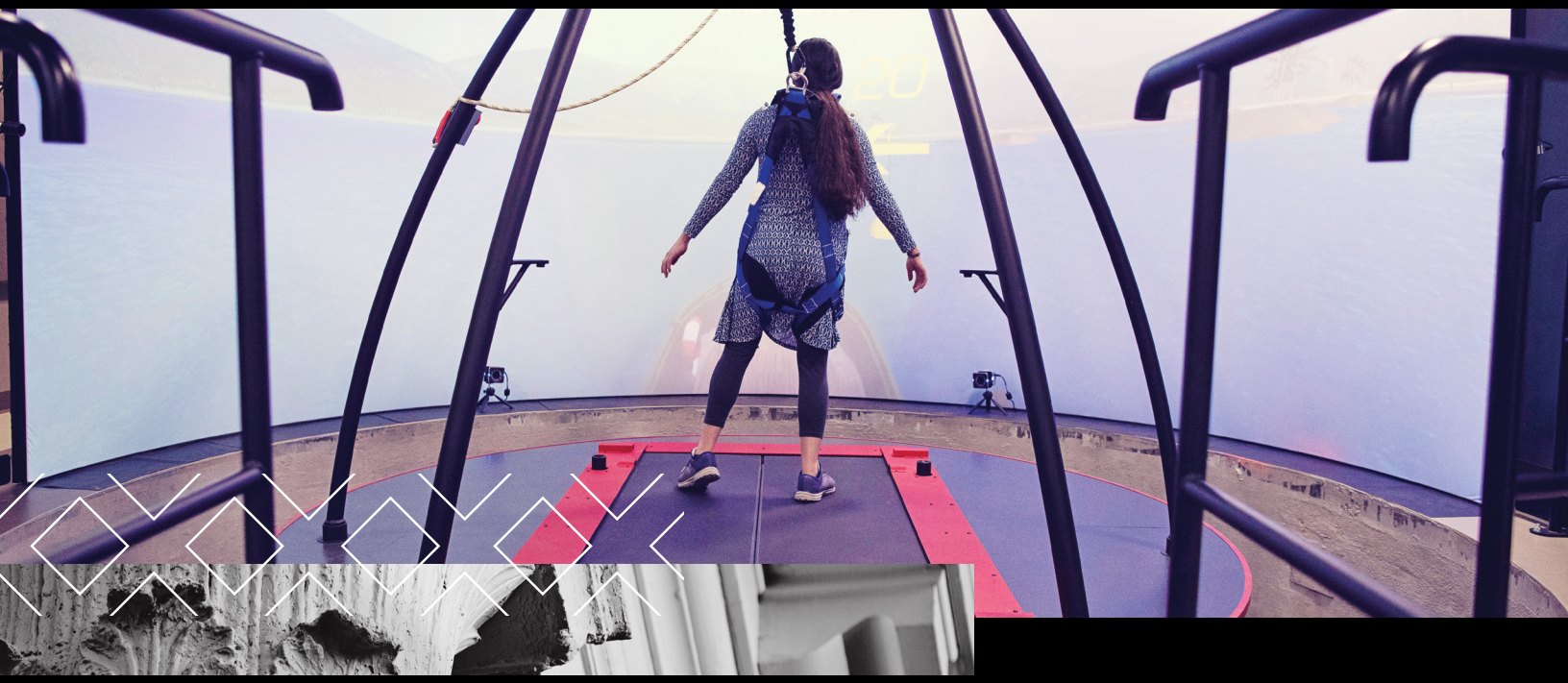
UNIVERSITY OF NEBRASKA AT OMAHA

DEPARTMENT OF BIOMECHANICS

ANNUAL REPORT 2021-2022



University of Nebraska Omaha

CONTENTS

INTRODUCTION

4 LETTER FROM THE DIRECTOR DR. NICK STERGIOU

OUR GLOBAL FOOTPRINT: FACULTY

7 DR. PHILLIPE MALCOLM PUBLISHES IN *SCIENCE ROBOTICS*

8 TEAM KAMENSKIY RECEIVES INDUSTRY GRANT

8 DR. MALCOLM RECEIVES NSF GRANT

9 DR. STERGIOU AND DR. LIKENS RECEIVE IARPA FUNDING

9 DR. MUKHERJEE RECEIVES AHA GRANT

10 PROMISING NEW INVENTION: SELF-PACED TREADMILL

11 DR. KINGSTON RECEIVES NIH R15 GRANT

12 FACULTY RECEIVE NU COLLABORATION GRANTS

15 AROUND THE WORLD

OUR GLOBAL FOOTPRINT: THE PEOPLE OF UNO BIOMECHANICS

21 WHERE ARE THEY NOW: NAMWOONG KIM

22 WHY I CHOSE UNO BIOMECHANICS: FABRICIO MAGALHÃES

24 NEW HIRES

OUR GLOBAL FOOTPRINT: STUDENT CENTERED

27 PURSUING A BS IN BIOMECHANICS: ISABELLA ARRAYALES

28 MY EXPERIENCE AS A GRADUATE ASSISTANT: PAULINE STRUCZEWSKA AND OLUWASEYE ODANYE

30 DR. JENNY KENT RECEIVES DISTINGUISHED ALUMNI AWARD

32 INTERNATIONAL RECRUITMENT

MOVCENTR IMPACT

35 UPDATES FROM PHASE II RESEARCH PROJECT LEADERS

37 UPDATES FROM OUR PILOT AWARDEES

38 UPDATES FROM RESEARCH CORES

41 2022 HUMAN MOVEMENT VARIABILITY & GREAT PLAINS BIOMECHANICS CONFERENCES

EDUCATION INITIATIVES

43 BIOMECHANICS UNITED

44 DR. SARA MYERS ELECTED AS PRESIDENT OF THE ASB

45 CARDIOVASCULAR BIOMECHANICS

46 THESIS AND DISSERTATION DEFENSES

47 DR. AMELIA LANIER AND COLLABORATORS PUBLISH CHILDREN'S BIOMECHANICS BOOK

48 LEADERSHIP POSITIONS AND STUDENT IMPACT (AWARDS, GRANTS, AND SCHOLARSHIPS)

FUN

49 OTHER CONFERENCES

49 GRADUATION WAS FINALLY IN PERSON!

50 COMMUNITY ENGAGEMENT ACTIVITIES

50 PATENT IS COMMERCIALIZED

RETHINK THE IMPOSSIBLE

In a few months from today and on September 5th, 2023, we will have the 10-year anniversary of our home, the Biomechanics Research Building. As I am reflecting back on these 10 years, our progress has been incredible. When we walked in this building, we were a group of thirty people, practically my research team. Now we have the Department of Biomechanics with twenty faculty members, more than 50 graduate students supported on grants, about 20 postdocs, staff, and technicians, and an armada of undergraduates working on a myriad of research projects. This department is responsible for one third of the external funding that is generated by our institution. We also have a bachelor's, master's, and doctoral degree in biomechanics. In 2019 the building underwent a remarkable transformation, expanding its size to more than double in order to accommodate the phenomenal growth. We have a unique and well-funded research center in human movement variability, and we are in the process of developing two more. We have 52 new inventions, 18 new patent applications, and 5 licensed start-ups. The entire enterprise is now under the Division of Biomechanics and Research Development and just a month ago we found that the division has had a total impact of $27.54 million on the Omaha metropolitan economy since its last evaluation in 2019. As you read inside this newsletter, we have even more success stories to share with you.

I wrote in 2013 for this same piece of our newsletter the following: *"As I walk through our building, I imagine a scientific sanctuary where exceptional scientists and clinicians are working in harmony to perform innovative research in biomechanics and where a workforce is molded to meet the scientific needs of our nation. I imagine travelers from around the globe as they come to the source of biomechanical knowledge and to be exposed to the latest discoveries. I imagine how these discoveries shape the future of health care by improving quality of life through the development of new diagnostic and treatment strategies. I see us giving more than we take from this life."* This vision is today's reality. Especially our global footprint – the theme of this year's annual report. When in other places exists violence, fear, hate, agony, in our world we have prosperity, happiness, and a continuous fight for the betterment of the lives of others. Our research has such an influence that it has recently been described as akin to Plato's allegory of the cave.

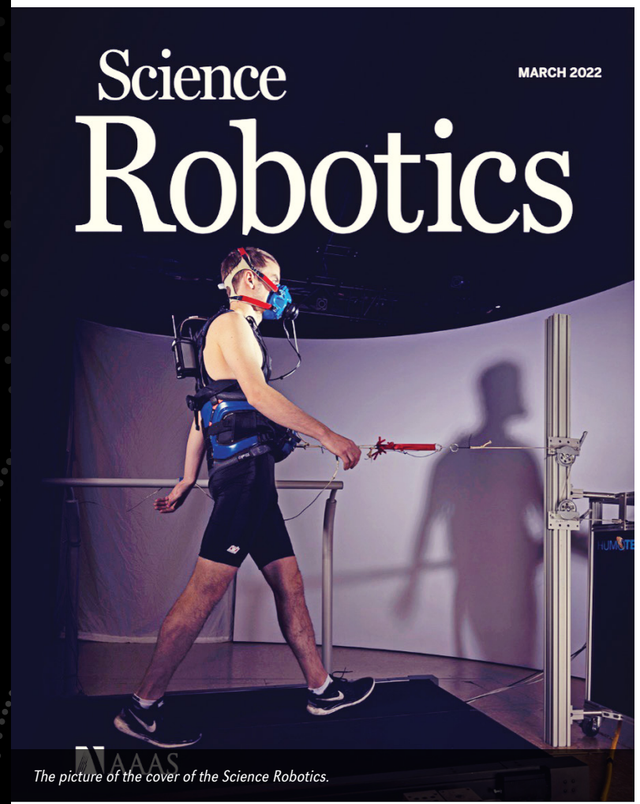
I admit that to arrive where we are today has not been easy. We faced numerous obstacles. However, we always made the choice of virtue over vice like the mythical hero Hercules in his famous dilemma. The choice was of hardship and honor. But this choice was also easy for us because we had the unwavering support of our donors and our university's leadership. Blessed with exceptional talent and indescribable tenacity, we continue achieving new heights, we continue towards our "Biomechanics Field of Dreams", we continue rethinking the impossible.

Thank *you*,

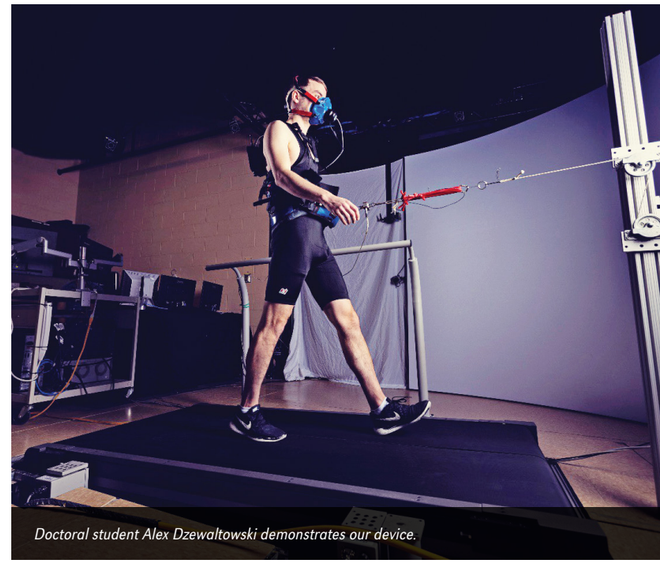
Dr. Nick Stergiou

OUR GLOBAL FOOTPRINT

FACULTY



The picture of the cover of the Science Robotics.



Doctoral student Alex Dzewaltowski demonstrates our device.

> “OUR RESEARCH SHOWED THAT THE PHASE WHERE BOTH FEET ARE ON THE GROUND IS THE BEST TIME TO APPLY FORCE TO ASSIST WALKING MOST EFFICIENTLY.”

DR. PHILLIPE MALCOLM PUBLISHES IN *SCIENCE ROBOTICS*

A study by Dr. Philippe Malcolm’s team was featured on the cover of Science Robotics.

A new study by Dr. Malcolm’s team described a new way to reduce the energy we spent during walking, the metabolic cost of walking, which could have applications for assisted walking therapy. The study showed that a strategically-timed pull from a robotic tether can reduce the metabolic cost of walking by half.

