

# Kellie Lim: NIDRR Scholar for the Year 2000

*Kellie's internship this summer takes her from the Northwestern University Prosthetic and Orthotic research programs to Washington to share her project with other National Institute on Disabilities & Rehabilitation Research (NIDRR) sponsored scholars*

**M**y name is Kellie Lim, and I am a junior majoring in Biological Sciences and Asian Studies at Northwestern University. I am interning at the Northwestern University Prosthetics Research Laboratory and Rehabilitation Engineering Research Program as a Scholar sponsored by the National Institute on Disability and Rehabilitation Research (NIDRR). My interest in this internship lies in the fact that I am a bilateral below-knee amputee and I have a desire to learn more about the field of prosthetics.

### **Personal knowledge of life with amputations**

When I was eight years old, I contracted meningococemia, a bacterial form of meningitis. This disease attacks the circulatory system and blocks the blood from circulating throughout the body. As a result, I became a multiple amputee, losing portions of my legs below the knees, my right arm below the elbow, and several fingers of my left hand. It was difficult learning how to perform the basic tasks of everyday life, but since I was still young, I learned quickly and adapted to my environment. Being naturally right-handed, the loss of my right hand was very difficult; I had to learn how to write again using my left hand. Since I was not fitted with a prosthetic arm until a few weeks after the amputation, I began to use only my left hand to perform every task. To this day, I have only used my prosthetic arm for tying my shoes.

Learning how to walk with prostheses, however, was the greatest challenge. I could not use a walker or crutches because my prosthetic arm was too awkward to

properly place my weight on it. Balancing my body weight while walking was particularly difficult since the prostheses were essentially stilts attached to me. It took me some time to actually think of the prostheses as my legs or an extension of my body, but after becoming dependent on them, my whole perspective of them changed drastically.

Nine years later, I began my college career at Northwestern University. Like many undergraduate students, I had to think about which studies to pursue and which career to aim towards. Since I was already interested in the field of prosthetics, I sought an internship that dealt with research in that area and this led me to the NIDRR Scholars program at NURERP.

The NIDRR Scholars Program provides opportunities for disabled undergraduate students to learn about research on social and technical issues in a wide range of disabilities. Currently, there are fifteen centers across the nation that participate in this program, and each center focuses on different disabilities. Each NIDRR Scholar works with a mentor, a faculty member at the facility, on a research project that deals with some aspect of disability. My mentor is Steven A. Gard, Ph.D., and the topic of my research project was "Quantitative and Subjective Analyses of Walking in an Individual with Bilateral Below-Knee Limb Loss," using myself as the primary subject.

The objectives of the study were to identify functional limitations of the prostheses and to identify compensatory actions employed by the bilateral below-knee amputee. The

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analysis to an audience who may have never been exposed to this field made me self-conscious. Overall, I felt that everyone understood my presentation.

The other research projects spanned a wide range of subjects. One project focused on the relationship between religiosity and disability, specifically how the onset of a disability affected an individual's religious behavior. Another Scholar became a mentor at a middle



*The White House was just one of the historical sites of Washington that Kellie, shown here with Dr. Steve Gard, enjoyed.*

school and organized a program that gave students hands-on experience in rehabilitation engineering. Other research projects concentrated on issues of visual and hearing impairments and the improvement of rehabilitation services for minority groups.

The duration of the seminar was not entirely devoted to presentations. The group was able to tour the White House and the Capitol. I enjoyed the tours immensely since I personally was able to see these historical places, which was much more impressive than viewing them on television or through pictures.

After the seminar in Washington D.C., I will continue to intern at NURERP for the summer. More in-depth analysis will be performed on the data collected from the research project on bilateral below-knee gait.

### **....former NIDRR Scholar**

In 1997, Brian Ruhe worked at Northwestern's prosthetic and orthotic research laboratory as what was then known as a Dole Scholar, precursor program to the NIDRR Scholar program. The intent of the program was to give students with disabilities the opportunity to explore a scientific field of study in the hope that more people with disabilities would choose

I will also be working with and analyzing data for Dr. Gard's research on the gaits of persons with bilateral above-knee and bilateral below-knee amputations.

### **Research on bilateral lower limb amputation is scarce**

Currently, there is not much literature reporting on the gait of persons with bilateral amputations. More attention is focused on study of the gaits of persons having unilateral above-knee and unilateral below-knee amputations. Dr. Gard believes that research into lower-extremity amputee gait will provide new information on how people with bilateral lower limb amputations compensate for their limb loss and may also offer new insight into the gait mechanics of able-bodied persons.



