



Capabilities

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Getting Back to Life: First You Make A Plan

Brian Ruhe and Jennifer Uhlers conducted tests on vertical shock-absorbing pylons in the Human Mechanics Measurement Laboratory at NUPRL&RERP this summer under the direction of Dr. Dudley Childress and Dr. Steven Gard.

By Jan Little

Spending the summer of 1997 as a Dole Young Scholar conducting research into gait patterns of people with amputations is a logical step toward the career Brian Ruhe has planned for himself. Some amount of luck was involved in achieving this step because when Brian called Northwestern University Prosthetics Research Laboratory and Rehabilitation Engineering Research Program (NUPRL&RERP) earlier this year, he had never heard of the Dole Young Scholar Program and didn't know that Northwestern was a candidate to participate in the program by hosting a scholarship recipient. Brian was just taking - to him - a typically logical step in pursuing his goals.

Brian wanted to talk to Dudley Childress, PhD, the director of the prosthetic and orthotic programs at Northwestern, about biomedical engineering, the field in which Brian had decided he would spend his career. In Brian's way of thinking, if you want to meet Dr. Childress, you pick up the phone and call him at Northwestern. Because Childress was out of the office, Brian had to convey his request to a staff member, but his enthusiasm was apparent even on the phone. When the Northwestern staff was considering a candidate for the Dole Foundation scholarship, Brian came immediately to mind.

Logical planning and confidence of success have

played a large role in Brian's life. He is a senior at Wright State University, Dayton, Ohio and will graduate in biomedical engineering next winter. Like many young men, Brian will graduate after four years of college, has earned top grades in college, worked part-time, enjoyed sports and the usual college students' fun. But, Brian had to add some other achievements. He has perfected walking on prostheses after his left leg was amputated at the lower thigh (transfemoral level) and his right, through the knee (disarticulation) level.

Brian's life changed at 10:27 p.m., January 30, 1993

A freshman in aeronautical engineering at the University of Cincinnati, Brian had brought his girl friend home to spend the weekend with his parents in Greenville, Ohio, a town several hours northwest of Cincinnati. Then came the accident. There has never been agreement on the details, but his car left the road and split in two against a tree. Brian's girl friend, Courtney, was killed instantly. The transmission gears of the car went through both of Brian's legs. The destruction of the car was so complete that the police had to call Brian's parents to determine the make and model.

Much of what Brian tells about the events following

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Dole Young Scholar Program Provides Experience in Science

Brian Ruhe is one of eight young men and women who were awarded Dole Young Scholarships this summer. For the past three years, the scholarships, provided by the Bob and Elizabeth Dole Foundation, are intended to give young men and women with disabilities the opportunity to further explore their interest in any area of science. Highlight of the program for the scholars is a meeting in Washington, DC where each scholar presents a report of his or her research. The meeting is also an opportunity for the scholars to talk with researchers and various representatives of agencies including the National Institute of Disability and Rehabilitation Research (NIDRR), which managed the scholarship program for the Dole Foundation.

Each scholar enters a mentoring relationship with an established scientist. Brian has worked under the direction of Dudley S. Childress, PhD and Steven A. Gard, PhD in analysis of the gait of bilateral amputees. Brian has been able to analyze his own gait using the instrumentation of the Human Mechanics Measurement Laboratory at NUPRL&RERP. He has also conducted some of the testing in a project to evaluate vertical shock pylons.

Brian has analyzed the gaits of people without amputations and people with amputation at the transfemoral, transtibial levels. Brian grins as he tells that his gait most resembles that of a Northwestern student who used full-length casts on both legs to act as a subject for Steven Gard's research into toe clearance. "I use a lot of hip hiking." ❖

Brian Ruhe

Continued

the accident was told to him by his parents because the accident caused loss of memory. When emergency medical personnel reached the scene, Brian was very close to bleeding to death from the open wounds of his amputated legs. The nearest trauma center, Miami Valley Hospital in Dayton, Ohio, could only be reached by helicopter — and Care Flight could not take off for Greenville because of high winds. Brian's luck was with him. The wind died down long enough for Care Flight to pick him up and take him to Miami Valley Hospital, where doctors realized that the amount of blood he had lost, combined with a lacerated liver, punctured lung, compound fracture of the humerus in his right arm, unidentified internal bleeding and severe head trauma made his chances for survival minimal — perhaps about 10%.

"I don't remember the first six weeks of my stay in the hospital," Brian recalls. "I wish I could have had the chance to thank the Doctor who saved my life — his name was Moran and he was connected with Wright-Patterson Air Force Base. But, I was totally out of it. Maybe someday, I'll find out where he is and be able to say thanks."