The optimal timing of that forward pull came as a surprise. “Our research showed that the phase where both feet are on the ground is the best time to apply force to assist walking most efficiently,” Dr. Malcolm said. Based on previous literature, our researchers believed they would see the highest energy savings by pulling when we push off the ground, the propulsion phase. The finding that the optimal assistance does not coincide with the propulsion phase supported the need for biomechanical testing rather than using biomimicry.

Biomimicry is a practice that learns from and mimics the strategies found in nature to solve human design challenges

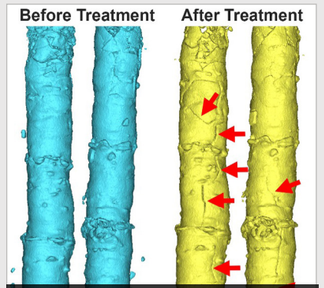
Our device worked by providing timed pulls from a motorized pulley while an individual walked on a treadmill. Since it only required wearing a waist belt, it was relatively easy to make individualized adjustments compared to more complicated devices. This type of assistance could be used for assisted exercise therapy in patients with disabilities during walking.

The significance of the study was further demonstrated by its publication to the very prestigious scientific journal, *Science Robotics*, where was also selected to grace its cover.

TEAM KAMENSKIY RECEIVES INDUSTRY GRANT

Dr. Alexey Kamenskiy and the UNO cardiovascular biomechanics team recently received an industry grant for $49,553.00 to partner with AngioDynamics, a globally leading medical device company, to test the company's Auryon Laser and the effect it has on medical arterial calcification. Coronary artery calcification is a collection of calcium in the heart's two main arteries and is caused when fat and cholesterol form in the arteries. Calcification is an issue because a buildup of plaque in the arteries causes blood to flow less effectively, the plaque can, in turn, break off and cause a heart attack or stroke.

The Auryon laser was created to help treat levels of calcification in arterial walls and produce information to help provide protection of the vessel wall. For the project, our cardiovascular biomechanics team will work with 14 vessel segments, all of which will be calcified. Then, they will undergo various procedures for testing with the Auryon laser. Once testing has been completed, the team can begin to summarize their findings for AngioDynamics to determine the effectiveness of the laser.



A micro-CT of a calcified human tibial artery before and after treatment with a laser, demonstrating that the laser is capable of cracking medial arterial calcification.

Experimental set-up at the UNO Biomechanics Research Building.

DR. PHILIPPE MALCOLM RECEIVES NSF GRANT

For a healthy young adult, walking for ten minutes consumes less energy than the calorie content of one slice of bread. However, as we grow older, our bodies become less energy efficient, turning simple daily activities like walking around a block into a daunting effort. Although the effect of aging on the energetic costs of walking is well-documented, we do not yet have a complete understanding of what causes the progressive increase in energetic cost. One of the challenges is that current technologies for assessing energy cost through the procedure of metabolic energy consumption are too slow to gain insight into the energetic cost of the different walking phases.

Dr. Malcolm's team and their collaborators at the University of Nebraska - Lincoln (UNL) received a grant from the National Science Foundation (NSF) for $238,430.00 to investigate this problem. Our UNO biomechanics researchers will conduct motion-capture experiments in which they will affect different phases of walking using a robotic waist tether. The UNL engineers will use data from these experiments to develop machine learning algorithms that estimate fluctuations in the energetic cost at a sub-stride cycle resolution.

This research is expected to lead to practical applications for walking rehabilitation for the aging population. Detecting the energetic cost of different walking phases will enable designing improved assistive devices, such as orthoses or exoskeletons.

DR. STERGIOU AND DR. LIKENS RECEIVE IARPA FUNDING

Drs. Aaron Likens and Nick Stergiou are partnering with Dr. Benjamin Riggan from UNL's Electrical and Computer Engineering program to collaborate on a research project for BlueHalo. BlueHalo, which is the supervising company, our team, and a group of scientists across the USA has received a $6,310,000.00 grant from Intelligence Advanced Research Projects Activity (IARPA) of the Office of the Director of National Intelligence via their Biometric Recognition and Identification at Altitude and Range (BRIAR) program. The goal of this project is to develop software algorithm-based systems capable of performing whole-body biometric identification at long-range and from elevated platforms. Our role in the project is to incorporate biomechanical modelling for the understanding of whole-body walking biometrics. A biometric is a measurable biological (anatomical and physiological) and behavioral characteristic that can be used for automated recognition. We aim to provide the ability to perform robust biometric identity intelligence across a wide spectrum of video data. This project also funds Mr. Seung Kyeom Kim, doctoral student in the Department of Biomechanics, who is supporting Dr. Likens and Dr. Stergiou in completing this exciting and challenging project.

Drs. Likens and Stergiou and their team.

> "OUR ROLE IN THE PROJECT IS TO INCORPORATE BIOMECHANICAL MODELLING FOR THE UNDERSTANDING OF WHOLE-BODY WALKING BIOMETRICS."

DR. MUKHERJEE RECEIVES AHA GRANT

Dr. Mukul Mukherjee and his team received $154,000 from the American Heart Association (AHA) for researching if stroke survivors can walk better with vibration devices in their shoes. This is based on the thinking that after a stroke, it becomes difficult to sense what is below the feet during different walking tasks. These vibration devices can assist in enhancing sensation and improving walking for these patients. Dr. Mukherjee and his team are also studying how the brain changes its neural activity when something touches your feet, like when you walk on pebbles. This project is a cross-campus collaborative effort between UNO, UNL, and UNMC. In addition to the AHA award for this project, support has also been received from the NU Collaboration Initiative. Dr. Mukherjee's students that work on this project have also received university-based awards such as GRACA and FUSE. All these awards support this exciting new intercampus collaboration between experts in tactile augmentation (Dr. Barlow, UNL), human brain mapping (Dr. Wang, UNL), rehabilitation engineering (Dr. Nelson, UNL), biostatistics (Dr. Cheng, UNMC), clinical neurology (Dr. Fayad, UNMC) and gait biomechanics and stroke rehabilitation (Dr. Mukherjee, UNO). Multiple students are working on this project including Mr. Takashi Sado (Ph.D.c), master's student Chris Engsberg, and Hannah Stogdill who is a BS student in Biomechanics.

The Grail Virtual Reality system at the UNO Biomechanics Research Building which is used in this research.

> "THESE VIBRATION DEVICES CAN ASSIST IN ENHANCING SENSATION AND IMPROVING WALKING FOR [STROKE] PATIENTS."

PROMISING NEW INVENTION:

SELF-PACED TREADMILL

Dr. Knarr and staff from the Machining and Prototyping Core, Russell Buffum and Travis Vanderheyden, received the 2021 UNeMed award for Most Promising Invention with a brilliant twist on an old concept. UNeMed is the tech transfer and commercialization office of the University of Nebraska. This invention sparked additional funding from the University's startup incubator, UNeTech, and has been licensed to a startup company, IMPOWER Health, who hopes to provide additional development and opportunities to bring this technology to market. Below is a story written by Dr. Joe Runge of UNeTech about our invention.

FABLED SELF-PACING TREADMILL IS REAL AND IT'S IN OMAHA

BY DR. JOE RUNGE

Stroke rehabilitation is hard. The damage a stroke causes to the brain and nervous system is extensive, sometimes irreversible, but often repaired through painstaking rehabilitation. That rehabilitation is hard work. The asymmetrical way a stroke victim's body works complicates rehabilitation. Even walking on a treadmill is difficult when one side of the victim's body doesn't move as well as the other. A group of students at the University of Nebraska at Omaha found the problem of matching treadmill pace enormously challenging.

So, they invented a new treadmill.

Using the laboratory's motion capture system, they were able to precisely measure the movement of stroke patients and automatically pace the treadmill to match their pace. It worked and the treadmill was able to automatically adjust to the patient's pace, step by step, and got the students thinking: What if we could adapt the same technology to treadmills outside of a recovery and rehabilitation hospital?

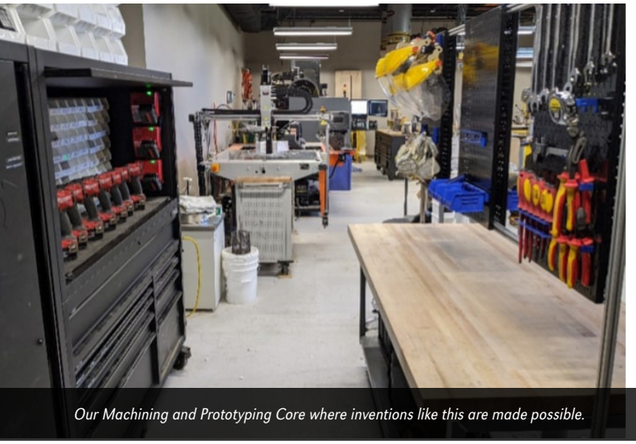
That question would not be answered until the Omaha Medical Technology Pipeline picked up the project. Those students, long since graduated, left their notes with the laboratory of Dr. Brian Knarr in the Department of Biomechanics. Working with the UNO Department of Biomechanics Prototype Laboratory, Dr. Knarr replaced thousands of dollars of motion capture sensors with less than one hundred dollars' worth of optical sensors. Those sensors implemented a new algorithm, inspired by the students' original work, and opened the door to a world where treadmills go at the runner's pace.

"I've never seen a more intuitive machine interface," said Nathan Preheim, founder of Proven Ventures, an Omaha investment firm. Preheim served to help found and recruit the leadership for Impower Health. The firm helped further development of the self-pacing treadmill to expand beyond stroke rehabilitation – and become the standard for treadmills.

"Self-pacing treadmills were sort of fabled in the industry," admitted Doug Miller, a former senior director at Life Fitness and the current CEO of Impower Health. "When this opportunity came along, I was skeptical, but over time I realized how much the inventors knew about human motion and how much of that knowledge was in their solution." Miller helped to guide the technical development and is now helping to supervise final adjustments of the algorithm. He also helped build a comprehensive engineering plan to make self-pacing a critical user feature but also a safety feature.

Each year there are thousands of treadmill injuries and a tragic handful of deaths. "If the treadmill knows how fast you're running then it knows when you've stopped or fallen over," said Miller. The same algorithm that creates the self-pacing feature can readily be adapted to serve as a reliable safety feature. Impower Health is currently in discussions with multiple fitness companies with a plan to raise the funds it needs to launch its first products later this year.

In time, Impower Health's technology could become essential for treadmills. "The technology is inexpensive to implement and makes the treadmill so much safer," said Preheim. "When it works, why shouldn't companies use it – why shouldn't they have to use it?"



Our Machining and Prototyping Core where inventions like this are made possible.

DR. DAVID KINGSTON RECEIVES AN NIH R15 GRANT

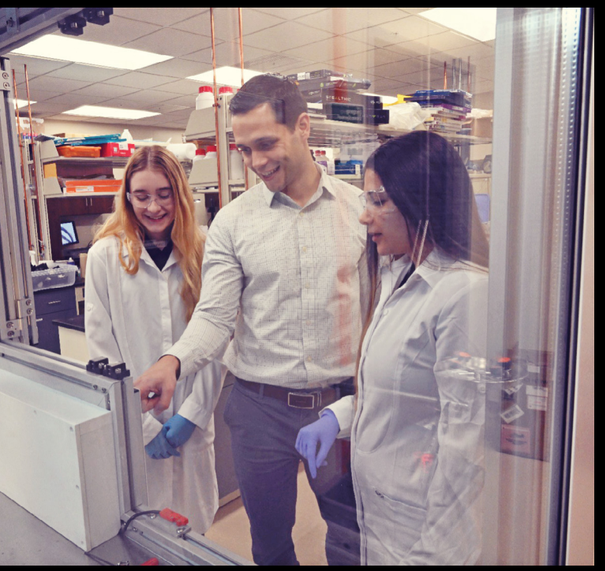
Drs. David Kingston and Brian Knarr, along with Dr. Vivek Dutt from UNMC/CHMC Department of Pediatric Orthopedics, received a 3-year $448,118 R15 award from the National Institutes of Health. Our team is investigating which walking rehabilitation approach could be best for children with cerebral palsy (CP). These children often undergo surgeries to improve overall mobility and energy efficiency during walking as they suffer from muscle and nerve issues that challenge movement control. Surgical interventions are highly invasive, requiring plaster casting for several weeks, and minimal weight bearing on the corrected limbs that makes recovery a long and difficult process. The goal of this project is to improve our understanding of the muscle and movement demands of overground, treadmill, (and for the first time) aquatic treadmill walking at various speeds. Using newly available waterproof sensors, this study will measure the underlying mechanisms of walking movements, comparing average developing children to children with CP. The project's long-term goal is to provide clinicians with better guidance on which walking rehabilitation method would work best to accommodate children with CP considering the diverse range of functional levels. We are thrilled to embark on this partnership with CHMC and to help improve the care for children with CP throughout the Great Plains region.