*Kellie seems to be wearing an "I made it!" smile as she and Dr. Margrit Meier visit the Capitol Building after a successful presentation at the NIDRR Scholars meeting.*

I have already gained much knowledge and new experiences from this internship, and this research has allowed me to understand how I have adapted to walking with prosthetic legs. I want to thank NIDRR and NURERP for providing me with this opportunity to learn about prosthetic research and become part of the process in analyzing and understanding bilateral below-knee amputee gait. ❖

careers in science. Brian Ruhe returned to Wright State University in Dayton, Ohio to complete his B.S. in biomedical engineering after his summer as a Dole Scholar. He has now returned to Northwestern as a candidate for an M.S. in biomedical engineering. He works with Dr. Dudley Childress and Dr. Steve Gard in research on gait of people with bilateral amputations. ❖

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gathering and processing of data on my walking study was performed at the VA Chicago Motion Analysis Research Laboratory. By comparing my data to those of an able-bodied female, I learned about how I had adapted to walking with prosthetic limbs.

### **My pelvic tilt may help me walk more efficiently**

I found that one of the more surprising aspects of my gait was that I hip hiked to increase foot clearance during swing phase. That is, I lift my hip higher on the side of my swing leg than an able-bodied individual to gain foot clearance. I also found that my pelvis has a

sustained anterior tilt, which I had noticed before this research but considered at the time as simply poor posture.

For cadence, step length, and walking speed, my data was compared with that of five able-bodied females. The data was plotted on graphs, and the general trends of the graphs showed that my cadence, step length, and walking speed were within the range of the able-bodied females but were more narrowly defined. In other words, during my walking trials I did not reach the full ranges of each parameter values that the able-bodied females did. I believe that my ranges of cadence, step length, and walking speed are narrower because of lessened stability.

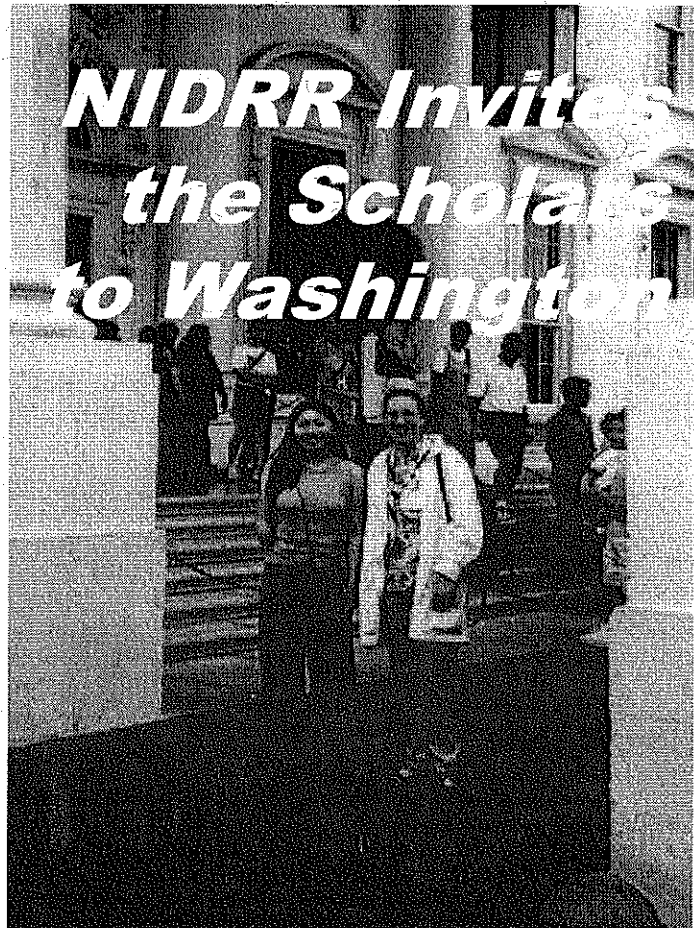
My ground reaction force data was similar to those of an able-bodied female. However, when I initially loaded my prosthesis with each step, I placed much more force on the ground than the average female. I interpreted this result as my need to "feel" the surface of the ground. ❖

## ***NIDRR Invites the Scholars to Washington***

In May 2000, all the NIDRR Scholars were invited to attend a conference in Washington, D.C. in order to meet other Scholars and to exchange information about their individual projects. I was very excited to attend this meeting since I had never been to the nation's capital and I wanted to learn about the areas other Scholars were researching.

The Scholars represented a wide range of learning and physical disabilities, and this, I believe, was the best part of the conference. Having little exposure to people with disabilities, I thought it was amazing how some Scholars adapted to the environment and excelled in every aspect of life.

Every Scholar gave a presentation of their research, and some opted to provide a short biography as part of the presentation. The willingness to talk about their disabilities and how they overcame challenges provided a view into their lives and their courage. When it was my turn to present my project, I became quite nervous. I have little experience in speaking in front of groups, and having to explain technical aspects of gait



*Kellie (left) and Dr. Margrit Meier, post-doctoral student at NUPRL & RERP, join tourists at the White House.*