Brian's first memory of the period following the accident is of waking up at 2:00 a.m. in the morning. "I realized I was in a strange place — not my dorm room — and that I hadn't just had a bad dream about being in this condition. The first thing I did was call my Mom and ask her to help me clear my mind and tell me about what happened. In the days that followed, I had to make a decision. Would I dwell on what I had lost — that I was an amputee and accept the role that people seemed to be assigning to my condition? Or, would I say, 'OK. This is

where I am.' and go about getting back to being a student — becoming an engineer — living the kind of life I wanted." Brian chose getting back to building the life he'd planned.

"Getting back" began with therapy as an inpatient at Miami Valley Hospital as soon as his condition was stable. The head trauma caused Brian's short term memory to be affected. "My Dad would visit me — and go down the hall for a Coke and when he came back I'd have forgotten he'd been there. I was likely to say, 'Hi Dad. It's good to see you today'". The psychiatrist was pessimistic about Brian's chances to regain a high enough cognitive level to return to college. Perhaps Brian could

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Cultural Attitudes Toward Prostheses: An Anthropological Approach

By Steve Kurzman

When most people hear “anthropology,” they think of Indiana Jones, or perhaps Margaret Mead. The word conjures up images of scientists digging up bones and artifacts to study an ancient culture, or observing the rituals of some exotic tribe of people. But an anthropologist in the Northwestern University Prosthetics Research Laboratory? Hardly. So I often find myself trying to explain why I am an anthropologist beginning research on the prosthetics field.

Anthropology includes four distinct disciplines. Archaeologists do the digging work to study past cultures; linguistic anthropologists study the relationship between language and culture, and physical anthropologists study human evolution. As a cultural anthropologist, I study beliefs, behaviors and the meanings that groups of people ascribe to their everyday experiences in the world.

Professor Renato Rosaldo of Stanford University relates a story about how he explained cultural anthropology when a physicist friend asked Rosaldo what anthropologists had discovered.

“Discovered?,” replied the surprised Rosaldo. “There’s one thing that we know for sure. We all know a good description when we see one. We haven’t discovered any laws of culture, but we do think there are classic ethnographies, really telling descriptions of other cultures.”

In addition to describing cultures, cultural anthropologists explain how culture shapes peoples’ behavior and experience of the world. As Henry Petroski wrote, “the object of a science may be said to be to construct theories about the behavior of whatever it is that the science studies.” Although Petroski is an engineer, he could easily have been speaking about cultural anthropology, which seeks to construct theories about the behavior of distinct groups of people

A U.S. prosthesis isn’t designed for Borneo

But I still haven’t explained what this has to do with prosthetics. I never gave much thought to prosthetics until a car made a left turn into the motorcycle I was driving in 1988 and left me a below-knee amputee. My life continued, albeit a bit more slowly, as I returned to college and later got my first prosthesis. And it didn’t occur to me that I could use anthropology to think about amputation or prosthetics until I was in Sarawak for my senior thesis in college. Sarawak is part of eastern Malaysia on the island

of Borneo, and I went there to study the tribal tattooing and art of an ethnic group of people called Iban. It rapidly became apparent that, although my prosthesis was well designed for my native California, it was not holding up very well in Borneo. The equatorial humidity there makes even the worst Midwestern summers feel relatively pleasant, and within two months the climate had wreaked havoc with my prosthesis and the rubber was rotting off my foot.

I also found that my prosthesis was not built for many local ways of moving one’s body. For instance, Iban people, like many southeast Asians, often squat on their haunches rather than sit on the ground or in chairs. No matter how hard I tried to jam my prosthesis into a squatting position, I couldn’t do it and was forced to impolitely sit

My prosthesis was not designed to let me follow local ways of moving one’s body

on the ground or stick my left leg straight out in front of me. The raised heel that accommodated my dress shoes back home also became an awkward problem as I followed Iban custom of walking about barefoot in people’s homes. Not the least of my worries was the fact that the Iban frequently use split and notched logs for ladders, bridges, and walkways and I found myself sweating with concentration while trying to maintain my balance across some muddy patch of jungle or river.

While this was often frustrating, it was not without its humorous moments. People in rural Borneo often bathe in rivers and, during my first day at one village, *everybody* stopped what they were doing to come stand on the riverbanks and watch as I hopped about on one foot in the shallow river trying to bathe myself.

Iban people also think about amputation and disability differently than Americans. Nobody asked me if I could drive a car or play basketball, but there was much speculation on whether I would be able to farm rice

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Anthropology and Prostheses

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paddies or ride in the small boats people use to travel on rivers. I suddenly felt much more disabled in Ibanland — even with my prosthesis — than I had ever felt at home. After a few experiences, I realized that my prosthesis was not a piece of universal technology, but was designed for a very specific landscape and way of moving one's body through that landscape. The fact that my prosthesis is designed for sitting but not squatting, or for walking with shoes but not barefoot, is hardly remarkable as I sit here writing this — but it made all the difference in the world when I was visiting Borneo.

I was struck that different cultures have varied ideas about what makes people disabled or able-bodied, depending on what physical activities and abilities they most value. I also realized that I could study these same issues at home and have a greater impact outside of the ivory towers of academic anthropology, so I decided to conduct my Ph.D. dissertation research on the prosthetics field in the USA.

