



Capabilities

Communicating the Science of Prosthetics and Orthotics

Volume 6, Number 1, January 1997

The Internet :

- What is it?*
- Who's on the Web from O & P?*
- How do researchers use it?*
- What can it do for manufacturers?*
- What's on it for people with amputations?*
- How may it change the future?*

By Jan Little



Have you “surfing the net” lately? You probably belong to one of two groups. You find new uses for the World Wide Web (WWW) every day — or you’re vaguely aware of this thing called Internet. If nothing else, you can’t avoid the lettering at the bottom of every television newscast, commercial, newspaper or magazine advertisement: “visit us at <http://www.ourstuff.com>.”

This issue about the Internet had its origin in a meeting of the Northwestern University PRL & RERP department. A student at Northwestern Medical School had claimed she never looked inside of books. She found everything she needed for study on the Internet. “Not possible”, said some. “Of course she could”, said others. “Let’s explore the ‘net for *Capabilities* readers”, said the group.

Our problem with this issue, of course, is that some of you know far more about the “net” than this author — and others of you are still a bit fuzzy on what the World Wide Web is. In an attempt to explore what effect the Internet has on prosthetics and orthotics and may have in the near future, we are presenting basic information for those who are not Internet experts, some illustrations of how the Internet is being used and some speculations about the future.

What is the Internet and how did it evolve?

It may seem that the Internet has come upon the scene only in the past five years, but it began in the early 1960’s, when the U.S. Government, extremely concerned about how the country would communicate after a nuclear attack, created the Advanced Research Project Agency (ARPA) under the Department of Defense (DOD). In 1969, ARPA created ARPANET that linked much of the country through four super computer stations, called nodes.

The diversity of “languages” used by computers stymied further networking until 1977, when a standard protocol was invented (TCP/IP) to allow any network to connect to ARPANET. To encourage development of networking, DOD funded projects at universities, beginning with UCLA, Stanford, UCSB and University of Utah. Eventu-

Continued on page 2

Internet Influence on P & O

Continued from page 1

ally, the number of universities funded by ARPA grew to 30 and in 1990, a conscious effort was made to add commercial and nonprofit information service providers -- such as Dow Jones, DIALOG and the National Library of Medicine to the Internet.

The use of the Internet began to turn away from the defense mode in 1983, when the military broke away and formed MILNET. In 1985, the National Science Foundation began to establish Internet access, centered on six super computers located across the United States. In June of 1990, ARPANET was shut down. It had been replaced by civilian and private efforts.

The Internet was not contained within the borders of the United States. Scholars in Europe were soon linking with colleagues in the U.S. In his very detailed time table of the history of the Internet, Robert Hobbes Zakon,¹ who titles himself "Internet Evangelist", rather peevisly reports that scholars use dates from 1971 to 1978 as the time when

Queen Elizabeth II sent her first e-mail message. Zakon claims written proof that it was in 1976.

Although the term "World Wide Web" was first used in 1990, it, too, had earlier beginning. Tim Berners-Lee, a consultant for CERN, a physics lab in Geneva, Switzerland, wrote a program in 1980 that he titled "Enquire-Within-Upon-Everything". This program enabled linking in a web-like manner between nodes.

Designing programs to build Web sites, locate topics and help people navigate on the Internet attracted entrepreneurs and entire new categories of software were developed to overcome the drawbacks of difficulty in accessing the Internet.

The effect was cumulative. With increased ease of use, more people began to use the Internet to communicate with others with similar interests. More information published on the Web attracted more users. Within about a decade, the Internet has gone from "the what?" to "are you running into traffic jams on the Web this morning?". Some economists express the feeling that the Internet may influence economic growth and stability. It may influence your life in prosthetics and orthotics. ❖

1. This history of the Internet is published on the Internet. It includes articles by Philip Johnson, Robert Hobbes Zakon, Vinton Cerf, and the research departments of a number of Public Broadcast stations. You may access this history at <http://www.loc.gov/global/internet/history.html>

Handy terms to help you Surf the Net

Surfing the Net - Using any of the software that searches or "browses" for topics. NUPRL&RERP receives 10 to 15 e-mail messages per week requesting information. Most requests report they found the site by "surfing the Net".

Search Engines and Directories -

Web sites may be accessed using a search engine, which queries computers connected to the Net and creates an index of pages in those computers. Some of the search engines are Infoseek, Hotbot and Altavista. Search engines have many more sites -- up to 50 million -- than directories. Directories, such as Yahoo and Magellan, file Web sites by category and are thought by some users to present more information from well-tested sources. *The Kansas City Star*, December 28, 1996, lists a guide to search engines and directories written by Marilyn Pendram, reference specialist for the Kansas City Public Library. You may access this guide at <http://www.kcpl.lib.mo.us>

Search engines are free to the user, but you will

see messages paid for by advertisers as you wait for the information you request.

