



Capabilities

Communicating the Science of Prosthetics and Orthotics

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Northwestern University Prosthetics Orthotics Center (NUPOC)



Mike Brncick, M.Ed., CPO
Director of NUPOC

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~Mike Brncick~



Mark Edwards, MHPE, CP

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~Mark Edwards~

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NUPOC's New Horizons: Envisioning the Future of P&O Education

"These educational initiatives ensure that NUPOC graduates will continue to influence the competitive and exciting field of prosthetics and orthotics for years to come."

We are delighted to dedicate this issue of *Capabilities* to the important changes underway at Northwestern University Prosthetics Orthotics Center (NUPOC). At NURERC, we work in close alliance with prosthetists and orthotists, relying on them in our research and testing of new designs and components. During the past five decades, NUPOC has educated many prominent prosthetists and orthotists. In coming years, the need for qualified prosthetists and orthotists will soar due to aging baby boomers and the concurrent retirement of half the current number of practicing prosthetists and orthotists. To meet the increasing need for highly qualified P&O specialists, in February 2007 NUPOC will convert to distance education and blended learning.

Distance education represents only part of NUPOC's future improvements. By 2010, in compliance with the guidelines issued by the National Commission on Orthotic and Prosthetic Education (NCOPE), NUPOC will build its program to master's level. Increasingly advanced and specialized training of P&O personnel guarantees that NUPOC graduates will enter the workplace with a competitive edge and be in high demand for clinical and research positions.

In 2008 NUPOC will mark its half-century of achievement in the education of prosthetists and orthotists. The professional contributions of NUPOC's graduates uphold its well-deserved and prestigious reputation. Graduates of NUPOC have studied human anatomy through didactic work and cadaver dissection; developed in-depth knowledge of materials and their applications; and, using traditional and CAD-CAM technology, have learned to measure, cast, thermoform and fit many different kinds of components. In addition to technical knowledge and expertise, P&O practitioners also develop treatment plans that help restore function, independent living and self-esteem to their patients.

Please enjoy learning about how NUPOC's shift to distance education and blended learning will enhance its excellent program and meet the growing demand for qualified P&O practitioners. These educational initiatives ensure that NUPOC graduates will continue to influence the competitive and exciting field of prosthetics and orthotics for years to come.

~R. J. Garrick, Ph.D.~
Editor, *Capabilities*

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NUPOC's Blended Learning Program: What It Means for Prosthetics and Orthotics (P&O) Education

By Mike Brncick, M.Ed., CPO
Director of NUPOC



Mike Brncick, M.Ed., CPO
Director of NUPOC

Exciting changes are underway at **Northwestern University's Prosthetics Orthotics Center (NUPOC)**. NUPOC is converting to blended learning in which we integrate online, interactive

learning modules with traditional, face-to-face clinical and classroom instruction. In short, blended learning combines distance learning with on-campus clinical experience. In February 2007, NUPOC will offer its first class using blended learning. More changes are in our future. NUPOC plans to build our blended learning program to a master's level in the near future.

Research shows that several, linked opportunities for learning can improve students' understanding of new material. We believe that blended learning will educate our P&O students more efficiently and effectively. Approximately six months of NUPOC coursework will be on-line, followed by two months of on-campus, clinical training mentored by NUPOC faculty.

As one of the first P&O schools in the country, NUPOC began training orthotists and prosthetists in 1958 and is considered the premier school of its kind. Two years ago, NUPOC faculty investigated how distance education could enhance the training of new P&O professionals. We recruited the help of Mr. **Dennis Glenn**, Assistant Dean and founder of Distributed Education in the School of Communication at Northwestern University. Mr. Glenn builds interactive

learning environments that individualize instruction over broadband networks using Distance Learning Courseware.

Initially, NUPOC faculty voiced concerns about converting to distance education and losing the well-established, pedagogical tradition of face-to-face instruction. To alleviate those concerns, NUPOC faculty made weekly visits to the Distance Learning Laboratory on the Evanston campus where we observed and conducted "practice" teaching sessions using the new technology. NUPOC recorded and produced a short course using the School of Communication server, thus developing faculty expertise in the new process and technology. As a result, we are convinced that distance education has become an educational standard that better enables NUPOC to present our curriculum to those who wish to become P&O professionals.

NUPOC students will use technology as a tool to pursue their education and deepen their knowledge. Our program provides students with equipment and software. Synchronous learning via videoconferencing allows students to "attend" class at home or office, wherever they have an Internet connection. For example, when studying gait analysis, students can review every slide and video that the instructor used in his or her presentation. Additionally, via Internet, students can interact with their classmates during instructor-guided group discussions. Lecture material, quizzes and formal testing are designed to enable each student's active learning. Throughout both distance learning and on-site coursework, NUPOC instructors always will be available to facilitate the educational process.