Child with cerebral palsy instrumented with waterproof and wireless sensors to record walking movement strategies and muscle activity.

Front (A), back (B), and side (C, D) views of a typically developing child with biomechanics sensors.

FACULTY RECEIVE

NU COLLABORATION GRANTS



Dr. Kaspars Maleckis and his graduate students are Pegah Nouri Mousa and Libby Caldwell working in the laboratory.

The CAREN Virtual Reality System located in the UNO Biomechanics Research Building where the work proposed in this study will be performed.

DR. MALECKIS STUDYING SYNTHETIC ARTERIAL SUBSTITUTES

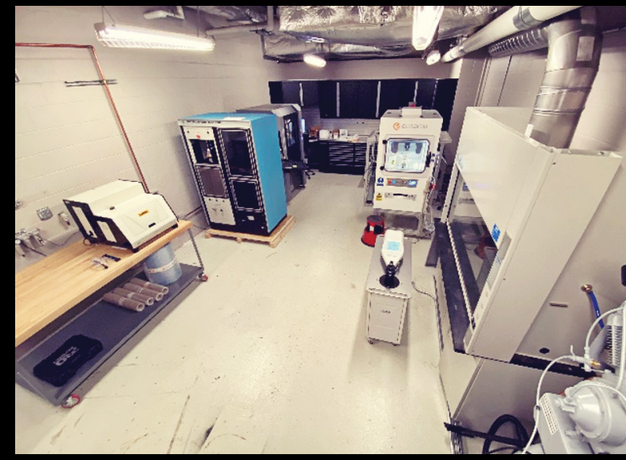
Dr. Kaspars Maleckis is teaming up with UNL's Dr. Stephen Morin and UNMC's Dr. Jason MacTaggart to develop and test novel mechanically and chemically optimized synthetic vascular substitutes. The goal of this collaborative project, which is funded by the NU Collaborative Initiative for $40,000, is to address the deficiencies of the synthetic arterial substitutes by combining the cutting-edge resources available accross the University of Nebraska campuses. Dr. Maleckis' team at UNO uses an advanced nanomanufacturing method called electrospinning to manufacture arterial substitutes called ENGs (Elastomeric Nanofibrillar Grafts) and tune their mechanical properties to our arteries. Dr. Morin's team at UNL is optimizing the surface chemistry of ENGs to enhance their thromboresistance and biocompatibility. Dr. MacTaggart's team at UNMC is performing pre-clinical animal studies to assess the surgical characteristics and biological performance of ENGs against state-of-the-art commercial devices. This project can eventually lead to the development of chemically and mechanically optimized arterial substitutes with improved clinical performance.

DR. CURTZE TO EXAMINE BALANCE, WALKING IN PATIENTS WITH PARKINSON'S DISEASE

While therapeutic deep-brain stimulation (DBS) is effective in correcting motor and non-motor symptoms associated with advanced Parkinson's disease (PD), the effects of DBS on walking are less clear. The aim of the newly funded $150,000.00 grant is to unlock the secrets of how the brain controls movements and what goes awry in PD. To study the neural control of balance and walking, the project uses implanted neurostimulation devices and wireless movement sensors to sense brain activity in the subthalamic nucleus (a highly interconnected node in the brain). By decoding the electrophysiological brain rhythms associated with gait and balance control, it is possible to develop adaptive DBS to improve gait function in people with PD. This study, which is led by our UNO Biomechanics Dr. Carolin Curtze, is in collaboration with Dr. Aviva Abosch, of UNMC's Department of Neurosurgery, and is funded by the NU Collaboration Initiative.

DR. SALKOVSKIY SECURES GRANT TO STUDY AEROSOL FILTRATION

Dr. Yury Salkovskiy received a 1-year $50,000 award to improve the performance of aerosol filtration materials using a modeling-guided optimization of their structure. During this project, Dr. Salkovskiy, along with Dr. Yuris Dzenis from UNL and Kevin Crown from the National Strategic Research Institute (NSRI), will develop and test new nanofibrous filters and create a comprehensive theoretical model for controlling the nanofiber orientation during manufacturing. They plan to lay the groundwork for creating a range of filtration systems based on aligned nanofibers, from large-scale air purification devices to ultra-light personal protective equipment. This project is focused on needleless electrospinning technology, which is easily scalable to mass production.



The UNO Biomechanics Micro CT Scanning Laboratory at the Biomechanics Research Building where this work will be performed.

DR. JADIDI INVESTIGATING BIOCHEMICAL ASPECTS OF PERIPHERAL ARTERIAL DISEASE

Peripheral arterial disease (PAD), the atherosclerotic obstruction of femoropopliteal arteries (FPAs), is associated with significant medical and economic burden, primarily due to a limited understanding of its pathophysiology. Because of this, a large number of surgical operations and interventions fail and require repetitive care. Dr. Majid Jadidi and his collaborator, Dr. Rebekah Gundry, Professor and Interim Chair of the UNMC Department of Cellular & Integrative Physiology, received an NU Collaboration grant for $39,841 to better understand PAD pathophysiology and develop tools that can help improve the clinical outcomes of PAD interventions. Over the past several years, they have investigated several aspects of PAD pathophysiology by obtaining FPAs from donors of all ages and assessing their intramural structure, mechanical properties, and physiologic characteristics. Similar to other atherosclerotic disorders, PAD is a complex dynamic process that at the molecular level involves the assembly of hundreds of proteins that alter the cellular processes and vascular remodeling. These proteomic changes occur in blood vessels before the appearance of clinical signs of atherosclerosis. Therefore, to improve early PAD detection and to interrupt the disease progression before clinical consequences occur, it is critical to identify the proteomic signature of healthy and diseased arterial tissues. With this grant, the goal is to use mass spectrometry-based proteomics techniques and determine the proteins, networks, and pathways associated with different stages of PAD (i.e., no, mild, moderate, and severe disease.)

Dr. Majid Jadidi working with his graduate student Elham Zamani.

DRS. DAVID KINGSTON, BRIAN KNARR AIM TO EASE BURDEN ON FAMILIES OF CHILDREN WITH CEREBRAL PALSY

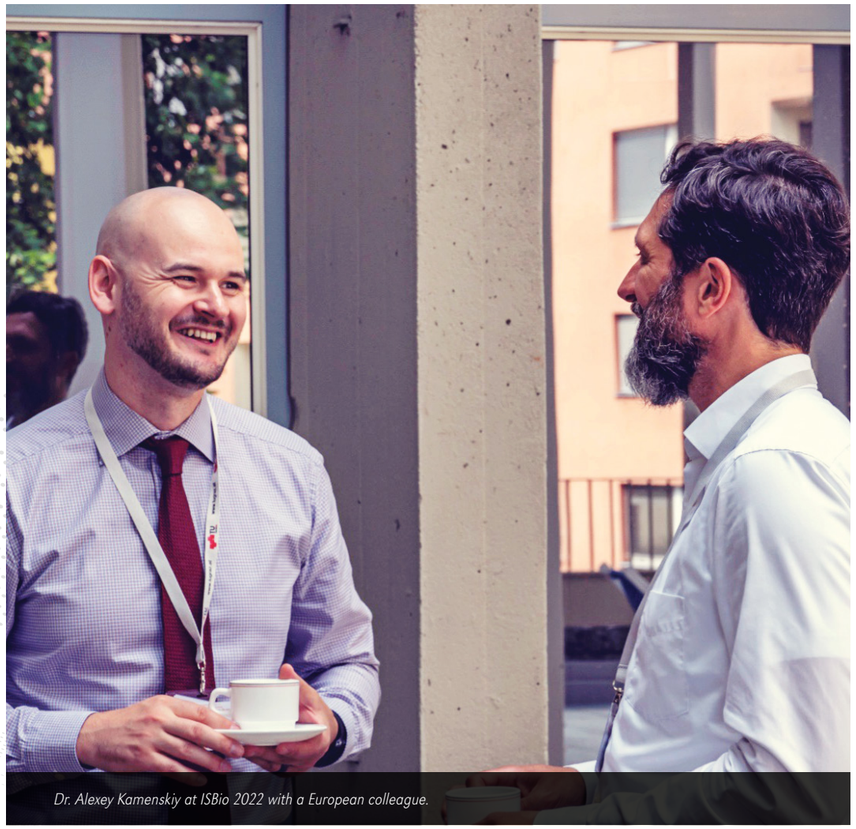
Doctors David Kingston and Brian Knarr, along with Dr. Hope Voto of the UNMC/CHMC Department of Physical Medicine and Rehabilitation, received a one-year award of $39,944. This funding will be used to improve patient access to objective assessment tools for evaluating the effectiveness of Botulinum toxin type A (BoNT-A) injections in children with cerebral palsy. BoNT-A injections help reduce muscle spasticity and are the most widely used medical intervention in children with spastic CP, despite reports of modest and short-lived effects. Because few medical centers have access to motion capture technology, how these injections impact walking patterns is still not understood. Clinical gait analysis uses marker-based 3D motion capture to record movement of the legs, pelvis, and trunk. These data are used to identify specific walking impairments for surgical planning in children with CP and other movement disorders. However, marker-based 3D motion capture has noted limitations for widespread use, including access to laboratories, the financial cost for families, and the need for highly trained personnel to operate equipment. Dr. Kingston's team is investigating a new motion tracking technology, marker-less motion capture, as a gait analysis tool in pediatric populations. The recent development of video-based marker-less technology offers a unique, alternative method for tracking human movement that is faster, easier to operate, and more comfortable for the patient. This will help determine if marker-less technology is a viable option to increase patient access to tools used for assessing BoNT-A injection effectiveness and reduce the burden to patients and their families to receive data-driven care.

UNO Department of Biomechanics staff and a CHMC physical therapist working with a patient during a clinical gait analysis session. Marker-based instrumentation is demonstrated for a patient requiring ankle-foot orthoses and a walking aid.

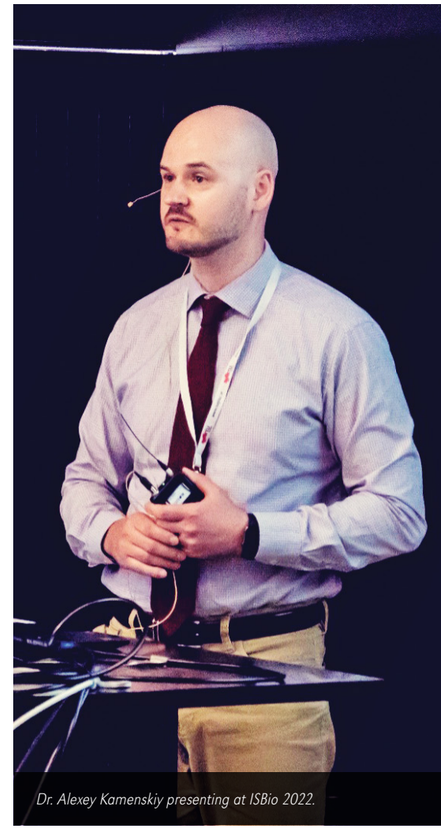
AROUND THE WORLD

DR. ALEXEY KAMENSKIY INVITED TO SPEAK AT SYMPOSIUM IN AUSTRIA

Drs. Alexey Kamenskiy and Anastasia Desyatova participated in the Symposium on Biomechanics: Challenges of the Next Decade (ISBio 2022). Dr. Kamenskiy was an invited speaker at this conference. The symposium took place at Graz University of Technology, Austria, from June 30- July 1, 2022. It was an excellent opportunity to meet many established and emerging scientists with a multitude of backgrounds in solid biomechanics. It highlighted the state-of-the-art research in mathematical modeling, computational simulation, and experimental methods used to study biological tissues, living systems, and complex patient-specific anatomies. In addition to underlining the existing cutting-edge research, the panelists delineated the most significant challenges of the next decade as well as niches of potential future breakthroughs.



Dr. Alexey Kamenskiy at ISBio 2022 with a European colleague.



Dr. Alexey Kamenskiy presenting at ISBio 2022.

UNO Biomechanics students, faculty, and alumni at the pre-conference workshop.

(From left to right) UNO Biomechanics students Jose Anguiano-Hernandez, Joseph Harrington, and Kayla Kowalczyk during a poster session.

UNO Biomechanics students and faculty along with two student friends from UKansas Engineering at the NACOB social event.

