

2011

Nebraska Biomechanics Core Facility 2010-2011 Annual Report, Issue 9

Nebraska Biomechanics Core Facility
University of Nebraska at Omaha

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Nebraska Biomechanics Core Facility *Strive for Excellence*

This year’s annual report is a little different. In years past, we have focused on telling you about our studies, about our work. This time, I want to focus on our students. They are truly the life of our facility and without them, we wouldn’t be able to accomplish the amazing things that we do every year. I hope that after reading about us that you will want to visit the Nebraska Biomechanics Core Facility (NBCF).

Following Nebraska and National initiatives, our facility is interdisciplinary in nature. Our thriving enterprise features engineers, mathematicians, scientists, surgeons, and clinicians exchanging ideas to gain additional insights on healthy and abnormal movement patterns. Using techniques from biology, engineering and mathematics, we have revolutionized the perception of how the neuromuscular system controls human movement. Our success often leads to new opportunities to advance our research initiatives. Unfortunately, these opportunities require funding beyond allocations provided by the state. We continually pursue and frequently receive grants that support our research efforts. You will read about many of these awards on the following pages. While this funding is critical, charitable gifts from individuals, such as yourself, are also vital to advancing our work. Private support, for example, further enables us to:

- purchase upgraded equipment and new technology
- attract and retain outstanding faculty and graduate students
- fund a facility addition to alleviate the current shortage of research and office space

To learn more about how you can support the important work of the Nebraska Biomechanics Core Facility, turn to page 20. Your gift will make a difference — enhancing our scientific pursuits and ultimately helping improve the lives of those we serve and beyond.

Thank you for your consideration,

Nick Stergiou, Ph.D.

Isacson Professor and Director of the Nebraska Biomechanics Core Facility (NBCF)



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**Pathological
Gait**



**Motor
Development**



Gait Analysis



Virtual Reality



Robotic Surgery



Stroke Rehabilitation

Nebraska Biomechanics Core Facility faculty and personnel have established a strong network at local, national and international levels. Supporters in our endeavors for excellence include several local and national foundations, institutes and associations that have granted us 11 awards for a total of over **\$6,000,000** during the last year!!!

In September 2010, the **National Institutes of Health** granted Dr. Iraklis Pipinos and Dr. Nick Stergiou an R01 grant for five years in the amount of **\$5,649,644**. This is the first major grant to support our work investigating the efficacy of treatment outcomes in peripheral arterial disease. Dr. Stergiou serves as the UNO principal investigator (PI), overseeing all data collections for this project at the UNO site. In another closely related project, Dr. Stergiou serves as a mentor for a three-year pre-doctoral fellowship (F31) awarded to Sara Myers from the **National Institutes of Health** to study the effect of aging and vascular occlusion on gait variability (**\$86,408**, 2009-2012).

The **Nebraska Research Initiative** has provided us with funding including a two-year award of **\$453,863** for the construction of a portable device (Balance-O-Gram) to evaluate sitting posture in infants (2009-2011), a two-year award of **\$538,000** for the construction of a novel wireless mobility monitoring system (2009-2011), and a two-year award of **\$681,057** to study the use of virtual simulators and robotic manipulators for the improvement of robotic surgery educational training (2009-2011). Dr. Stergiou serves as PI for the first Nebraska Research Initiative grant, while he is a co-investigator for the latter two.

Our leading and well-funded project is related with our first lifetime milestone – sitting up. The **National Institute of Disability and Rehabilitation Research** has granted a three-year award of **\$577,182** to investigate interventions of sitting in young children with moderate to severe cerebral palsy (2008-2011). Dr. Stergiou serves as the co-PI working closely with Dr. Reggie Harbourne from the Monroe Meyer Institute at the University of Nebraska Medical Center. He also serves as co-PI for a grant from the **American Physical Therapy Association** exploring the development of early postural interventions of sitting and reaching in preterm infants (**\$30,000**; 2009-2010).

Continuing grants include an award from the **Alzheimer's Association** to study the effect of Wii-Fit on improving gait and balance in Alzheimer's dementia (**\$43,153**; 2009-2011) (PI: Padala), an award from the **UNMC Center for Clinical and Translational Research** (**\$19,835**; 2009-2011) (PI: Rennard) to study chronic obstructive pulmonary disease and an award from the **NASA Nebraska Space Grant and EPSCoR** to study the effect of physiological mechanisms on skeletal muscle strength and performance (**\$33,995**; 2010) (PI: Stergiou).

Lastly, we had the great privilege of procuring the first ever **National Institutes of Health** K99/R00 in the state of Nebraska. Dr. Nick Stergiou serves as the primary mentor on this project with Dr. Leslie Decker as the PI. Dr. Decker was awarded **\$727,502** to investigate the effects of cognitive loading on gait variability in older adults. She hopes to identify mechanisms of fall risk in the aging population.

Nebraska Biomechanics Core Facility



Front Row (left to right): Jeff Kaipust, Ben Bowder, Dr. Sara Myers, Shane Wurdeman, Dr. Dan Blanke, Dr. Nick Stergiou, Elena Kokkoni, Neil Huben, Nate Hunt, Ryan Hasenkamp. **Back Row (left to right):** Bryan Arnold, Heather Henning, Dr. Leslie Decker, Jon Carey, Nate Hamilton, Dr. Fabien Cignetti, Josh Haworth, Austin Korgan, Dr. Mukul Mukherjee, Chun-Kai Huang, Chi Wei Tan, Dr. Srikant Vallabhajosula, Dr. Joseph Siu, Jenna Yentes, Jung Hung Chien.

The NBCF would like to welcome the latest addition to our team, Jeff Kaipust. Jeff started in August as the inaugural NBCF technician and works closely with all NBCF members to expedite our daily operations of the facility. A recent graduate of the Master's in Science program through the University of Nebraska at Omaha, Jeff has worked with Dr. Stergiou for the past five years. He started as an undergraduate volunteer and during his graduate studies worked as the biomechanics teaching assistant as well as a research assistant. Jeff stayed with NBCF to take on this new position and continue working closely with Dr. Stergiou.



Jeff Kaipust, M.S.



Dr. Sara Myers

We would also like to take this opportunity to welcome our newest faculty member. Dr. Sara Myers, a recent graduate of University of Nebraska Medical Center, has joined our faculty at the University of Nebraska at Omaha, School of Health, Physical Education and Recreation. She will continue as the Assistant Director of the Nebraska Biomechanics Core Facility, working closely with Dr. Stergiou. Dr. Myers will teach Undergraduate Biomechanics, Anatomy & Physiology, and various other courses. She plans to continue her research in peripheral arterial disease and gait variability. Dr. Myers is a great asset to the University as well as our facility.

NEW PERSONNEL



Srikant Vallabhajosula came to us from India via Florida. He received his Bachelor's in Mechanical Engineering from Osmania University in India and Master's in Mechanical Engineering from University of Cincinnati. His PhD is from the University of Florida in Applied Physiology and Kinesiology. His PhD research work focused on evaluating the effects of deep brain stimulation on balance and gait in Parkinson's disease. He is currently working on our robotic surgery and staircase related projects.



Chi-Wei Tan came to us from Singapore after working for a year and a half at the Agency for Science and Technology Research. He received his Bachelor's in Mechanical Engineering from the University of Strathclyde in Scotland. He obtained his Master's degree in Bioengineering from the National University of Singapore. He is currently working on staircase related projects.



Chun-Kai (Kai) Huang joined the NBCF in 2010. He received his BS and MS degrees from the Department of Physical Therapy and Graduate Institute of Rehabilitation Science at Chang Gung University in Taiwan. Kai focuses his PhD research work on gait analysis in virtual reality; also, he joins the robotic-assisted surgery research team with Dr. Siu at the Medical Center.



Nate Hunt came to us from the University of Nebraska, Lincoln. Nate received his BS degree in Physics. His degree focused on modeling and numerical methods for physics. His undergraduate research consisted of testing particle detectors for the CERN accelerator and development of an artificial intelligence game playing system. Nate's current research work focuses on modeling variability using mathematical chaos theory.



Jon Carey received his BS degree from Northwest Missouri State University and is currently pursuing an MS degree in Exercise Science. He is a Graduate Teaching Assistant and teaches the lab components of Physiology and Anatomy, and Laboratory Methods in Exercise Science undergraduate courses. His research focuses on elastic loading exercise methods for use in injury prevention and exercise for special populations.



Nate Hamilton joined the NBCF after his first year working on his MS degree. He is originally from Las Vegas, Nevada and came to Nebraska for his undergraduate degree in Exercise Science at Creighton University. His role in the facility involves teaching the undergraduate Biomechanics lab section, assisting Advanced Biomechanics graduate students in their course projects, and assisting undergraduates in Laboratory Methods.