P&O students must become critical thinkers and problem solvers. From the start, students must be responsible for their learning experience so that as P&O professionals they can assume responsibility for their patients' physical function, safety, well-being and comfort. P&O students must learn, integrate and apply complex knowledge to become full-fledged, allied health

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professionals. P&O professionals must analyze and think critically to develop treatment plans that help patients become more independent in their daily life. NUPOC instructors are always available to help our students develop these skills.

Distance education will be different from the traditional, on-site education model that NUPOC has used from its inception; however, our fundamental educational principles will remain the same. Under the careful

supervision of NUPOC instructors, our students will learn to evaluate, design, fabricate and fit prostheses and orthoses for patients. NUPOC's distance and on-site curricula will continue to emphasize education through problem solving as the best way to prepare P&O clinicians for a professional career. Through the blended learning program, NUPOC can increase our students' knowledge while continuing to provide the meaningful clinical experience that is an essential core of our curriculum.

New Funds Support Educational Initiatives

By Mark Edwards, MHPE, CP

Northwestern University Prosthetics Orthotics Center (NUPOC) held its Gala Trilogy Fundraiser on March 2, 2006 during the 32nd Annual American Academy of Orthotists and Prosthetists (AAOP) Meeting in Chicago, IL. Funds generated from the Gala will support NUPOC's distance learning initiative and master's degree program..

The Gala honored faculty members **Dudley S. Childress, Ph.D.**, **May Cotterman, M.Ed., PT**, **Gunter Gehl, CP**, and **James Russ, CO**; and awarded posthumous tributes to former faculty members **Charles Fryer, MS, PT**, and **Blair Hanger, CP**.

Ted and Loretta Thranhardt, along with **Becker Orthopedic, Hanger Orthopedic Group, Otto Bock** and **Ohio Willow Wood**, underwrote the "Northwestern University Donation Fund Challenge." This Challenge offered matching funds up to \$50,000 to individuals and/or companies that donated to NUPOC. NUPOC is grateful to those who comprised the Northwestern University Donation Fund Challenge and to all individuals and companies who supported the NUPOC benefit. These funds will help launch NUPOC's Blended Learning Certificate Program (on-line distance education); augment NUPOC's infrastructure; and establish NUPOC's clinical master's degree.



Gala Awardees (clockwise from upper right) Dudley S. Childress, Ph.D.; Gunter Gehl, CP; May Cotterman, M.Ed., PT; James Russ, CO; and daughters of Blair Hanger, CP.

As ever, NUPOC is committed to academic excellence in prosthetics and orthotics. Financial gifts and contributions enable NUPOC to maintain and enhance educational programs that benefit the entire orthotics and prosthetics community. Learn how you can support NUPOC's ongoing educational initiatives by contacting our Registrar: v-rachel@northwestern.edu or our office: NUPOC, Room 1712, 345 East Superior Street, Chicago, IL 60611.

Inside the Transition to Distributed Education

By Mike Brncick, M.Ed., CPO
Director of NUPOC

We are happy to announce that NUPOC is accepting applications for the February 2007 blended learning program. Continuity and innovation are the hallmarks of our distributed education curriculum. NUPOC faculty and students will maintain face-to-face interactions using the Internet. Students will have real-time classroom experience by means of Internet videoconferencing. Via Internet, the flow and exchange of information between instructors and students will assure that students act as members of a class cohort, each of whom actively participates and contributes to the learning process.

At the start of each NUPOC semester, students will attend an orientation to meet their instructors and classmates, learn how to use the technology, and receive the necessary equipment for videoconference capabilities. Our program provides students with equipment and software, enabling them to attend class from their home or office. Students can access the distributed learning component wherever they are located, provided they have an Internet connection with suitable connection speed. NUPOC's Director of Distance Learning, Ms. **Jodi Fox**, will assist NUPOC students in establishing these connections. Upon completion of the orientation, students will go home and "link up" to the program.

As detailed below, videoconferencing allows NUPOC students to benefit from both *synchronous learning* and *asynchronous learning*. *Synchronous learning* means that students interact in "real time" with their classmates and faculty. NUPOC's new distance learning classroom is equipped with five cameras that capture all faculty and student interactions. A "producer" in a control room selects appropriate camera angles, records and distributes the live video stream to our distance learning students. Via their Internet connections, NUPOC students appear on a video screen, ask questions and interact with faculty and classmates as easily as if they were in a classroom.

Synchronous learning via videoconference enables students to participate in multi-location team projects. Wherever they may be, students can create virtual working groups. Today, NUPOC students gather in the library to work on case studies and group projects; from February 2007, our students will work collaboratively with their classmates via the Internet.

Asynchronous learning relies on web-delivered modules of pre-recorded lectures that students can access and view repeatedly at any time. The information is archived and accessible 24 hours a day, 7 days a week. Students may view lectures in their entirety or in sections. *Asynchronous learning* lets NUPOC students learn at their best pace and schedule. Instead of relying on their class notes, students can repeat exact lectures and demonstrations. If they wish, students can use their computers to add their own notes to each section of a lecture. Later, they can access those notes as easily as the lecture itself.