CANADA

In August 2022, UNO Biomechanics hosted an exhibitor table and workshop at the North American Congress of Biomechanics meeting in Ottawa, Canada. Assistant Professor, Dr. Aaron Likens, and Doctoral Student, Anaelle Charles, hosted a pre-conference workshop titled "Multifractal Methods for Movement Science".

THE STUDENTS LISTED BELOW PRESENTED THEIR RESEARCH AT THE CONFERENCE:

- Anaelle Charles - Oral Presentation
- Corbin Rasmussen - Oral Presentation
- Abderrahman Ouattas* - Oral Presentation
- Arash Mohammadzadeh Gonabadi* - Poster

PRESENTATION

- Zahra Salamifar* - Poster Presentation
- Kayla Kowalczyk - Oral Presentation
- Oluwaseye Odanye* - Oral Presentation
- Farahnaz Fallah Tafti* - Poster Presentation
- Joseph Harrington - Poster Presentation
- Tyler Hamer - Poster Presentation
- Sheridan Parker - Poster Presentation
- Kolby Brink - Poster Presentation
- Alex Dzewaltowski* - Poster Presentation
- Seongwoo Mun - Poster Presentation
- Jose Anguiano-Hernandez - Poster Presentation
- Emily Steffensen - Poster Presentation
- Alli Grunkemeyer - Poster Presentation
- Erica Hinton - Poster Presentation
- Jutharat Poomulna - Poster Presentation

**These students were unable to attend in person and had another member from their team present their work.*

DIRECTOR'S INTERNATIONAL PROMOTING TRIP

GERMANY

Dr. Stergiou attended the 2nd Movement Academy at Darmstadt Germany in October 2022. The academy, of which Stergiou is a founding member, seeks to bring together scientists, practitioners, clinicians, and other movement enthusiasts.

The Movement Academy Participants

Dr. Stergiou discussing variability during the Movement Academy.

Dr. Stergiou with a Movement Academy participant performing an exercise.

DIRECTOR'S INTERNATIONAL PROMOTING TRIP

PORTUGAL

In November, Dr. Stergiou spent two weeks in Portugal. He visited several academic units, met with previous postdocs turned successful professors, gave lectures and a nonlinear workshop, visited old friends, and also made many new friends. Always by his side was his friend and organizer of the entire trip Dr. Orlando Fernandes from the University of Evora.

At the University of Evora with Dr. Orlando Fernandes, a dear friend and collaborator.

Nonlinear Analysis Workshop participants at the Politecnico de Leiria organized by Dr. Maria António Castro and Dr. Fernandez.

With Dr. Luis Silva, previous post-doc and now a scientist, at the Nova University of Lisbon.

At the Instituto Politécnico de Santarém Escola Superior de Desporto de Rio Maior with Professors Fernandes and Branco.

At the School of Health Sciences of Alcoitão with professors Esteves and Fernandes.

With Dr. Joao Vaz, now a professor and previous post-doc, at the University Egas Moniz.

OUR GLOBAL FOOTPRINT

THE PEOPLE OF UNO BIOMECHANICS

WHERE ARE THEY NOW?

NAMWOONG KIM

(International - South Korea)

I would like to thank UNO's Department of Biomechanics for giving me this opportunity to write this. I want to let the department know how much I've enjoyed my time working for there. This is an incredible department, and I feel fortunate to have been a part of it for these past four years. It's been a pleasure working with each one of the faculty and students, and I wish everyone nothing but the best.

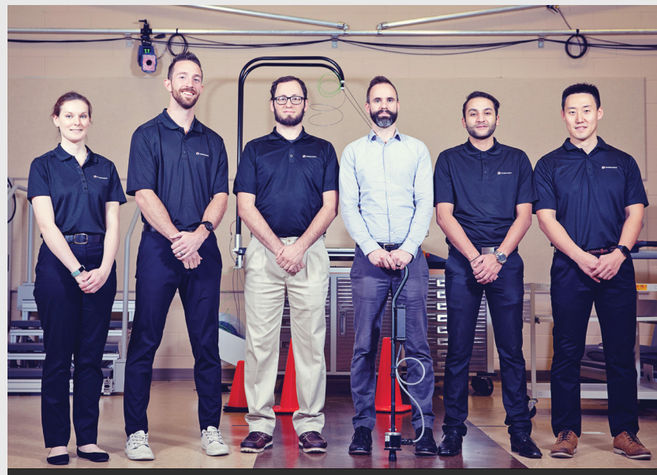
Upon graduating with my Ph.D., I was able to work as a research associate at UNO for a short time. I found my academic and professional experience at UNO provided me with a broad view that is useful in assisting students and being an independent researcher.

I am currently working as an Assistant Professor at the Department of Health and Kinesiology in Incheon National University in South Korea.

I serve as a co-director of Athletic Training Center there, focused on the prevention, assessment, and rehabilitation of postural control deficits in individuals with musculoskeletal injuries, with an emphasis on ankle, knee, and hip joint injuries. I am also involved in educating and supervising athletic training students, coaches, and athletes.

I was truly fortunate to be able to work in the Department of Biomechanics and to say I am a member of UNO Biomechanics. Doors have opened and opportunities are in abundance when you declare yourself a member of this family. I hope that I can work with the department again in the future to continue pushing the boundaries of biomechanics research.

> "I WAS TRULY FORTUNATE TO BE ABLE TO WORK AT THE UNO DEPARTMENT OF BIOMECHANICS AND TO SAY I AM A MEMBER OF UNO BIOMECHANICS."



Namwoong Kim with Dr. Brian Knarr and his team in 2018.

WHY I CHOSE UNO BIOMECHANICS: **FABRICIO MAGALHÃES**

(International - Brazil)

During my bachelor's degree in physical therapy, I was introduced to the basic concepts of biomechanics applied to motion analysis. My passion grew for the complexity of the human body, how it self-organizes internally, and how the movements emerge from the interactions among anatomical structures. However, I realized how limited my knowledge was at this time. When I enrolled in my master's, I worked with my mentors Dr. Hans Menzel and Dr. Mauro Chagas to deeper into the biomechanics theories regarding soft tissue deformation, human motion, and motor control. I also got the chance to expand my knowledge about subareas of biomechanics, like sports, rehabilitation, and cardio-pulmonary. Embracing new skills, but wanting more, I continued my training in biomechanics by doing a Ph.D. in Bologna (Italy). There, I met other brilliant biomechanics researchers: Drs. Aurelio Cappozzo, Angelo Cappello, Silvia Fantozzi, Lorenzo Chiari, and Alberto Leardini.

"THIS EXPERIENCE CHANGED MY PERSPECTIVE AND OPENED A UNIVERSE OF OPPORTUNITIES FOR FUTURE STUDIES. "

Not only did I learn how to effectively use equipment built for biomechanical assessments, but I also learned to design and build equipment, processing code, and protocols. This experience changed my perspective and opened a universe of opportunities for future studies. Five years later, I completed a postdoctoral fellowship under the supervision of Dr. Sérgio Fonseca and Dr. Thales Souza. I could finally combine all the biomechanical knowledge learned during my master's in sports sciences and Ph.D. in bioengineering and apply them to Rehabilitation Sciences. During this time, I was invited to teach basic biomechanics, clinical biomechanics, and sports biomechanics at universities in Brazil. I was also invited to be a visiting professor of Biomechanics in Colombia.

When the pandemic made opportunities to work with biomechanics in my home country started to be difficult, I looked for career opportunities abroad.

"WHEN I SAW THE STRUCTURE OF THE LABORATORIES, THE EQUIPMENT, AND THE DIVERSE EXPERTISE OF FACULTY, I KNEW THIS WAS THE BEST OPPORTUNITY FOR ME."

I found excellent facilities around the world, like the University of Queensland (Brisbane, Australia) with Dr. Paul Hodges, University of Central Lancashire (Preston, England) with Dr. Jim Richards, University of Ottawa (Ottawa, Canada) with Dr. Mario Lamontagne, and last (but not least), University of Nebraska at Omaha with Dr. David Kingston. When I saw the structure of the laboratories, the state-of-the-art equipment, the diverse expertise of faculty, and the job description to be responsible for shared laboratories, deal with the manufacturers, support faculty and students, perform clinical gait analysis, and lead research studies, I knew this was the best opportunity for me.

"THIS IS WHY I CHOSE UNO BIOMECHANICS; A MIX BETWEEN ONE OF THE BEST BIOMECHANICAL FACILITIES IN THE WORLD AND THE BEST COLLEAGUES TO WORK WITH."

"BEYOND THE WORLD-CLASS FACILITIES, I HAVE MET RESPECTFUL, FRIENDLY, AND COMPETENT PEOPLE."

After a thorough selection process, I was offered the position and have been working here since February 2022. I am convinced I made the right decision. Beyond the world-class facilities, I have met respectful, friendly, and competent people. This is why I chose UNO Biomechanics; a mix between one of the best biomechanical facilities in the world and the best colleagues to work with.

DEPARTMENT OF BIOMECHANICS

NEW HIRES

DR. FABRICIO MAGALHÃES

Dr. Fabricio Magalhães received his bachelor's degree in physical therapy from the Pontific Catholic University of Minas Gerais in Brazil, with a specialization in orthopedics, sports, and manual therapy. He stayed there to complete a master's degree in Sports Science before going to the University of Bologna in Italy to receive his doctoral degree in Bioengineering. After receiving his Ph.D., he completed a post-doctoral fellowship in Rehabilitation Science from the Federal University of Minas Gerais in Brazil. Dr. Magalhães has also previously worked as a lecturer and led full-scale research projects in human motion and performance. He was the manager of the movement analysis laboratory at the School of Physical Education, Physical Therapy, and Occupational Therapy at the Federal University of Minas Gerais (Brazil). Magalhães currently works with works with UNO Biomechanics as a Research Scientist and Laboratory Technician within the within the Movement Analysis Core under the direction of Core Director Dr. David Kingston.

DR. MADHUR MANGALAM

Dr. Madhur Mangalam graduated from the University of Georgia Athens in December 2018 with a Ph.D. in Psychology, followed by postdoctoral training in Neuroscience at Northeastern University Boston. He joined UNO's Department of Biomechanics as a Research Associate in August 2022 under the direction of Dr. Aaron Likens, and in January 2023, was hired as an Assistant Professor. Dr. Mangalam's research is focused on studying movement variability to decipher the "choreography" of physiological fluctuations associated with complex behaviors. His research leverages cutting-edge analytical techniques such as "multifractal analysis" and "multiscale probability density function analysis" borrowed from statistical physics and fluid dynamics to study these physiological fluctuations. While in the Department of Biomechanics, Dr. Mangalam's goal is to further develop these approaches to investigate how complex biomechanical phenomena unfold across timescales (from individuals to groups to populations and from seconds to minutes to weeks). He plans to identify and model the processes that characterize the creativity and emergence of biological and psychological behavior.

DR. TYLER HAMER

Dr. Tyler Hamer received his Ph.D. from the University of Nebraska at Omaha in July 2022 and joined the UNO Department of Biomechanics as a Research Associate. His research focuses on the implementation and evaluation of various sport-specific performance programs alongside investigating the effects of single-sport specialization and workload in athletes. Dr. Hamer has extensive experience interpreting and analyzing sport-specific movements and how they relate to performance and injury risk. As a research associate his goal is to expand his research into additional sports where he wishes to build upon pre-existing injury screening modalities.

DR. FELIPE YAMAGUCHI

Dr. Felipe Yamaguchi joined the UNO Department of Biomechanics as an Associate Researcher in August 2022 following the completion of his Ph.D. in Biomechanics and Movement Science at the University of Delaware. At UNO works in the Movement Analysis Core (MOVAN) under the direction of Core Director Dr. David Kingston. As part of MOVAN, he is responsible for providing resources, education, advisement, and services related to the analysis of human movement. His research focuses on how we achieve balance during walking and standing. He has tremendous experience implementing and developing biomechanical models within a virtual reality environment.

DR. TODD LEUTZINGER

Dr. Todd Leutzinger joined the UNO Department of Biomechanics as an Instructor in January of 2022. He received his Ph.D. in Biomechanics from UNO and is now the instructor for the department's Anatomy and Physiology courses. He focuses on student engagement in the Department of Biomechanics through involvement in our undergraduate mentoring program. He also assists with engaging students in the community through outreach events as a way to ieducate K-12 students about the field of Biomechanics.

