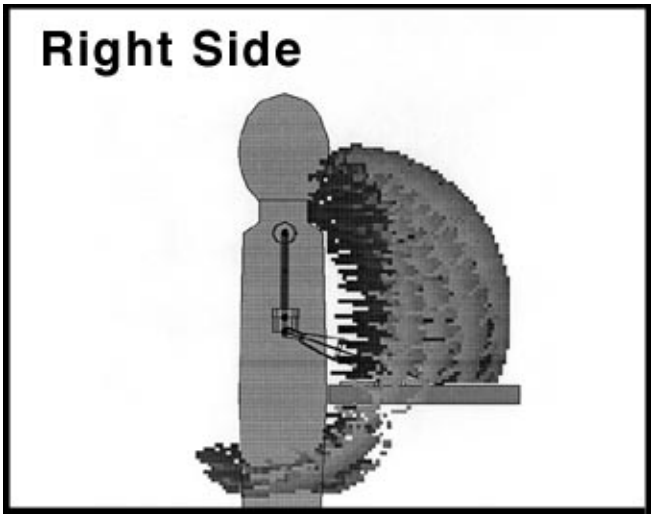
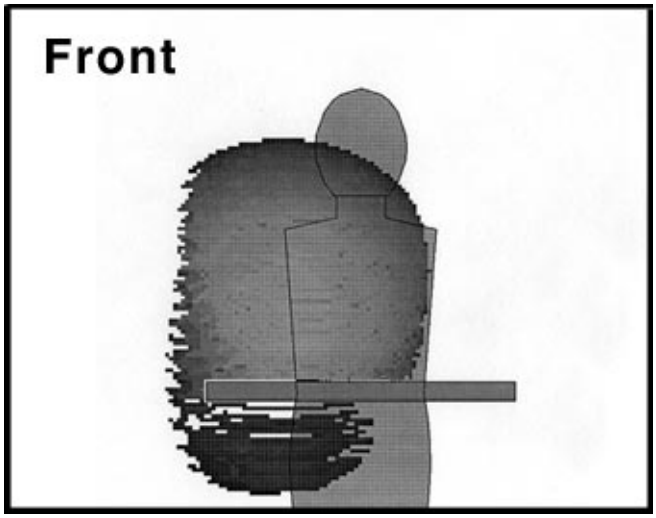
# Capabilities

Communicating the Science of Prosthetics and Orthotics

Volume 4, Number 3, October 1995


*Functional workspace, within the prehensor of a proposed shoulder disarticulation prosthesis can be positioned, is provided in the PADSS. Note the "subject" is modeled as standing at a table.*

## Prosthetic Arm Design and Simulation System (PADSS) for assessing alternative fitting of upper-limb prostheses

*By Craig W. Heckathorne*

Developing an arm prosthesis that fully restores the manipulative capabilities of the amputated limb is beyond current prosthetic science and practice. The difficulty is especially apparent for persons with amputation levels higher than the elbow and for those with bilateral amputations.

### Current components and control strategies

In spite of the difficulties, many persons with these amputation levels are able to benefit from the partial restoration that can be achieved with the variety of upper-limb components and control strategies now available. However, development of the prosthetic fitting is typically a labor intensive and time consuming process, generally involving several iterations as the prosthesis design is implemented, evaluated, and modified.

With the objective of reducing the time and effort involved in this clinical process, we undertook the development of a computer-based tool, the Prosthetic Arm Design and Simulation System (PADSS). It is intended, through graphic representations, to assist the prosthetist in visualizing and analyzing multi-component arm prostheses and in comparing different possible designs prior to fabrication.

### Client and prosthesis are modeled

The current PADSS implementation displays a stylized representation of the client and a proposed prosthesis design. The client is modeled from a set of anatomic measurements,

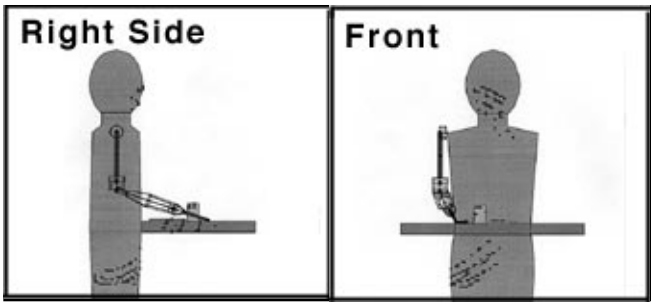
*Continued on page 2*

**PADSS System**
*Continued from page 1*

and the prosthesis is modeled from components specified and configured by the prosthetist.