The Nebraska Biomechanics Core Facility is fully equipped with key biomechanical research technologies and can provide services of consultation, data analysis, data collection, and software training to the Nebraska and Western Iowa research community and its partners. We can provide biomechanical support for surgeons, physical therapists, biomedical engineers and other related professionals. We will continue fostering collaborative projects seeking to integrate modern biomechanical techniques with biotechnology related research activities. Our facility promotes the state of Nebraska as a leader in biotechnology and will enhance the economic development of the state via biotechnology-based industrial growth.

Motion Analysis
The Industry Leader for 3D Passive Optical Motion Capture

NDI *Measurement You Can Trust*

AMTI
FORCE AND MOTION

BERTEC

KISTLER
measure. analyze. innovate.

BIODEX

DELAYSYS[®]

NeuroCom[®]
a division of natus



Facilities include: Gait lab, infant sitting lab, virtual reality lab, acoustics lab, robot lab, and Biodex lab.



UNO STEPS UP RESEARCH

On February 7, 2011, the *Omaha World Herald* ran a front page article on the University of Nebraska at Omaha's research programs. Featured in the article was the Nebraska Biomechanics Core Facility. The article can be read on the *Omaha World Herald* website at the following address:
<http://www.omaha.com/article/20110207/NEWS01/702079923>

INTERNSHIP OPPORTUNITIES IN THE NBCF!!!

The following students completed their internship in the NBCF during 2010-2011:

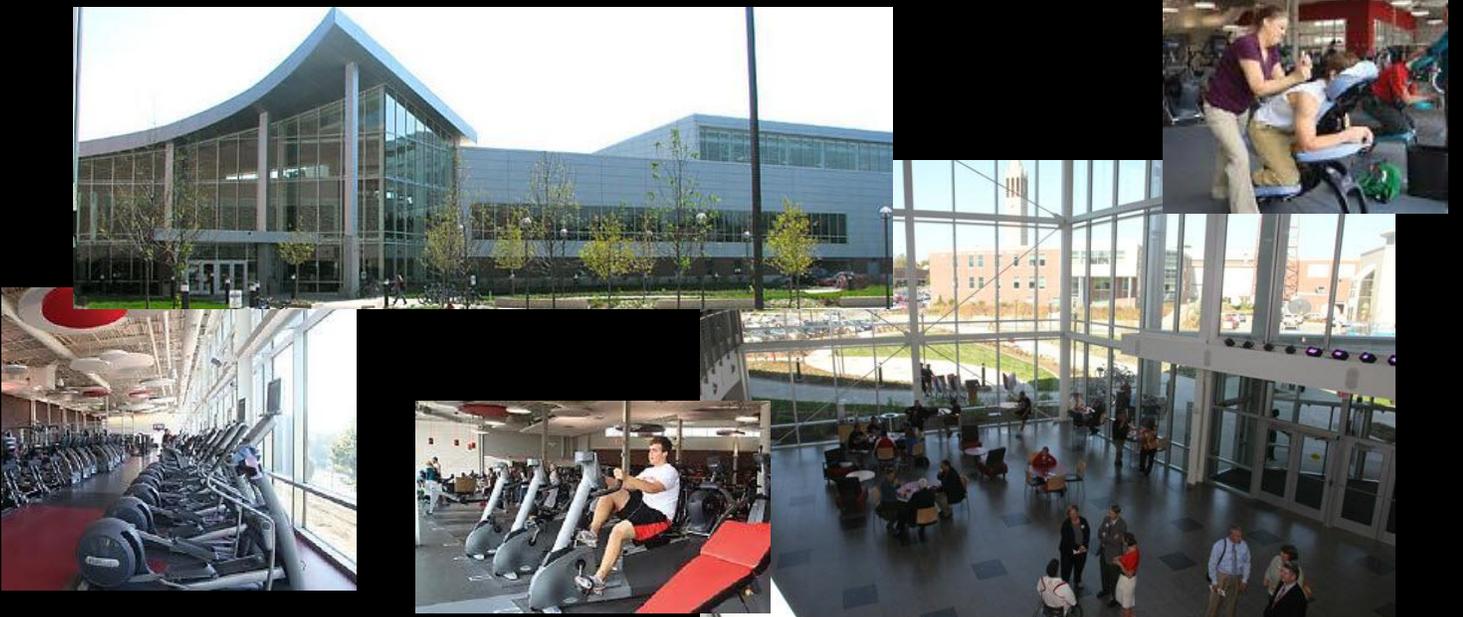
- Krupa Savalia (UNMC; MD/PhD Scholars program); Summer 2010
- David Taylor (UNMC MD/PhD); Summer 2010, Lab rotation
- Jill Westcott (UNMC MD); Summer 2010
- Neil Huben (UNO BS in Biotechnology); Summer 2010
- Chelsea Boettner (Creighton; Exercise Science); Summer 2011



<http://www.unomaha.edu/biomech/also/intern.php>

HPER RENOVATION

The Health, Physical Education and Recreation (HPER) building recently underwent a \$38.6 million renovation. The building is 240,000 square feet and houses the School of HPER and Campus Recreation. New and improved features include a 28-foot climbing wall, dance laboratory, two double gyms, indoor jogging track, golf & archery lab, 22-person spa, MAC court, on-staff massage, a café, outdoor venture center, personal training, swimming pool, spinning room, two 7,500 square foot fitness centers and eight racquetball courts. Uniquely enough, this building also houses the Injury Prevention & Care facility and Student Health Services. Injury Prevention & Care offers free services provided by staff athletic trainers during business hours. Student Health Services features on-staff nurses, physicians and an x-ray machine. This building is also the home of the Nebraska Biomechanics Core Facility, which allows us to use these services for our research.



Dr. Sara Myers is a Nebraska native who grew up in the town of Hampton, population 430. Every member of her 10 person family learned how to work hard while producing crops and livestock on their farm. High school athletics and activities were also a big part of Sara's life as she participated in volleyball, basketball, track, FFA, band, choir, National Honor Society, and student council. One of the most memorable events of her high school career was winning the Class D2 State Volleyball Championship. Athletics were actually a major part of Sara's UNO experience, as she played on the Maverick Women's Basketball Team during her undergraduate years. Sara was always very fascinated with athletic medicine and thus began her undergraduate career in Exercise Science. Sara's work ethic was demonstrated time and time again. If juggling her academic studies with athletics wasn't enough of a challenge, Sara gave birth to her first child and didn't miss a beat. In fact, when Sara gave birth to her second child on a Friday, she was in class the following Tuesday night! This work ethic and perseverance is what we strive for in NBCF and Sara sets an outstanding example for students. Sara became interested in Biomechanics after taking several undergraduate courses with Dr. Stergiou. Sara worked as an undergraduate volunteer, graduate teaching assistant and later as a doctoral research assistant. During her time in the NBCF, Sara has collected data from more subjects than the population of her hometown! Sara was privileged enough to be awarded a fellowship from the National Institutes of Health to fund her dissertation research. She was also the recipient of several other grants. After completing her dissertation, Sara is very excited to begin a full-time position in the School of HPER at UNO. She is especially grateful that she can continue working with Dr. Stergiou and staying in Nebraska will keep her close to family. Her journey from high school until now has been challenging, stimulating, and rewarding. Sara appreciates the opportunity to learn from great educators at UNO who encouraged her to apply and pursue research, scholarships, and grants. She looks forward to working with these and many other individuals in the future, as well as teaching and mentoring the next generation of Exercise Science students at UNO.



Drs. Myers and Stergiou at graduation.

Erin Fosnaugh grew up in Lincoln, Nebraska with dreams of playing college soccer somewhere exciting. For her, this did not include Nebraska. Don Klosterman, head coach at UNO, invited her for a visit. Perhaps it was the familiar mid-western rapport between the players or Coach's concise description of grueling but short 6:30am practices, but one week later she committed. The players on the team were all mid-western girls, and they knew how to work. During the next four years they always finished in the NCAA Division II national top 5 rankings and won the national championship title in 2005. A curiosity of the human body coupled with a drive to "do more" and benefit the greater community lead her to pursue activities for a career of improving the health of others and solving problems. Throughout her four years at UNO, Erin also coached youth clinics, tutored in physics, spent two spring breaks volunteering in New Orleans for Hurricane Katrina relief, and served as president of UNO's Pre-Health Professionals Club. Erin worked as a research assistant in our facility for three years under the mentorship of Dr. Stergiou as well as many other invaluable senior NBCF members and scientists. She helped with several projects and conducted gait analysis, providing shoe prescriptions for runners. She capped off her undergraduate research with two abstracts. This experience propelled her into medical school. The highlight of her Exercise Science major was an



internship at Clinica Esperanza in Roatan, Honduras. She spent nine weeks triaging, filling prescriptions, and examining patients side by side with physicians in the second poorest country in the western hemisphere. The hardest part was leaving. She has recently finished her first year of med school at UNMC and continues to "do more" than study. She is on the SHARING Board (UNMC's student-run clinic) and will spend one month improving her medical Spanish in Nicaragua. The best part of her first year of medical school was treating patients in Jamaica over spring break. Funny, eight years ago she thought staying in Nebraska for college would be so boring!

Erin (2nd from left) and colleagues in Jamaica this spring.