DR. FARAHNAZ FALLAH TAFTI

Dr. Farahnaz Fallah Tafti joined the UNO Department of Biomechanics as a Research Associate in September 2021 after completing her Ph.D. in the same department. Her research focuses on walking impairment and rehabilitation programs in patients who suffer from peripheral artery disease. She has also explored balance performance during walking in clinical populations. She hopes to continue her work to improve rehabilitation methods to enhance walking and balance performance in clinical populations.

MR. ANDREW WALSKI

Mr. Andrew Walski received a B.S. in Biomechanics from the University of Nebraska at Omaha in May of 2021. Upon graduating, he then joined the department as a Laboratory Technician to help develop projects such as the Wearable Apparatus for Slip Perturbations (WASP). He continued in this role until September 2022 when he took the position of Research Development Engineer in the Machining and Prototyping Core (MAPRO) under the direction of Dr. Brian Knarr. In this new role, he hopes to benefit the department and the Center for Research in Human Movement Variability by creating high-quality devices for a variety of research purposes.

OUR GLOBAL FOOTPRINT

STUDENT CENTERED

PURSUING A BS IN BIOMECHANICS:

ISABELLA ARRAYALES

(International - Mexico)

My first encounter with biomechanics was with my father in Mexico. He was working on this research project in gymnastics studying the vault of Alexa Moreno. I was little and didn't understand what he was working on. I just knew he was doing something called biomechanics.

During junior high school I started worrying about my career because I didn't have anything planned. I wanted to go to college in the U.S., but I hadn't decided on a major. In high school, it was required your senior year to choose a group of certain classes related to the career you plan to follow. There were four options: chemical biology, physical mathematics, physics, humanities, or economy. It was a hard choice because my favorite classes were physics, math, and biology. I've always been interested in health, but I decided to go for the physical-mathematics group. I knew I was going to study something related to that area, I just hadn't determined what exactly. I admit it was scary, and I felt uncertain not knowing what exactly I wanted to specialize in, let alone what my career would be.

One night I began asking my father all these questions about biomechanics and I realized this area had everything: biology, physiology, anatomy, physics, mathematics, and chemistry. There is no biomechanics major in Mexico, so I knew I had to leave my home if I was going to pursue this career. I started looking at universities and found UNO. I had already heard about this school through my father. He had mentioned their biomechanics department, but I hadn't seen pictures or what the program was all about. I searched the program and facilities, and I was fascinated. At the beginning of my senior year, I was excited to begin the application process.

I was pleased to have my parents' support for this decision and was thrilled when I got admitted to UNO.

I have been here for several months, and this major has my heart. My classes are fantastic; they're everything I'm interested in. The number of things I'm learning from my physiology and anatomy course are incredible. After taking Introduction to Biomechanics and Analytical Methods in Biomechanics, I'm positive this is what I want to do. It has been hard for me to be far from home but having my parents' support is everything to me. The things I'm learning and the experience I've gained are worth it. With an interest in sports biomechanics and human variability, I've had the opportunity to get involved in the pitching lab. It has been amazing seeing the work they do there. On the other hand, I also had the chance to assist in the research of a variability project and I'm impressed. I realized there is so much you can do in this career, there are a lot of areas where you can focus, and I'm excited to see what's next for me at UNO and beyond.

I'm a dancer and I want to continue dancing my whole life, so for my research project, I plan to analyze and study dancers to help prevent injuries. However, I don't want to limit my research to dancers. I like sports and I was a gymnast for 8 years. It is still my favorite sport. I would love to work with gymnasts one day to help improve their technique. I appreciate the support I've received since I arrived at this university and the department of biomechanics. The teachers and staff here are absolutely amazing.

> "I HAVE BEEN HERE FOR SEVERAL MONTHS, AND THIS MAJOR HAS MY HEART. MY CLASSES ARE FANTASTIC; THEY'RE EVERYTHING I'M INTERESTED IN. THE NUMBER OF THINGS I'M LEARNING FROM MY PHYSIOLOGY AND ANATOMY COURSE ARE INCREDIBLE."

MY EXPERIENCE AS A GRADUATE ASSISTANT:

PAULINE STRUCZEWSKA

(International - Belarus)

I joined UNO's Cardiovascular Biomechanics research team as a Graduate Research Assistant in August 2021. Originally, I am from Minsk, Belarus, and I completed my bachelor's degree in Moscow, Russia. I am glad to continue my education at UNO as a master's student. On the Cardiovascular Biomechanics team, I assist Dr. Alexey Kamenskiy with several projects related to biomechanics of human arteries. This research will allow us to achieve better clinical outcomes for endovascular treatment for Peripheral Artery Disease.

Since I was a teenager, I wished to touch the world of science and it became real when I got this opportunity to come to the US to be a part of this incredibly diverse team. Here, I learned how to work with medical imaging equipment, perform mechanical testing of tissues, and analyze their structure using histology. Apart from all these skills, UNO's Department of Biomechanics has taught me how to collaborate with other students while working on a project as well as how to present my work properly using scientific language. I strongly believe that the skills and experiences that I obtained here will become the foundation of my future career, whether it will be in academia or industry.

MY EXPERIENCE AS A GRADUATE ASSISTANT:

OLUWASEYE ODANYE

(International - Nigeria)

Learning and conducting research in UNO's Department of Biomechanics has been a positive and thorough educational experience. When deciding on a graduate program for my master's degree, I looked for ones with a Biomechanics focus because I was interested in movement-based research involving bionics and use of assistive devices. I found the UNO Biomechanics program through a google search, reached out to the faculty within, and connected with my advisor, Dr. Brian Knarr.

Thus far, I have partaken in diverse clinical-based research entailing movement in the stroke population and investigated how assistive devices impact the gait of stroke survivors. Also, I have recorded improvements in using different motion capture systems and other equipment and software used for collecting and analyzing biomechanics data. Throughout my program journey, my background as a physical therapist aids me in utilizing these quantitative data with qualitative assessments to make inferential, scientifically viable deductions and interpretations. The part I enjoy the most is sharing this progressive and ground-breaking research with fellow scientists, faculty, and students from different backgrounds through conference presentations (like the Human Movement Variability and Great Plains Biomechanics Conferences), manuscript writing, and publishing articles with team members and collaborators from diverse fields.

For myself, I envision a future where I work in an industrial setup doing translational research and innovating new technologies to ease movement and improve the level of independence for diverse clinical populations. Ultimately, I want to play a central role in ensuring African nations also benefit from biomechanics technologies.

DR. JENNY KENT RECEIVES DISTINGUISHED ALUMNI AWARD

Dr. Kent was an international graduate student who earned a Ph.D. in 2018.

I relocated from London, England to pursue my Ph.D. at UNO in the Summer of 2014. At the time I had secured a government job working as a (civilian) scientific officer in the main military rehabilitation hospital in the UK, where I ran a movement laboratory and had developed a new clinical service for military personnel with amputation and complex traumatic injury. On working with many people who have experienced limb loss, I developed an interest in understanding how prosthesis users learn to control their new limb and adapt to walking with it. I was also frustrated with the lack of adequate outcome measures for people with amputation. This is an important deficit in rehabilitation. If you cannot measure outcome, you cannot demonstrate whether a treatment or intervention was effective or not. In turn, this makes it difficult to justify prescribing more costly treatments (in the case of prosthetics, particular high-end devices), or pursuing new interventions. The nonlinear techniques that were being used in Omaha by Dr. Stergiou and his team offered a new way of looking at movement and motor control and I was keen to learn more. I was also inspired by the excitement and passion for biomechanics research there, and I truly felt that the department (still small at the time) was going places. On meeting Dr. Stergiou at the first Nonlinear Analysis Workshop he conducted in Europe (Dublin, 2013), I had a telling feeling of excitement-mixed-with-curiosity that ultimately lead to me accepting a graduate assistantship, packing two huge bags and flying across the pond.

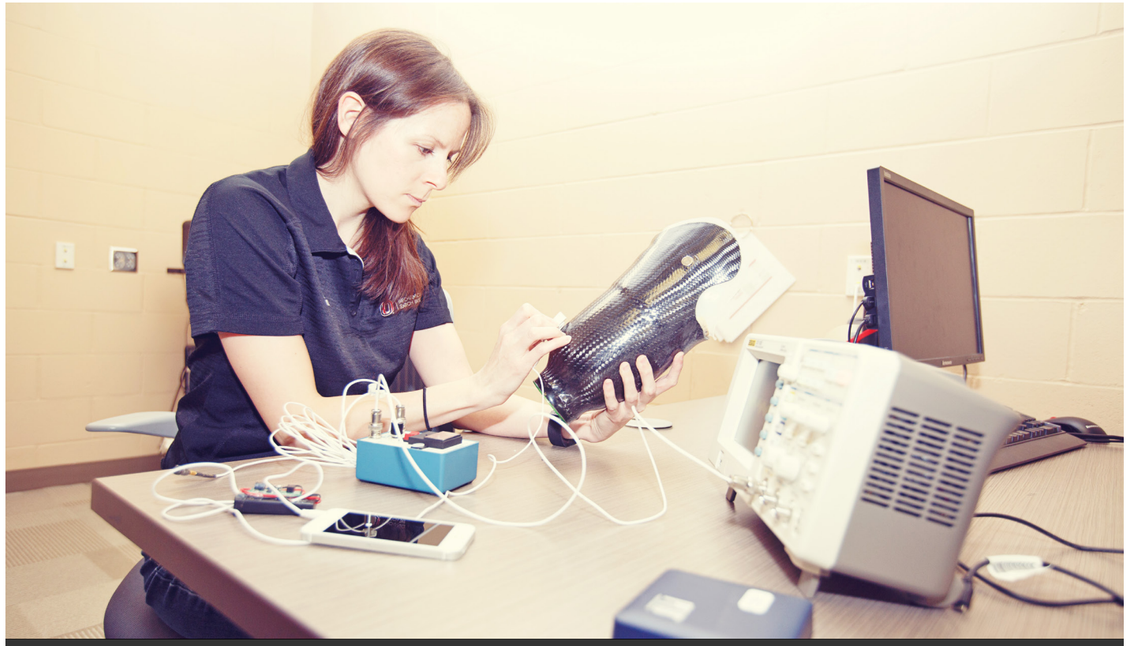
My time at UNO was loaded with opportunity. I already had a strong technical foundation in biomechanics, but in addition to learning new analytical skills, the program exposed me to new concepts, ways of thinking and theories born from a broad range of scientific disciplines; far extending the engineering concepts I'd studied in a previous life. From the weekly journal clubs to the Friday Doctoral Seminar with invited renowned speakers, to the walls that you could draw your ideas on, everything was geared towards learning, collaboration, and developing understanding and new ideas. I am so appreciative of the experience, which, although hard work, ultimately shaped the way I think.

After graduating from UNO in 2018 I moved back more intentionally in the direction of prosthetics and pursued postdoctoral study at Northwestern University's Prosthetics-Orthotics Center in Chicago with Dr. Matthew Major. There, on an Advanced Rehabilitation Research and Training fellowship, I had the opportunity to work closely with prosthetists, learning more about the art and science of fabricating, aligning and selecting appropriate components for people with limb loss.

Last year I accepted my current position as an Assistant Professor in the Department of Physical Therapy at the University of Nevada Las Vegas, where I am continuing my research in mobility and prosthetics. I am excited for what is to come. There is a great deal to be done to improve mobility and quality of life following amputation. Prosthetics, scientifically, is still a new field with so much to discover. While the technology has improved considerably over the years, there is still limited knowledge on the human side of prosthetic rehabilitation, which is where I lay my hat. I am lucky to have some fantastic students working with me on this research, and sincerely appreciate the insights of all the individuals with amputation I have met here who have been open to sharing their experiences.

> "DESPITE THE PLETHORA OF GREAT UNIVERSITIES IN THE UK, I MAINTAIN THAT MY DECISION TO RAISE STAKES AND HEAD TO NEBRASKA WAS AN INSPIRED ONE!"