As a basis for comparing different designs, the PADSS calculates and displays the workspace volume and contact map. The workspace volume defines the space around the person in which the prehension device can be positioned. The contact map shows the area on the body of the modeled client that can be touched with the tip of the prosthetic prehensor. The workspace volume illustrates reach; whereas, the contact map highlights near-body space. Both are important for activities such as self-care.

Still under development, the PADSS shows intriguing possibilities for prosthetics education and component design, in addition to its target role as a clinical tool. ❖




*Contact map showing areas (in darker shading) that can be touched by the prehensor of the proposed prosthesis. Shaded area on face indicates that the subject should be able to bring food to the mouth.*

This work is supported by the National Institute on Disability and Rehabilitation Research. The first PADSS version was implemented by Michael Redding, who joined the project in fulfillment of his Master of Science degree. The author wishes to recognize Mr. Redding for his significant contributions to this work.

# Northwestern University PRL & RERC welcomes vistors from both sides of the globe

Applying prosthetic and orthotic advancements to the lives of amputees may be influenced in Australia, the United Kingdom and Europe by research and practices at Northwestern University PRL & RERP. Sharing research and practices was part of some of the visits to the University this summer. The research being conducted at Northwestern has attracted interest in many parts of the world and was the reason that three groups chose to travel to Chicago to learn more.

**University of Strathclyde**

As part of their advanced studies, nine students and an accompanying lecturer, Karyn Ross, from the National Centre for Training and Education in Prosthetics and Orthotics, University of Strathclyde, Glasgow, Scotland, chose to visit Northwestern University PRL & RERP to see first hand the ongoing research projects being conducted by Dudley S. Childress, Ph.D., Director, staff members and graduate students. On July 26, the Strathclyde University students spent the day touring the laboratories and hearing lectures on upper-limb prostheses, aided ambulation, human mechanics measurement and computerized methods.

The group also studied methods used in prosthetics and orthotics at Department of Veterans Affairs facilities in the Chicago area. Their studies in the United States also included visits to facilities in Boston, MA. Prosthetists and orthotists from many European countries receive part of their education at University of Strathclyde. Students visiting NU PRL & RERP included: Cheryl Clark, Alison Cockshoot, Jennifer Fergusson, Katerine Jansen, Joane Leon, Marvin Martin, Francine Mitchell, Robert Rooney and Mohammad Sallak.

**Bendigo Health Care Group**

A three person team from the Amputee Best Practice Demonstration Unit at Ann Caudle Centre in Bendigo, Victoria,

*Continued on page 7*

*Capabilities* (ISSN 1055-7156) is published in April, July, October and January by Northwestern University's Rehabilitation Engineering Research Program. Program Director, Dudley S. Childress, Ph.D. Editor & Designer, Jan Little

Subscription is free to all individuals interested in prosthetics and orthotics. For contribution guidelines and advertising inquiries, write to the address below. Address subscription information, address changes and other correspondence to: *Capabilities,* Northwestern University RERP, 345 E. Superior St., Room 1441, Chicago, IL 60611.

*The Young Dole Scholars pause during their Washington Conference. Front (left to right) Sascha Bittner, Derek Hoeing. Back (left to right) Mary Zappa, Jan Sendzik, Jaime Hardt and Eric Hearst*

*Jaime Hardt (center) with,left, Dudley S. Childress, Ph.D., Director of NU PRL& RERC and, right, Tamar Heller, Ph.D., Director of the Rehabilitation Research and Training Program on Aging with Mental Retardation, University of Illinois at Chicago.*

# Dole Foundation/NIDRR Young Scholar tries out biomedical engineering in a Northwestern University internship

*By Jaime Hardt*

Hello. My name is Jaime Hardt and I am a junior at Northwestern University, majoring in engineering. This past summer, I had the opportunity to intern at NU's Prosthetic Research Laboratory and Rehabilitation Engineering Research Program in Chicago. This internship was funded by The Dole Foundation and NIDRR's Young Scholars Program. The purpose of this internship program was to interest undergraduate students with disabilities in areas of research that impact disabled individuals.

