transduction device. By strobing all devices from a common source, data is obtained in a time-coherent manner at individually controlled sampling rates.

Position transduction is done using two modified CODA-3 Movement Monitoring Systems. These sys-

tems are used together to provide sufficient and possibly redundant information about the spatial position of up to eight markers. Reaction forces can be measured from two AMTI biomechanics platforms that are located within a raised floor. The raised floor is metal-surfaced and is interfaced to a system we developed which allows temporal information to be monitored from up to eight (foot) contacts. Eight channels for analog telemetry are available. Data collection through several other analog and digital channels is also possible. These signals, for example, can come from pressure transducers or event switches.

Some data can be processed and displayed as taken in real time. In addition, the data acquisition system is

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Left Photo: View of Mechanics Measurement Laboratory showing the metal surfaced-walkway, the biomechanics platforms and the two CODA instruments in the "V" configuration that is used to improve unique marker identification.

Right Photo: Video frame of unilateral above-knee subject during the prosthetic stance phase. The floor reaction vector is overlaid as measured. The graph shows the magnitude of the vertical force during the entire stance phase with the arrow indicating the instant that the picture is acquired. The two construction lines intersect at the rotation center of the four-bar linkage knee.

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connected via ethernet to the SPARC workstation resources of the laboratory. Through this, the data can be further processed and stored and/or displayed using several methods. Quantitative data can be post-processed rapidly and displayed through routines written to interface with the interactive graphic capabilities of the DaDisp analysis package. We have also integrated the facility for acquiring video data along with other quantitative information. Picture information acquired with signal data can then be combined to allow visualization of the data together. In the video figure, an image is presented concurrent with the floor reaction vector which was present at the instant the picture was sampled. The amputee is wearing a four-bar linkage knee and the picture has been annotated to show the instantaneous rotation center which exists at the intersection of the two lines. This is actually one of several images that make up a computer-based movie of the subject's whole stance cycle. The floor reaction and the picture data is combined and allows visualization of the progression of the floor reaction—which changes in magnitude, application point, and orientation—that acts between the amputee and the walking surface during the stance phase.

The HMML is a jointly used facility, supported by the VA and by NIDRR. ♦

## Education

### Northwestern University Medical School Prosthetic-Orthotic Center Bulletin of Courses

Now available, the Bulletin describes the Center's curriculum for the two-semester 1993-1994 school year. Both continuing education and certificate programs are described.

For those interested in continuing education, fourteen courses are offered in orthotics, prosthetics, prosthetics-orthotics, and pedorthics. Courses are geared to the O&P professional, rehab clinician, or physician.

For those interested in pursuing careers as prosthetists or orthotists, the University offers a Certificate Program in Orthotics and a Certificate Program in Prosthetics during both semesters.

To receive your copy of the Bulletin, write or call the  
*Prosthetic-Orthotic Center*  
Northwestern University Medical School  
345 E. Superior St., 17th Floor  
Chicago, Illinois 60611 USA  
Phone (312) 908-8006.

### First Annual Technical Advisory Panel Meeting Fifth Annual Consumer Advisory Panel Meeting

The Technical Advisory Panel (TAP) and Consumer Advisory Panel (CAP) of the Rehabilitation Engineering Program (REP) met jointly this year in Chicago on October 2. The newly-formed TAP is an advisory group consisting of O&P professionals. This year marked the group's first meeting. The REP is pleased to welcome the following:

Dr. Lawrence Carlson, *University of Colorado*  
Dr. Richard Foulds, *AI DuPont Institute*  
Dr. Robert Jaeger, *Illinois Institute of Technology*  
Mr. James Kaiser, C.P., *Scheck & Siress O&P, Oak Park, IL*  
Mr. Maurice LeBlanc, C.P., *Stanford University*  
Mr. Lawrence Quigley, C.P.O., *Lakeshore O&P, Chicago*  
Mr. Michael Quigley, C.P.O., *Oakbrook Orthopedic Services, Oakbrook Terrace, IL*

The TAP will be advising the REP on the technical aspects of research directions during the NIDRR grant period of 1993-1998. The group will meet formally yearly and also on an ad-hoc basis.