Using a search engine - If you're just browsing, you may select a major category, such as "Health". You will then be offered a number of categories relating to health and medicine. If you choose "disability", you will be shown another listing of related topics. You can go from there to "prosthetics", for example. You will then see a

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

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

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

listing of web pages relating to prosthetics. You'll soon discover the quickest route to the information you're seeking, for example using the heading "Medicine" to "Orthopedics" to "Prosthetics".

If you are seeking a specific topic, such as "upper limb prostheses", you may choose to type that phrase into the box marked "Search". The engine will then tell you how many references exist using that phrase and list the references in order of most frequently visited site.

Accessing the WWW if you know the URL - if you know, for example that you want to visit the Northwestern University Center for Prosthetic and Orthotic Research and you've read our publications, you know that our Uniform Resource Locator (URL) is <http://www.repoc.nwu.edu/> Internet software will have a command marked "Open". When the URL for Northwestern is typed in the box, the site will immediately be accessed.

Using the Links - Web Masters -- the people who design, set up and maintain Web sites -- show

certain words in a different color to indicate that these are links. When you arrive at the NUPRL & RERP site, for example, you will notice the words "Northwestern University" are highlighted in purple. Clicking on the words takes you to the Web Site for the university, where you can browse for information on faculty, courses, etc. Clicking on "Home" brings you back to the original page.

You will also find an area on most sites called, "Related Links". WWW users chat back and forth to link to one another's site. Early users of the Internet thought this intricate linking resembled a spider's web, hence the World Wide Web came about.

When you visit the Northwestern prosthetics site of NUPRL&RERP, you will find links that lead to the Northwestern University Prosthetic-Orthotic Center, consumer services for people with amputations, commercial suppliers of orthotics and prosthetics, professional societies and other sites

Continued on page 11

NUPRL&RERP Staff and Students Have Various Internet Needs

The staff and students at the NUPRL & RERP spend a great deal of time using computers. Software they have developed for use in the Human Mechanics Measurement Laboratory lets them study various phases of normal human movement and how prostheses interact with the human body. They use computers to design components of prostheses and to conduct finite element analysis.

It's not surprising, therefore, to find that the staff and faculty find the Internet just another tool to conduct more thorough research in prosthetics and orthotics. The question posed to them was, "could you find all the information you need to completely study a topic by using the Internet and without opening a book?"

The Internet puts people just down the hall

Steven Gard, PhD, said that the Internet allows persons doing research to obtain information much more quickly than would otherwise be possible. Research groups can inform others of their interests and share preliminary data long before this data will be published in print. Gard looks forward to laboratories sharing data and conducting research projects via the Internet. "The Internet allows people to communicate as if they were just down the hall from each other", he adds.

Keith Oslakovic notes that using the Internet should prevent the situation which often occurred in the past. Researchers would be exploring similar or identical topics and would be unaware of one another unless they met at a conference or read a journal article.

Janet Jhoun, candidate for PhD, like other students at NUPRL&RERP, finds the Internet very useful in searching for and reviewing literature. For example, she visits libraries at other universities, including the University of Strathclyde in Scotland, via the Internet. Using the Internet, Janet can quickly access sites from her desk, such as the National Medical Library, that previously would have required extensive time and travel. Once at the site, she can use programs such as "Visible Man", a series of tomographic pictures of components of the human body.

Laura Miller, also a candidate for PhD, saves both time and money using the Internet. She searches for books and journals she needs so she can be sure they are available for interlibrary loan. She also finds that her view of her research topic, human ambulation, is more well-rounded because she can share the ideas and needs of users of prostheses and orthoses by visiting Web pages.

Are the NU students and faculty ready to give up books? The answer was a unanimous "No". ❖

Computers Supplement Prosthetic and Orthotic Education...

...winning at Jeopardy at NUPOC may help you sign C.P. after your name

By Mark Edwards, C.P.
Director, Prosthetic Education, NUPOC

Teaching someone about orthotics and prosthetics usually requires at least classroom demonstrations in order to help students to understand the principles and concepts being discussed. However, sitting through hours upon hour of lectures can make it difficult to concentrate enough to absorb all of the information being presented. The philosophy of the Northwestern University Prosthetic-Orthotic Center, to allow students to experience clinical practice, has been combined with a variety of teaching tools to facilitate learning. The Center is taking advantage of the new technologies to enhance our post graduate training programs.

NUPOC uses computer generated presentations to aid in the didactic portion of the program. These programs use animation, detailed outlines with transitional bullet points, images and video all on the same screen. These features allow the lecturer to focus on a particular point by eliminating inappropriate or excessive material on the screen. Fewer distractions and a strong presentation of important principles help the student follow lectures. In addition, NUPOC is developing video presentations of lectures that students can view on their own. This has been very helpful for students who miss a lecture due to illness or who feel they need extra preparation for an exam.