I was excited to get started. First, I needed to pick a project. I decided to study something I have had a good deal of experience with for the past nineteen years -- cerebral palsy. You see, I have cerebral palsy and was interested in learning more about it.

**Choosing a research topic**

Using the Human Mechanics Measurement Laboratory located in the Northwestern University PRL & RERP, I decided to analyze and compare my gait with that of a subject my own age, a volunteer summer intern, who does not have cerebral palsy. The study was supervised by Dr. Dudley Childress and a number of his graduate students.

We looked at a number of components of gait. We studied walking speed, vertical displacement, step rate, stride length and other aspects of ambulation.

Then it was off to Washington, D.C. for a four-day conference. This conference was a chance to meet the other eight Young Scholars and their mentors and to learn what each one was doing. Each Scholar gave a presentation on their work. The topics of the presentations ranged from assistive technology for disabled parents (e.g. cribs and playpens at wheelchair height) to improvements for the Dragon Dictate system, which enables a person to operate a computer through voice commands. We also heard from a number of leaders in the disability field. It proved to be a very informative and enjoyable couple of days.

Analyzing the data

After the conference, it was back to steamy Chicago. It was mid-July and I still had two more months in which to continue my research. While we had taken data for a wide range of walking speeds (very slow to very fast), due to the limited amount of time, we had only focused on the data taken at our natural speeds for the presentation at the conference in Washington, D.C. Now we processed and analyzed the rest of the data.

The results were interesting. In general, we found that in almost every aspect of ambulation that we compared, my data changed faster as walking speed increased than did that of the other subject. For example, I would "bob" up and down increasingly more than she would as we walked faster and faster.

Working on this project, as well as being around the many different people here who are working on a variety of different projects dealing with prosthetics, orthotics and walking in general gave me a great opportunity to get a feel for what biomedical engineering really is. It has been really enjoyable. I'd like to thank the sponsoring organizations, Dr. Childress, and the other people from the Northwestern University PRL & RERP who helped to obtain and analyze the data. ❖

p to myoelectric hands and continued care of his son and the new infant.

# Two Leaders in Northwestern University Prosthetic-Orthotic services Retire

As many of our readers may be aware, the Northwestern University Prosthetic Research Laboratory and Rehabilitation Engineering Research Program are closely related to both the Northwestern University Prosthetic-Orthotic Center, which provides education leading to certification for prosthetists and orthotists, and the Prosthetic-Orthotic Services of the Rehabilitation Institute of Chicago. Dudley S. Childress, Ph.D. is Executive Director of both the Laboratory and Research Program and the Prosthetic-Orthotic Center.

August 31 marked the retirement of two individuals who have provided a great deal to all of the P & O services at Northwestern and RIC.

**Yeongchi Wu, M.D.**

Yeongchi Wu, M.D. served his residency in Physical Medicine and Rehabilitation at the Northwestern Hospital system in 1975. Since 1984, Dr. Wu has served in many capacities at Northwestern University and the Rehabilitation Institute of Chicago. He has been an Associate Professor in the Department of Physical Medicine and Rehabilitation at NU, Director of the Amputee Program at RIC and an attending physician at both RIC and St. Francis Hospital, Blue Island, IL. He also served as Assistant Chief of Rehabilitation Medicine and Director of the Prosthetics and Orthotic Clinic at Veterans Administration Lakeside Medical Center, Chicago, IL. Indeed, Dr. Wu's close ties with VA Lakeside have been critical in the cooperative research conducted jointly by the Northwestern University PRL and VA Lakeside.

Dr. Wu has been prolific in publication of articles and papers which contribute to the general knowledge about amputation, prosthetics and treatment of amputation. He holds two patents for innovative urinary catheters and has invented three products and processes that are widely used in treatment of amputation: removable rigid dressing for below-knee amputee, Scotchcast preparatory below-knee prosthesis and "Wire Adaptor" for prosthetic pylon attachment to the socket.