Ryan Hasenkamp was born and raised in the town of Columbus, Nebraska (population 20,000). He is the youngest in a family of four. He grew up in a quality family where he learned a core set of values and ethics. His father is an electrical engineer and his older sister recently graduated with her Master's in civil engineering. Ryan figured that he would follow in their footsteps and pursue engineering. Ryan studied engineering for three years then came to the realization that if he spent the rest of his life as an engineer he could be successful and earn a lot of money, but he would not be happy with his life. So he dropped his major, uncertain about his future. While contemplating what to do, Ryan was given some

advice: follow your passion. Being passionate about sports and physical fitness, Ryan started studying Exercise Science. Ryan was doing so well in his classes, particularly Anatomy and Physiology, which is widely regarded as one of the most difficult classes in Exercise Science, his lab instructor recommended him for a job with NBCF. As Ryan learned more about biomechanics, he became more intrigued and continued working in the facility. He has since earned awards and grant funding. He is set to graduate in December 2011 and plans to continue his education at UNO working as a graduate teaching assistant. Ryan has found his calling working at NBCF and looks forward to continuing to expand his knowledge and experiences in the field of biomechanics.

Ben Bowder is a born and raised Omahan. In high school, Ben was involved in numerous school and community groups. After choosing to continue his education at UNO, Ben looked for opportunities to enhance his college experience. During this process, Ben applied and was accepted to UNO's Honors Program. Acceptance in the Honors Program also yielded him two scholarships, a Regents Scholarship and the Distinguished Scholar. In June of 2010, Ben met with Dr. Stergiou and inquired about available research opportunities. The opportunity to attend weekly journal clubs composed of current research presented by members of the facility, and guest lectures from other professors on campus have been an invaluable experience for him. In the facility his responsibilities lie in data collection, processing data, and managing subject databases. As a result of Ben's experiences on campus and with NBCF, he recently changed majors from Biotechnology to Bioinformatics. After switching majors Ben met the requirements for the Walter Scott Jr. Scholarship and was awarded this prestigious award this spring. Continuing to get more involved in NBCF and on campus, Ben is excited to continue his academic career at UNO, get more involved in virtual reality related studies, and eventually begin his own study at NBCF.



Ben (far right) with Jon Carey, Mr. Bones, Nate Hamilton, and Whitney Korgan.

Bryan (right) teaching one of our undergrad volunteers, Sammy.



Bryan Arnold grew up in Papillion, Nebraska and spent time at the University of Nebraska's campuses at both Lincoln and Omaha. He recently (Spring 2011) graduated from UNO with a major in Neuroscience and minor in Psychology. He recalls that he knew absolutely nothing about biomechanics up until about a year ago. After looking into it more, he thought that pursuing a path in biomechanics would be interesting, but did not think that his background tied into the subject. After meeting with Dr. Stergiou once, he was certain that NBCF was the place he wanted to be and contribute. He learned that others were also interested in pursuing education in Neuroscience, and was assured that not only could his Neuroscience background tie into work in the facility, but would actually be quite beneficial. Bryan found that there was a very wide array of skill sets throughout the NBCF, far beyond strictly biomechanics or exercise science majors. While working in NBCF he has been able to work with some of the most advanced equipment in the world and has been exposed to studies related to pathology. Bryan states that his favorite thing about working in the facility is the relationships he has built with his co-workers. "Not only are these some of the most intelligent people I have met, but they have all been very helpful and a lot of fun to work with." In the future, Bryan would like to pursue a career path in either family medicine or pediatrics. Working in NBCF will serve as a great source of training and research in medicine.

It was before **Shane Wurdeman** began high school that he became fascinated with the science that would dictate his passion and later his education and career choices. During middle school, while sitting at home channel surfing, he came upon a Discovery channel special that featured a man who invented his own prosthetic foot allowing him to run despite having suffered a leg amputation. Shane always had an inquisitive nature and often wanted to learn more about "how things work." He was instantly amazed at the science and mechanics behind such a feat and hence the beginning of his career in prosthetics and biomechanics was born. As a Nebraska native, he chose to stay in Omaha after high school and in 2003 he graduated from Creighton University with a Bachelor of Science degree in physics. After receiving his bachelor's degree, he began working as a technician at a prosthetics clinic. This led Shane to pursue his Master's of Science degree in prosthetics and orthotics from the Georgia Institute of Technology in Atlanta, Georgia. After graduating he found himself in Los Angeles, California, working at the Shriners' Hospital as well as the Veterans' Affairs Medical Center. He began his doctorate studies in biomechanics in 2009. Some of his reasons for choosing the NBCF included the equipment at the facility, but also the ambitious students at all levels of their studies, strong clinical collaborators, and most importantly an advisor, Dr. Stergiou, who is knowledgeable, dedicated, and approaches human movement research with an "out of the box" mentality. All of this has proven invaluable over these past two years. Through this journey, he was fortunate to marry his best friend, Asha, and recently became a proud father to their beautiful daughter, Uma.



Jon testing out the oximeter.



Shane and Dr. Stergiou during a social.

Jon Carey's transition from a 16-year corporate career in the architecture field began when he hired a personal trainer in late 2006 to get in better shape for a martial arts competition. After seeing the difference an educated approach to fitness could have, he made the decision to turn his fitness "interest" into a career. After a short stint with one of the national chain gyms, he started his own personal training business. Two other trainers introduced Jon to competitive power lifting and soon he was spending as much time reading exercise research papers as he was preparing for competitions, digging into the "science" of exercise science. Several Cornhusker State Games gold medals and a couple state records later, Jon can say this experience really led him to understand how much he still needed to learn about human exercise physiology and biomechanics. In January 2009, he decided to further his education and pursue a graduate degree in Exercise Science. Perhaps it was a little naïve, but he thought a Master's degree would involve taking some classes for a couple years and maybe writing a thesis. While at UNO, Jon has had great learning experiences that go far beyond those humble expectations. In January 2010, he had the opportunity to work in the NBCF; subsequently he was offered a Graduate Teaching Assistantship. One of the most unexpected, but most rewarding aspects of Jon's graduate education has been the opportunity to teach several undergraduate courses, including the lab components of Physiology & Anatomy and Laboratory Methods in Exercise Science. Jon also served as a Student Representative on the College of Education's Graduate Studies Committee, and this spring was honored to receive the 2011 Graduate Student Service Award. What started out as a then 46-year old father of two "taking some classes and maybe writing a thesis" has, fortunately, evolved into much more than he could have ever anticipated. A modest goal of being a better personal trainer has led to a wide variety of exercise-related career options. But there's another important message as well. Jon didn't start personal training, powerlifting, martial arts or his graduate degree until he was in his 40's... it is never, never, never too late to start. Just get started... then, don't stop.

Dr. Jessie Huisinga began working in NBCF in August 2005. She had previously worked at a small consulting company on the East coast as an engineer. While working in “the real world”, Jessie felt uninspired by the idea of simply working to help make an independent company successful. Her goal was to have an impact in improving quality of life for healthy and pathological populations. Upon realizing that working in the private sector was not what she wanted, Jessie returned to graduate school. She accepted a graduate assistantship to work at NBCF without having seen the facility. This felt a little crazy because her only experience thus far had been a conversation with Dr. Stergiou where he outlined the mission of the facility and promised that she would work harder than she could ever imagine. Originally from Davenport, Iowa, she had learned a work ethic that she hoped would live up to Dr. Stergiou’s “work harder than she could ever imagine” expectations. And she did! During her first year, she worked as a teaching assistant in addition to performing research. On top of teaching and course load, Jessie (along with Sara Myers) performed upwards of 7 data collections per week, each data collection lasting a minimum of two hours. Upon completion of her Master’s degree, Jessie again approached the job market and though successful in interviewing and receiving job offers, she opted to obtain her PhD. This decision initiated a long string of conversations reassuring her mother that “Yes, someday I will get married and have kids, just not right now.” Due to her diligence, she was extremely successful throughout her years with NBCF. She has published several papers, abstracts and was well funded. Jessie accepted a position as a postdoctoral research fellow working for Dr. Fay Horak at Oregon Health and Science University. This decision began yet another set of conversations reassuring her mother “Yes, this is a real job and no, I won’t live on the West coast forever but now you have a fun place to visit.” Approaching her research with the same work ethic displayed at NBCF, she is continuing her work with multiple sclerosis patients and plans on pursuing job opportunities as an assistant professor after her postdoctoral position ends.



Drs. Blanke, Huisinga, and Stergiou at the December 2010 graduation.