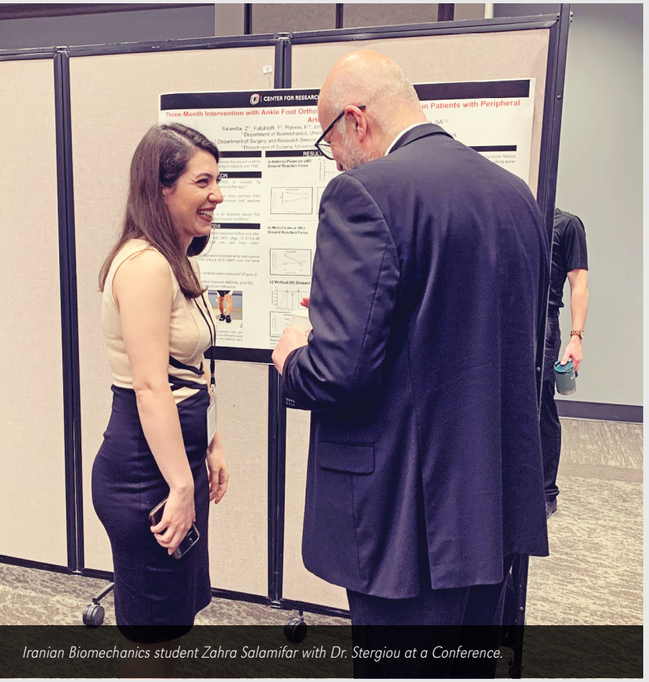
Despite the plethora of great universities in the UK, I maintain that my decision to raise stakes and head to Nebraska was an inspired one! Being awarded a Distinguished Alumnus award at UNO this year was a huge honor, and it was wonderful to head back to old grounds and see all the new developments and accomplishments. I will always be grateful to Dr. Stergiou, the faculty, and my peers at UNO for the integral part they played in my career and life trajectory, and proud to be an alumna of UNO Biomechanics.



Dr. Kent in the spring of 2016 as a UNO graduate student.

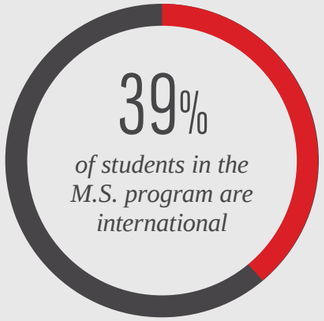
INTERNATIONAL STUDENT RECRUITMENT

Iranian UNO Biomechanics students and Dr. Majid Jadidi.

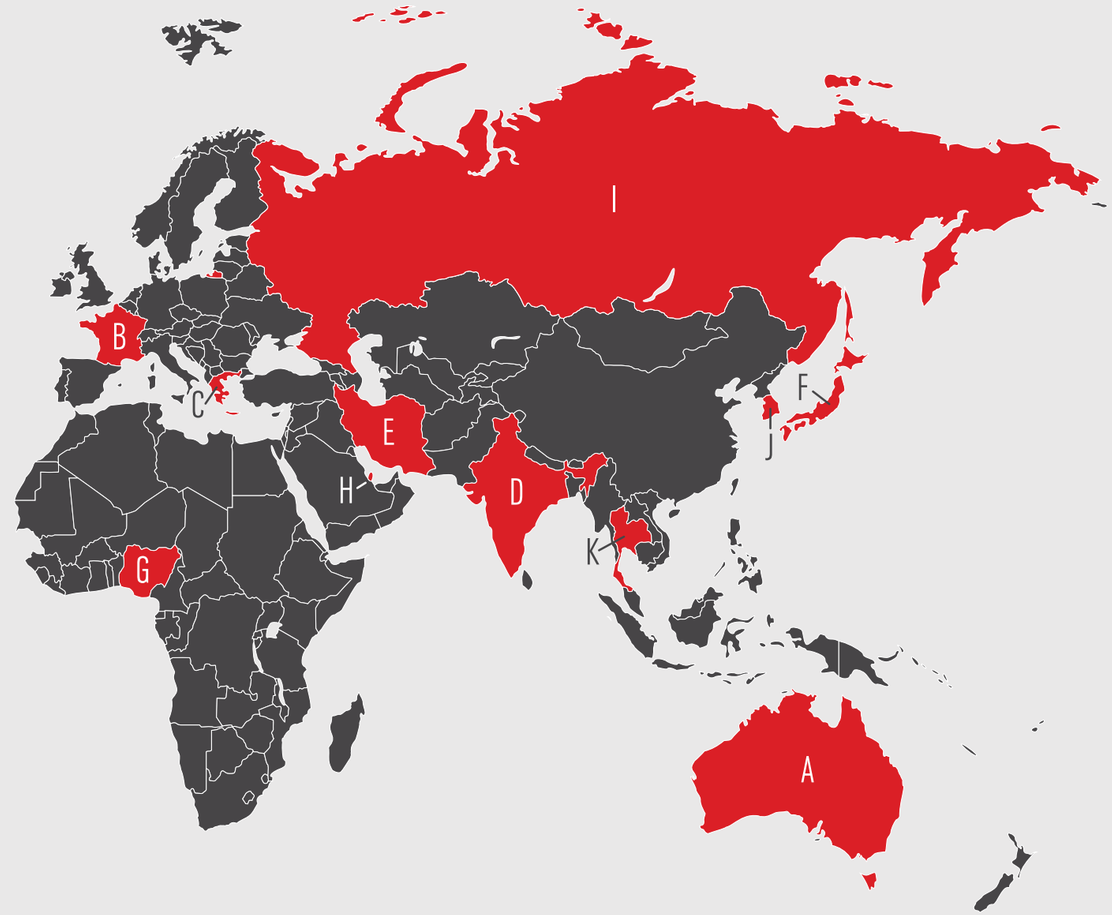


Iranian Biomechanics student Zahra Salamifar with Dr. Stergiou at a Conference.

UNO Biomechanics programs have not only increased overall enrollment but have also increased international student recruitment.



Did You Know? UNO Biomechanics Director Dr. Stergiou was the first international graduate assistant of UNO's School of Health, Physical Education, and Recreation (HPER) back in 1989.



Countries where students have been recruited from:

A	AUSTRALIA	E	IRAN	I	RUSSIA
B	FRANCE	F	JAPAN	J	SOUTH KOREA
C	GREECE	G	NIGERIA	K	THAILAND
D	INDIA	H	QATAR		

MOVCENTR IMPACT

UPDATES FROM PHASE II RESEARCH PROJECT LEADERS

> “THE GOAL OF THIS LINE OF RESEARCH IS TO IMPROVE BALANCE CONTROL FOLLOWING A SLIP, AND TO REDUCE THE HIGH NUMBER OF INJURIES AND DEATHS IN OLDER ADULTS THAT RESULT FROM FALLS DUE TO SLIPS EACH YEAR.”

DR. HUNT (USA)

Dr. Nathaniel Hunt, a Research Project Leader in our COBRE Phase II and Assistant Professor in the UNO Department of Biomechanics, along with his team recently published two new papers on multi-directionality in slips. The goal of this line of research is to improve balance control following a slip, and to reduce the high number of injuries and deaths in older adults that result from falls due to slips each year.

Why do some slips result in a devastating fall while others we walk away from and forget? Dr. Hunt and his team perform experiments in the lab that reproduce lifelike slips within the safety of a harness. They measure how the body moves during the critical milliseconds of the attempted recovery. When someone begins to slip, they will try to pull back their slipping foot and step their back foot onto the ground underneath their body. But the research team’s new data on multi-directionality in slips reveals that recovering from a slip is much more complicated.

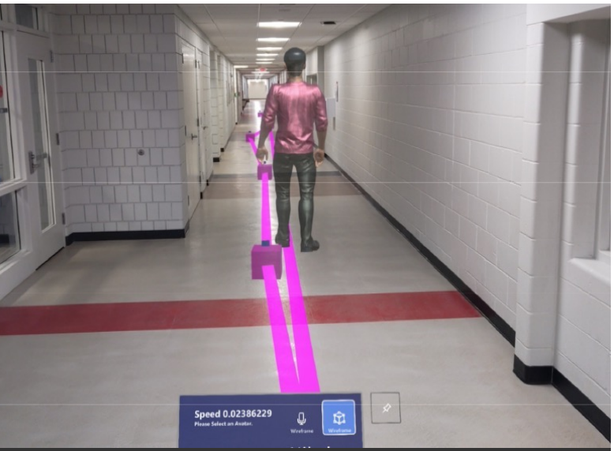
In a recent paper published in Scientific Reports, led by Ph.D. student Corbin Rasmussen, their slipping data demonstrates that the direction of the slipping foot is sensitive to timing. If the slip happens a fraction of a second later, then the foot will slip sideways instead of forward. In another recent paper published in Frontiers in Public Health and led by Ph.D. student Abderrahman Ouattas, models have shown that when both feet slip things get even more complicated. The front and back feet may slip forwards or sideways in similar or opposite directions. Surprisingly, when the researchers tried to use the slipping movements to predict whether the person fell or recovered, their predictions were accurate using side-to-side movements rather than front-to-back movements.

Preventing falls and maintaining mobility in the community is a crucial part of healthy aging. Dr. Hunt and his team hope that a better understanding of effective recovery movements in response to multi-directional slips can be used to keep us all on our feet.

DR. MALCOLM (BELGIUM)

Dr. Philippe Malcolm, a Research Project Leader in our COBRE Phase II and an Assistant Professor in the UNO Department of Biomechanics, along with his team published a high-impact paper featured on the cover of Science Robotics that received a federal National Science Foundation (NSF) grant. His team's research is focused on developing hip exoskeletons for patients with peripheral artery disease to, assist them in being able to walk longer and without pain.

In other ongoing collaborative research, they developed a garment that could apply slight resistance to the impaired leg and elastic assistance to the less impaired leg in stroke patients. This garment has a low cost and can be worn daily for variable-speed gait rehabilitation training. Furthermore, his team also conducts research using a custom-hardwired electromyography system that allows assisting faster-than-biological muscles. In an experiment with 10 participants, they found that this faster-than-biological assistance could help augment muscle activation during a reaching task.



A virtual companion walking alongside an older adult.

DR. MASTORAKIS (GREECE)

Dr. Carolin Curtze, a Research Project Leader and an Assistant Professor in the UNO Department of Biomechanics, along with her team investigate gait impairments in people with Parkinson's disease. Gait impairments are a core feature of Parkinson's disease and patients become more visually dependent to compensate for their motor deficits. Yet, visual dysfunction is common in Parkinson's disease. So, their recent research project aims at understanding how gaze behavior relates to stability during walking and turning in complex real-world settings. They also work on the development of digital biomarkers of mobility during daily living to identify disease-specific gait and turning impairments for a spectrum of neurological diseases (e.g., Parkinson's disease, multiple sclerosis, and cerebella ataxia). The long-term goal is to use these digital biomarkers to monitor disease progression and clinical trials.

> "THE RESEARCH OF DR. MASTORAKIS AND HIS TEAM HAS BEEN PUBLISHED AT PREMIER CONFERENCE AND JOURNAL VENUES IN COMPUTER SCIENCE."

Mobile eye-tracking and wireless movement sensors to observe gaze behavior during walking and turning. Dr. Curtze's team includes undergraduate and graduate students with backgrounds in biomechanics, biomedical engineering, and physical therapy.

DR. CURTZE (GERMANY)

Dr. Carolin Curtze, a Research Project Leader and an Assistant Professor in the UNO Department of Biomechanics, along with her team investigate gait impairments in people with Parkinson's disease. Gait impairments are a core feature of Parkinson's disease and patients become more visually dependent to compensate for their motor deficits. Yet, visual dysfunction is common in Parkinson's disease. So, their recent research project aims at understanding how gaze behavior relates to stability during walking and turning in complex real-world settings. They also work on the development of digital biomarkers of mobility during daily living to identify disease-specific gait and turning impairments for a spectrum of neurological diseases (e.g., Parkinson's disease, multiple sclerosis, and cerebella ataxia). The long-term goal is to use these digital biomarkers to monitor disease progression and clinical trials.

UPDATES FROM OUR PILOT AWARDEES 2021-2022

DR. SPYROS MASTORAKIS, ASSISTANT PROFESSOR

Dr. Mastorakis, who is an Assistant Professor with UNO Computer Science, highlighted in his pilot project the enormous potential that Augmented Reality holds for gait rehabilitation by creating immersive mechanisms (avatars) to achieve gait rehabilitation. For this work, he received best paper award runner-up at the 20th Institute of Electrical and Electronics Engineers (IEEE) International Conference on Pervasive Computing and Communications. Dr. Mastorakis' pilot project allowed him to transition to a Research Project Leader on our COBRE Phase II and to secure funding from the NSF.