Dr. Wu is a quiet, unassuming man whose wisdom and thoughtfulness is a welcome addition to any meeting or problem-solving session. But he is also a man of many talents and interests. Both his oil painting and his sculpting have won top prizes in art competition.

Dr. Wu will not be missing from the corridors of Northwestern University PRL&RERP, nor from VA Lakeside Medical Center. He says he intends to "put in a few hours" each week. His friends and colleagues look forward to those times.

**Heinrich Prommer, C.O.**

Heinrich "Henry" Prommer, Chief Clinical Orthotist at the Rehabilitation Institute of Chicago, also retired on August 31, 1995. Mr. Prommer assumed this position in July of 1974 and directed all aspects of clinical services including budget and management for the next eleven years.

Mr. Prommer, who received his early education in orthotics from the German Technical School for Orthopedic Shoe Technique in Hannover, Germany, spent his early career as an orthotist in Toronto and Vancouver, Canada. He came to the United States in 1963 and joined the orthotic department of Michael Reese Hospital, Chicago, IL.

Mr. Prommer was a charter member of the American Academy of Orthotists and Prosthetists. He authored "Foot Problems: What the Shoe Repairer Can Do", an article which is widely used by fabricators of orthopedic shoes. The RIC Prosthetics-Orthotics Service will miss Mr. Prommer's work and his dedication to service. ❖

## Dr. med. Rene Baumgartner, world leader in Orthopaedic Surgery retires in Germany

Dr. med. Rene Baumgartner, one of the world's leading orthopaedic surgeons in the field of prosthetics and rehabilitation, recently retired from the Medical Faculty of the University of Munster in Munster, Germany. He had been Director of the University Clinic for Technical Orthopaedics and Rehabilitation at the University for many years.

Dr. Baumgartner not only continued the Hepp/Kuhn tradition of excellence in prosthetics and orthotics at Munster, but he, Dr. Ernst Marquardt (at Heidelberg) and others of their generation continued the advancements begun in Germany by Drs. Ferdinand Sauerbruch, Konrad Biesalski and Max Lebsche. In 1915, Sauerbruch was perhaps the first person to introduce the "clinic team" concept to the prosthetics and orthotic field. Many people regard Biesalski as the father of the rehabilitation concept. Dr. Baumgartner carried on these traditions and passed them on to the young physicians he trained. ❖

# Courtney Ratto works her way toward the Gold in Atlanta in '96

*Courtney Ratto prepares to compete for US Paralympic Swim Team berth.*

Unless you've been hiding in a cave, you know that the United States will host the 1996 Olympic Games in Atlanta, Georgia. You may, however, have missed the fact that the US will also be hosting the Paralympic Games, using the same sports venues, 12 days after the Olympics open.

The Paralympics, initiated following the 1960 Olympics in Rome, Italy, tests the top athletes with disabilities from around the world. At this time, 117 nations have entered competitors in the Games. Training for the Paralympic events is a year-round job for the athletes. Many Paralympic records approach the marks set in the same events in the Olympics except for the wheelchair racers, who turn in faster times than the foot racers. To qualify for the Games, an athlete must have spinal cord injury, cerebral palsy, spina bifida, amputation or other major disabling condition.

One young woman who hopes to capture a gold medal for the United States in swimming at the Paralympics is Courtney Lynn Ratto. Courtney has already won medals in regional competitions, which are held to qualify athletes to be members of the US Swim Team. At the regional competition held at Massachusetts Institute of Technology in June, Courtney won a Bronze in the 100 meter Breaststroke, Silver in the 50 meter Butterfly and Gold in the 50 meter Freestyle. In 1994, she won Bronze and Silver at the Ohio State competition. At the International Swim Trials in Atlanta in mid-August, she placed second and fourth in her events to qualify her for the final USA Swim Team trials to be held in March at Rutgers University.

Courtney, the daughter of Linda Lee Ratto, a member of the Northwestern University Rehabilitation Engineering Research Program Advisory Committee, and her husband, David, was born without her left hand and a portion of her left arm.