The Consumer Advisory Panel also met to give the REP consumer input on the newly-awarded NIDRR grant. This is the fifth regular meeting of this group. Members of this panel include:

Edward Eckenhoff, *National Rehabilitation Hospital*  
Bill Lintz, *American Cancer Society*  
Johnnie Pearson, *North Carolina Division of Veterans Affairs*  
Margaret Pfrommer, *TAAD Center*  
Linda Lee Ratto, *Rehabilitation Consultant & Author*  
Carol Scholar, *INTERCORP*  
Hector Torres, *University of Tennessee Medical Group*  
Wayne Vercellotti, *Wisconsin Amputee Golf Assn.*  
Rose Wilson, *COPH*

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This year's meetings were held in conference areas of the Rehabilitation Institute of Chicago and the Rehabilitation Engineering Program. On the agenda were technical presentations by REP staff, a tour of the Human Mechanics Measurement Laboratory, a site visit to Northwestern University Medical School's Prosthetic-Orthotic Center, and joint and separate "roundtable" meetings where panel members could exchange ideas with REP staff and among themselves.

Highlights of the technical presentations included a live CAD-CAM socket-mold forming demonstration; a lively presentation by Dr. Yeongchi Wu on the "Walkabout," a new reciprocating gait orthosis; and presentation of results of upper-limb prosthetic studies, including the use of direct muscle attachment as a control method for prostheses. ♦

## Review

### **No Pity: People with Disabilities Forging a New Civil Rights Movement**

By Joseph P. Shapiro. ©1993, Joseph P. Shapiro. New York: Times Books. ISBN 0-8129-1964-5. Hardcover, \$25.00 U.S.

In this provocative book, Mr. Shapiro describes one side of the disability rights coin: the right to be disabled, period. As he states, "A disability, of itself, is not tragic or pitiable—[this] is at the core of the new disability rights movement." His extensive interviews and case histories outline the growth of civil rights for the disabled. That persons with disabilities have rights is a fairly new concept, historically. "According to the thinking of the disability rights movement, it is not so much the disabled individual who needs to change, but society...Says [a disability rights activist], 'Disability only becomes a tragedy for me when society fails to provide the things we need to lead our lives—job opportunities or barrier-free buildings, for example. It is not a tragedy to me that I'm living in a wheelchair.'"

For persons with disabilities, this book may serve as an affirmation of their own feelings and desires. For the student of history and of civil rights, this book can serve as a reference and as an eye-witness perspective of one extreme. For the professional involved in aiding persons with disabilities, this book may cause the disturbing thought that perhaps services—and research—are not needed. Since this book merely describes a perspective, time and maturity may lead all sides to the conclusion that societal solutions are everyone's responsibility—and societal problems are not merely one group's fault. Rating: *Two stars*.

## Skallagrigg

By William Horwood. ©1987, Steppemole Enterprises. London: Penguin Books. Available from Special Needs Project (see below). Price based on import costs.

This intriguing fictional story brings together Arthur, a boy with cerebral palsy, and his counterpart Esther, a brilliant computer games specialist, seventy years in the future. They are united by their love of *Skallagrigg*, a mystical being who unites the disabled community wherever his name is spoken. Esther is determined to find out who *Skallagrigg* really is, and in doing so, grows into a realization of what her disability keeps her from doing—and what it helps her achieve.

You will be uplifted by this book, its spiritual message, and unlike the book *No Pity*, your awareness will be inoffensively heightened and challenged as to the universal needs of all people, for all people are disabled in some way. Rating: *Five stars*.

### **Special Needs Project Good Books about Disabilities**

This very special mail-order source for books, operated by Mr. Hod Gray, caters specifically to the needs and interests of persons with disabilities and their rehab care professionals. In correspondence with Mr. Gray he states, "Here are three ways that we are better [than other sources for disability-related books]: we're easy to reach, we're toll-free, we take credit cards and purchase orders, and we ship fast as a bunny. What parent, professional, or information specialist wants to order blind a book at a time from three, four, or a dozen addresses? I didn't, so I started *Special Needs Project*."

Mr. Gray's knowledge about books in print and his enthusiasm are infectious. The Project's extensive catalog offers a variety of hard-to-find and special topic books and magazines. Book reviews, AppleLink and electronic bulletin board services, and catalogs-on-disk are also available. To find out more, write or phone Special Needs Project, 1482 East Valley Road, Suite A-121, Santa Barbara, CA 93108-1241, telephone (1-800)-333-6867. ♦

Note our new rating system: More stars, better reading!

### **Coming in December: NU REP-PRL 1993 Activities Report**

Read about state-of-the-art advancements in P&O in this photocopied, easy-to-read synopsis. For more information on reserving your copy, contact Bonnie at (312) 908-8560.

## Resource Unit Information Request

All information is free. Check off what you need and mail this coupon back to:

**Northwestern University REP/Resource Unit**  
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