Throughout the *asynchronous learning* phase, NUPOC instructors will monitor students' progress through each module. They will evaluate quizzes and tests, track correctly or incorrectly answered questions, and note how many times students select a particular question for review. This accumulated information will guide faculty decisions about future curriculum development and course content. Also, instructors will hold "Virtual Office Hours" so students may ask questions about any portions of the lectures that require clarification.

NUPOC has reduced the time students must be on campus, thus reducing the non-academic costs of the program. At present, the post-graduate certificate program is six months long. Blended learning requires approximately six months of coursework conducted on-line, followed by two months of focused clinical training mentored by NUPOC faculty members. While on campus, students can continue to access and review all the learning modules they studied during the distance portion of the course.

During the two-months on-campus clinical program, students attend lectures and clinical procedures from morning until late afternoon, five days a week. Anatomy and cadaver dissection continue to be core requirements. NUPOC instructors will supervise and critique students as they perform newly learned procedures.

In the near future, the P&O profession will require a master's degree; and NUPOC now is developing the master's level curriculum. NUPOC's blended learning

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Wired for the Future: Distance Education in Prosthetics and Orthotics

By Desmond Masterton, CO, C.Ped.

As I walked into my office this morning I had to step over a ganglia of wires. After working in the health field for fifteen years, I could have sworn that I saw the branches of the brachial plexus. But, then again, it could have been just a ganglia of wires. The reason for these wires is because Northwestern University Prosthetics-Orthotics Center (NUPOC) is getting wired for the future.

Long before we began to rewire, we at NUPOC recognized that “Distance Education” already had become a popular and viable alternative to on-site training. Transcripts of students who applied to our program often showed classes such as “Distance Course-Physics.” In the past, evaluators of such a transcript might have reacted with a variety of responses, such as, “Wow! Can they do that? Hmmm. But, do they learn anything? What happened to the classroom? Doesn’t anybody want to attend class? This is just pure laziness!” In fact, this is how students learn. Today, distance education has become a standard in educational programming and NUPOC is proud to launch distance education in prosthetics and orthotics.

We live in the age of Blackberrys, Instant Messaging, iPods, text messaging, and more. Through technology, information can become instantaneously accessible and repeatable. **Dennis Glenn** (Assistant Dean for Distributed Education in the School of Communication at Northwestern University) noted that students of distance learning demonstrate increased learning when compared to on-site students. Certainly, students are ready, so why should we instructors balk?

Consider the impact that distance education may have on orthotics. For orthotics students who attended on-site courses, recall some of the really tough lectures you attended, such as “Biomechanics of the Foot and Ankle,”

“Scoliosis/ Kyphosis,” “Cobbing/ Blueprinting” and “Lower Limb Alignment.” Next, consider fabrication lectures about “How to Make a Conventional AFO,” “Tibial Torsion,” “Deflection” and “Stirrup Attachment.” And, I haven’t even mentioned KAFOs!

Now, imagine being able to watch those lectures before attending class. Your mind will be fertile ground, ready to absorb vast amounts of new information. If something doesn’t quite sink in, you can go home, rest, get into comfortable clothes and review the puzzling material over and over again. If you still have questions, you can email any time of day. If you

are old-fashioned, you can come directly to the instructor and ask your questions. What a great concept!

As an instructor, I recognize that this digital age provides us with fantastic tools! Efficiently and effectively using the digital transmission of knowledge ensures that our students will learn the essentials of orthotics. Orthotics students still will be required to attend on-site opportunities where they will demonstrate through practical application all that they have learned through the distance portion. As ever, students’ on-site activities will be monitored and graded by instructors who are certified in their respective fields by the American Board for Certification (ABC) in orthotics and prosthetics. Distance education in prosthetics and orthotics will not replace the physical presence of a learning environment, but will augment and complement it.



Desmond Masterton, CO, C.Ped.

Human Anatomy: The Foundation of Prosthetics and Orthotics Education

By Alya Nayvelt, DMD, and Mark Edwards, MHPE, CP



Mark Edwards, MHPE, CP

Gross Anatomy is the most enduring subject in the education of prosthetists and orthotists. As the P&O certificate program shifts to blended learning, human anatomy and the cadaver section of NUPOC's curriculum will remain pre-eminent. During distance learning, students will develop

anatomical knowledge using on-line self-assessment examinations; and while on-site they will increase their anatomical knowledge by cadaver dissection. Students will have access to all archived lectures and procedures both on and off campus.