Courtney obviously considers her lack of a left hand a minor matter for her chosen activities. In addition to training for competition swimming, she holds two life guard jobs in Fayette County, GA. She earned her Red Cross Lifesaving Certification, CPR & First Aid Certificates in order to qualify for the jobs. She's held class office and been active in several clubs, committees and boards in addition to playing soccer at Sandy Creek High School, where she's a junior this year. She spends hours visiting families with new babies who, like Courtney, were born without limbs. She earned 6 college credits for her efforts in the Peer Visitation Seminar at Emory University, sponsored by the Amputee Foundation of Greater Atlanta and J. E. Hanger, Inc.

With Courtney's energy and concentration, she may stand on the top platform at the Olympic Stadium in Atlanta as the American flag raises to the top of the center pole, to accept a Gold medal for the United States. ❖

**Want to find out more about what other sports are chances for amputees to excel? Or, how you can become involved in the 1996 Paralympics?**

Contact:
Disabled Sports USA
451 Hungerford Drive
Suite 100
Rockville, MD 20850
301/217-0960

Contact:
Atlanta Paralympic Organizing Committee
1201 W. Peachtree Street, NE
Suite 2500
Atlanta, GA 30309
404/724-2837

# *Saying Good-bye: Allowing the Pain of Loss*

**By Carol Scholar, M.S., R.N., C.R.C.**

There are many kinds of good-byes.

Good-byes can signal temporary absence or a permanent loss. We casually say good-bye to family members, friends, co-workers and business contacts every day. We experience more difficult and painful good-byes with permanent losses -- when we lose loved ones, friends, jobs, and our health or functional abilities. Perhaps one of the most disturbing realizations calls for saying good-bye to a favorite illusion -- that we have total control over our lives. Contrary to popular New Age dictum, we do not always "create our own reality". Rabbi Kushner has enlightened us in his books on faith and the meaning of loss that bad things do happen to good people, randomly and for no apparent reason.

A recent insightful feature by staff writer Jim McKeever, in the *Syracuse Herald American* newspaper, entitled "Why We Need 'Good-bye'" led me to reflect on the concept of saying "good-bye" as a first step in the recovery process associated with the loss of a limb. The article stirred a very old, yet still tender memory of how a kind and wise healer once helped me do just that in preparation for my arm amputation eleven years ago. I share it in hopes that it might help someone in someway.

**Remembering past pleasures**

I was sitting on a couch. It was a sunny day and brightness filled the room. I remember thinking the sun should not be shining. I told her of my unbelievable impending loss. Soft gentle music played as I sat in silence, crushed by the weight of heavy emotions. She finally asked me if I was willing to try something. She asked that I reflect and share with her the pleasures that my right arm and hand had given me over the course of my life. I closed my eyes and visualized all the ordinary, yet wonderful things I had experienced. The tears flowed easily as I told her about my children that I had held so lovingly in my arms when they were babies...the care I had enjoyed giving patients in my work as a nurse...the earthy pleasure of kneading bread...and, of course, much more. She then asked me to express my gratitude for all that my arm had given me and to say...goodbye...to that part of me that had served me so well for so many years. This simple, yet meaningful exercise helped me more than words could ever express to discover the depth of my pain. Sharing my incredible sadness with another so honestly and in such a basic way allowed me to validate my own reality.

**Mending our cup**

McKeever quotes the words of Rev. Nick Cardell, a Unitarian Universalist minister: "Words of farewell give 'the mended cup of meaning' to all life's partings." Cardell believes, as in Native American lore, that in life, each of us is given a cup. Then certain things happen -- sickness, divorce, death -- that crack the cup so it doesn't hold water as well as before. "We must mend the cup so we can go on. Saying goodbye, letting go, is part of that mending process."