Nate Hunt grew up in Lincoln, Nebraska. Although outsiders may incorrectly think it a pejorative term, Nate was part of the group that was referred to as ‘band nerds’. He played the trumpet in the high school marching band, symphonic band and pep band; as well as piano in the jazz band. Nate also played sports, including basketball and soccer for a couple years and cross country for a year. When he was ten years old, he told someone once that he wanted to be a brain surgeon. At Nebraska Wesleyan, he declared a chemistry and biology major with the goal of eventually attending medical school. However, it just didn’t feel right. He really had no idea what he wanted to do with his life; with no clear goals in sight he found it difficult to apply himself. He continued studying biology at UNL, but in the meantime



Nate (far right) with Neil Huben, Josh Haworth and Shane Wurdeman.

sampled many different areas and became much more attracted to the universal laws of physics. The great physicist Richard Feynman said “Nature uses only the longest threads to weave her patterns, so each small piece of her fabric reveals the organization of the entire tapestry.” This is how Nate wanted to learn about the world. In order to continue to pay tuition, Nate enlisted in the Army. He had been in the Army Reserve for two years when he learned that he would spend the upcoming year in Iraq. There, Nate worked the night-shift in a job with plenty of time to read. In that year he learned about biomechanics, dynamical systems and chaos, cellular

automata, biomedical engineering, prosthetics controlled by cortical brain-machine interfaces, artificial intelligence and neuroscience. When he came home, he completed his degree in Computational Physics and went on a massive search for a graduate program that fit all the areas that he was excited about. While working at a coffee shop on the University of Nebraska Omaha campus, Nate met an avid coffee drinker, Dr. Stergiou. He had been searching the entire country and even internationally for a graduate program that combined the study of human movement, the brain and chaos. Nate can’t believe how lucky he is to have found exactly the program he was looking for in the Exercise Science program, only a couple hundred yards from the coffee shop. In NBCF he has originated his dream research project. On a day-to-day basis he creates mathematical models of walking and chaos, developing music that is imbued with different chaotic properties and using 3D motion capture and nonlinear mathematical analysis to analyze the chaotic patterns in walking. He gets to draw not only on his physics, biology and computer programming background, but also his musical knowledge from his years as a ‘band nerd’.

PERIPHERAL ARTERIAL DISEASE AND GAIT

Peripheral arterial disease (PAD) is a debilitating disease affecting 8-to-12 million people in the United States. The most common characteristic of this disease is the hardening and narrowing of the arteries in the legs. PAD patients develop increased pain in their legs when they walk for more than a block or even up a slight incline. As they walk, their leg muscles need more blood. Since their blood vessels are partially blocked, oxygen doesn't reach their working leg muscles which results in pain. The overall goal is to determine the limitations caused by the disease and also to decide which treatments are best for the PAD patients.



Dr. Pipinos



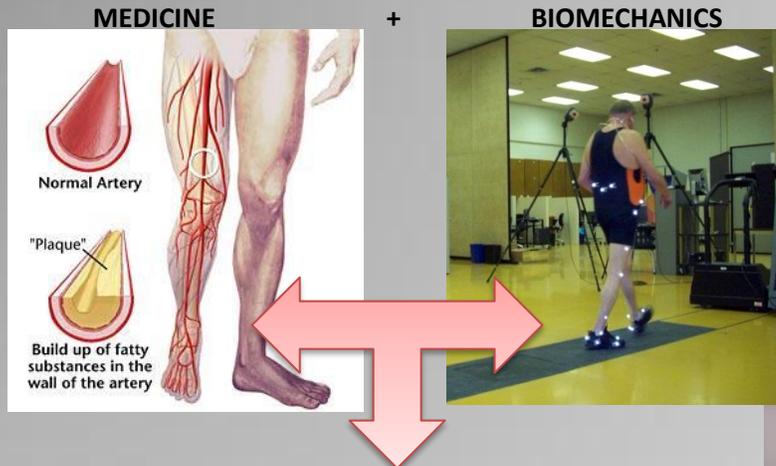
Dr. Johanning



Dr. Lynch



Dr. Longo



Dr. Stergiou



Dr. Myers



Mr. Wurdeman



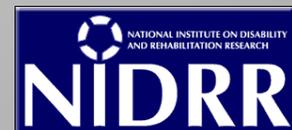
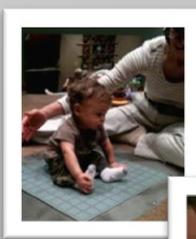
Ms. Yentes

MOTOR DEVELOPMENT STUDIES

Cerebral palsy (CP) is a term used to describe a group of chronic conditions affecting body movements and muscle coordination. It affects 2 to 3 children per 1,000 live births and is caused by damage to one or more specific areas of the brain, usually occurring during fetal development, childbirth or infancy. It also can occur before, during or shortly following birth. Children with CP may not be able to walk, talk, eat or play in the same ways most other children do. So far, there is no known cure for CP, thus medical interventions are limited to the treatment and prevention of complications arising from CP's effects. However, because infants with symptoms of CP are not always diagnosed in the early months after birth, caregivers often miss the opportunity of early intervention services. Early intervention protocols are crucial for a child's motor development because the nervous system is very pliable in infancy and can be "re-shaped" based on the treatment. The goal of this project is to develop and evaluate innovative rehabilitation interventions in order to improve movement deficits related to sitting balance present in CP children. In addition, we have begun a series of protocols investigating the link between perception and action in children with autism spectrum disorder. Autism is a developmental disorder that appears in the first 3 years of life, and affects the brain's normal development of social and communication skills. The exact number of children with autism is not known. A report released by the U.S. Centers for Disease Control and Prevention suggests that autism and related disorders are more common than previously thought. It is unclear whether this is due to an increasing rate of the illness or an increased ability to diagnose the illness.



Drs. Harbourne and Dusing



Drs. Stergiou and Cignetti



Mr. Haworth



Ms. Kokkoni

VIRTUAL REALITY

As costs continue to decline and system usability improves, innovative virtual reality (VR) approaches have emerged that demonstrate value for scientific understanding and treatment of difficult clinical conditions. The rationale behind these applications is that a VR system will allow the patient to walk in an environment that can be more pleasant than a hospital room, where the therapist can also incorporate additional challenges to be tried in a user-friendly and safer situation. However, research has not kept pace with the engineering. Thus, the scientific support for the application of these systems is limited. The goal of this project is to lay the foundation for the proper utilization of advanced biotechnologies, such as virtual reality environment, for studying gait related disabilities.



Drs. Siu and Mukherjee Mr. Chien Mr. Huang



ROBOTIC SURGERY

Robot-assisted surgery is a form of minimally invasive surgery performed by a surgeon who controls a medical robot like the daVinci™. With the advancement of medical developments and new technology, it is now more challenging to learn surgical techniques, requiring more experience and practice to master them. This led us to consider alternative training environments outside the operating room. Virtual simulation has been increasingly implemented in medical education. Training in virtual simulation provides a risk-free and low-cost environment for surgical trainees to learn robotic surgery. The goal of this project is to implement an effective, quantifiable and cost-efficient training environment for surgical trainees. The implementation of a training program using simulation will provide trainees an optimal opportunity to learn robot-assisted techniques independently and effectively.



Drs. Siu and Vallabhajosula Mr. Chien Mr. Huang

OTHER GAIT RELATED PROJECTS

Multiple sclerosis: To develop and evaluate innovative rehabilitation interventions in order to slow disease progression and improve movement deficits, related to both balance and walking, present in MS patients.

Gait and cognition: To develop screening tools for early identification of future fall risk in the elderly and to evaluate new therapeutic interventions that would counteract the underlying pathological process.

Chronic obstructive pulmonary disease: To determine the presence of abnormal walking patterns in patients with chronic obstructive pulmonary disease.

Stair negotiation: To determine the effect of aging and the cognitive demand of stair negotiation.

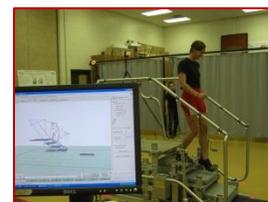
Gait and music: To determine the effect of different types of music on gait patterns in young and older adults.



Dr. Decker Mr. Wurdeman Ms. Yentes Mr. Hunt



Dr. Vallabhajosula Mr. Tan



American Alliance for Health, Physical Education, Recreation and Dance



ROBOTIC REHABILITATION IN STROKE PATIENTS

In the NBCF, a strong collaborative team lead by Dr. Mukherjee is performing several research studies looking at the usefulness of robots for stroke rehabilitation. Dr. Mukherjee is working closely with Dr. Nick Stergiou and collaborating with Dr. Pierre Fayad, the chairman and Dr. Tony Wilson, Assistant Professor and magnetoencephalography (MEG) scientist in the Department of Neurological Sciences at the University of Nebraska Medical Center. We initiated these studies with a fellowship from the **American Heart Association** and are continuing them with support from the **Nebraska Research Initiative**. Several extramural proposals are under review at the National Institute of Neurological Disorders and Stroke/National Institute of Health.



Dr. Fayad, M.D.



Dr. Wilson, Ph.D.

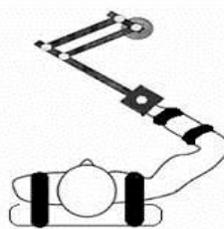
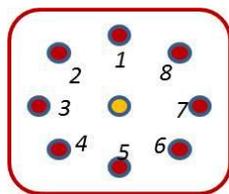


Dr. Mukherjee, Ph.D.