Anthropology of the prosthetics field

Although the prosthetics field is quite complex, I am focusing my research at the Northwestern University Prosthetics Research Laboratory and prosthetics shops in the Chicago area. At these research sites, I am working with engineers, prosthetists, and amputees in an effort to better understand how each group thinks about prosthetics.

In one sense, prostheses are very tangible things that possess certain observable characteristics and properties. But in another sense, they become very different things depending on your perspective. My prosthetist may consider my prosthesis to be a piece of “good work” from his point of view, but to me, it's “my leg.” If you managed to gather an engineer, a prosthetist, and an amputee in a room together with a prosthesis, they would all talk about the same thing in very different ways. The focus of my research is the study of how these groups of people look at this object of mutual concern — prosthetics — and make it meaningful to themselves.

This is important because prosthetics is a team effort. Engineers, prosthetists, and amputees all collaborate with each other. Engineers must be aware of what amputees need and want to avoid conducting research that will never be developed into anything. Conversely, amputees benefit from understanding of their needs incorporated in engineering research. Prosthetists and engineers work together on design and manufacturing issues. Prosthetists and amputees collaborate in a more direct and apparent way when they interact in a shop or clinic.

We are all dependent on each other in this system, this sub-culture. My goal is to develop a better understanding of how each of these groups thinks about prosthetics. This knowledge could serve as the guideline for an improved level of communication and collaboration within the prosthetics field and, ultimately, better prosthetics and care for amputees.

Expectations differ between team members

One issue I am currently studying is the clinical interaction between prosthetists and amputees, who often have very different expectations from each other and have to go through some complex negotiations to make sure the prosthesis satisfies the needs of the amputee. A related issue is how popular culture, advertising, and mass media portrayals and misrepresentations of prosthetics may influence recent amputees' expectations of prostheses.

While prosthetists and engineers tend to view prosthetics technology as an extension of amputees' bodies, many recent amputees appear to consider prosthetics as a replication of their limbs. The difference is that professionals in prosthetics optimally consider them to be tools which will allow amputees to regain much of their function, while many new amputees seem to look at the actual prostheses as functional enhancements. A firmer knowledge of how both groups see their roles in the process could offer guidelines for making this process more productive for each.

Prosthetics becoming increasingly “professionalized”

Another issue I am studying is the ongoing “professionalization” of the prosthetics field since the 1950s. While prosthetics was once a craft practiced by artisans, it is rapidly becoming more closely related to the medical and engineering professions. While this offers some obvious advantages such as technological innovations, it also raises some issues related to the delivery of rehabilitation and prosthetics.

The prosthetists-in-training undergo a very rigorous education which includes both lectures and practical labs in a wide variety of subjects. The education process increasingly incorporates elements of engineering, such as courses in biomechanics and materials sciences, and elements of the medical profession, such as residencies and a “patient management” style of interacting with amputees. The process of manufacturing prosthetic interface sockets is also increasingly influenced by engineering with the continuing development of computer automated CAD/CAM systems for making sockets.

While some prosthetics students and prosthetists welcome these ongoing shifts, others appear to be resistive. As art, medicine, and engineering all converge in prosthetics, we need a better understanding of how the

professionalization of prosthetics will impact amputees.

The second aspect of my research begins with the idea that prostheses, like all other forms of technology, are specifically designed and created for the environment, activities, and mobility of the person using them. Americans design prostheses to be appropriate for typical everyday activities in America. Take sports equipment as an analogy. You wouldn't try to play tennis with a hockey stick, or dribble a football during a basketball game — they simply wouldn't work very well given the rules of each game. You wouldn't be able to return a volley during the tennis match, and dribbling a football would challenge anyone. We tend to create prostheses for the “rules of the game” in our everyday lives. Driving a car, for instance, is very important in American culture and symbolizes independence, freedom, and mobility for many of us.

It is not surprising that stories and advertisements of upper-extremity prostheses often picture amputees driving. Race is also very important to Americans' sense of identity, and it is no mistake that prostheses can be pigmented in a variety of skin colors to reflect this. Accordingly, we can study how prostheses are designed, created, and used in order to gain a better understanding of how American culture values certain kinds of activities or forms of mobility. This will ultimately lead to a much better understanding of what it means to be disabled or able-bodied — and what it means to be an amputee.

Although rehabilitation literature has developed some fairly sophisticated ways to think about disability, American popular culture uses a rigid binary system of disability and ability to describe people's level of function in their environment, and their ability to perform important activities such as standing, walking, seeing, hearing, speaking, grasping, and carrying.

Categories often mutually exclusive

We often speak of these categories as all-encompassing and mutually exclusive, meaning that everybody is either disabled or abled, but a person cannot be both. The categories are only considered flexible in the sense that a person can shift from one to the other, usually from able-bodiedness to disability (think about the last time you heard that someone had “become able-bodied”). Even though we often speak of disability in these terms, it is rarely this clear in everyday life.

