

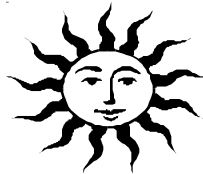
# Capabilities

Communicating the Science of Prosthetics and Orthotics

Volume 7, Number 3, July 1998

## Summer is the Busiest Time of the Year for NUPRL&RERP and NUPOC.....

Although *Capabilities* is somewhat smaller this issue, members of the staff of the Northwestern University Orthotics and Prosthetics Research and Education Programs have been pursuing many projects and interests. Among the many projects, a major effort has been the participation in the 9th World Congress of Orthotics (ISPO). Dudley Childress, PhD, Director of the Northwestern University prosthetics and orthotics research and education programs, shares his experiences at ISPO with our readers.



### *Report on the 9th World Congress of the International Society for Prosthetics and Orthotics (ISPO).*

By Dudley S. Childress, Ph.D.

The 9th World Congress of ISPO was held at the Congress Centre in Amsterdam (Amsterdam RAD), The Netherlands, June 28 - July 3, 1998. The Congress, held every three years, was attended by over 3000 participants from nearly 100 countries. It is the most important worldwide meeting of the prosthetics and orthotics (P&O) community and is an event not to be missed. Its importance is due principally to its international scope and the active interdisciplinary participation by surgeons, physicians, consumers, prosthetists, orthotists, pedorthists, therapists, engineers, movement scientists, manufacturers, distributors, etc. In addition, its triennial nature allows for significant change and advances between meetings while still enabling one to keep pace with the state of the field. The next World Congress, the 10th, will be held in Glasgow, Scotland (U.K.), July 1-6, 2001.

The Dutch organizers did a superb job of putting the Congress together. J. Hans Arendzen, Secretary General, J.H.B. Geertzen, Deputy Secretary General, and W.H.

Eisma, Chairman, are to be highly praised and recognized for their leadership roles, but many others were involved as well in the Herculean task of putting on this ISPO meeting.

#### **OPENING**

The meeting was officially opened on Sunday afternoon by Her Royal Highness Princess Margriet of the Netherlands. Participants were welcomed by S. Sawamura, of Japan, the President of ISPO, and there were remarks by J. Ebbink, President of INTERBOR, and by E. Pupulin, Chief, Rehabilitation Unit of the World Health Organization. H.J.B. "Binks" Day, of the U.K. gave the Knud Jansen Lecture, which is named for Dr. Jansen, the Danish founder of ISPO. The lecture was founded as a memorial to Jansen, a leader in the field of technical Orthopaedics and Rehabilitation.

*Continued on page 2*

Dr. Day, an orthopaedic surgeon, has been connected with the field of P&O for more than 30 years and remains an active participant in ISPO activities. He spoke about his experiences in the field and of the need for continuation of the clinical team as promoted by Knud Jansen.

A "Welcoming Reception" followed in the Exhibits area after the formal ceremonies. The Exhibits area was large and well supplied with natural light that entered from the perimeter of a high ceiling. The lighting and spaciousness made the area an inviting venue for the participants and the approximately 160 exhibitors.

### **ATTENDEES:**

Congress participants with Northwestern University or Rehabilitation Institute of Chicago (RIC) connections were: George Bertos, Dudley Childress, Laura Fenwick, Craig Heckathorne, Tom Karolewski, Todd Kuiken, M.D., Laura Miller, William K. Smith, M.D., Elaine Uellendahl, Jack Uellendahl, Richard Weir, and Yeongchi Wu, M.D. This group was involved with 15 presentations in a variety of sessions. Presentation titles by these attendees are listed below under the classification of the session.

### **FREE PAPERS**

"Neuromuscular Reorganization to Improve the Control of Myoelectric Prostheses," T. Kuiken

"The Trans-Humeral Four-Function Forearm Set-Up," C. Heckathorne (S. Duff, J. Uellendahl, D. Childress)

"Designs for Humeral Rotation Mechanisms," C. Heckathorne (E. Grahn, R. McCall, D. Childress)

"Assumptions in Calculation and Interpretation of Inverse Dynamics," L. Miller (V. Sanchez-Urrutia, D. Childress)

"A Portable, Real-Time, Ultrasound Ranging Device for the Clinical Evaluation of Gait," R. Weir (D. Childress)