DR. SONG-YOUNG PARK, ASSOCIATE PROFESSOR

Dr. Song-Young Park received tenure and promotion to Associate Professor in the UNO School of Health and Kinesiology. His pilot project provided the groundwork necessary to start his investigation of the physiological mechanisms underlying movement related deficits in patients with Peripheral Artery Disease (PAD). Dr. Park used the data from his pilot project to receive NIH funding. Specifically, he is a Co-Investigator on an NIH R01 titled "MitoQ treatment of claudication: myofiber and micro-vessel pathology." Additionally, he is a Co-Investigator with MOVCENTR Phase I Research Project Leader, Dr. Kota Takahashi, who received an NIH R01 award titled "Thermoregulation in individuals with a leg amputation: mechanics and vascular physiology factors to understand risks for tissue complications." His total dollar amount for these two projects is $1,139,774.00 which is an excellent return for the small pilot award he received of just $20,000.

Dr. Spyros Mastorakis

Dr. Song-Young Park

UPDATES FROM RESEARCH CORES

MACHINING & PROTOTYPING CORE UPDATE

The Machining and Prototyping (MAPRO) Core, under the direction of Dr. Brian Knarr, involves the use of two major laboratory spaces within the UNO's Biomechanics Research Building: The Machine Shop and the Additive Manufacturing Laboratory. The most basic function of the core is to provide services that utilize these spaces and their personnel and equipment. These services are for professionals in the University of Nebraska system, the local area, but also for people outside our state to progress their research or other projects. This core can design, prototype, manufacture, repair, maintain, or install a wide range of devices and instrumentation. This past year saw the addition of over $200,000 of high-end machines to the space.

The Machine Shop is a 1223 ft² space that includes an engineering office and garage-equipped work bay. The Machine Shop is also equipped with both traditional and advanced machinery that allows for prototyping and fabrication in materials ranging from various woods to metals, plastics, and other unique composite materials. Equipment in this space includes a wide collection of hand tools, a traditional knee mill (Knee Mill, Bridgeport, New York, USA), metal lathe (Optimuum, Germany), 3-Axis CNC milling machine (Baron, China), vertical band saw (Powermatic, Tennessee, USA), table saw (Powermatic, Tennessee, USA), compound miter saw, drill press (Powermatic, Tennessee, USA), belt/disc sander (Powermatic, Tennessee, USA), 3-Axis CNC routing machine (Powermatic, Tennessee, USA), bench grinder (Jet, Washington, USA), sewing machine (Bernina, Steckborn, Switzerland), VLS 6.60 laser cutter (Universal Laser Systems, Arizona, USA) HandyScan 700 Laser 3D scanner (Creaform, Quebec, Canada), and a small format circuit board CNC milling machine (Bantam Tools, California, USA). Also included are large scale additive manufacturing machines that include four Pro2 Plus (Raise3D, Irvine, CA, USA), a Rostock Max V2 and V3 (SeeMeCNC, Ligonier, IN, USA), a 300 Series Workbench Pro (3D Platform, Roscoe, Illinois, USA).

The Additive Manufacturing Laboratory includes a primary 675 ft² space for general activities and a secondary 224 ft² space specifically designed for printing metal components. The space has six Ultimaker 2+ Extended (Ultimaker, Geldermalsen, Netherlands), two uPrint SE plus (Stratasys, Eden Prairie, MN, USA), an Objet 260 Connex3 (Stratasys, Rehovot, Isreal), a Robo R2 (Robo 3D, San Diego, CA, USA) and a Form 2 and Fuse 1 (Formlabs, Somerville, MA, USA). The secondary space has a ProX DMP 200 (3D Systems, Rock Hill, SC, USA), with specially designed ventilation and fire suppression systems. Two of the printers are capable of Stereolithography, two by Selective Laser Sintering and the remaining through Fusion Deposition Modeling. Three can print support materials that can be dissolved in a special solution or removed with a contained power washer. Printing materials include plastics, wood, metal, and composites.

> "THIS CORE CAN DESIGN, PROTOTYPE, MANUFACTURE, AND REPAIR, MAINTAIN, OR INSTALL A WIDE RANGE OF DEVICES AND INSTRUMENTATION. THIS PAST YEAR SAW THE ADDITION OF OVER $200,000 OF HIGH-END MACHINES TO THE SPACE."

> "UNDER THE DIRECTION OF DR. DAVID KINGSTON, MOVAN HAS CONTINUED TO GROW AND IMPROVE SERVICES AVAILABLE TO OUR RESEARCHERS AND EXTERNAL CLIENTS FROM ALL OVER THE WORLD USING CUTTING-EDGE TECHNOLOGIES."

MOVEMENT ANALYSIS CORE UPDATE

The Movement Analysis (MOVAN) Core maintains state-of-the-art systems for measuring behavioral function and movement analysis while providing technical support for the interdisciplinary studies conducted by academic and industrial researchers. Core services include access to human behavioral function measurements (3-D kinematics, kinetics, electromyography, and imaging) to study human movement variability and neuromuscular control of movements like walking, standing, and reaching. They also include access to unique capabilities within the Biomechanics Research Building such as virtual reality environments, EEG and fNIRS capabilities, dual-task measurements, blood flow and ultrasound technologies, portable pulmonary and energy expenditure assessments, movement modelling and simulation, and muscle strength measurements to ask novel questions related to human movement.

Under the direction of Dr. David Kingston, MOVAN has continued to grow and improve services available to our researchers and external clients from all over the world using cutting-edge technologies. Two new staff started with the core in 2022. Dr. Fabricio Magalhães (Research Scientist and Laboratory Technician) came to us from a Laboratory Manager position at the Federal University of Minas Gerais in Brazil and Dr. Felipe Yamaguchi (Research Associate) joins us following his Ph.D. at the University of Delaware. Their expertise in multisegment foot modelling and virtual reality leverages our existing research infrastructure to advance our clinical gait analysis services for Children's Hospital and Medical Center (CHMC) Omaha and next-generation studies of human movement variability on unstable surfaces using visual feedback. MOVAN has received approval and implemented our MOVCENTR Research Participant Registry. With the assistance of our Lead Coordinator, Ms. Lindsey Remski, MOVAN researchers can now ethically access contact information and screening criteria as a local resource for subject recruitment in experimental studies. We have invested in what we believe could be the future of clinical and sport movement science and markerless technology. Two of our laboratory spaces are now fully equipped with high-definition color video systems that can simultaneously record marker and markerless motion capture. MOVAN is positioned to be a leader in verifying markerless motion capture as a useful tool to improve the range of questions MOVCENTR investigators can ask. Dr. Kingston continues to work closely with Drs. Vivek Dutt and Hope Voto, partnering clinicians at CHMC, on a variety of different research projects to improve health care in pediatric populations with movement disorders as noted by his success with NIH and local funding bodies.

Interested in starting a project with MOVAN?
Email: **bmchmovan@unomaha.edu**

> “THIS COMING YEAR NONAN IS WORKING ON SOME EXCITING CHANGES THAT WILL BRING THE MATERIALS OF OUR NONLINEAR ANALYSIS WORKSHOP TO A WIDER AUDIENCE. THIS CORE HAS BEEN HARD AT WORK IN DEVELOPING AND VALIDATING NEW NONLINEAR ANALYSIS TECHNIQUES.”

NONLINEAR ANALYSIS CORE UPDATE

The Nonlinear Analysis (NONAN) Core enhances the availability of resources to examine movement variability data through the lens of nonlinear analysis and provide technical support for the interdisciplinary studies conducted by academic and industrial researchers. Core services include access to a multitude of nonlinear analysis tools, such as: Lyapunov exponent, entropy, detrended fluctuation analysis, surrogation techniques, recurrence quantification analysis, and correlation dimension. Besides access, assistance in computer programming, processing data, and data interpretation are also available. Consultation services are available for grant submissions, experimental and methodological designs, and results dissemination.

Under the direction of Dr. Aaron Likens, NONAN continues to grow. Two new personnel arrived, Research Associate, Dr. Madhur Mangalam and Laboratory Technician, Mr. Joel Sommerfeld. Various faculty, and staff from NONAN traveled to ISPGR in Montreal and NACOB in Ottawa, giving two workshops to over 120 people. We also traveled to NASPSPA in Hawaii and hosted a Nonlinear Analysis Workshop. This coming year NONAN is working on some exciting changes that will bring the materials of its Nonlinear Analysis Workshop to a wider audience. This core has been hard at work in developing and validating new nonlinear analysis techniques.

In 2023 NONAN will be attending the Society for Neuroscience’s annual conference in San Diego. So, if you are there, stop by and say hello! They also plan on attending a number of other conferences to hold workshops on how you can leverage analysis specialties in your day-to-day research. NONAN’s services are available for individuals in the University of Nebraska system, as well as individuals outside of the system and from around the world. If you are curious about the techniques and services the core has to offer, feel free to reach out via email.

2022 HUMAN MOVEMENT VARIABILITY & GREAT PLAINS BIOMECHANICS CONFERENCES

OVERVIEW

We were so excited to be back in-person for 2022! We had 124 registrations, and a record 68 abstract submissions! For the first time, this year included a pre-conference workshop hosted by Nonlinear Analysis Core Director, Dr. Aaron Likens covering Phase Space Reconstruction and Dynamics, Measures of Uncertainty, and Fractals and Multifractals.

We had seven vendors: Delsys, AMTI, Theia Markerless, UNeTech, XSensor, Bertec and Motion Analysis. Thank you so much for your support. However, it wasn’t all science. We had happy hour at the Inner Rail in Aksarben, building tours of the Biomechanics Research Building, played vendor bingo and had a social media scavenger hunt!

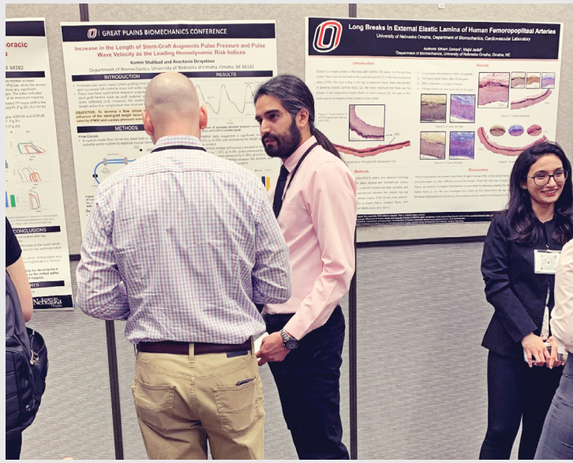
KEYNOTE SPEAKERS

Dr. Jaap van Dieen from VU Amsterdam was the Barry T. Bates Keynote Speaker for the Human Movement Variability Conference. Dr. van Dieen’s presentation was titled, “Center of Mass State Feedback for the Control of Gait Stability.” His presentation was focused on the body’s center of mass, and the basic knowledge used to improve gait stability in individuals with fall risk.

Dr. Veerle Segers from Ghent University was the Keynote Speaker for the Great Plains Biomechanics Conference. Dr. Segers presentation was titled, “A Biomechanical Perspective on Lifetime Running.” Her presentation was focused on how biomechanical insights can help avoid running-related injuries.

AWARDS

- ***AMTI Best Scientific Impact Podium Presentation Award:*** *Madihah Kazim*
- ***Motion Analysis Best Scientific Impact Podium Presentation Awards:*** *Anaëlle Charles and Sheridan Parker*
- ***Theia Markerless Best Clinical Impact Podium Presentation Award:*** *Liz Pekas*
- ***Promising Student Award:*** *Kolby Brink*
- ***Outstanding Poster Awards:*** *Angeleau Scott, Ayisha Bashir, Sivapriya Devidas, Stephanie Mace*



EDUCATION INITIATIVES

BIOMECHANICS UNITED

Biomechanics United is an official Student Chapter of the American Society of Biomechanics and a registered student organization at UNO. Being part of the American Society of Biomechanics student body chapters allows students at UNO to network with other students across the country and provides opportunities to meet professionals in the field. Biomechanics United as a student organization at UNO provides both graduate and undergraduate students the opportunity to interact with one another outside a classroom or laboratory setting. The group is student run and student focused with an emphasis on building greater relationships amongst the biomechanics community at UNO. Every month the group hosts a social and a professional event to provide its members with an outlet from the stresses of school and research while also helping form them into strong young professionals in the field.

2021-2022 CHAPTER OFFICERS:

PRESIDENT:
Kolby Brink, Master's Student

TREASURER:
Kayla Kowalczyk, Master's Student

SECRETARY:
Megan Woods, Undergraduate Student

FACULTY ADVISOR:
Dr. Brian Knarr, Associate Professor

MEETING CHAIR:
Angeleau Scott, Master's Student

PROGRAM CHAIR:
Meghan Prusia, Undergraduate Student

CO-ADVISOR:
Dr. Amelia Lanier, Instructor and Outreach Coordinator

CO-ADVISOR:
Laura Rotert, Academic Program Coordinator

DR. SARA MYERS ELECTED AS PRESIDENT OF THE ASB

The American Society of Biomechanics (ASB) is a scholarly society for biomechanics.