Learning to use the Internet is part of the course

While studying at NUPOC, students are required to use computers to prepare presentations of research topics related to prosthetics and orthotics. They learn to enter, format and prepare the background for their presentation, giving them a new skill that results in a noticeable improvement over the traditional presentation methods using chalkboards or overhead projectors.

CD-ROM packages purchased by NUPOC expand the courses. Two electronic "visiting lecturers" from Gillette Children's Hospital include *Normal Gait* and *Pathological Gait* are interactive and allow students to evaluate their knowledge at various levels of difficulty. Such programs are extremely important in allowing the students to learn at their own speed.

NUPOC still requires students to take an anatomy lab using a cadaver. After taking the lab, however, students use *Animated Dissection of Anatomy for Medical Students* and *The Human Body*, to dissect and identify anatomical structure at their own pace.

Programs that specifically relate to prosthetics and orthotics are not yet commercially available. A program from Corel, titled *The Amputee*, will soon be released. NUPOC, in 1993, developed a program titled *Student Interactive Prosthetics Program*. Students use this program to enhance their understanding of fitting and dynamic alignment. The interactive program allows mistakes to be made by the beginning student, but proper procedures must be performed before the student can achieve the next level.

NUPOC has recently placed computer terminals in the 17th floor P & O library that connect to both the Northwestern University Medical School library and the Internet. Students are encouraged to use these terminals for e-mail, class projects and to write resumes. The material on the Internet that relates to P & O is "bookmarked". Net access programs help students find relevant material more quickly.

Computer design was introduced in 1992

The NUPOC Certificate Program implemented using computers in CAD/CAM in 1992. Using the NU Medical School's Weinberg Medical Informatics, each student has hands-on experience after receiving lectures and demonstrations that introduce the techniques. For one transtibial fitting, each student casts, digitizes and performs rectifications using the Seattle Shapemaker System on a computer terminal.

Using feedback from the faculty, the student can modify their digitized shape, send the information to the automated carver and retrieve a plaster model of the socket they have designed. A static fitting with a transparent interface is performed and assessed by the student. Future plans are to incorporate transfemoral fittings in the practical experience with CAD/CAM. Our goal at NUPOC is to keep pace with the technology that is being developed and used in clinical practice.

NUPOC has also developed testing programs that use computers to create clinical experiences and simulated scenarios. Students must choose appropriate cues, then are given electronic responses that are weighted to create a score that reflects the student's success in each scenario. Scenarios simulate evaluations, clinic settings, dealing with other allied health and medical professionals, fittings and problem solving. *Prosthetic Jeopardy*, a quiz game, is used on the computer to create interactive challenging reviews before exams. These programs are evolving constantly and are being used as a first experience to prepare students for the American Board of Certification examinations. ❖

Ken Fenstermacher: “Using what I’ve got to do what I want to do...”



When Ken Fenstermacher had both arms amputated at a shoulder disarticulation level, the challenge to Ken and the Northwestern University/Rehabilitation Institute of Chicago team was to give him optimum function. The system chosen combined manual and electric prostheses. At the left, Ken uses an early version of the system to put paper in a typewriter. On the right, he shows his current system.

By Jan Little

When Ken Fenstermacher recently bought a Massey-Fergusson garden tractor, it was cause for a wave of optimism to pass through the prosthetics department of the Rehabilitation Institute of Chicago (RIC) and a few sighs of relief were breathed in the Northwestern University Prosthetic Research Laboratory and Rehabilitation Engineering Research Program (NUPRL & RERP). The NURERP/RIC prosthetic development team hopes the new tractor might save some of the wear and tear on Ken’s upper limb prostheses. Ken is promising to use the tractor to assist in digging holes, picking up bags of landscaping bark, pulling up large weeds or small trees and otherwise testing his prostheses to the limit.

Ken and his wife, Connie, occasionally travel from their home in Marysville, Kansas to visit RIC and Northwestern. The trips are usually for some repairs or changes to his prostheses. Repairs are done locally. It’s not that the prostheses are faulty. The gusto with which Ken attacks life would strain anything mechanical short of bulldozers and earth moving equipment.

Pioneering double shoulder disarticulation prostheses

A typical day for Ken may include a bit of landscaping, painting or repairing the house, building in his workshop or working on his computer. One of NUPRL&RERP/RIC’s best test pilots for upper limb prostheses, he has conducted experiments with uses that prosthetists and therapists don’t often consider. For example, Ken has found that shoveling is hazardous to prostheses. Ken points out that technique is important. Once he forgot to turn his electric

gripper to the correct position — and he and Connie spent some time searching in the snow for the hook, which had stayed attached to the shovel rather than Ken’s prostheses.

Having both arms amputated at the shoulder as a result of an electrical accident presented challenges which Ken has met with the assistance of strong teams. Connie, a key player on Ken’s family team, describes Ken as “the most bull headed guy I’ve ever heard of”. Craig Heckathorne, a key player on the Northwestern University/RIC team, described Ken as coming to RIC with a list of skills he wanted to develop and taking charge of defining specific tasks. But to Ken, the challenge that is most important is using his experience to help others for whom amputation has changed their lives.