"A Microprocessor Based E.P.P. Controller for Electric-Powered Prostheses," Y. Bertos (R. Weir, C. Heckathorne, D. Childress)

### **SYMPOSIA**

"Upper-Limb Prosthetics: Current Practice and Future Trends," C. Heckathorne

"Upper-Limb Orthoses: Current Practice and Future Trends," L. Fenwick

"A Century of the Sauerbruch-Lebsche-Vanghetti Muscle Cineplasty: the US Experience," R. Weir

"Integration of Below-Elbow Prostheses with the Human Body: Principles and Possibilities," D. Childress (R. Weir, C. Heckathorne)

### **PLENARY SESSION**

"Experimental Research and Modeling in Lower Limb Prostheses," D. Childress

### **INSTRUCTIONAL COURSE**

"Socket/Interface Design Considerations for Upper Limb Prostheses," J. Uellendahl

"Mechanical Properties of Artificial Feet: Some Practical Interpretations," D. Childress (A. Hansen, E. Knox, L. Miller)

*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.

This work was funded by the National Institute on Disability & Rehabilitation Research (NIDRR) of the Department of Education under grant number H133E30007. The opinions contained in this publication are those of the grantee and do not necessarily reflect those of the Department of Education.

Copyright 1997 Northwestern University Rehabilitation Engineering Research Program. All rights reserved. Reproduction by any means of the entire contents or any portion of this publication without prior written permission is strictly prohibited. Limited copying for educational purposes is allowed.

## **AUDIOVISUAL SESSION**

“Establishing Parameters for Ischial Containment Sockets Designs,” T. Karolewski

## **POSTER SESSION**

“An Economic Cosmetic Covering for Preparatory Prostheses,” T. Kuiken

## **A FEW PROGRAM HIGHLIGHTS:**

The Congress organizers divided the event into three parts, (1) Technology for Children, (2) Technology for the Elderly, and (3) Technology for the active life period. It is not possible to cover the event in much detail in this short survey. The reader should know that the views expressed here are the personal views of the author and that the highlights listed are only intended to give an “impression” for some of the meeting’s content.

“**Child and Mobility**”, a plenary session by W. Motloch of California, emphasized the “window of opportunity” from about 2 to 12 years of age when mobility aids can meet the developmental needs (social, physical, and mental) of maturing children. The aids can enable children to develop the concept of independence at an early age by being able to “move to” what they want or desire or to “move away” from what is boring or disliked. Motloch pointed out the many advantages of mobility aids when children are young, even though they may decide not to use the aids as they move into adolescence.

**Upper-Limb Orthoses:** Orthotists who have worked with upper-limb orthoses are familiar with the problems of making these orthoses functional, lightweight, simple, and unobtrusive. The WILMER group in Delft, headed by D. Plettenburg, reported on their work in this area and displayed a number of well-designed orthoses and prostheses at the meeting. They appear to have overcome many orthotic problems with design of the WILMER elbow orthosis.

“**Roll-Off**” Design Study: Dr. Klaas Postema of the Netherlands, in a series of instructional courses and symposia emphasized the importance of deep knowledge concerning prosthetic feet, orthopaedic footwear, and ankle-foot orthoses. He suggested that a better understanding of

the use of “roll-off’s (rocker bottoms) needs to be developed for pressure control in shoes, for shoe design, for prosthetic foot design, and for orthosis design (AFOs).

**Appropriate Technology:** A number of well-attended sessions at the Congress addressed issues of P&O technologies for people in countries where income is low and/or where conflicts have resulted in an unusually large number of traumatic amputations. There were a number of papers concerning evaluations of the effectiveness of various technologies in various countries. Several papers were concerned with use and evaluation of the polypropylene prosthetic technology developed by the International Committee of the Red Cross (ICRC).

The effectiveness of CAD/CAM in a few countries was examined. Chas. A. Blatchford & Sons, Ltd., a U.K. prosthetics company, introduced the Atlas System in their exhibit area and J. Shorter reported on this high technology, low cost, prosthetic system for developing countries.