Blended learning is not so different from some teaching and testing methods already in use at NUPOC. In autumn 2005, a computerized final examination based on didactic

and clinical coursework tested NUPOC students' knowledge of abstract anatomy. Clinical images prompted them to correlate information they learned in anatomy class and laboratory. Prepared by two mock exams, students took the final exam in Northwestern University's Computer Lab using their own computers and working at a self-selected speed. The computer exam challenged students to demonstrate mastery of 1) medical and anatomical terms; 2) surface anatomy; 3) three dimensional visualization of parts and regions of the body; 4) relationships between structure and function; and 5) knowledge of normal anatomy with recognition of abnormal anatomy.

Today, as in past centuries, human anatomy and cadaver dissection remain mysterious, complicated and absolutely essential for all medical professions. Anatomy is the base upon which the entire medical career is built and it is necessary for prosthetists and orthotists, too. Gross Anatomy is the first course in the education of prosthetists and orthotists and establishes the groundwork for their future clinical practice. Students come to P&O from diverse backgrounds, so at the outset Gross Anatomy teaches students how to study, take notes, use textbooks, and correlate lecture material with

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program will be appealing and accessible to neophytes and established practitioners who wish to obtain a master's degree.

NUPOC is proud to train P&O professionals to work productively in the rewarding field of prosthetics and orthotics. We believe that blended learning will provide rigorous training in prosthetics and orthotics, while continuing our tradition of educational excellence. With its combination of on-campus and on-line education, NUPOC faculty and staff are excited and enthusiastic to offer this unique program to educate new prosthetists and orthotists.

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NURERC News

Erin Boutwell, B.S., joined NURERC and is pursuing a master's degree in biomedical engineering at Northwestern University. In 2005, she graduated from Virginia Commonwealth University in biomedical engineering. She has received a National Science Foundation Graduate Research Fellowship.

Andrew Hansen, Ph.D., and his wife, **Lori**, celebrated the birth of their son, **Cody Hansen**. Congratulations!

laboratory experience. Gross anatomy challenges students to retain vast amounts of intricately related information in a short time. Our goals at NUPOC are twofold: 1) to help students master the complexities of human anatomy, and 2) to instill ethical behavior so that as P&O professionals they can fulfill their responsibilities to their patients, profession and society. Formal instruction is a key to that success.

Alya Nayvelt, DMD, is NUPOC's talented and resourceful instructor of human anatomy. Her lectures are fascinating, systematic and multifaceted. She clarifies and streamlines difficult anatomical relationships, making them readily accessible. Personable and approachable, Dr. Nayvelt interacts individually with each student, engaging them in discussion to ensure understanding and retention. Using examples from real life, she revisits key information during several lectures to make anatomical concepts memorable and clinically applicable. Each lecture highlights normal anatomy and its function, and integrates the anatomical basis for differential diagnoses, therapeutic and surgical procedures. Invariably, student evaluations report that Dr. Nayvelt makes anatomy interesting and exciting.

Anatomy is a highly visual discipline that demands control of specialized terminology. Throughout the course, students learn correct anatomical vocabulary, working with the instructor to define and retain all Greek and Latin words. From the outset, NUPOC teaches accurate terms and trains students to visualize the three dimensional nature of the human body. The course begins with simplified, schematic pictures and progresses to complicated, visual images. Initially, students concentrate on surface anatomy and structures necessary for clinical diagnosis and physical examination. Gradually, they learn to visualize three-dimensional anatomical structures. Dr. Nayvelt illustrates points of anatomy with hundreds of effective slides. Far from an exercise in memorization, these slides, together with cadaver dissection, ensure that the study of anatomy is dynamic, compelling and stimulating. To promote understanding of three-dimensional relationships and prepare students for advanced courses, Dr. Nayvelt also interprets X-rays and computer images.

Human anatomy at NUPOC emphasizes the importance of cadaver dissection. Students work

together in teams only in the anatomy laboratory, so we create a friendly, responsive atmosphere and encourage them to extend that professional cooperation to their future clinical practice. Knowledge of normal anatomy represents



Alya Nayvelt, DMD

the cornerstone for understanding the consequences of injury or disease. Dissection is the best way to learn the number of body structures and variations in shape, size, location, such as the distribution of blood vessels and nerves.

While dissecting cadavers, Dr. Nayvelt identifies prior surgical procedures (such as artificial joints) and pathologies. She sparks students' interest with up-to-date clinical facts, how to access and use them in a clinical setting. For example, while teaching the functional anatomy of the normal vertebral column, she also explains the cause, diagnosis and treatment of low back pain. In this way, Dr. Nayvelt reinforces basic concepts with important, new research about the pathophysiology and potential biochemical treatments of disc-mediated pain.

Anatomy provides P&O professionals an academic and ethical foundation for their future clinical work. We believe that cadaver dissection is the best way to reinforce didactic knowledge and to learn human anatomy. At NUPOC, we are proud to present essential anatomical training that equips our graduates to think in anatomical terms, converse with professional colleagues, serve their patients well, and become responsible allied health professionals.

Materials Science at NUPOC

By Thomas Karolewski, CP, FAAOP



Thomas Karolewski, CP, FAAOP

Knowledge about materials is important to our students' educational experience and distinguishes prosthetics and orthotics (P & O) practitioners from other allied health professionals.