We often don't allow ourselves to properly mend our cup. We live in a society that pressures us to value living in the fast lane with little time or patience for personal pain and the healing process. We often hope for a quick fix for our discomfort. Medicalization of many of life's conditions has contributed to the belief that solutions usually lie outside ourselves. We look to professionals and self-help "experts" to remove our anxiety, sadness and depression. Typical responses to very difficult circumstances may be viewed incorrectly as pathological. We might wonder, "What is wrong with me?" Additionally, if we share our pain too much, well meaning relatives and friends may unknowingly stifle our experience by letting us know that they can't bear to see our suffering. Those who have experienced a significant loss often end up feeling inadequate and guilty for not being able to "do better". Feelings of isolation arise when trying to protect others from the truth.

**To share rather than "to fix"**

It seems that to be of help to others in times of loss calls for us to learn to increase our openness to pain as a natural part of the human condition. To truly "be with" someone and witness their pain is very painful. It is tempting and natural to slip into evaluating, treating and trying "to fix" rather than just being fully present and attentive to a person's truth as he/she experiences it at the moment. Aside from true clinical depression, which might need additional measure, most people facing significant loss need someone to witness the awful, unbelievable depth of their pain.

Facing emotional pain without blaming ourselves or others involves recognizing it "as a natural response to the inherent, fluctuating conditions of an imperfect world," says Christopher McCullough, Ph.D. in his recent book, *Nobody's Victim: Freedom from Therapy and Recovery.* He states we must learn to stop finding the "reason" for our pain and focus on facing it head on. He suggests the following:

**1. accept that bad things will occur in your life**
**2. admit to yourself you don't control everything that happens to you**
**3. recognize that pain and suffering can be a natural evolutionary stage**
**4. allow others to see you suffering**

It is true that we will never be rid of emotional pain as long as we are alive and experience loss. But with courage and by allowing others to share as we struggle with our very tough "good-byes", we can continue to mend the cracks in our cup of life and go on with hope. ❖

***Carol Scholar is a member of our Consumer Advisory Panel. She is a graduate of Syracuse University and is a certified rehabilitation counselor. Her professional background includes nursing, independent living and rehabilitation in the private sector. She resides in Liverpool, NY with her husband, Dennis.***

**NU PRL & RERC Welcomes Visitors**

*Continued from page 2*

Australia also chose to further their education at Northwestern. Rosalind Deacon, senior physiotherapist, Andrew Cox, prosthetist and Kim Hall, occupational therapist and team leader conducted a survey of how the Northwestern/Rehabilitation Institute of Chicago teams approach work with amputees. Among topics in their survey were: number of amputees treated, cause of amputation, amputation and post-amputation surgical practices, referral protocols and cost of treatment.

The Australian team also visited the VA Medical Center, Memphis, TN, Snell Prosthetics & Orthotics Laboratories, Little Rock, AR, and the Department of Veterans Affairs Amputee Practice Training Center in Los Angeles, CA. Their visit to Northwestern and RIC was on August 22.

**The MED Partners Project**

In an effort to make students in mid- and secondary education aware of potential careers in medicine and the academic paths that lead to those careers, the International Museum of Surgical Science, a division of the National College of Surgeons, initiated the MED Partners Project. This project helps teachers develop programs in their schools and provides opportunities for students to visit representative medical facilities.

Northwestern University PRL & RERP has been chosen as a visitation site. Through the months of July and August, a total of eight teachers and 28 students visited the program. The teachers and students saw how current technology can enable restoration of significant function to a person following an amputation. Perhaps the most immediate benefit from the visits was for a teacher who has several students in her classes who operate computers using their toes. The speech controlled computer system demonstrated by Margaret Pfrommer, research associate, showed the teacher a means to greatly enhance use of computers by persons without use of their hands. ❖

*From ten to thirty people visit the Northwestern University PRL & RERP each day without walking through the door. They visit the NUPOC Page on the World Wide Web =>http://www.repoc.nwu.edu/ to read papers, see videos and exchange information.* ❖

# *Weir and Gard earn Doctoral Degrees at NU PRL & RERP*

Richard Fergus ffrench Weir and Steven Allen Gard are the latest in an impressive line of research engineers to earn their Ph.D.'s in biomedical engineering under the mentorship of Dudley S. Childress, Ph.D.