Electrical accident changed life

Ken uses two upper limb prostheses after an accident with electricity resulted in damage to his arms so extreme that bilateral shoulder disarticulation amputation was required. A 42-year old journeyman lineman for a utility company, Ken had a 15 year record of no accidents that resulted in loss of time. On Mother’s Day 1989, the 20-year veteran was repairing a power line while using a truck with a boom. The line, which had been damaged when a car hit a utility pole, was being repaired without turning off the power, a routine practice safely used by linemen across the country. Without Ken’s knowledge, there was a flaw in the equipment being used and he came in contact with 7,200

Continued on page 6

Ken Fenstermacher

Continued from page 5

volts while working on a ground wire.

The odds were against Ken surviving the accident. Immediately after the electricity passed through Ken's body, the doctor, in front of whose office the utility pole was located, walked from church across the street. "He was a general practitioner in a small Kansas town," Ken says, "And he didn't know what to do — except get me to emergency treatment."

By further coincidence, a paramedic, who had stopped for coffee just down the street didn't wait for a command. He immediately ran to his ambulance and within minutes Ken and the doctor were on their way to Marysville. Realizing that Ken's condition could not be treated at Marysville, a helicopter was called to fly him to the Kansas University Medical Center in Kansas City. In the intensive care unit, it became apparent that when Ken fell asleep he stopped breathing. A nurse stayed by his side for 48 hours, shaking and slapping him to keep him awake.

Surviving the accident was only the beginning

Ken survived those 48 hours, but doctors determined that arm amputation was the only way to save his life. Later, the family learned that his heart had stopped three times during the surgery. Ken recalls hearing a conversation between nurses and doctors as he was regaining consciousness. A nurse asked a doctor what process they had used that saved Ken's life. The doctor replied that it was just that Ken was the most stubborn person he'd ever seen. There was no medical explanation.

Doctors told Ken that he would be in the hospital for four to six months. Ken said he'd be home by Father's Day. Twenty-seven days after he arrived at the Kansas University Medical Center, he left the hospital to spend Father's Day with his family. He returned for rehabilitation. Typical of Ken, when he returned for some rehabilitation, he designed his own physical therapy program. He recalls a young physical therapist, when she first came to his room, blurting out, "What do they expect me to do with you?" It was then he realized that few medical people had dealt with a condition like his and that he would have to take charge of how he lived the rest of his life.

"Work with what you've got" is Ken's motto. He could hold a pen in his mouth, so he practiced signing his name. He could use his foot, he found out, to open doors. He could get out of his room. Walking seemed like good exercise, so he began involving department staff in regularly scheduled walk/talk sessions. To fight the boredom of the hospital, he made up activities like teasing an 11 year

old, badly burned girl to make her work against the pain and stand straight. He chuckles as he recalls chiding her about walking like an old granny. "You were here a long time when I came," he'd tell her. "I'll bet you'll be here a long time after I get out." She responded to his challenge — and left the hospital the day after Ken left.

Who's worked with double shoulder disarticulation?

Like many rehabilitation centers, the Kansas University Medical Center invited the commercial prosthetists in the city to participate in the amputee clinic. Once again, none of the medical professionals involved in the clinic had experience with a person with Ken's condition. "I was told that there were two places that might be able to fit me with prostheses," Ken said. "One was in Houston and the other, in Chicago. One of the prosthetists knew some of the NUPRL&RERP/RIC prosthetic people and urged me to go there. Since it was fall, I kind of wanted Houston — warmer in the winter, so of course, we picked Chicago — but I'm glad we came to Chicago."

In October 1989, less than six months after the accident, Ken arrived at the Rehabilitation Institute of Chicago. Ken's needs fitted well with work being done by the NUPRL&RERP/RIC engineering and prosthetic team in developing a systematic approach to prosthetic design for persons with high level bilateral amputations. The team Ken joined in Chicago included Dudley Childress, PhD, and Craig Heckathorne, MSEE, from the Northwestern prosthetic research programs and Jack Uellendahl, CPO, Steve Duff, CP, Yeonchi Wu, MD, Julie McCauley, OTR and Judy Meredith, OTR, all from RIC.

It quickly became apparent to all involved that Ken's attitude agreed with the prosthetic team. Designing a system of prostheses for Ken was approached as a matter of providing him with tools to use in doing the tasks he had defined. No one talked about "replacing Ken's arms". The team chose to use a body-powered prosthesis on his dominant side and an electric powered prosthesis on his left side. The body-powered prosthesis provides Ken with proprioceptive feedback through the control cables, giving him better fine control to perform tasks needing dexterity. The electric-powered prosthesis, on Ken's left, includes an electric gripper to give him a more powerful grip, an electric wrist rotator and an electric elbow to give him greater lifting capacity.