**Older Persons with P&O Needs:** A number of sessions emphasized the needs of elderly disabled persons. Plenary session presentations by Dr. D. Sipsma, a gerontologist from The Netherlands and Dr. R. Meier of Denver emphasized special problems of older persons. Sipsma suggested a slogan for the assistive equipment, which was, “simple, light in weight, nice to see, and good to handle.” Meier emphasized the importance for trans-femoral amputees to stretch hip and trunk extensors and to strengthen hip abductors. He indicated that the most important determinants of outcome are, spousal support, home setting, motivation, and adaptability—not the technology that is provided.

**Outcome Studies and New Instrumentation:** There were many papers concerning P&O outcome studies. These papers reflect changing medical funding policies worldwide. Questions abound as to what measurements are most valuable to outcome assessment and what technical methods are appropriate for assessment of performance in routine clinical environments. A number of new technologies for activity monitoring and for simplified analysis of gait were presented.

**Computer-Controlled Knee Mechanisms:** Demonstrations at the meeting of knee mechanisms that are computer controlled, particularly the C-Leg from Otto Bock,

*Continued on page 4*

suggest that this will be an area of substantial future development. Powerful new microprocessor computer chips that have high reliability and that operate at low power dramatically change the future landscape for prosthetic knee and ankle design. Knee and ankle coupling during gait and automatic adaptation of the ankle to slopes and/or rough terrain appear to be reachable design goals. It appears that the electronic control revolution may usher in a new era of increased lower-limb function that ultimately may be available at low cost.

**Osseointegration Update:** Dr. B. Gunterberg, a Swedish orthopaedist, gave a report on development of the new concept of osseointegrated prostheses, and Mr. R. Bergkvist, a prosthetist in Göteborg, Sweden presented a case report of osseointegration prosthetic treatment in trans-femoral amputation. Dr. Gunterberg reported that more than 50 patients with upper and lower limb amputation have been managed with osseointegration. The outcomes of the first 16 patients (12 unilateral trans-femoral, one bilateral trans-femoral, and three trans-tibial) with a minimum follow-up time of three years were presented. All the patients had difficulties using a conventional prosthesis socket because of short limbs or skin problems. All the subjects improved function with the osseointegrated prostheses. Superficial infections were frequent but treatable. Deep infections occurred in one-third of the patients. Dr. Gunterberg reported that they are concentrating on short trans-femoral limbs and that the infection figures are improving as new techniques are employed. He feels the procedure will become one of choice for selected cases.

### ***SOCIAL ACTIVITIES:***

After the Opening Reception on Sunday there was a Municipal Reception in the "Oude Kerk" (Old Church) on Monday evening. Wednesday afternoon was free for touring. Many rehabilitation facilities in the Amsterdam area were available for site visits that afternoon, and of course there was the Rijksmuseum, the Vincent van Gogh Museum and many other points of cultural interest in and around Amsterdam. A beautiful Congress Dinner was served on Thursday evening at the Beurs van Berlage, an attractive old stock exchange building. During the dinner Dr. W. Beasley of New Zealand related the history of how some ill-conceived Dutch decisions were all that kept New Zealand and Australia from being Dutch colonies. Dessert and dancing followed at Hotel Krasnapolsky, on Dam Square.

### ***CLOSING CEREMONY (Friday, July 3)***

Awards were presented at the closing ceremony and there was a changing of the guard for the next Congress.

Mr. Van Philips, of the USA, received the Brian Blatchford Prize for his achievements in the design of the Flex-Foot. Van is well known as the designer and developer of the Flex-Foot and related prosthetic foot systems. He is the founder of Flex-Foot, Inc. and a graduate of the Prosthetics Education Program at Northwestern University.

Dr. D.K. Harrison, of the U.K., received the Forcheimer Prize for the most outstanding paper to appear in *Prosthetics and Orthotics International* during the last three years prior to the Congress. The paper's title is: "Amputation Level Assessment Using Lightguide Spectrophotometry," Vol. 19, No. 3, pp. 139 - 147, Dec. 1995.

Geza Kogler, C.O., Ph.D., won the Free Paper Award for the best free paper presentation at the Congress. The title is: "The Influence of Medial and Lateral Orthotic Wedges on Loading of the Plantar Aponeurosis In Vitro Study." Geza is at Southern Illinois University Medical School in Springfield, IL.

Todd Kuiken, M.D., of the Rehabilitation Institute of Chicago placed 2nd in the Free Paper Award contest. (See Free Paper above for title)

J. H. Arendzen, the Secretary General of the 9th ISPO World Congress presented the ISPO banner to D. N. Condie (Scotland), symbolizing Condie's assumption of the position of Secretary General for the 10th ISPO World Congress in Glasgow, Scotland. N. A. Jacobs, of the University of Strathclyde, is the new President of ISPO.