**Richard F. ff. Weir**

Dr. Weir earned his Ph.D. in Biomedical Engineering from Northwestern University in June of 1995. His doctoral dissertation, *Direct Muscle Attachment as a Control Input for a Position Servo Prosthesis Controller*, is only one of the research projects he has conducted in the area of upper-limb prostheses. His work has been published in the proceedings of two World Congresses of the International Society of Prosthetists and Orthotists (ISPO). For the 7th World Congress of ISPO in Chicago in 1992 and for the 8th World Congress, Melbourne, Australia, in 1995, Weir presented progress reports in the studies of direct muscle attachment as a control input for prosthetic controllers. He has also presented at RESNA and the American Academy of Orthotists and Prosthetists.

Born in Dublin, Ireland, Dr.Weir received his BA/BAI (with Honors) in Microelectronics and Electrical Engineering from Trinity College, Dublin, Ireland. His M.S. in Biomedical Engineering was earned at Northwestern University. He is currently a post-doctoral research engineer at the Northwestern University Prosthetics Research Laboratory.

**Steven Allen Gard**

Dr. Gard will be awarded his Ph.D. in Biomedical Engineering from Northwestern University in December. His work has focused on lower-limb prostheses, with his dissertation being titled *An Investigation of Foot Clearance Issues in Normal and Above-Knee Amputee Gait.* He has written papers and given presentations on a variety of topics integral to the comparison of normal and above-knee amputee gait including: Biomechanics of Human Walking, Sensitivity Analysis of Swing Leg During Walking, Investigation of 4-Bar Linkage Knee Kinematics and Effect of Pelvic List on Foot Clearance During Normal Gait. His work for his M. S., also from Northwestern University, involved developing and characterizing instrumentation that would allow strain gauges to be used in battery powered prosthetic limbs. Dr. Gard's work has been presented at the 7th World Congress of ISPO, Chicago, 1992 and the 8th World Congress of ISPO, Melbourne, Australia, 1995. He has had articles, authored in cooperation with Craig W. Heckathorne, Erick H. Knox and Dudley S. Childress in *Medical & Biological Engineering & Computing* and *Journal of Biomechanics* (accepted for publication).

Dr. Gard earned his B.S. in Bioengineering from Texas A & M University, College Station, TX. He is currently a Post Doctoral Fellow at Northwestern PRL & RERP. ❖

## Resource Unit Information Request

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

**Northwestern University RERP/Resource Unit**
**345 E. Superior St., Room 1441**
**Chicago, IL 60611 USA**

*Allow two to three weeks for delivery*

___ Send me more information on lab activities.
___ Start my subscription to *Capabilities.*
___ Send me one copy of *P&O Resource Directory.*
___ Send me the information packets checked below.

Information Packets (limit 5 per coupon)

___ Quick Info Sheet: Funding Ideas for Prosthetic-Orthotic Devices
___ ADA List of Publications
___ Above Knee Prosthetics
___ Amputation
___ Braces & Crutches
___ Below Knee Prosthetics
___ Children's P & O
___ Choosing a Prosthetist
___ Congenital Conditions Book List
___ Disability Issues (general)
___ Feet
___ Gait
___ Hands
___ Hip Disarticulation/Hemipelvectomy
___ Lower Limb Prosthetics (general)
___ Lower Limb Orthotics (general)
___ Media Kit (the story of the Resource Unit)
___ Myoelectric Packet
___ Publications for the New Amputee
___ O & P School
___ Orthotics (general)
___ Pain and Phantom Pain
___ Post Polio
___ Prosthetics (general)
___ Sockets
___ Sports/Recreation
___ P & O Statistics
___ Support Groups
___ Symes
___ Testimonials
___ Upper Limb O & P
___ Video List
___ What is P & O ?

***Capabilities***
ISSN 1055-7156
Northwestern University Prosthetics Research Laboratory and Rehabilitation Engineering Research Program

345 E. Superior Street, Room 1441
Chicago, Illinois 60611-4496
Phone Help Line: 312/908-6524
**E-Mail: reiu@nwu.edu**
**web site =>http://www.repoc.nwu.edu/**

**Address Correction Requested**

Non-Profit Organization
U.S. Postage
PAID
Permit #2435
Chicago, IL 60611