After the team designed the system, Ken's achievement of his goals was just starting. Ken went home and tested the system. Although Ken had a mental "laundry list" which he shared with the team, perhaps not all of the uses to which he would subject his prostheses were included.

Probably many traditional expectations about capabilities of double upper limb amputees were changed as Ken

experimented. He found he did not have enough strength to steer his pick up truck with the standard steering wheel and that some adaptations should be made to the truck. He found he could catch a “run-away” lawn mower after he accidentally drove it into a hidden hole. By continually demanding more function from his prostheses, Ken challenged the Northwestern/RIC team.

The team has learned much about upper limb needs

The team working together enabled Ken to return to Kansas and resume his life. But more important, other people who experience upper limb amputation continue to benefit from the practical knowledge that Ken and his Northwestern/RIC team have gained about upper limb prostheses.

Solving the complex problems presented by Ken led the team to be aware of the need for improvement in a number of aspects of upper limb prostheses. The punishment Ken gives his prostheses has led the team to redefine the level of durability necessary in upper limb prostheses. Ken’s upper limb system weighs 12 to 13 pounds. The effort required by that weight has made the Northwestern researchers launch projects to reduce the weight of individual components.

Ken Fenstermacher has used team work to take back his life after the accident which might have left him totally helpless. His goal now is to make sure that his experience makes life better for others. His story, told on videos, has made many medical professionals aware that there can be an active life for bilateral upper limb amputees. Now

Ken hopes he can reach out to others with physical disabilities.

There are times when you have to turn to others

When asked what advice he would give others, he replies, “It’s very important that you keep in mind that there are times when you need help dealing with the frustrations and depressions that never go away when you live with a disability. For example, one of the biggest things you have to deal with (as a bilateral upper limb amputee) is the loss of human contact. You can’t hug people, you can’t wipe a tear off a face — you can’t hold your grandchild — you can’t offer a shoulder to cry on.”

“It can build up on you. You have to realize that this is going to get to you sometimes. The other bad thing for me about having a disability is learning to be able to ask for help. I’ve always been such an independent cuss. Asking others to do things is one of the hardest things I have to do.”

Ken’s experience continues to benefit many. He sums up his message with, “I’ve learned to live using what I’ve got. I’ve figured out how to do what I want to do. Sure, there are bad times mixed in with the good. You can laugh or you can cry. Laughing is a lot more fun than crying.” ❖

(NOTE: In the July 1993 issue of *Capabilities*, Craig W. Heckathorne, MSEE, NUPRL & RERP Research Engineer detailed the technical aspects of the development of the upper limb prostheses system used by Ken Fenstermacher. If you’d like a copy of this article, please contact *Capabilities*. Videos are available from Education Services, Rehabilitation Institute of Chicago, 345 E. Superior St., Chicago, IL 60611.)

Support is the key to success

Ken Fenstermacher likes to share his story to show what a critical role support of others plays in successful return to a full life. The extent of Ken’s amputations made him a pioneer. There were few others in the country that had experienced double shoulder disarticulations. There were few people to tell Ken what came next and what achievements he could attain.

The strength of Ken, his wife, Connie, their two daughters and son-in-law is extraordinary. For thousands of others who experience amputations, however, support from outside can be invaluable to them and their families. Dozens of amputee support groups exist across the nation. Members of these groups perform services such as peer counseling, family support, and shared experience with practitioners and prosthetic or orthotic devices.

UnLIMBited Abilities is the support group that operates in cooperation with the Rehabilitation Institute of Chi-

cago. Started in 1994 at the urging of Dr. Yeonchi Wu, the group meets on one Saturday morning each month. Peer counseling is a major part of UnLIMBited’s activities. Members visit persons who have experienced amputations while they are still in the hospital. In some instances, members will meet with the prospective amputee or family members prior to the amputation to help them know what to expect during each step of the recovery.

UnLIMBited functions in Chicago, so another service provided to members is support while returning to big city living as an amputee. Together, group members tackle the public transit system, learn the best way in and out of entertainment venues, share experiences with community services and trade tips on travelling.

For more information about UnLIMBited, contact Judy Hill, 312/908-2782, Room 783A, 345 E. Superior Street, Chicago, IL 60611. ❖

The Internet Affects Life at NURERP Now...

...or, "please respond by return e-mail or I'll flunk fourth grade"

Mention the Internet and usually someone will comment, "not very many people can use the Internet...it can't be a real effective way of disseminating information"... True, not everyone has a computer with a modem and the capacity to use the Internet in his or her home, but people are finding ways to access the Internet.

Since the NUPRL&RERP page went on-line in January of 1995, 27,000 people have visited our site. This is undoubtedly more people than we could reach through newsletters, reports and conference presentations in a like amount of time. What seems more important is the personal, one-on-one nature of the contacts we make via the Internet.