A person's level of functioning may fluctuate or vary in different activities: an amputee may be able to walk quite well, for instance, but not run at all. People also become temporarily disabled when they break a leg, but then regain able-bodiedness. When Americans are hard-pressed to define disability, we often resort to legal definitions — but even this has drastically changed in modern history. The category didn't even exist in a legal

sense until it was invented in English Poor Laws in the 19th century. Ongoing debates over the Americans with Disabilities Act would seem to indicate that we are still defining what is legally considered to be a disability. It is clear that there are no easy answers to the question of what it means culturally to be physically disabled or able-bodied in everyday American life.

Amputees who use prostheses or other forms of adaptive technology, for that matter are a perfect example of this. In one sense, our level of amputation and our level of function both with and without prostheses are extremely varied and may influence whether we consider ourselves disabled or not on a day-to-day basis. In another sense, we don't seem to fit into either category, and many amputees don't consider themselves to be disabled or able-bodied. We are physically impaired, yet we can perform

Perceptions of people with amputations differs in some ways from people with other disabilities

most of the everyday activities considered able-bodied in American society, such as walking down the street, driving a car, or picking groceries off the shelf in a supermarket. Because of this funny paradox, amputees offer a perfect opportunity to rethink the issues we usually talk about in terms of “disability” and “able-bodiedness” in terms of “mobility.”

Cross-cultural aspects will be studied

The cross-cultural aspect of my research into how culture influences our mobility and prosthetics will entail travel to India and Cambodia in the Fall of 1998 to study the Jaipur foot, an inexpensive lower-extremity prosthesis widely used in the Third World. The Jaipur foot is made from rubber recycled from automobile tires, imported aluminum sheeting, and cloth. The materials, except for the aluminum, are locally available and allow for a cost of only US\$25. The price is somewhat reasonable for amputees in developing nations and the materials offer a truly sustainable prosthetic technology.

The Jaipur foot is also designed for the specific cultural and geographical context of consumers in India and other developing nations such as Cambodia. While all prosthetic technology is culturally specific, the Jaipur foot is appropriate to local body movements and geography, such as walking barefoot in wet and muddy climates. Drs. Kabra and Narayanan, who developed the foot in India, make this point best: until the advent of the Jaipur foot, available ankle-foot prostheses were impractical for most

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Adolescent Idiopathic Scoliosis: The Boston Approach to Orthotic Management

*By Desmond Masterton, CO
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Galen, an anatomist, physiologist and physician, described dynamic orthotic management of scoliosis (131- 201 A.D). Adolescent Idiopathic - which means of unknown origin - Scoliosis (AIS) is still managed orthotically today. The spine normally curves from front to back, but if it curves from side to side the condition is scoliosis. In addition to curving to the side, the spine with scoliosis rotates, twisting and pulling the chest so that one side of the chest becomes more prominent than the other. Scoliosis is a triplanar deformity.

Numerous orthoses are useful for managing AIS. The important thing to consider when choosing any method of orthotic management is whether it will lead to success. Will the orthosis ultimately stop progression of the curve and avoid the necessity for surgery?

Methods of orthotic management of AIS often bear names describing their development site such as Boston, Milwaukee, Miami, Lyonnaise, Wilmington and Charleston. The Boston Orthosis was developed by Bill Miller, an orthotist, and Dr. John Hall at Boston Children's Hospital in the early 1970s. The Milwaukee orthosis was the standard treatment for AIS at the time, but Miller discovered that 60% of the patients could be accommodated by six models of the many old body molds that were being stored. For two years, they tested prefabricated Lumbo Sacral Orthotic (LSO) modules instead of the custom-made pelvic section of the Milwaukee CTLSO (Cervical Thoracic Lumbo Sacral Orthosis). The Scoliosis Research Society reported that their tests showed the modules achieved satisfactory fittings.

Thirty Modules Fit 80% of the Patients

Miller and Hall then experimented with removing the neck ring when apical curves were T-10 or inferior. Further work showed that even with apical curves of T-8, there was really no difference between the TLSO Boston Module and the standard Milwaukee orthosis. Today, the Boston orthosis offers 30 modules that will fit 80 % of patients with AIS with apical curves T-8 or inferior. Modules are available with 15° or 0° lordosis, but 15° is the preferred module. Custom modules are also available.

A number of factors must be considered when determining who is a candidate for orthotic management of AIS. Skeletal maturity is determined radiographically.

Adolescent Idiopathic Scoliosis, left untreated, may result in physical and psychological pain

If a patient has at least one — and preferably two — years of growth left, correction may be achieved with orthotic management. The second factor considered is curve magnitude as measured by the Cobb Method. Curves between 25° and 40° are considered for orthotic management. Curves less than 25° may be orthotically managed provided there is radiographic evidence of rapid progression of the curve. In skeletally immature patients with high magnitude curves and those undergoing growth spurts, the curve magnitude will progress more quickly. Contraindications to orthotic management of AIS would be: patient is skeletally mature, very strong psychological aversion to management, neuromuscular or paralytic scoliosis, or thoracic lordosis.