The figure below shows schematics, displays and the rehabilitation robot used in the following study: "The Effect of Augmented Sensory Feedback in Motor Learning of Upper Limb Movements in Chronic Stroke Survivors." The goal of the project was to determine whether training with visual feedback enhances the learning process of a new environment in chronic stroke survivors and to apply this training to examine the effect on accuracy during reaching movements. Results from this study will demonstrate the effectiveness of our techniques to improve motor learning in stroke survivors. Ongoing studies are investigating the mechanisms of these changes through innovative brain imaging technologies that will bring to light how the brain is affected. These

experiments will further the understanding of neural control of abnormal movements in stroke subjects and will provide a new direction to stroke rehabilitation.



From left to right: A grid of 8 targets for center-out reaching movements, schematic view from the top, top view of a subject holding the manipulandum.



Department of Surgery

Iraklis Pipinos, MD, PhD – Vascular Surgery
 Jason Johanning, MD – Vascular Surgery
 Thomas Lynch, MD – Vascular Surgery
 Dmitry Oleynikov, MD – General Surgery
 Matthew Longo, MD – Vascular Surgery

Department of Internal Medicine

Jane Potter, MD – Geriatrics
 Brenda Keller, MD – Geriatrics
 Kalpana Padala, MD – Geriatrics
 Steven Rennard, MD – Internal Medicine

Department of Neurological Sciences

Pierre Fayad, MD – Neurology
 Tony Wilson, PhD – Experimental Neurology

College of Nursing

Mary Filipi, PhD – Adult Health and Illness

College of Public Health

Kendra Schmid, PhD – Biostatistics

STATE COLLABORATIONS



College of Education

Jennifer Huberty, PhD – Health Promotion
 Melanie McGrath, PhD, ATC – Athletic Training

Amy Teten, PhD – Special Education

College of Arts & Sciences

Jeffrey French, PhD – Psychobiology
 Lisa Kelly-Vance, PhD – Psychology
 Brigette Ryalls, PhD – Cognitive Psych.
 Jonathon Santo, PhD – Psychology
 Dora Matache, PhD – Mathematics
 Jack Heidel, PhD – Mathematics

College of Information Science & Tech.

Hesham Ali, PhD – Computer Science
 Jon Youn, PhD – Computer Science
 Raj Dasgupta, PhD – Computer Science
 Bastola Dhundy, PhD – Computer Science



Song Ci, PhD – Computer Engineering
 Hamid Sharif, PhD – Computer Engineering
 Shane Farritor, PhD – Mechanical Engineering



Joseph Threlkeld, PT, PhD – Physical Therapy
 Terry Grindstaff, PT, PhD, ATC, SCS, CSCS – Physical Therapy



Judith Burnfield, PhD, PT – Physical Therapy



Michael Gorga, PhD – Human Sensory Physiology
 Nick Smith, PhD – Perceptual Development

MUNROE-MEYER INSTITUTE

Wayne Stuber, PT, PhD, PCS – Physical Therapy
 Regina Harbourne, PT, PhD, PCS – Physical Therapy
 Sandy Willett, PT, MS, PCS – Physical Therapy

Shelley Smith, PhD, FABMG – Molecular Genetics
 Wayne Fisher, PhD – Center for Autism Disorders
 Max Kurz, PhD – Biomechanics



IOANNINA MEDICAL CENTER – GREECE

Over the past decade, the NBCF has established a successful collaboration with the Orthopedic Sports Medicine Center of Ioannina (OSMCI). The OSMCI is a contemporary research laboratory that belongs to the Orthopedic Surgery Department of the University of Ioannina. Anastasios D. Georgoulis, Professor of Orthopedic Surgery, is the founder and director of the OSMCI. The experience of the personnel from OSMCI ranges from medical students and residents, to physical therapists, exercise physiologists and biomechanists. For more information, please visit:



Dr. Georgoulis

<http://www.osmci.gr/en/home>

We have several ongoing experiments to identify the best way to reconstruct the anterior cruciate ligament (ACL). Dr. Stergou is currently the Scientific Consultant of OSMCI who designs almost all ongoing experiments at this laboratory. He also helps with the organization and structure of OSMCI. He visits Ioannina at least two times a year to ensure that all projects progress smoothly.



Kostas Patras monitoring a data collection at OSMCI

NATIONAL COLLABORATORS

UNIVERSITY OF MICHIGAN

Beverly Ulrich, PhD – Professor in Movement Sciences and Director of the Developmental Neuromotor Control Lab
 Research interests: Infants, Down syndrome, Parkinson’s disease
 Daniel Ferris, PhD – Associate Dean of Research and Associate Professor, School of Kinesiology
 Research interests: Neuromechanics

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

Kevin Guskiewicz, PhD, ATC – Professor and Department Chair of Exercise and Sport Science
 Research interests: Sport-related Injuries
 Darin Padua, PhD, ATC – Associate Professor and Director of the Sport Medicine Research Laboratory
 Research interests: Sport-related Concussion, ACL Injury

UNIVERSITY OF DELAWARE

Cole Galloway, PhD – Associate Professor in Physical Therapy
 Research interests: Motor Behavior, Infant Development

UNIVERSITY OF NEW ENGLAND

Jim Cavanaugh, PT, PhD – Assistant Professor in Physical Therapy
 Research interests: Ambulatory Activity, Parkinson’s disease

UNIVERSITY OF MARYLAND

John Jeka, PhD – Professor in Kinesiology
 Research interests: Motor Control, Sensorimotor Integration

VIRGINIA COMMONWEALTH UNIVERSITY

Stacey Dusing, PhD, PT – Assistant Professor in Physical Therapy
 Research interests: Preterm Infants, Pediatric Physical Therapy

UNIVERSITY OF TENNESSEE, KNOXVILLE

Daniela Corbetta, PhD – Associate Professor in Motor Development
 Research interests: Perceptual & Motor Development

UNIVERSITY OF NEVADA, LAS VEGAS

Janet Dufek, PhD – Associate Professor
 Research interests: Gait and Gait Adaptations in Special Populations, Variability in Human Movement
 John Mercer, PhD – Associate Professor
 Research interests: Aqua Locomotion, Forensic Biomechanics

UNIVERSITY OF KANSAS MEDICAL CENTER

Randolph Nudo, PhD - Director of the Landon Center on Aging
 Research interests: Stroke, Neural Mechanisms

UNIVERSITY OF WASHINGTON

Sally Westcott McCoy, PhD – Associate Professor in Department of Rehabilitation Medicine
 Research interests: Physical Therapy

REHABILITATION INSTITUTE OF CHICAGO

T. George Hornby, PhD, PT – Research Scientist and Physical Therapist, Sensory Motor Performance Program and Research Assistant Professor, Feinberg School of Medicine
 Research interests: Gait Retraining

INTERNATIONAL COLLABORATORS

UNIVERSITY OF TECHNOLOGY SYDNEY, AUSTRALIA

Aron Murphy, PhD – Associate Professor, Center for Health Technologies
 Research interests: Performance Injuries, Training Adaptations

VICTORIA UNIVERSITY, MELBOURNE AUSTRALIA

Kevin Ball, PhD – Lecturer, School of Sport and Exercise Science
 Research interests: Sports Biomechanics
 Simon Taylor, PhD – Biomechanics Lecturer
 Research interests: Lower limb coordination during gait

IOANNINA MEDICAL CENTER, GREECE

Anastasios Georgoulis, MD – Professor of Orthopedic Surgery
 Research interests: ACL Reconstruction

ARISTOTLE UNIVERSITY, THESSALONIKI GREECE

Georgios Tzetzis, PhD – Associate Professor Department of Physical Education and Sports Science
 Research interests: Feedback Models in Team Sports
 Vassilia Hatzitaki, PhD – Assistant Professor Department of Physical Education and Sports Science
 Research interests: Motor Control



Ms. Pat Jung and the College of Education Cabinet	April 2010
Dr. Tibor Hortobagyi, East Carolina University	April 2010
MARS Middle School students	May, December 2010
Dr. Mary Filipi and RN students	July 2010
PhD external reviewers	August 2010
Mary Our Queen Middle School students	October 2010
UNMC Nursing students	November 2010
Lego Masters (home school students)	November 2010
Omaha High School Athletic Training Day	December 2010
Westside High School students	December 2010
Omaha World Herald	December 2010
Mr. Tom Barker, CEO West Wireless	December 2010
Millard Public Schools physical education teachers	March 2011
West Wireless	March 2011
Council Bluffs Public Schools physical education teachers	April 2011
University of Nebraska Foundation employees	May 2011
Daniel J. Gross Catholic High School Engineering Team	May 2011
PhD external reviewers	May 2011

SOCIAL EVENTS



Left: Divya and Srikant at the fall party; Middle: Jon, Nate, Austin, JC and Joseph during a social; Right: Nick with students in San Diego

NBCF members and visitors always enjoy intellectual discussions, interaction and food!!!



Nate's favorite: pot luck day!