Most days, two or three "visitors" take the time to click on the button which requests more information. The requests then enter our e-mail box for processing. About half of these requests ask to be sent information shown on the form -- which is also printed on the back of each *Capabilities* issue. Another approximately quarter of the requests are for information about becoming a prosthetist or orthotist. Those requests are zapped upstairs by e-mail and handled by NUPOC.

Then there are the requests that are more unusual

A librarian in a small town in a South American country was surfing the Net and, after visiting our site, realized that there might be some help for the wife of a friend, who has an unusual amputation for which she had not found satisfactory help. The request enabled contact to be made between the amputee in South America and a physician from the Rehabilitation Institute of Chicago who specializes in treating amputees.

A orthotist in Texas was unable to find a solution to a rare allergic reaction that one of his clients had to every orthotic material with which the orthotist was familiar. The Web put the Texas orthotist in touch with a Northwestern University orthotist who had just seen a new material that had just been introduced. When last heard from, the Texans had found the material solved the problem.

Families of people who have just experienced an amputation find a way to access the Net. Often, the access is completed using the computer in Dad or Mom's office, but one enterprising fellow talked the people at the local Air

Force base to locate and contact Northwestern. He only needed one shoe and hated to have to throw the other away. The "One Shoe Crew"¹ in San Francisco was happy to help.

Homework Helper on-line

Some of our favorite contacts are with the prosthetists and orthotists of tomorrow. About once a month, our e-mail will contain a message that reads somewhat as follows,

"Please send me all the information you have about electric hands for people who don't have their own"....or... "I'm doing my fourth grade class project on prosthetics this year. Please send me everything." Usually, there is a sense of urgency implied, such as, *"I need this by next Monday"....or... "I'm sorry to rush you, but our science fair is day after tomorrow"....* Fortunately, e-mail does not take much time to use and we always answer. Our information must be helpful, judging from the thank you notes we receive from students reporting that they got a good grade on our joint project.

Another group that comes to us through e-mail are the families of people who have had amputations. Perhaps the Internet will solve a problem that has long faced those of us who either personally have a disability or have a loved one with a disability -- where to find what we need. As the search engines become more complete and more organizations publish pages on the Net, our job of finding things is diminishing. Answers to questions such as, "Can I ski after having my leg amputated?", "What kind of dynamic feet are available -- who uses them and what do they think about them?" and "where can I find kitchen utensils to make preparing meals easy using only one hand?" can be rather quickly found by one with access to the Net. We use the Net to find information for those use our Help Line or write to us.

Television sets that access the Internet are now on sale in most cities. We're hoping they'll be used to visit our site. ❖

1. The One Shoe Crew is a not-for-profit organization that matches shoe sizes with potential shoe partners by computer. Partners pay a \$10 matching fee, then exchange shoes. Located at 86 Clavela Avenue, Sacramento, CA 95828-4647 Phone 916/364-SHOE.

Places you might like to visit on the WWW...

...Professional contacts as close as your keyboard

O & P NetWork Connection <http://www.cloudnet.com>

Even if you don't have time to travel to Alexandria, VA, this site gives you quick access to resources of:

AAOP AOPA NCCA NOCA IAOP ISPO ABC BOC BCP PFA

Pages at this site include:

- O & P Societies, Journals & Certifying Agencies
- Join the O & P NetWork Connection Conferences
- O & P Inquiries and Responses (Interactive information network)
- Directory of Orthotic, Prosthetic, Pedorthic Facilities
- Board for Orthotist Certification Home Page
- O & P NetWork Connection Medical and Allied Health Designations
- Orthotic & Prosthetic Definitions
- Links to Disability WWW Sites
- "HOT" Links to Orthotic & Prosthetic WWW Sites
- Why do I need a Web Site?
- Let us create an attractive Web Page for your Orthotic, Prosthetic facility
- Orthotics & Prosthetic NetWork Connection's Internet Search Page
- Infoseek Guide: Your roadmap to the Internet
- O & P NetWork Connection Users Favorite Sites
- PC Magazine's Best Shareware of the Year
- Shareware.com
- What can you do to help support O & P Connection?

...a virtual professional meeting, product exhibit/demonstration, resource directory

Orthotics & Prosthetics Online (<http://www.oandp.com>)

This one of a growing number of commercial Web sites on the Internet is constructed and maintained by O & P Digital Technologies, Inc. On November 18, 1996, there were 26 pages on this site describing products from as many manufacturers. This "electronic product demonstration" increases constantly.

Other services made available on this site include:

- Education - professional schools and continuing education opportunities
- Research - summaries
- Organizations for prosthetists and orthotists
- Discussion groups - no discussions of billings, fees for service - only clinical questions
- Calendar of related to O & P
- Networks
- Publications
- Patient Care Facilities
- Users' Forum
- Directory
- Product Information
- Related Information - including consumer groups
- Distractions - also could be called "games"
- Classifieds

...of interest to consumers and prosthetic and orthotic practitioners

National Rehabilitation Research Information Center (NARIC) <http://www.cais.com/naric>

A directory of all National Institute on Disability and Rehabilitation Research (NIDRR) research, training and education, technology assistance and other programs including personnel, research reports and publications.