### ***POST-CONGRESS EVENTS AND VISITS:***

Following the close of ISPO on Friday, D. Childress went to Berlin for a July 4th P&O Symposium organized by Dr. George Neff at the Oskar Helene Heim Hospital, Free University of Berlin. This Symposium brought German Traveling Fellows of the last four years together with their U.S.A. hosts for an all-day meeting. The German Traveling Fellow program in Technical Orthopaedics was initiated in 1993 and has been a highly successful program for interchange of information and ideas in technical orthopaedics between the U.S.A., Canada, and Germany. The

program also is a research career stimulant for young, outstanding German clinicians.

Dr. René Baumgartner, one of Europe's distinguished orthopaedic surgeons, organized a small post-congress touring group that visited rehabilitation facilities in Switzerland. On Monday, June 6, the group visited Botta & Sons, a P&O laboratory located in Biel. This laboratory is among the best in the world. It is known all over Europe for innovative limb fittings of high performance and superior appearance (The best I've ever seen). A unique aspect of the Botta facility is the use of CAD/CAM to create ischial containment trans-humeral sockets made of wood. Mr. Botta and associates not only have high technical abilities; they also have relationships with their clients of mutual respect and admiration.

On July 7 the group toured the SUVA Bellikon Rehabilitation Center in Bellikon. This comprehensive rehabilitation center is in a new building located in the country where it is perched on a low mountain overlooking a beautiful valley. We were hosted by the Co-Chief Surgeon, Dr. W. Winkler. Bellikon recently developed an electric hand with a thumb that is sensitive to shear and normal stress so that the hand automatically can maintain an appropriate gripping force on an object even under load-changing conditions. Dr. N. Seichert, Director of Research & Development, showed us interesting accomplishments in the development of new gait assessment methods; methods that relate to our own attempts to develop simple gait assessment approaches that can be used within practical clinical environments. (The Baumgartner tour continued on July 8 to a highly-regarded customized shoe facility in Zürich,

but unfortunately the author was unable to attend this part of the tour.)

From July 6 to July 7, Craig Heckathorne visited Mr. David Gow, Director of the Rehabilitation Engineering Services at the Princess Margaret Rose Orthopaedic Hospital in Edinburgh, Scotland. His visit was mainly to discuss developments of a modular electric arm, a modular partial-hand prosthesis system, and silicone glove fabrication methods. These projects all relate to similar activities in our own laboratory. Craig also visited the David C. Simpson Library, which was opened in Fall 1997.

### ***AFTER THOUGHTS:***

In 1972, A. Bennett Wilson, Jr., Director of the Committee on Prosthetics Research and Development (CPRD) of the National Research Council, recommended that Mr. John Billock and the author make a trip to Europe to study the state of prosthetics there. The recent European trip made clear the major advances of the last 25 years and the way in which research and development work has changed. The changes in travel and communications potentially can make P&O research and development an integrated worldwide endeavor. Today we feel almost as connected with laboratories on other continents as we do with labs across the city in which we work. Disability issues everywhere — both similar and different — should benefit through the interactions of researchers, clinicians, and others worldwide. Rehabilitation is surely an area that transcends international boundaries. ❖

---

## **NUPOC's Summer is Busy**

Although the 40-plus students who attended prosthetic and orthotic certificate programs departed in May, NUPOC continued to teach other courses during the month of June. Three courses in Pedorthics were held in June and were all well attended by many O&P and other allied health professionals. These courses gave a great foundation of knowledge for those wishing to pursue certification in Pedorthics from the Board for Certification in Pedorthics (BCP).

An Orthotics and Prosthetics Overview course was given to suppliers and manufacturers also in June. The attendance was over 30 people with backgrounds in sales and support services for various O&P suppliers.