The Team is Critical to the Success

The most important factor in successful use of the Boston system is cooperation among the team consisting of patient, family, physician, certified orthotist (CO), physical therapist and nurse. The patient must agree that he or she will wear this orthosis a minimum of 18 hours and, preferably, 23 hours a day until skeletal maturity is achieved. The physician prescribes and orchestrates. The CO fabricates, monitors and fits the orthosis. The physical therapist performs comprehensive evaluation, gait training with the orthosis and designing an exercise program to assure the patient's flexibility. The nurse educates the patient on skin care, donning and cleaning the orthosis.

The LSO or TSLO will be prescribed depending on the number and location of the curves. After reviewing the prescription, the latest radiograph of the patient's spine and taking extensive measurements, the CO will order the appropriate module, trim the orthosis to the measurements and install pads. Then, the patient is seen for the initial fitting. During this initial fitting, the orthosis is evaluated in both the sagittal and coronal planes with the patient standing, then seated with hips and knees flexed to 90°. The orthosis should be tight, but not cause pointed pressure. The patient should stand with the pelvis and shoulders level and the head positioned over the spinous process of S1 in

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NU Prosthetic & Orthotic Programs Move to PM&R

On September 1, 1997, the Northwestern University Prosthetics Research Laboratory, Rehabilitation Engineering Research Program and Prosthetic-Orthotic Center became a part of the Department of Physical Medicine and Rehabilitation (PM&R). PM&R is a unit of the Northwestern University School of Medicine.

Traditionally, prosthetics and orthotics have been associated with orthopaedic surgery because amputations were performed by orthopaedic surgeons. As the practice of medicine has evolved, physical medicine and rehabilitation has become more dominant in care and the rehabilitation of people with amputations. The move by the Northwestern prosthetic and orthotic programs from the Department of Orthopaedic Surgery to PM&R was logical in light of the intense daily interaction in cooperative programs between P & O research and education and the Rehabilitation Institute of Chicago (RIC). PRL&RERP research engineers and NUPOC instructors are members of the RIC Prosthetic-Orthotic Clinical Services team. ❖

Childress Addresses International Rehab Medical Meeting

“New Surgeries, New Technologies, New Thinking: Another Sauerbruch” was the title of the address presented by Dudley S. Childress, PhD at the Eighth World Congress of the International Rehabilitation Medicine Association meeting, IRMA VIII. The conference was held in Kyoto, Japan, August 31 through September 4, 1997.

Childress also addressed the Chicago Institute of Medicine at the September 10, 1997 event featuring the annual presentation of the Russe Award. Childress received the Russe Award for 1996. ❖

Jhoun Earns PhD, Berkley, MS

Janet Jhoun has earned her PhD in Biomedical Engineering from Northwestern University with her work, “Studies of Human Standing, Stepping, and Gait Initiation”. Dr. Jhoun’s research will contribute to the overall understanding of human ambulation. Dr. Jhoun, whose husband, Dr. Anthony Makarwicz is also a biomedical engineer, is currently conducting post-doctoral studies at NURERP.

Jeffrey Berkley has earned his Master’s degree in Biomedical Engineering with completion of his research,

described in his thesis, “Determining Soft Tissue Material Properties for the Purpose of Finite Element Modeling of the Below Knee Amputee Residual Limb”. Berkley will continue his research in the Biomedical Engineering program for doctoral candidates at the University of Washington, Seattle, WA. ❖

Heckathorne Presents Keynote Address

Craig W. Heckathorne, MSEE, was the opening keynote speaker at the MEC ‘97 Myoelectric Controls / Powered Prosthetics Symposium. Mr. Heckathorne spoke on “Engineering Research and Clinical Collaboration” in the service of persons with arm amputations. MEC ‘97, organized and hosted by the Institute of Biomedical Engineering at the University of New Brunswick, was held in Fredericton, New Brunswick, Canada, July 23-25, 1997. ❖

Edwards and Malas Active in National Education

Mark Edwards participated in the national meeting of the National Commission of Orthotics & Prosthetics Education (NCOPE), August 8-9, 1997, in Alexandria, VA. NCOPE is continuously elevating requirements for courses preparing orthotists and prosthetists for certification. Bryan Malas attended the National Association of Prosthetic and Orthotic Educators (NAPOE), September 9-10 in Charlotte, NC. He lectured to physical therapy students at St. Andrews University, St. Joseph, MI, September 22. ❖