Application of materials science to the human body is a specialization that defines the prosthetics and orthotics profession within the medical community.

In 1997 Northwestern University Prosthetics Orthotics Center (NUPOC) added a new course to the certificate program: "Introduction to Materials Science" taught by Dr. Richard F. ff Weir. By completion of the course, students had learned fundamental concepts and properties of materials used in P&O, how to select and use those materials, and how to troubleshoot catastrophic material failure.

Over time, the materials science course has grown into a series that includes lectures by many professionals in the P&O industry. The current roster of materials science lectures and their instructors includes:

"Introduction to Materials and Strength of Materials" by **Richard F. ff Weir Ph.D.**, is the foundation for subsequent lectures. This overview includes properties, definitions, metals, dislocations, stress-strain curve and, most importantly, failure analysis.

"Safety in the Orthotics and Prosthetics Workplace" by **Julie McCay, CP**, educates students

about safety practices in orthotics and prosthetic facilities, Ms. McCay identifies hazards associated with chemicals used in P&O facilities and emphasizes precautions that P&O professionals must follow to protect themselves and others in the workplace.

Gerald Stark, BSME, CP, FAAOP, teaches **"History of Metals,"** providing a comprehensive look at metals from the unique perspective of manufacturers. Employed at **Fillauer Inc.**, Mr. Stark teaches types of metals, crystal structure, forming methods, metals comparison, manufacturing, and laboratory issues.

Gary Bedard, CO, FAAOP, employed at **Becker Orthopedic**, teaches **"Clinical Thermoforming Technology."** A foremost expert, Mr. Bedard's work has helped transform thermoforming in the P&O laboratory. Presenting a comprehensive overview of thermoplastics, he traces its history from inception to its future potential.

Dave Bassett, CP, Vice President at **Foresee Orthopedic**, teaches **"Thermosets and Their Use in Orthotics and Prosthetics."** Focusing on thermoset resins and composites, Mr. Bassett covers topics that include fiber types, resin types, manufacturing techniques, and laminate design.

Alan Darby, C.Ped, L.Ped, President of Darby Enterprises, presents **"Understanding Materials Properties."** Conducting a comprehensive overview of materials properties used in pedorthics, Mr. Darby includes information about energy absorption, durometer, molding capabilities, bondability, and skin safety.

This series presents knowledge that is vital for the successful practice of prosthetics and orthotics. As Coordinator of the NUPOC Materials Science series, my goal is to maintain and constantly improve our high standard of education. To that end, NUPOC instructors blend a comprehensive approach with newest advances in the field, resulting in P&O professionals who demonstrate a firm grasp of theoretical and clinical materials science.

NUPOC: State-of-the-Art Training in Prosthetics

By Mark Edwards, MHPE, CP

NUPOC's **Blended Learning Prosthetics Certificate Program** will continue working closely with prosthetics manufacturers, enabling our students to use state-of-the-art components and fitting techniques. In the Upper Limb course, **Otto Bock Healthcare** provides electric-powered components that NUPOC students use to design, fabricate and fit various self-suspending, transradial, myoelectric prostheses. Also, they offer a daylong workshop where NUPOC students learn to use Otto Bock's components and software. Otto Bock Healthcare provides laptops, training in their "Myoboy" software for myosite testing and an overview of various, externally powered prehensors. Students conduct myotesting on model demonstrators and fit evaluation interfaces that they have designed. After achieving socket fit, NUPOC students assemble temporary prostheses and fit these components. After the fitting, NUPOC students collaborate with occupational therapists from Otto Bock and the **Rehabilitation Institute of Chicago (RIC)** to train demonstrators how to use these high-tech prostheses.

During the Lower Limb course, NUPOC students learn about total surface-bearing sockets using a combination of suspension methods, including pin-locking systems, suction suspension, and vacuum assisted suspension. Companies such as **Össur, Fillauer, Ohio Willow Wood, and ALPS** generously donate liners and other components specifically for NUPOC student training. Their generosity benefits NUPOC students who learn valuable fitting techniques and are well prepared to use these techniques in clinical practice.

CAD-CAM is another tool we teach our students during the Lower Limb curriculum. **Ohio Willow Wood** and **OandP-I** have donated two TracerCAD™ systems to Northwestern University for our students' use. Also, Ohio Willow Wood has donated the Omega II Image Capture System. During a demonstration lecture, NUPOC students learn to use these high-tech systems. Using optical scanners and software rectification schemes, our students use contemporary management techniques to fit their patient demonstrators. In the future, we plan to provide more hands-on exposure to CAD through collaboration with additional companies.

By means of video conferencing, NUPOC can add new seminars and workshops, thus combining continuing education in prosthetics and orthotics with the newest technology and research. NUPOC's Blended Learning Prosthetics Certificate Program will enable us to present cutting-edge technology using both on-line and on-site curricula and to provide NUPOC students with superlative training.