The NU-RIC Ischial Containment Prosthesis course was also held the last week in May. This course is one of

*Continued on page 7*

# The VA Presents

News from the  
Department of Veterans Affairs

By Robert Baum, VA Chicago Health Care System, Lakeside Division

## VA Chicago is Reducing the Risk of Amputation: Part II - Diabetes Education

Diabetes occurs when the body is unable to process sugar into energy. It is one of the more common disorders afflicting VA Chicago patients and there is no cure. But diabetics have the ability to take control of their disease by modifying their lifestyles and nobody is more important in helping them to accomplish this than the Diabetes Educators who work with them. "I tell my patients this is a new awakening," says Charlene Powell-Puryear, RN, MSN, Certified Diabetes Educator at the West Side Division. "We're teaching them the type of lifestyle they should follow even if they didn't have diabetes. How to eat right, exercise, regular medical check-ups — all the things you have to do to stay healthy."

### Tailoring the program to the individual

Powell-Puryear says that standard diabetes education includes information about the disease, acute and chronic complications, self-management, blood glucose monitoring, meal planning, exercise and foot care. She works closely with many services — particularly Nutrition & Food, Recreation Therapy, Podiatry, Nursing and Medical Service — to tailor her program to meet each patient's individual needs. "We show them how they can incorporate their own ethnic foods into their meal plans and how insulin or other diabetes medications may interact with their daily activities," she says, "Many times I just reinforce what my patients have already learned from their primary care physician or nutritionist."

Most of all, she shows her patients how they can take back control of their lives — empowering them — by learning how to use a blood glucose monitor to test themselves and, if needed, give themselves insulin injections. At the Lakeside Division, two nurses work as a team to provide these services. Sue Visor, RN, Certified Diabetes Educator, is responsible for the initial diabetic instruction, which includes dynamics of the disease and how it affects the body, while Beverly Barksdale, RN, is coordinator of the Meter

Clinic, which distributes blood glucose monitors, and provides follow-up outpatient care.

Visor consults with all newly diagnosed diabetic patients — providing one-on-one teaching with veterans and their families and leading weekly group sessions. Part of her job is to instruct patients who are insulin-dependent how to inject themselves. For those patients who are unable to give themselves shots, she will teach a family member to provide this service or request a visiting nurse. "We look at the whole person, not just a blood sugar level," says Visor. "We do a total assessment of the patient, including his lifestyle, personal needs and any family member who is available to assist him."

Barksdale agreed, "You can't just assume that you can send a patient home and his wife will be able to take care of him. Every patient has different needs. For instance, diabetes can affect a person's eyesight, so you may need some special apparatus, such as a "talking" blood glucose monitor or some other type of visual aid."

### Over 850 patients enrolled

Barksdale is coordinator of the Meter Clinic, which opened in January 1996 and has already enrolled over 850 patients. She instructs patients how to use a blood glucose level monitor, which requires a finger stick to draw a drop of blood. The blood sample is placed on a chemical strip, which is inserted into the monitor and provides a reading of the patient's glucose level within 40 seconds. "This is a very helpful tool that lets the patients take an active part in their health care," says Barksdale, "They really feel it's helping them to help themselves."

Over half of the 20 patients who have joined the program are still exercising regularly and several have been able to reduce their medications by maintaining lower blood sugar levels as a result of the exercise programs.

Although long-term complications include eye damage, heart and kidney disease, nerve damage and foot problems, patients who control their diabetes can prevent or minimize these disorders.

Following the diabetes educator's prescription for control of eating healthy foods, exercising regularly, maintaining the proper weight and monitoring blood glucose levels daily can help patients to live full and happy lives. ❖

### **SYMPTOMS OF DIABETES**

Over five percent of the population has diabetes - but almost half don't even know it. The following symptoms may indicate the presence of diabetes.

- Constant Thirst
- Tiredness
- Frequent Urination
- Slow Healing Cuts
- Extreme Hunger
- Numbness in Hands or Feet
- Rapid Weight Loss
- Dry, Itchy Skin
- Nausea or Vomiting
- Frequent Infections
- Blurred Vision
- Lack of Energy

Editor: Ray Leber, *VA Chicago Links*

### **NUPOC's Summer is Busy**

*Continued from page 5*

the few "hands-on" courses offered for professional continuing education credit for experienced ABC certified prosthetists.

The American Board for Certification (ABC) also held their annual exam at NUPOC in June. 120 candidates seeking certification in orthotics took the three day examination and 70 candidates seeking their prosthetics certification took part in another three day examination. These rigorous examinations were held from June 18-28.