Access Unlimited <http://www.accessunlimited.com>

Dozens and dozens of links to services for people with disabilities including sports and recreation groups, trans-

Continued on page 10

Visiting on the Internet

Continued from page 9

portation, electronic showrooms of assistive technology, education, information on the Americans with Disability Act, medical services, etc.

CRERO Home Page <http://trace.wisc.edu/CRERO>

An organization which enables the Coalition for Rehabilitation Engineering Research Organizations to share ideas, research results and other topics of interest.

RESNA <http://www.ari.net/resna>

Under construction, this page offers information for rehabilitation engineers and assistive technology specialists including the technical assistance available from the NIDRR-funded assistive technology program in each state.❖

These are only a few of the many Web sites you will find helpful as you work with or use prosthetics and orthotics. Capabilities and Northwestern University PRL & RERP do not endorse any of these sites nor offer opinions on the contents of the sites.

Glimpsing into the future...

...or, stand a little closer to the camera so we can adjust your knee

Remember when science fiction used to be about rockets that flew in outer space and scientists who could “adjust genes” to produce people with specific characteristics? If you’re over 40, you remember when others used to laugh if you said you believed this could happen. Guess what?

Cyberspace -- the Internet -- electronic communications is on an accelerating curve of advancements unequaled in our lifetime -- maybe in history. Five years ago, engineers in universities were entertaining colleagues with virtual reality rooms. Today, we go to our computer, take a virtual tour of the grocery store, place our order and give the 30-minute time window in which we want delivery to our door.

Of course, there is no way to know if the Internet will continue to grow at the rate it has been growing, or if economical or technical problems will slow or stop progress. But, speculating about what may be possible in the future can be based on what exists now.

Distance Learning

As this is written, the University of Strathclyde, Strathclyde, Scotland, offers post-graduate diplomas in Lower Limb Prosthetics, Lower Limb Orthotics and Clinical Gait Analysis. While some of the required course of study offered from Strathclyde is still in printed work book format, interactive presentations of lectures and clinical demonstrations will make it possible to attend class via the Internet. In fact, some universities have begun to recruit people to design distance learning curricula so they may expand enrollment.

Internet Clinics

Telecommunications companies, such as Ameritech, demonstrated using the Internet to conduct medical conferences and clinics. Perhaps in the future, the person with high level double upper limb amputation will be able to be “seen” by doctors, prosthetists, research engineers and therapists from different facilities without any necessity for travel by the patient or the practitioners. Perhaps such clinics could be a part of course work in prosthetic and orthotic specializations.

Long Distance Gait Analysis

A gait analysis system using artificial intelligence -- Dr. Gait -- has been developed at Ohio State University under the direction of Sheldon R. Simon, MD. Perhaps further advances of the system may enable clinicians to use less expensive, portable methods of recording specific data about actions and functions of a person’s gait. The data could then be analyzed by one or more experienced analysts who might even be at different sites.

The on-line Clinical Gait Analysis of the University of Curtin in Perth, Australia, has been designed by Chris Kirtley, Ph.D., M.D. The site may be accessed at <http://www.curtin.edu.au/curtin/dept/physio/pt/staff/kirtley/cga/>. This site presents movies of the gait of people with a variety of conditions such as above-knee amputation, below-knee amputation, poliomyelitis and cerebral palsy. Data about the gait analysis is also available on the site. Visitors to the site are invited to submit comments and share their thoughts about the analysis.

Glimpsing into the Future

Continued from page 10

Fabrication at a central manufacturing facility

Perhaps economy of scale would be a factor in manufacturing sockets or other prosthetic components at a central manufacturing facility, similar to the Pin Dot manufacturing facility for seating components. Digital patterns for seat and back supports for use in wheelchairs are created at clinics around the country by using sensor-equipped measuring devices. The digital pattern is then used to produce much less costly supports than could be produced at multiple sites. ❖

The Internet -- P & O

Continued from page 3

related to P & O, biomechanics, etc. The NUPRL&RERP site also links to other research programs sponsored by the National Institute on Disability and Rehabilitation Research (NIDRR) through the National Rehabilitation Information Center (NARIC).

Commercial pages

Suppliers of prosthetic and orthotic components are finding the Internet is a viable method of distributing information about their company and products. In an article in *Biomechanics*, May 1996, Sara Aase, Assistant Editor notes that "within the past six months, the niche (O & P) has exploded". Her article, which can be read at <http://www.ifi.mpls.com/biomech/may96/oandp.html>, reports how various manufacturers made their decision to add the WWW to their education and sales efforts.