NURERC News

Dudley S. Childress, Ph.D., and Steven A. Gard, Ph.D., members of the editorial board for *The Journal of Rehabilitation Research & Development* (a publication of the RR&D Service, Department of Veterans Affairs) attended the annual board meeting in Baltimore, MD, on July 27, 2006.

Craig W. Heckathorne, M.S., and Richard F. ff Weir, Ph.D., were invited participants at the Liberating Technologies Boston Digital Arm course, held at the Rehabilitation Institute of Chicago, August 28-30, 2006.

Joshua S. Rolock, Ph.D., was invited to serve on the National Institutes of Health (NIH) Study Section on Musculoskeletal Rehabilitation Sciences. The meeting took place in Bethesda, MD, July 12-14, 2006.

William (BJ) Johnson, B.E., and Stefania Fatone, Ph.D., BPO(Hons), published "Dynamic Analysis of an ARGO User" in *The Academy Today*, Vol. 2, No. 3 August 2006, ppA10-A11. Find it in the AAOP insert in *O&P Edge*, August 2006.

R. Konz, S. Fatone, and S. A. Gard published "Effect of Restricted Spinal Motion on Gait" in *The Journal of Rehabilitation Research & Development*, Vol. 43, No. 2, April/March 2006, pp. 161-170.

Liang-Wey Chang, Ph.D., PE, CPO, returned from the National Rehabilitation Engineering Research Center, Institute of Biomedical Engineering, National Taiwan University to NURERC where he conducted research during the summer.

Steve Steer, M.S., returned from medical school to NURERC where he worked with **Andrew Hansen, Ph.D.**, on the Shape&Roll prosthetic foot project during the summer.

Angelika (Kiki) Zissimopoulos, M.S., received her Master of Science degree in Biomedical Engineering from Northwestern University in June. The title of her thesis is "The Biomechanical and Energetic Effects of a Stance-Control Orthotic Knee Joint." Congratulations!

Narendra Vaidya, M.S., worked in our laboratory this summer on upper limb projects.

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Elena Sorci: CPO in Training

By R. J. Garrick, Ph.D.

Elena Sorci joined NURERC this summer as the 2006 Rehabilitation Engineering Research Center (RERC) Scholar. Funded by the National Institute on Disability and Rehabilitation Research (NIDRR) of the Department of Education (Grant number H133E030030), NURERC's scholar program provides an opportunity for young academicians with a disability to participate in research and encourages them to pursue a career in rehabilitation research. Ms. Sorci completed NUPOC's orthotics program and currently is completing the prosthetics program. Ms. Sorci has an undergraduate degree in Movement Sciences from the University of Illinois at Chicago (UIC). Her interest in orthotics and prosthetics grew from her own orthotic treatment for Charcot-Marie-Tooth. Elena is working with **Stefania Fatone**, Ph.D., CPO, on a pilot evaluation of Ankle Foot Orthoses using roll-over shapes.

At UIC, Ms. Sorci majored in biology until an English assignment changed her career course. Assigned to interview someone in a career that interested her, she decided to speak with a person in P&O. After learning about the requisites for P&O certification, she transferred her credits to Movement Sciences. Movement Sciences is founded in normative studies and provides a comparative basis for knowledge of disability. In Movement Sciences, Ms. Sorci studied the physiology of the body during exercise, including diverse areas such as neuroscience and motor control in learning.

Typically, Movement Sciences graduates pursue Physical Therapy, Occupational Therapy or Biomedical Engineering. Her academic advisor was unfamiliar with P&O as a career choice, so Ms. Sorci researched entrance requirements to NUPOC's P&O certificate programs. "I did the groundwork, so I had



Elena Sorci

a clear idea about what I should study. By the time I graduated, I already knew about NUPOC, not just because it is here in Chicago, but because of its educational quality and excellent reputation."

Ms. Sorci explained that P&O integrates her academic and leisure interests, "I like to design new things. That is why I like P&O so much. I can combine my interests in science, anatomy and physiology with the human element. I like to use my hands and be active, and I enjoy talking with patients. P&O offers me that combination and balance. P&O

incorporates everything I'm interested in."

Enthusiastic and passionate about her study, Ms. Sorci described her experience at NUPOC, "The teachers at NUPOC are excellent. They are poised in front of the class and that provides us with really good professional role models. They are exacting and strict, because they have to be. They know how much work we students do. They know that we spend a lot of time in class and that we study more at home. The teachers know how to keep us motivated. They are encouraging, supportive and understanding. They're really great. They keep us interested and show us that learning the material can be fun." Ms. Sorci reflected on her work in the Orthotics and Prosthetics programs, "My experience at NUPOC has been fabulous. I've enjoyed it so much. My only wish is that the program could be longer because I want to spend more time studying."