Gard and Weir Present at ASB

Steven Gard, PhD and Richard Weir, PhD, NUPRL&RERP staff members, presented reports of their research at the American Society of Biomechanics meeting in Clemson, SC, September 24-27, 1997. Gard spoke about the effect of stance-phase knee flexion on vertical displacement of the trunk during normal walking. Weir presented a poster reporting progress in development of the Direct Ultrasound Ranging System (D.U.R.S.) method of measuring certain aspects of gait. ❖

Miller authors consumer article

Laura Miller, PhD candidate, discussed the history, state of the art and future of crutches in an article published in the September 1997 issue of *In Motion* magazine. *In Motion* is the consumer publication of the Amputee Coalition of America. ❖

In Memory

Robert D. Keagy, MD

Robert D. Keagy, MD, was a good friend and supporter of NUPOC and the prosthetic research programs at Northwestern University. His long-time friend and colleague, Dudley Childress, said of Dr. Keagy, "Bob was taught physics at Northwestern by Paul Klopsteg and was a member of the Compere office for many years. He ran the amputee clinic at the Rehabilitation Institute of Chicago for 40 years and loved teaching in Northwestern's P & O education program. He particularly liked children."

Childress continued, "Bob had an abiding interest in mechanics and biomechanics and studied with Dr. Jacquelin Perry at Rancho (Los Amigos, Downey, CA). He liked gadgets and was active in wind surfing, scuba diving and roller blading. If you showed him something he liked, he'd invariably say 'neat!' -- or 'nifty!' He was strongly opinionated, but was right most of the time. Nevertheless, he was open to change and read the literature assiduously. He was innovative and conservative at the same time. I believe he was one of the first persons to ever make EMG recordings from the iliopsoas muscle, leaving a wire electrode in the muscle after a pelvic procedure. He will be greatly missed."

Dr. Keagy died August 1, 1997. He is survived by his wife, Alberta, three sons, John, Robert and James, a daughter, Laura and four grandchildren. ❖

Colin A. McLaurin, ScD

Colin A. McLaurin, like the legendary Johnny Appleseed, travelled around the U. S. and Canada, planting ideas, nurturing new concepts and starting programs in rehabilitation engineering. Colin had already developed a number of concepts that would change prostheses when he left Toronto's Sunnybrook Hospital in early 1957 in response to a request from Clinton Compere, MD to come to Chicago. "Mac", as many knew him, made reality of Compere's dreams of a comprehensive program in prosthetics research at Northwestern University.

Colin McLaurin left Northwestern in 1963 to return to Toronto, where he strongly influenced the advancement of the fledgling field of rehabilitation engineering in Canada. He later inaugurated the program in Rehabilitation Engineering Research at the University of Virginia in Charlottesville, VA.

Colin was an important supporter of several organizations which advanced both prosthetics-orthotics and rehabilitation engineering. He was active in the Council on Prosthetics Research & Development (CPRD) and RESNA, the Rehabilitation Engineering Society of North America. Although many of his concepts were far ahead of their time, they are standards now in prosthetics, wheeled mobility and rehabilitation engineering.

Colin McLaurin died August 5, 1997 at the age of 75. With his droll sense of humor, he may have enjoyed being compared to Johnny Appleseed. ❖

Anthropology and Prosthetics

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Indian amputees because they conformed to neither their work environment nor their cultural ethos. They required covering footwear, rendering them unsuitable for use by the farmer while working in his fields, or indoors in most Indian households. These prostheses would not allow the user to walk over uneven terrain and certainly would not allow comfortable cross-legged sitting or squatting."

In conclusion, I, like Professor Rosaldo, don't expect to discover any properties or laws of the prosthetics field. But I do hope that my research will contribute to a better understanding of how we collaborate around prosthetics and potentially facilitate more communication among amputees, engineers, and prosthetists. ❖

Steven L. Kurzman is a Ph.D. candidate in anthropology at the University of California, Santa Cruz. The author welcomes all comments, suggestions, and questions, and may be reached by mail at: NU Prosthetics Research Laboratory, 14th floor, RIC, 345 E. Superior St., Chicago, IL 60611, or by email at kurzman@cats.ucsc.edu.

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Consumer and Technical Advisory Panels Meet

Research Must Have Relevance to Real Life

After nearly four hours of presentations, Lawrence E. Carlson, PhD, remarked that the review of Northwestern's research shows a proliferation of observations (traditionally made about the prosthetics/orthotics field) being tested scientifically. Carlson, Professor of Mechanical Engineering at the University of Colorado, Boulder, was one of the nine members of the Consumer and Technical Advisory Panels who met in Chicago on September 20, 1997.

The panel members listened to reports of progress in prosthetic/orthotic research and education conducted by the Northwestern University Prosthetics Research Laboratory (NUPRL), Rehabilitation Engineering Research Program (NURERP) and the Prosthetic Orthotic Center (NUPOC). Topics presented included Upper Limb Prostheses, Use of Computers in Analysis, Design and Fabrication, and Ambulation.