Above: Nick at the grill
Left: Heather and Nick at the summer party



That's why we love Nick! Wii Bowling parties on the VR screens



Top: Elena and Nick at graduation; Second: Nick playing charades; Third: Neil, Jenna and Srikant in DC; Bottom: Nate, Jenna and Elena in San Diego



Guess which baby picture goes with each NBCF member



Above: Josh, Nick, Mr. Bones and Jeff
Left: Jeff doing his best "Titanic" on the stairs



Dr. Stephanie Studenski

Professor, Geriatric Medicine at the University of Pittsburgh School of Medicine, and Director of the Claude D. Pepper Older Americans Independence Center at the University of Pittsburgh
Presented: Mobility and aging: Progress and new directions



Dr. Iraklis Pipinos

Associate Professor, Department of Surgery, University of Nebraska Medical Center
Attending Surgeon, VA Nebraska – Western Iowa Health Care System
Presented: Myopathy of peripheral arterial disease



Dr. Yuki Tochigi

Research Associate Professor in the Department of Orthopedics and Rehabilitation at the University of Iowa
Presented: Measurement of leg motion complexity for quantification of gait function



Dr. Michael Cortese

Associate Professor, Department of Psychology, University of Nebraska at Omaha
Presented: Examining theories of word processing via reading aloud and lexical decision



Dr. Aron Murphy

Associate Professor, University of Technology Sydney, Australia
Presented: Research Overview



Dr. Dora Matache

Associate Professor, Department of Mathematics, University of Nebraska at Omaha
Presented: Boolean networks and chaos



Dr. Frank Buczek

Chief, Engineering and Control Technology Branch Health Effects Laboratory Division, NIOSH
Presented: Translating clinical biomechanics to occupational outcomes



Dr. Daniel Corcos

Director, Motor Control and Learning Program in the School of Kinesiology and Professor of Movement Sciences, Neurology, Physical Therapy, and Bioengineering, University of Illinois Chicago
Presented: Exercise interventions for Parkinson's disease



Dr. Thomas Stoffregen

Professor & Director, Affordance Perception-Action Laboratory, University of Minnesota
Presented: Postural variability and visual performance

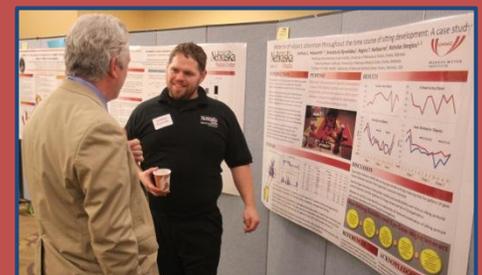


BIOMECHANICS RULES!!!

At the Fall NBCF party, to the delight of every member of the facility, Dr. Stergiou gave everyone a t-shirt. All at once, every member opened a wrapped package to find inside a t-shirt reading "Biomechanics Rules!!!" These t-shirts have been worn proudly by the members of the facility. They have even traveled the world!



1. Anastasia Kyvelidou, MS: 2nd place Graduate Poster Research Presentation, UNO 2nd Annual Student Research and Creative Activity Fair, 2010.
2. Anastasia Kyvelidou, MS: Graduate Studies Research Fellowship from UNMC, 2010.
3. Austin Korgan: UNO Committee on Research and Creative Activity, 2010-2011.
4. Ben Bowder: Walter Scott Jr. Scholarship, 2012-2015.
5. Ben Bowder: Isaacson Distinguished Scholar Scholarship, 2011.
6. Ben Bowder: Regents Scholarship UNO, 2011-2015.
7. Chun-Kai Huang, MS: Best Graduate Poster Research Presentation, UNO 3rd Annual Student Research and Creative Activity Fair, 2011.
8. Dimitrios Katsavelis, MS: Graduate Studies Research Fellowship from UNMC, 2010.
9. Heather Henning: UNO Committee on Research and Creative Activity, 2010-2011.
10. Jennifer Yentes, MS: NASA Nebraska Travel Award for JEGM, 2010.
11. Jennifer Yentes, MS: Student Travel Scholarship to the JEGM combined meeting, 2010.
12. Jennifer Yentes, MS: American Society of Biomechanics Graduate Student Grant-in-Aid, 2010.
13. Jennifer Yentes, MS: NASA Nebraska Space Grant & EPSCOR Fellowship, 2010-2011.
14. Jennifer Yentes, MS: NASA Nebraska Travel Award to Neuroscience, 2010.
15. Jennifer Yentes, MS: American Alliance for Health, Physical Education, Recreation and Dance, Graduate Student Research Grant, 2011-2012.
16. Jennifer Yentes, MS: UNMC Graduate Studies Fellowship, 2011-2012.
17. Jennifer Yentes, MS: UNMC Regents Tuition Fellowship, 2011-2012.
18. Jennifer Yentes, MS: Student Travel Scholarship to the GCMAS 2011 Meeting, 2011.
19. Jennifer Yentes, MS: Student Travel Scholarship to the ATS International Conference, 2011.
20. Jennifer Yentes, MS: Best Graduate Oral Research Presentation, UNO 3rd Annual Student Research and Creative Activity Fair, 2011.
21. Jennifer Yentes, MS: NASA Nebraska Travel Award for ATS 2011, 2011.
22. Jessie Huisinga, MS: UNO Research and Creative Activity, 1st place Graduate Poster Presentation, 2010.
23. Jessie Huisinga, MS: NASA travel award, 2010.
24. Jessie Huisinga, MS: UNO College of Education Travel Grant and NASA travel award, 2010.
25. Joshua Haworth, MS: American Society of Biomechanics Graduate Student Grant in Aid, 2010.
26. Joshua Haworth, MS: Autism Speaks Weatherstone Pre-doctoral Fellowship, 2010-2013.
27. Jon Carey, BS: School of Health, Physical Education, and Recreation 2011 Graduate Student Service Award, 2011.
28. Jon Carey, BS: NASA Nebraska Space Grant & EPSCOR Fellowship, 2010-2011,
29. Jon Carey, BS: UNO Committee on Research and Creative Activity, 2010-2011, (2x).
30. Krupa Savalia, BS: NASA Nebraska Space Grant & EPSCOR Fellowship, 2010-2011.
31. Nate Hunt, BS: NASA Nebraska Space Grant & EPSCOR Fellowship, 2010-2011.
32. Neil Huben: Fulbright Scholar, U.S. Student Fulbright Program, Institute of International Education. Aristotle University of Thessaloniki, Greece. 2011-2012.
33. Neil Huben: College of Education Excellence Fund Travel Grant, 2011.
34. Neil Huben: Gait and Clinical Movement Analysis Society Student Travel Scholarship, 2011.
35. Neil Huben: 2010-2011 University Committee on Research Grant Recipient Award (2x), 2011.
36. Neil Huben: NASA Nebraska Space Grant Travel Grant, 2011.
37. Neil Huben: College of Arts and Sciences Excellence Fund Travel Grant, UNO Spring 2011.
38. Neil Huben: OAK Foundation & E.A. Morris Charitable Trust, Omicron Delta Kappa National Leadership Honor Society, 2011.
39. Neil Huben: UCRCA Student Award for Travel (2x), 2010.
40. Neil Huben: NASA Nebraska Space Grant & EPSCOR Fellowship, 2010-2011.
41. Neil Huben: Great Plains Honors Council 2010 Dennis Boe Award. Awarded for "outstanding scholarly paper of research", 2010.
42. Neil Huben: 2010 2nd Annual UNO Student Research & Creativity Fair Undergraduate Oral Presentation First Place, 2010.
43. Neil Huben: NASA Nebraska Travel Award for JEGM 2010, 2010.
44. Neil Huben: 2010 Academy of Sciences Research Grant, 2010.
45. Neil Huben: 2010 UNO College of Arts and Sciences Excellence Fund Travel Grant, 2010.
46. Neil Huben: 2010 UNO College of Education Excellence Fund Grant, 2010.
47. Ryan Hasenkamp: UNO Committee on Research and Creative Activity, 2010-2011.
48. Ryan Hasenkamp: School of Health, Physical Education, and Recreation 2011 Undergraduate Student Service Award, 2011.
49. Ryan Hasenkamp: Helen B. Hewitt Scholarship, School of Health, Physical Education and Recreation, 2011.
50. Shane Wurdeman: UNMC College of Public Health Research Consortium 2010, Best Poster Presentation, 2010.



Neil Huben, a native Omahan and a spring 2011 graduate from UNO, has worked for three years as an undergraduate researcher at the NBCF. During this time, he received NASA Nebraska Space Grant and EPSCoR Fellowships and has worked as a UNMC Undergraduate Research Fellow with NBCF collaborator Dr. Jason Johanning. All of his work has paid off, for the 2011-2012 academic year, Huben has been awarded a Fulbright Scholar grant to conduct research with Dr. Vassilia Hatzitaki and the Motor Control and Learning Laboratory at Aristotle University of Thessaloniki, Greece. Neil is the first student from UNO to ever receive the Fulbright Scholar grant! In receiving the Fulbright, Neil attributed several UNO professors, specifically NBCF's Nicholas Stergiou, Jason Johanning, and Sara Myers. "Receiving the Fulbright is a great honor," said Neil. "This award is the result of NBCF professors investing much time into my academic and research growth, encouraging and inspiring me to pursue my dreams."