Ms. Sorci and her classmates at NUPOC demonstrate hard work and dedication. We wish her and her NUPOC colleagues the best of luck and future success in the important field of prosthetics and orthotics and rehabilitation research.



NEWS FROM THE DEPARTMENT OF VETERANS AFFAIRS

Veterans Affairs Prosthetic and Orthotic Laboratories: A Unique Health Care Environment Providing Advanced Prosthetic and Orthotic Appliances to Our Nations' Veterans

By **Richard H. Nelson, CPO, and John Milani, CPO**

The mission of the Prosthetic and Sensory Aids Service (PSAS) is to provide specialized, quality patient care by furnishing properly prescribed prosthetic equipment, sensory aids and devices promptly, economically and in compliance with laws, regulations and policies. PSAS serves the disabled veteran as both pharmacy for assistive aids and case manager for prosthetic equipment. A national network of PSAS prosthetic and orthotic laboratories provides a unique system of healthcare for veterans who have had an amputation of the upper or lower extremities, or who experience limb paralysis or weakness.



Figure 1: Prostheses on display at healthcare booth.

Accreditation and Continuing Education

Veteran Health Administration (VHA) Prosthetists and Orthotists are dedicated to serving our VA patients and future combat patients by providing the most current technology and products. Accreditation of labs, certification of staff by nationally recognized credentialing agencies, residency

programs, and continuing education are among VA efforts to ensure that our Prosthetic and Orthotic Laboratories function at their highest level. The VA actively seeks independent accreditation of its 58 Orthotic Prosthetic Laboratories. At this time, the American Board for Certification in Orthotics and Prosthetics (ABC) or the Board for Orthotist/Prosthetist Certification (BOC) accredits fifty-six (96%) of our O/P Labs. The VA actively recruits certified practitioners for its facilities. Currently, of the 189 employees who staff VA Orthotic Prosthetic Laboratories, 127 (67%) are certified as Orthotists and/or Prosthetists by the American Board for Certification in Orthotics and Prosthetics or the Board for Orthotist/Prosthetist Certification.

To maintain specialization, VA encourages and funds the participation of its certified Orthotists/Prosthetists in continuing educational programs at national and regional levels. During the past two years most of our certified Orthotists/Prosthetists have attended at least one national or regional continuing educational symposium. A sizable VA contingent has attended recent annual meetings of the American Academy of Orthotists and Prosthetists (AAOP). Preceding these Academy meetings, VA conducts full day business and clinical educational sessions.

To further supplement these efforts and meet the unique needs of our O/P clinical and technical staff, VA is developing its own educational programs. To train and mentor new O/P clinicians, VA is working with the National Commission on Orthotic and Prosthetic Education (NCOPE) to host O/P residency programs in VA facilities. Currently, NCOPE accredits residency programs at eight VA Orthotic Prosthetic Labs. In coming months, the number of VA NCOPE accredited facilities will continue to increase. In partnership with the VA Office of

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Academic Affiliations, each of the VA Orthotic Prosthetic Labs accredited by NCOPE will recruit and employ as many as two O/P residents per year.

Access to Advances in Technology and Medical Care

VHA has developed a Polytrauma System of Care (See “VHA Polytrauma System of Care Enhances Amputation Care for Combat Injured Veterans” *Capabilities*, Vol. 14, No. 3, 2006, pp. 8-9) to meet the rehabilitation needs of veterans with injuries from current combat operations in Iraq and Afghanistan. Blasts are the most common cause of recent combat injuries. The term “Polytrauma,” a new word in the medical lexicon, describes injuries to multiple body parts and organs that occur as a result of exposure to blasts. In polytrauma, traumatic brain injury (TBI) frequently occurs in combination with other disabling conditions such as amputation, auditory and visual impairments, spinal cord injury (SCI), post-traumatic stress disorder (PTSD), and other medical problems. Due to the severity and complexity of polytrauma injuries, these service



Figure 3: Wearer descending stairs using C-Leg.



Figure 2: CAD/CAM scanner digitizing a cast of a residual limb.

members and veterans require extraordinary coordination and integration of clinical and other support services. As part of this system of care, our PSAS and Prosthetic and Orthotic Laboratories actively participate at Polytrauma Centers, and throughout the VHA system of care, to provide quality services and products to our patients.

Veterans benefit from the latest scientific advances in health care and technology at VA Medical Centers (See Figure 2). VA health care specialists have access to the latest technologies and many labs have CAD/CAM capabilities, which enhance access. These include orthotic stance-control knee systems, prosthetic microprocessor components such as the RHEO knee, Adaptive knee, and C-Leg, and the PROPRIO foot. These computer-controlled hydraulic, pneumatic, and rheomagnetic systems are regulated by internal feedback. Sensors in the pylon and the knee itself send information, such as toe load, knee angle, and other data, to an onboard microprocessor (See Figure 3). We aim to increase mobility and improve quality of life for a greater range of amputees than ever before.