A typical web site includes product descriptions, information about the company, links of interest to amputees, ordering information and an e-mail link to allow you to send your questions and comments.

Maintaining a Web site takes time, the proper personnel and funds. However, the nature of electronic media is much more fluid than the printed page. Some manufacturers are enthused about the potential to change product specifications, prices and other customer information instantly.

You may find commercial pages sponsored by manufacturers of prostheses and orthoses by using the "Yellow Pages" provided by search engines or by checking a research or consumer site. ❖

Northwestern University PRL& RERP & NUPOC faculty and staff in the news

Some of the recent recognitions received, research published and lectures presented by faculty and staff members of Northwestern University prosthetics and orthotics research and education programs....**Dudley S. Childress**, PhD, Director of NUPRL&RERP and Executive Director of NUPOC, was initiated into the Institute of Medicine of the National Academy of Science in October at ceremonies in Washington, DC. Dr. Childress indicated that many discussions during the three-day meeting focused on how computer technology and the Internet would affect the nature of medicine....**Craig W. Heckathorne**, was the invited lecturer at the Department of Bioengineering, Marquette University, Milwaukee, WI in November. His lecture was titled, "Introduction to Electric-Powered Arm Prostheses and Myoelectric Control"....Over 300 physicians and other members of the **American Congress of Rehabilitation Medicine** and the **American Academy of Physical Medicine and Rehabilitation** toured NUPRL&RERP and NUPOC during the annual meeting of both societies in mid-October....**Bryan Malas, CO**, Director of Orthotic Education, NUPOC, over the past four months lectured Rehabilitation Institute of Chicago (RIC) residents in physical medicine, the Orthotist and Prosthetists National Training Conference held by the Department of Veterans Affairs and physical therapy classes at Midwest University. Bryan's article, "Nonsurgical Management of Genu Recurvatum" was featured in the October issue of *Team Rehab Report Magazine*....**In Motion Magazine**, the publication of the Amputee Coalition of America, featured two articles on NUPRL&RERP, NUPOC and RIC cooperative works in prosthetics and orthotics in the October issue....The research report, "Three-Dimensional Pelvic Motion During Human Walking: An Example of How Projections can be Misleading", authored by **Steven A. Gard, PhD**, **Erick H. Knox, PhD** and **Dudley S. Childress, PhD** was published in the October *Journal of Biomechanics*, Volume 29 (10) 1387-1391....**Mark Edwards, CP**, Director of Prosthetics Education, presented, "Establishing Parameters for Ischial Containment Socket Shapes" to the Florida Association for Orthotists and Prosthetists**Richard F. ff Weir, PhD**, and **Steven A. Gard, PhD** presented at the Fall Scientific Seminar of the Midwest Chapter of the Academy of Orthotists and Prosthetists in September. Weir presented, "Cineplasty Revisited: Muscles as a Control Input for Powered Prostheses" and Gard presented "The Influence of Four Bar Linkage Knees on Prosthetic Swing Phase Floor Clearance"... **Stephanie Michaud**, masters candidate, and **Dr. Gard** were presenters during the Annual Gait Symposium, honoring Sheldon R. Simon, MD, Chief of Orthopedic Surgery, Ohio State University. Ms. Michaud's presentation was "Standard vs. Prosthetic Walking: Some Quantitative Observations"; Dr. Gard's, "The Effect of Pelvic Obliquity on the Vertical Excursion of the Trunk During Normal Walking" The Symposium was sponsored by Children's Memorial Hospital Gait Lab. ❖

Capabilities

ISSN 1055-7156

Northwestern University Prosthetics Research Laboratory
and Rehabilitation Engineering Research Program

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



Address Correction Requested

Resource Unit Information Request

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

**345 E. Superior St., Room 1441
Chicago, IL 60611 USA**

Allow two to three weeks for delivery

- Send me more information on lab activities.
- Start my subscription to *Capabilities*.
- Send me one copy of *P&O Resource Directory*.
- Send me the information packets checked below.
- Information Packets (limit - one copy of each item)
 - Quick Info Sheet: Funding Ideas for Prosthetic-Orthotic Devices
 - ADA List of Publications
 - Above Knee Prosthetics
 - Amputation
 - Braces & Crutches
 - Below Knee Prosthetics
 - Children's P & O
 - Choosing a Prosthetist
 - Congenital Conditions Book List
 - Feet

- Gait
- Hands
- Hip Disarticulation/Hemipelvectomy
- Lower Limb Prosthetics (general)
- Lower Limb Orthotics (general)
- Myoelectric Packet
- Publications for the New Amputee
- O & P School
- Orthotics (general)
- Pain and Phantom Pain
- Prosthetics (general)
- Sockets
- Sports/Recreation
- P & O Statistics
- Support Groups
- Symes
- Upper Limb O & P
- Video List
- What is P & O ?

Name _____

Address _____