Neil (far left) with Dr. Stergiou and Austin Korgan

One of our doctoral students, Joshua Haworth, has recently been awarded a fellowship by the national organization Autism Speaks. This places Joshua in a cohort of eight other fellows nationally selected to conduct dissertation level research specifically directed at discovering causal mechanisms, novel diagnostic tools, and effective therapeutic strategies for those with ASD (Autism Spectrum Disorder). "As stewards of this generous gift to Autism Speaks, we believe the Weatherstone Fellows program not only jumpstarts careers of promising scientists, but leverages our investment by creating collaborations with both the leading autism researchers of today and within the community of these Weatherstone fellows." Mr. Haworth has become surrounded by an outstanding, multi-disciplinary mentorship team. He has also been awarded the Graduate Student Grant-in-Aid from the American Society of Biomechanics.



Jenna Yentes received the American Alliance for Health, Physical Education, Recreation and Dance Graduate Research Grant for her project investigating gait abnormalities in chronic obstructive pulmonary disease. She will present her findings at the conference next March. Jenna was also awarded the Graduate Student Grant-in-Aid from the American Society of Biomechanics.



Five members of the NBCF have been funded from NASA to complete clinical-related projects. Congratulations to Jon Carey, Nate Hunt, Neil Huben, Krupa Savalia and Jenna Yentes!

<http://ne.spacegrant.org/index.php?page=about>



Jon Carey, a graduate teaching assistant, and Ryan Hasenkamp, an undergraduate research assistant in the NBCF were awarded with HPER Service Awards for the 2010-2011 school year. These awards are presented to an undergraduate and graduate student who has demonstrated a high level of personal service to the program.



In April 2011, Jeff Kaipust, MS, the Nebraska Biomechanics Core Facility technician, was awarded the School of Health, Physical Education and Recreation teaching award. Jeff has been teaching part time within the School for the past four years. Jeff started as the teaching assistant for Biomechanics, teaching the laboratory section. He progressed to teaching other courses, such as Laboratory Methods.

ARTICLES – REFEREED JOURNALS

- Cignetti, F., Kyvelidou, A., Harbourne, R.T., Stergiou, N. (2010) Anterior-posterior and medial-lateral control of sway in infants during sitting acquisition does not become adult-like. *Gait Posture*. Jan;33(1):88-92
- Decker, L.M., Cignetti, F., Stergiou, N. (2010) Complexity and Human Gait. *Revista Andaluza de Medicina del Deporte*. 3(1):3-13
- Decker, L.M., Moraiti, C., Stergiou, N., Georgoulis, A.D. (2011) New insights into anterior cruciate ligament deficiency and reconstruction through the assessment of knee kinematic variability in terms of nonlinear dynamics. *Knee Surg Sports Traumatol Arthrosc*. Mar 29; [Epub ahead of print]
- Deffeyes, J.E., Harbourne, R.T., Stuber, W.A., Stergiou, N. (2011) Sensory information utilization and time delays characterize motor developmental pathology in infant sitting postural control. *Motor Control*. Apr; 15(2): 302-17
- Giotis, D., Tsiaras, V., Ristanis, S., Zampeli, F., Mitsionis, G., Stergiou, N., Georgoulis, A.D. (2011) Knee braces can decrease tibial rotation during pivoting that occurs in high demanding activities. *Knee Surg Sports Traumatol Arthrosc*. Mar 3; [Epub ahead of print]
- Harbourne, R.T., Willett, S., Kyvelidou, A., Deffeyes, J., Stergiou, N. (2010) A comparison of interventions for children with cerebral palsy to improve sitting postural control: a clinical trial. *Phys Ther*. Dec;90(12):1881-98
- Huisinga, J.M., Pipinos, I.I., Stergiou, N, Johanning, J.M. (2010) Treatment with pharmacological agents in peripheral arterial disease patients does not result in biomechanical gait changes. *J Appl Biomech*. Aug;26(3): 341-348
- Huisinga, J.M., Pipinos, I.I., Stergiou, N, Johanning, J.M. (2010) The effect of pharmacological treatment on gait biomechanics in peripheral arterial disease patients. *J Neuroeng Rehabil*. Jun 7;7:25
- Katsavelis, D., Mukherjee, M., Decker, L., Stergiou, N. (2010) Variability of lower extremity joint kinematics during backward walking in a virtual environment. *Nonlinear Dynamics Psychol Life Sci*. Apr;14(2):165-78
- Katsavelis, D., Mukherjee, M., Decker, L., Stergiou, N. (2010) The effect of virtual reality on gait variability. *Nonlinear Dynamics Psychol Life Sci*. Jul;14(3):239-56
- Koutakis, P., Johanning, J.M., Haynatzki, G.R., Myers, S.A., Stergiou, N., Longo, G.M., Pipinos, I.I. (2010) Abnormal joint powers before and after the onset of claudication symptoms. *J Vasc Surg*. Aug;52(2):340-7
- Kurz, M., Markopoulou, K., Stergiou, N. (2010). Attractor divergence as a metric for assessing walking balance. *Nonlinear Dynamics Psychol Life Sci*. Apr;14(2):151-64
- Kyvelidou, A., Harbourne, R.T., Shostrom, V.K., Stergiou, N. (2010) Reliability of center of pressure measures for assessing the development of sitting postural control in infants with or at risk of cerebral palsy. *Arch Phys Med Rehabil*. Oct;91(10):1593-601
- Kyvelidou, A., Harbourne, R.T., Stergiou, N. (2010) Severity and characteristics of developmental delay can be assessed using variability measures of sitting posture. *Pediatr Phys Ther*. Fall;22(3):259-66
- Luo HY, Ci S, Wu DL, Stergiou N, Siu KC. (2010) A Remote Markerless Real-time Human Gait Monitoring for e-Healthcare Based on Content-aware Wireless Multimedia Communications. *IEEE Wireless Communications*. 17(1): 44-50
- Moraiti, C.O., Stergiou, N., Vasiliadis, H.S., Motsis, E., Georgoulis, A. (2010) Anterior cruciate ligament reconstruction results in alterations in gait variability. *Gait Posture*. Jun;32(2): 169-75
- Morley, J.B., Decker, L.M., Stergiou, N., Dierks, T., Blanke, D., French, J.A (2010) Effects of varying amounts of pronation on the mediolateral ground reaction forces during barefoot versus shod running. *J Appl Biomech*. May;26(2):205-14
- Mukherjee, M., Siu, K.C., Katsavelis, D., Fayad, P., Stergiou, N. (2011) The influence of visual perception of self-motion on locomotor adaptation to unilateral limb loading. *J Motor Behav*; 43:101-11
- Myers, S.A., Pipinos, I.I., Johanning, J.M., Stergiou, N. (2011) Gait variability of patients with intermittent claudication is similar before and after the onset of claudication pain. *Clin Biomech*. March; [Epub ahead of print]
- Myers, S.A., Stergiou, N., Pipinos, I.I., Johanning, J.M. (2010) Gait variability patterns are altered in healthy young individuals during the acute reperfusion phase of ischemia-reperfusion. *J Surg Res*. Nov;164(1):6-12
- Patras, K., Ziogas, G., Ristanis, S., Tsepis, E., Stergiou, N., Georgoulis, A.D. (2010) ACL reconstructed patients with a BPTB graft present an impaired vastus lateralis neuromuscular response during high intensity running. *J Sci Med Sport*. Nov;13(6): 573-7
- Siu, K.C., Suh, I.H., Mukherjee, M., Oleynikov, D., Stergiou, N. (2010) The effect of music on robot-assisted laparoscopic surgery. *Surg Innov*. Dec;17(4): 306-11
- Smith, B.A., Stergiou, N., Ulrich, B.D. (2010) Lyapunov exponent and surrogation analysis of patterns of variability: profiles in new walkers with and without Down syndrome. *Motor Control*. 14(1):126-42
- Yentes, J.M., Sayles, H., Meza, J., Mannino, D.M., Rennard, S.I., Stergiou, N. (2011) Gait abnormalities are related to COPD: An investigation of the NHANES III dataset. *Respir Med*. Jan;105(1): 80-87
- Zampeli, F., Moraiti, C.O., Xergia, S., Tsiaras, V.A., Stergiou, N., Georgoulis, A.D. (2010) Stride-to-stride variability is altered during backward walking in anterior cruciate ligament deficient patients. *Clin Biomech*. Dec;25(10): 1037-41

KEYNOTE SPEAKER

1. Siu KC. Nebraska Robotics Expo 2011. *The Use of Simulation in Robotic Surgical Training*. Ashland, Nebraska. February 19, 2011.
2. Stergiou N. APTA Combined Sections Meeting, *Nonlinear Dynamics in Physical Therapy Intervention: How does the new concept of Complexity relate to Clinical Practice?* San Diego, California. February 19, 2010.
3. Stergiou N. New Challenges in Research Administration, *Teamwork + Trust = Success: Faculty and Sponsored Programs Working Together*. Omaha, Nebraska. April 25, 2010.
4. Stergiou N. North American Society for the Psychology of Sport and Physical Activity, *Nonlinear Dynamics in Motor Development*. Tucson, Arizona. June 12, 2010.
5. Stergiou N. American Society of Biomechanics, *Grant Writing for the NIH*. Providence, Rhode Island. August 18, 2010.
6. Yentes JM. 2011 Nebraska Summit on Entrepreneurship. *Innovative research fuels future advances in health care*. Omaha, Nebraska. February 25, 2011.