July is usually a quiet time for NUPOC, so Director of Orthotic Education, Bryan Malas, CO, and Assistant Director, Desmond Masterton, CO, took the opportunity to teach orthotics in Columbia, South America. These two Northwestern faculty members spent ten days introducing new orthotics materials and procedures to doctors, therapists and orthotists from all parts of South America.

Assistant Director of Prosthetics Education, Tom Karolewski, C.P. and Elaine Uellandahl, C.P. were in attendance at the ISPO Scientific Symposium in Amsterdam from June 26-July 3. Tom lectured on "Establishing Parameters for Ischial Containment Socket Shapes" during the scientific meeting. (See story on page 1.)

Fall Certificate Program Courses in orthotics and prosthetics will begin on August 3, 1998. Faculty and Staff of NUPOC are also busy planning the 40th Anniversary and Alumni Reunion celebration which will take place on September 19, 1998 immediately following the AOPA Annual meeting to be held at the Hyatt Regency Chicago. ❖

## **NUPRL&RERP Assesses the Future**

Planning for the most critical research projects in prosthetics and orthotics as the next century begins is occupying much of the staff time at NUPRL&RERP this summer. Like many rehabilitation engineering research centers (RERCs), the Northwestern University RERP is invited to apply for funding from the National Institute of Disability and Rehabilitation Research (NIDRR) at regular intervals. As this issue of *Capabilities* goes to press, recent projects are being evaluated and the needs of people who use prosthetics and orthotics assessed. From these activities, proposed research projects for the coming five year period will be designed.

Research projects conducted by NUPRL&RERP have focused on three basic areas: Upper Limb Prosthetics, Ambulation and Aided Ambulation and Computer-Aided Engineering. In addition to addressing these areas, plans are being formulated for continuing to increase involvement of consumers and develop methods of evaluating outcomes of prosthetic and orthotic applications. ❖

## **Activity Report Available**

The *Northwestern University Prosthetics Research Laboratory and Rehabilitation Engineering Research Program Activity Report*, detailing the progress of research projects conducted by NUPRL&RERP from 1995 to 1998 is now available. Research projects sponsored by both the National Institute of Disability and Rehabilitation Research (NIDRR) and the Department of Veterans Affairs Rehabilitation Research and Development (DVARR&D) are discussed. A free copy of the report may be obtained by writing to NUPRL&RERP, 345 E. Superior St., Room 1441, Chicago, IL 60611. ❖

**Capabilities**

ISSN 1055-7156  
Northwestern University Prosthetics Research  
Laboratory and Rehabilitation Engineering  
Research Program  
345 E. Superior Street, Room 1441  
Chicago, IL 60611-4496

**Non-Profit  
U.S. Postage  
PAID  
Northwestern  
University**

Phone Help Line: 312/908-6524  
E-mail: reiu@nwu.edu  
web site =>http://www.repoc.nwu.edu/

**Change Service Requested**

**Resource Unit Information Request**

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

**Northwestern University PRL & RERP**  
345 E. Superior St., Room 1441  
Chicago, IL 60611 USA

- Pediatric Prosthetics
- Prosthetic Feet
- Prosthetics & Orthotics: General
- Upper Limb Prosthetics & Orthotics

*Allow two to three weeks for delivery*

- Send me a copy of the latest *Activity Report.*
- Start my subscription to *Capabilities.*
- Send me one copy of *P&O Resource Directory.*
- ADA List of Publications
- Amputee Support Groups
- Association of Children's Prosthetic-Orthotic Clinics List
- Video List

Other Sources for Prosthetic & Orthotic Information:

**Consumer Information:**

National Limb Loss Information Center  
900 East Hill Avenue - Suite 285  
Knoxville, TN 37915  
Toll Free: (888)AMP-KNOW

**Prosthetic-Orthotic Education:**

National Association of Prosthetic & Orthotic Education  
1650 King Street - Suite 500  
Alexandria, VA 22314  
e-mail: opncope@aol.com

**General Information about Prosthetics & Orthotics:**

American Orthotic & Prosthetic Association  
1650 King Street - Suite 500  
Alexandria, VA 22314

Bibliographies of NUPRL&RERP Publications Available on the Following Topics:

- Above Knee Prosthetics
- Ambulation, Gait & Posture
- Biomaterials
- Below Knee Prosthetics
- Computer Aided Engineering/Design/Manufacturing

Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_