No less important than new prosthetic technology is the overall care an amputee receives during rehabilitation. Over the years the model for care has improved services to VA patients. VA does not stop at teaching amputees to walk or use prosthetic arms or hands; rather, we seek to integrate body, mind, and machine. Continuing care and long-term support from VA multi-disciplinary teams demonstrate that patients often can improve their functioning months or years after injuries or amputation.

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In the past, most VA prosthetic patients were injured or lost limbs in combat. Today a typical patient is a middle-aged male who suffered an amputation or loss of function due to disease or Cerebral Vascular Accident (CVA). But, the VA is providing orthoses and prostheses to increasing numbers of women veterans and veterans of the conflicts in Iraq and Afghanistan.

Meeting Future Needs

To meet future needs, VA has appointed **John Milani**, CPO, to the position of National Clinical Manager, a full-time position that oversees the practice of orthotics and prosthetics at its facilities. The National Clinical Manager oversees comprehensive management of the O/P Labs, development of NCOPE O/P residency programs, O/P facility accreditation, staff certification, continuing professional education and standards for professional development and work environment. The O/P Lab Workgroup, founded and chaired by Mr. Milani, consists of certified orthotists and prosthetists from VA O/P Labs throughout the country and acts in an advisory capacity to develop quality improvement and strategic plans for VA O/P Laboratories.

Strategic planning envisions that VA O/P Labs will set the national standard for the practice of orthotics and prosthetics. VA expects to be one of the largest affiliations for O/P residencies in the USA. Through increased funding of continuing education, state of the art facilities and opportunities for research, we encourage progressive O/P clinicians to select careers in VA facilities.

Capabilities appreciates **Robert M. Baum** for making this article possible. To request future articles or to express interest in VA developments in prosthetics, please contact:

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NURERC Tour: Connecting with the Future

By R. J. Garrick, Ph.D.

An important function of Northwestern University Rehabilitation Engineering Research Center (NURERC) is to educate others in the science of prosthetics and orthotics. Tours are opportunities for NURERC to disseminate information about our research and ideas to people who visit our lab. Visitors include people who use prostheses and orthoses, prosthetists, orthotists, doctors, therapists, researchers and students.

In August, NURERC hosted a tour for NUPOC students. NURERC staff manned stations and explained projects such as the **Shape&Roll Foot** that can be fabricated from local materials in developing countries; neural and myoelectric controls in upper limb prostheses; CAD/CAM uses in prosthetics, including **Squirt Shape** socket fabrication; human movement analysis, and more.

Capabilities spoke with NUPOC student, **James Del Bianco**, about his recent visit to NURERC. He explained how his visit to NURERC helped focus his thinking about his career objectives. *"I thought the tour of NURERC was interesting and exciting. I have a*



Visiting NURERC: **Jim Del Bianco** (center) from Phoenix, Arizona, worked for 5 years as a technician in upper and lower limb P&O. He has a degree in mechanical engineering and is completing his coursework at NUPOC. Also shown are NUPOC students **Alex Trumper** (left) from Montreal, Quebec, Canada, and **Nydia Marzan-Harding** (right) from Puerto Rico.

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NUPOC students (from right) **Jim Del Bianco, Tom Most, Kate Kopriva, and Nydia Marzan-Harding** listen as NURERC Research Engineer, **Kerice Tucker** (left), explains CAM and Squirt Shape technologies.

degree in mechanical engineering from Arizona State University, so I was really excited to visit the NURERC lab and learn about the projects. I love to think of new ideas. I love design. I can use engineering information effectively to communicate with researchers. I'm excited about the prospects of doing research."

Jim described how research projects like those at NURERC intersect with his career interests. "First I



NURERC Research Assistant Professor **Stefania Fatone**, Ph.D., BPO (Hons), discusses human motion analysis with NUPOC students.

want to be as good a clinician as possible, but in the future I would like to be involved in research. I want to be as well educated in P&O as possible. I plan to take the master's degree in P&O when it becomes

available at Northwestern University. I think that as a person gains more knowledge, a person will be more willing to try new ideas. Based on my own daily experience as a clinician/technician, already I have ideas about how to make improvements. I want to combine clinical work, research and design in prosthetics and orthotics."

Jim considered how he would integrate clinical P&O with rehabilitation engineering research, "I think that clinicians will have the best ideas for what patients need. My combined knowledge as an engineer and clinician allows me to understand what's possible and to communicate it. As a clinician with a degree in



NURERC Research Engineer and Prosthetist, **Craig Heckathorne**, M.S., explains projects in upper limb prosthetics to NUPOC students.

engineering, I would like to conduct research studies in P&O."

Partial fulfillment of the NURERC mission is to guide interest and talent into rehabilitation engineering. Jim Del Bianco is one NUPOC student who is connecting his visit to NURERC with his career goals. We hope that NURERC tours encourage other NUPOC students to parlay their training and clinical careers into rehabilitation engineering research.

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