Research, Education, Clinical Teamwork Essential

Reports in all three areas demonstrated the increasing integration of research, clinical service and education in the Northwestern University programs in prosthetics and orthotics. In Upper Limb, for example, Craig Heckathorne is part of the Rehabilitation Institute of Chicago (RIC) clinical team that designs and customizes prosthetic systems for persons with upper limb

amputations. In a number of cases, these people have amputation of both upper limbs at high levels. In addition, Heckathorne teaches at NUPOC. Several of the research staff members, including Steven Gard, PhD and Richard Weir, PhD, teach at NUPOC and work with the staffs of RIC and Veterans Administration Chicago Health Care System Lakeside Division in clinics. In the area of utilizing computers in prostheses, Joshua Rolock, PhD and Kerice Tucker have designed and fabricated sockets that are tested by many RIC clients with lower limb amputations.

After completing the review, the members of the Panels discussed the presentations. Their recommendations were presented to the staff of the Northwestern prosthetic and orthotic programs to aid in determining the direction of future research. The remarks of the Panels were complimentary about the research and the interaction of research, education and clinical services. Recommendations focused on three basic areas:

- greater emphasis is needed on research into orthotic design, fabrication and application;
- Northwestern must continue to disseminate results of research to consumers; and
- a structured method must be developed to gather input from consumers to guide research projects.

Management of AIS

Continued from page 6

the coronal plane. In the sagittal plane, the patient should stand erect.

If the patient extends posteriorly over the posterior superior trim line and exhibits hypokyphosis, the patient may have tight hip flexors. After the patient has worn the orthosis for two or three weeks, adjustments are made and a radiograph taken of the patient standing while wearing the orthosis. It is expected that the curve will be corrected by at least 50% and 100% is not uncommon. Follow-up is scheduled every three to six months depending on the physician.

Successful orthotic management of AIS results if there is no curve progression at skeletal maturity and no surgery. Without treatment, AIS results in back pain, inhibited respiration, an altered physical appearance and possible psychological problems. ❖

Panel Members Attending the Meeting

Consumer Advisory Panel

*William Lintz, Columbus, OH
Johnnie Pearson, Winston-Salem, NC
Margaret Pfrommer, Chicago, IL
Hector Torres, Millington, TN
Wayne Vercellotti, Joliet, IL
Rose Wilson, Tinley Park, IL*

Technical Advisory Panel

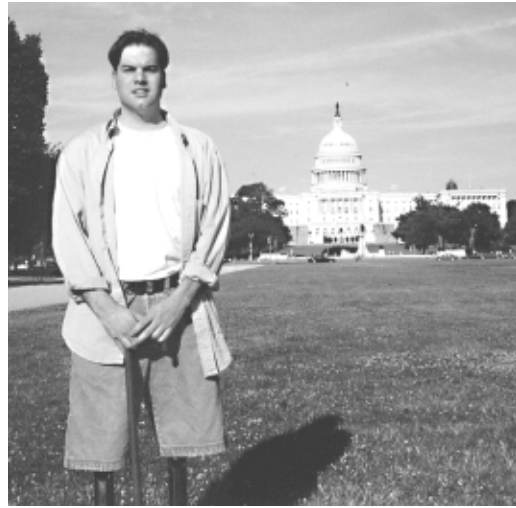
*Lawrence Carlson, PhD, Boulder, CO
Maurice LeBlanc, MSME, CP, Palo Alto, CA
Lawrence Quigley, CPO, Chicago, IL*

Brian Ruhe: First, A Plan

Continued from page 2

never be self-sufficient, the psychiatrist told Brian's parents.

April 19, 1993, sixty nine days after the accident, Brian went home. "Everything was still fuzzy," Brian says. The orthopaedic surgeon who took over Brian's care after trauma treatment had told Brian that it would be a waste of time for the surgeon to prescribe prostheses. They would only be cosmetic because there was no chance that Brian would ever walk again. But there was one person at Miami Valley Hospital who encouraged Brian to talk his way into being seen at the amputee clinic at Miami Valley Hospital. Dr. Jacob, head of the Rehabilitation Department, seeing Brian's determination, decided it was worthwhile to let him try to learn to use prostheses.



Bryan's summer as a Dole Scholar focused on three activities. (Left) Like all students, Bryan spent some time "hitting the books". (Right) Using the Human Mechanical Measurement Laboratory, Bryan studied his gait and compared it to gaits of others. (Center) But, there was time for sightseeing as Bryan attended the Dole Scholar Meeting in Washington, DC.

Carrie Brush, RPT, had been assigned Brian as a patient because her specialty was working with people after they had severe head trauma. Their personalities were complementary and Carrie believed in the stubborn 18-year old. Although Brian would ordinarily change therapists to work with one who specialized in gait, Carrie Brush and Brian decided to continue to work together. Carrie had never worked with an amputee and didn't consider herself an expert in gait training, so she and Brian experimented until they found what worked.