Trip to Australia

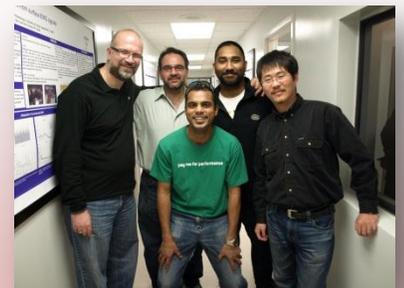
Dr. Nick Stergiou represented NBCF at the *University of Technology of Sydney, Australian Institute of Sport at Canberra* and *Victorian Institute of Sport at Melbourne, Australia* during February 2011. He taught a three-day and a one-day workshop on nonlinear analysis.



From left to right: Dr. Aron Murphy, Kylie Johnson and Dr. Stergiou

Trip to Florida

Dr. Nick Stergiou represented NBCF while visiting the University of Florida in December 2010. He was invited by Dr. Christou to tour the facilities and establish collaboration.



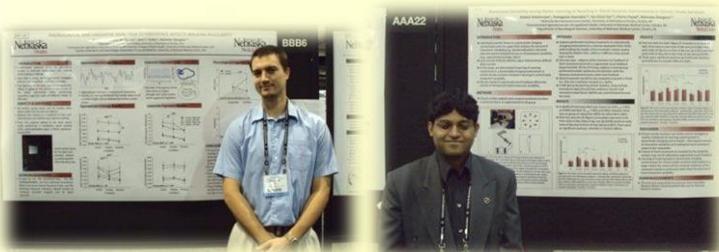
Drs. Stergiou and Christou with several of Dr. Christou's students

Academic Generations

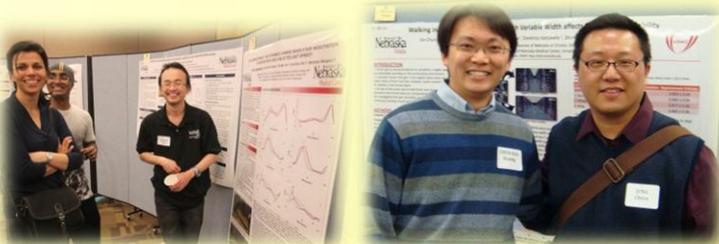
While on his trip to Australia, Dr. Stergiou happened upon not just one, but two academic siblings! During his PhD years, Dr. Stergiou was mentored by Drs. Barry Bates and Jody Jensen. Dr. Stergiou's dissertation was an extension of Dr. Bruce Mason's dissertation work. Dr. Bruce Mason was one of Dr. Bates first PhD students and Dr. Stergiou was one of his last. While at the Australian Institute of Sport, Dr. Mason and Dr. Stergiou met for the very first time! In addition, Dr. Stergiou met Dr. Nick Brown. Dr. Brown had studied under Dr. Jensen in Texas. Amazing how the family tree branches!



Top Left: Dr. Stergiou and Dr. Mason at the Australian Institute of Sport swimming facilities
Bottom Left: Dr. Stergiou with Dr. Bates in Las Vegas
Above: Dr. Stergiou and Dr. Brown at the Australian Institute of Sport



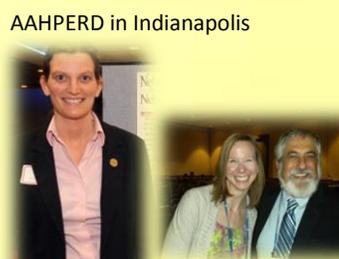
Neuroscience Conference in San Diego



UCRCA Conference in Omaha



GCMAS Conference in Washington DC



ATS 2011 in Denver

For more than 25 years, the revolutionary work of the Nebraska Biomechanics Core Facility (NBCF) at UNO has led to a new understanding of human movement; such as how people stand, walk and physically interact with their environment. The facility has earned an international reputation for excellence in basic and clinical research.



Our research in cerebral palsy and peripheral arterial disease, for example, has influenced the treatment and therapy options available to persons living with these disabilities. The facility has patented the wireless Gait-O-Gram, a biomedical instrument designed to measure an individual's walking parameters. Currently research efforts are also focused on robotic assisted surgery, chronic obstructive pulmonary disease, Alzheimer's, stroke and elderly populations.

These achievements bring opportunities to advance our program. But this growth requires funding beyond allocations provided by the state. Charitable gifts to the Nebraska Biomechanics Excellence Fund are needed to help advance the critical work occurring at NBCF. This funding will support new equipment, a facility addition, student scholarships and faculty support. **We feel so strongly about our facility and the work that we do that every one of our students, faculty and staff have contributed to the fund. The NBCF was the first entity in the University of Nebraska system to procure 100% support internally.**

Join us in our efforts by making a gift today. Please complete the pledge card on the next page and return it to the University of Nebraska Foundation, at 2285 South 67th Street, Suite 200, Omaha NE 68106. Or visit us at

<http://nbcf.unomaha.edu>

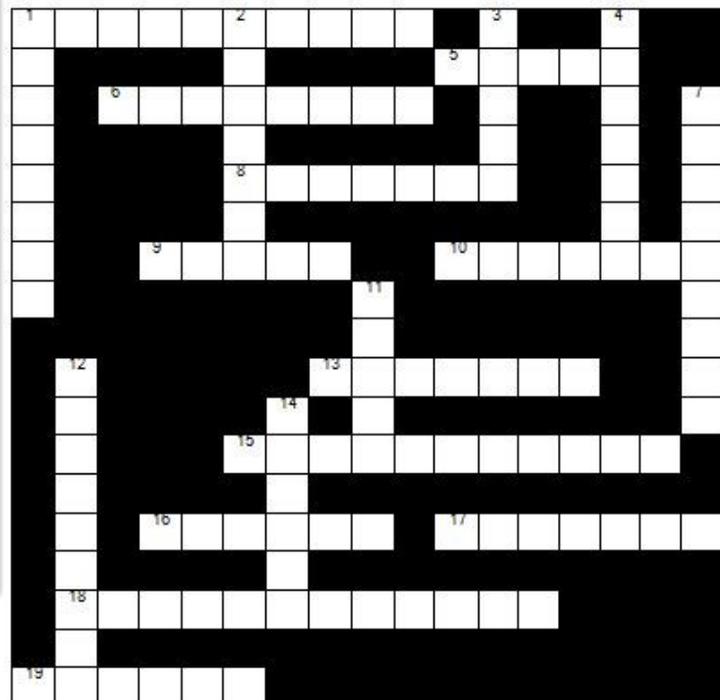
ACROSS

1. Description of motion with space and time.
5. Wrote *Dynamic Patterns*
6. Rate of change in position.
8. Tendency of a system to resist a change in motion.
9. Most common unit of length.
10. He claimed a function could be expanded into a series of sines.
13. -9.81 m/s^2
15. Study of human movement.
16. Laid the foundation for classical mechanics.
17. Recognized as the first true biomechanist.

DOWN

1. Forces
2. Muscle acting to cause a movement.
3. Fluent in 8 languages. Formed basis of modern AC electrics.
7. Using multiple cameras, he created the "zoopraxiscope".
11. m^*a
12. Wrote *De Motu Animalium*
14. Wrote *Biomechanics and motor control of human movement*

BIOMECHANICS CROSSWORD



Answers: ACROSS 1. Kinematics 5. Kelson 6. Velocity 8. Inertia 9. Meter 10. Fourer 13. Gravity 15. Kinesiology 16. Newton 17. d'Avinci
DOWN 1. Kinetics 2. Agonist 3. Tesla 7. Muybridge 11. Force 12. Aristotle 14. Winter

Yes, I/we would like to support the Nebraska Biomechanics Core Facility with a gift to:

Nebraska Biomechanics Excellence Fund # 103240 Other _____

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_____ *Card Number* _____ *Exp. Date*

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I'd like to fulfill my pledge of \$ _____ payable over _____ years (*not to exceed five years*) beginning _____ (*month*) of _____ (*year*).

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Address _____

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My company _____ will match this gift. The company form is enclosed. (If you, or your spouse, are employed by a company with a matching gift program, your gift could be increased. Contact your employer's personnel office for more information.)

I have already included the Foundation in my estate plans through my will, trust or life insurance.

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