Progress is slow

His rehabilitation was still held up. "Even after the prescription, it took a couple of months to get my prostheses. The prosthetists at Fidelity Orthopedic in Dayton had to design what I would need," Brian said. "Working with them to figure out what I needed took time, but I learned

that designing prostheses is an engineering challenge."

Brian had only begun to succeed when infection set in around the pin holding the compound fracture in his right arm. He had to have surgery to remove the pin, then spent six weeks at home on IV treatments to eliminate the infection. Then he had surgery on his wrist in an attempt to restore some of the function lost when the ulnar nerve was damaged. Carrie Brush taped the crutch to Brian's arm to take some of the stress off the wrist and they kept working. He progressed from parallel bars to crutches to leaning against walls to walk. When snow and ice came to Greenville in the late fall of 1993, Brian was outside learning how to walk on ice and snow with two prostheses.

He was also back in school. The psychiatrist had made Brian angry by telling his parents that he would not regain much cognitive ability. He enrolled in gen-

eral education classes at Edison State Community College in Greenville to prove to himself that the psychiatrist didn't know what he was talking about. "September 1993 was pretty hectic," Brian remembers. "I had the surgery on my wrist. I was back at school at Edison. I went back to visit high school teachers to fill in memories that I'd lost. There were ongoing legal problems because of the accident. And, mostly, I had to decide where I was going next."

The next step in Brian's campaign to "get back where I was" was to plan the career he would pursue. He had been fascinated by the design and fabrication of his prostheses by the prosthetists at Fidelity and later went to work part time for the company. Talking to his former teachers, the prosthetists and others strengthened his conviction that his interests and skills could best be used in biomedical engineering. Brian decided not to return to

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: Targeting Diabetes

In January of 1996, the Prosthetic and Sensory Aids Service of the Lakeside Division of the VA Chicago Health Care System, working with a registered nurse, became a key component in a newly established Glucose Meter Clinic. Since January 1997, over 400 patients have been trained to check their blood sugar levels and issued glucometers for home monitoring. These patients return to the clinic four times each year for follow-up. This practice has resulted in a 1.4 percent drop in glycosylated hemoglobin levels. This translates into a relative reduction in diabetic complications of approximately 40 percent. In addition, prior to distribution of glucometers, 45 percent of the patients in the study had glycosylated hemoglobin levels above 9 percent. One year into the project, only 25 percent of the subjects had a level above 9 percent, a drop of 20 percent. Gathering and analyzing statistics has been coordinated by the Associate Chief of Staff for Ambulatory Care with the involvement of many disciplines at Lakeside Division.

Diabetic care is being targeted by another avenue through involvement of Prosthetic and Sensory Aids Service and our membership on the Preservation-Amputation Care and Treatment Program (PACT), which was established by the VA in 1994. The PACT program educates and monitors numerous veterans at risk of amputation. Because approximately 15 percent of people with diabetes are at risk of amputation, proper and timely intervention and care can save limbs. PACT patients are screened, treated, counseled and, when appropriate, referred to specialty care.

According to Phyllis Trammel, RKT, PACT Program Coordinator at Lakeside Division, "PACT's interdisciplinary approach involves staff from Physical Medicine and Rehabilitation, Prosthetic and Sensory Aids Service, Medicine, Surgery, Nursing and the Rehabilitation Institute of Chicago. PACT is a great example of the emphasis the VA places on prevention and the wisdom of doing so." ❖

In the July issue of *Capabilities*, the Public Law offering increased access to prosthetics was listed as PL 103-262. The correct number is 104-262.

Brian Ruhe -- Continued

the University of Cincinnati, where the campus was inaccessible to someone using prostheses or a wheelchair. He instead chose Wright State University in Dayton, Ohio because biomedical engineering there was well known.

By September of 1994, Brian had rented an apartment in Dayton and enrolled in Wright State University as a biomedical engineering student. "I was finally feeling good about getting back to where I was. I needed to prove my independence to myself." His work at Fidelity progressed from working as a prosthetic technician to programming CAD/CAM sockets on computers.

While studying at Wright State, he learned about the Northwestern University research program in prosthetics and orthotics. Brian added a new goal — go to

Northwestern. He hopes to enroll in the Northwestern University graduate biomedical engineering program.

Why does Brian think it's important to tell his story? "I got so mad when doctors made up their minds that I couldn't go back to college — or that I couldn't walk on prostheses. I've done both. I've gotten where I am because I was raised to go after what I wanted and not expect to have things just given to me. If you have the will, you can overcome tragedy. There are many ways to take back your life and to achieve your goals. Sometimes the traditional ways that medical people have been taught aren't the only ways — or even the right ways. Sure, using prostheses isn't as much of a success story as if they had been able to re-attach my legs — but my life works for me. Maybe people reading my story will learn that if the person with the injuries has a plan, the medical people should listen — should be supportive. No one can really forecast how any person will handle his or her disability." ❖

Capabilities

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- Hands
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- Lower Limb Prosthetics (general)
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