Sara Myers, Ph.D., is a professor in the Department of Biomechanics and Interim Associate Vice Chancellor of the Office of Research and Creative Activity (ORCA) at UNO. Dr. Myers' current research is focused on improving the quality of life in patients with peripheral artery disease. Her research has been funded by the National Institutes of Health (NIH), the Department of Veterans Affairs (VA), and NASA.

Dr. Myers has been an active member of the American Society of Biomechanics (ASB) since 2007 when she attended her first ASB meeting. Since then, she served on the ASB Conference Planning Committee in 2013 when the headquarters were in Omaha, NE. Annually, Dr. Myers presents research at their annual conference, participates in their mentorship program, and reviews grants for their education and awards committees. "I love being involved in ASB because the biomechanics community feels like my extended family. I appreciate how the Society invests in students and promotes biomechanics as a discipline," Myers says.

When Dr. Myers began her undergraduate studies at UNO, the biomechanics degree programs did not exist, and the terminology "biomechanics" was new to many. Fast-forward to 2022, and UNO is home to one of the most prestigious, nationally known Biomechanics research centers - leading innovation in research and education. In her new role as ASB President, Dr. Myers hopes to work with the ASB Executive Board to create a process to endorse and recognize biomechanics curricula as well as enhance science communication, promoting the discipline of biomechanics within academia and the public.

"It is an honor to be elected as President of the ASB. Contributing to the Society's legacy drives my desire to be involved in ASB leadership." As this year's President-Elect, she has been involved in the site selection for the 2024 Annual ASB Meeting, monthly meetings of the Presidential line, and Quarterly Executive Board meetings. As President, Dr. Myers hopes to grow the society by emphasizing programs that connect members and encouraging a community that is inclusive of all biomechanics disciplines.

"CARDIOVASCULAR BIOMECHANICS RESEARCH AT UNO AIMS AT THE DISCOVERY, DEVELOPMENT, AND TRANSLATION OF INNOVATIVE TECHNOLOGIES TO TREAT CARDIOVASCULAR DISEASE."

CARDIOVASCULAR BIOMECHANICS LAB INFORMATION AND COURSE DEVELOPMENT

In 2019 we expanded our department's portfolio of research by adding cardiovascular biomechanics to our repertoire. Since then, the cardiovascular research has been flourishing, slowly growing, and adding more and more students to the expanding team.

Cardiovascular disease is the leading cause of death and disability worldwide, and cardiovascular biomechanics research at UNO aims at the discovery, development, and translation of innovative technologies to treat it. With Dr. Alexey Kamenskiy at the helm, the team of faculty also includes Dr. Anastasia Desyatova, Dr. Kaspars Maleckis, Dr. Majid Jadidi, and Dr. Yury Salkovskiy. Our cardiovascular team has also developed strong collaborative connections with the vascular surgeons over at UNMC.

Today, the cardiovascular team includes ten students who use biaxial mechanical testing, hemodynamic testing, mCT and SEM imaging, structural evaluation using histology, manufacturing using electrospinning and electrospraying and more to understand human artery function, pathophysiology, and the development of better cardiovascular devices and materials. The department is also offering now courses in the subject including Cardiovascular Biomechanics, Biomaterials, and Introduction to Mechanics of Biomaterials.

THESIS AND DISSERTATION
DEFENSES

THESIS DEFENSES

KAITLIN FRASER
Defense: November 23rd, 2021

Motor dexterity and behavior in chronically ill children after isolation

GARRETT EGGLESTON
Defense: April 13th, 2022

The Effect of External Focus Cues on Lower Back Pain During the Golf Swing

TAYLOR KINNEY
Defense: April 14th, 2022

The Impact of Sport Specialization in Baseball on Scapular Kinematics and Kinetics

KAYLA KOWALCZYK
Defense: April 19th, 2022

Low-Cost Asymmetric Hip Brace for Gait Training

STEPHANIE MACE
Defense: April 26th, 2022

Dynamic Visual Acuity: Is Replicating the Dynamics of the Environment Important or Will a Simple Eye Chart Do?

ANGELEAU SCOTT
Defense: April 11th, 2022

Relationship of Shoulder Strength to Kinetics and Kinematics in Collegiate Baseball Pitchers

SIENA SENATORE
Defense: April 21st, 2022

Algorithm-guided prosthesis fitting for reducing intact knee loading and minimizing fitting time

MICHAEL SERVAIS
Defense: April 10th, 2022

Analyzing Thoracic Spine and Hip Mobility and the Effects on Kinematics in the Golf Swing and Its Relation to Injury and Performance

JOSE ANGUIANO-HERNANDEZ
Defense: June 8th, 2022

Changes to Stance Limb Plantar Force and Ankle Joint Mechanics During Normal and Assisted Walking in Patients with Type 2 Diabetes

KOLBY BRINK
Defense: June 17th, 2022

Irregular Metronomes Alter Bimanual Coordination Dynamics

JOSEPH HARRINGTON
Defense: July 18th, 2022

Changes in Lower-limb Muscle Activity and Kinematics During Dry and Aquatic Treadmill Walking in Children with Cerebral Palsy

TAYLOR WILSON
Defense: July 22nd, 2022

Surface and Task Effects on Fractal Characteristics in Gait

DISSERTATION DEFENSES

FARAHNAZ FALLAH TAFTI
Defense: July 20th, 2021

Stability of Human Walking during Steady State and Perturbed Conditions

NAMWOONG KIM
Defense: July 20th, 2021

Development of Visual Biofeedback Strategies to Reduce Joint Loading Asymmetry in Individuals Post ACL Reconstruction

TODD LEUTZINGER
Defense: November 2nd, 2021

The Effect of Handrail Use on Knee Joint Loading, Balance, and Confidence When Negotiating Stairs in Individuals Who Are Obese

TYLER HAMER
Defense: April 19th, 2022

Investigation of Sport Specialization History and Workload Management on Pitching Biomechanics in Collegiate Baseball Pitchers

ERICA HEDRICK HINTON
Defense: March 25th, 2022

The impact of real-time visual biofeedback on overground walking speed in individuals post-stroke

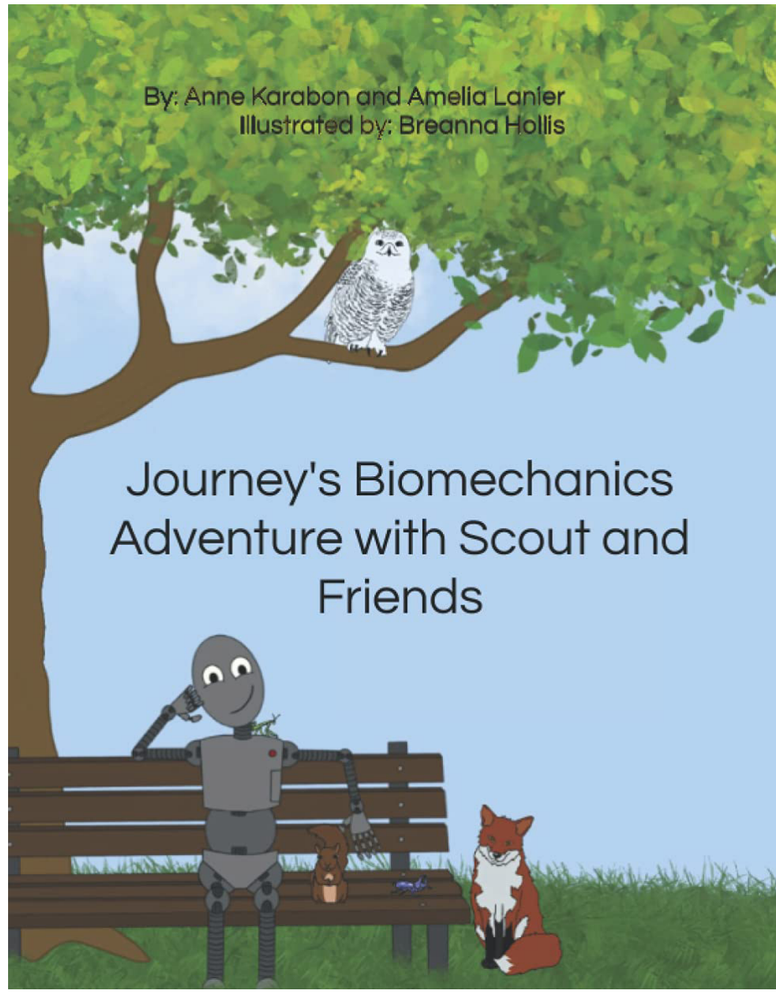
ARASH MOHAMMADEZADEH GONABADI
Defense: May 27th, 2022

From musculoskeletal modeling toward designing devices to reduce metabolic cost

DR. AMELIA LANIER AND COLLABORATORS PUBLISH CHILDREN'S BIOMECHANICS BOOK

Biomechanics faculty in collaboration with faculty in UNO's Teacher Education program published a children's book and teacher guide to introduce biomechanics concepts to elementary students. The book was published by Drs. Amelia Lanier Knarr and Anne Karabon and was part of a National Science Foundation (NSF) Award titled 'Biomechanics to Offer Diverse Young Minds Opportunities to Develop, Explore, and Learn STEM (BODYMODELS)'. The BODYMODELS project worked with local Omaha teachers to introduce biomechanics concepts into elementary classrooms to improve STEM learning and confidence in both students and teachers. Teachers participated in a three-week professional development workshop learning about biomechanics concepts, current biomechanics research, and techniques in inquiry-based learning. From BODYMODELS there have been over 60 teachers in the Omaha metro area now trained in biomechanics STEM learning. With the addition of the children's book and teachers guide, there is now an opportunity for children across the country to learn biomechanics.

Journey's Biomechanics Adventure with Scout and Friends follows Journey the robot as he learns about biomechanics principles through interactions with his animal friends. After getting wet by a city-park sprinkler, Journey's joint and gears no longer work properly. Through the help of Scout the squirrel, and some oil, Journey learns about the special ways other animals move while also learning about force, momentum, range of motion, center of mass, gravity and many other concepts. In addition to the Journey's story, there is a teacher guide which provides an in-class activity, vocabulary words, and concepts that correspond to different parts of the story. This format allows teachers to link story time to STEM activities. This book is now available on Amazon and will support the use of biomechanics as a tool for STEM learning within elementary schools and private homes for years to come.



> "THE BODYMODELS PROJECT WORKED WITH LOCAL OMAHA TEACHERS TO INTRODUCE BIOMECHANICS CONCEPTS INTO ELEMENTARY CLASSROOMS TO IMPROVE STEM LEARNING AND CONFIDENCE IN BOTH STUDENTS AND TEACHERS."

LEADERSHIP POSITIONS STUDENT IMPACT

Our dedicated students have the opportunity to obtain prestigious grants, awards, and scholarships based on the high-quality research they conduct in the Biomechanics Research Building.

2022 Office of Research and Creative Activity Fair Awards:

Best Graduate Oral Presentation
Nikolaos Papachatzis

Outstanding Graduate Oral Presentation
Tyler Hamer

Meritorious Graduate Oral Presentation
David Salazar

Best Graduate Poster Presentation
Farahnaz Fallah Tafti

Best Undergraduate Poster Presentation
Sydney Andreasen

Outstanding Undergraduate Poster Presentation
Meghan Prusia

Honorable Mention Undergraduate Poster Presentation
Alicia Andersen

2022 Human Movement Variability and Great Plains Biomechanics Conferences Awards:

AMTI Best Scientific Impact Award
Madihah Kazim

Outstanding Poster Award
Angeleau Scott

Motion Analysis Best Scientific Impact Award
Anaëlle Charles

Motion Analysis Best Scientific Impact Award
Sheridan Parker

Promising Student Award
Kolby Brink

Outstanding Poster Award
Sivapriya Kuniyil

Outstanding Poster Award
Ayisha Bashir

Outstanding Poster Award
Stephanie Mace

2020-2021 FUSE Grants:

Katie Andersen
Cody Anderson
Sydney Andreasen
Danielle Calpin
Isha Dhakal
Nate Evans
Sadie Limback
Luke Partusch
Meghan Prusia
Roberto Saavedra
Hannah Stogdill

2020-2021 GRACA Grants:

Kolby Brink
Garrett Eggleston
Arash Mohammadzadeh Gonabadi
Tyler Hamer
Taylor Kinney
Kayla Kowalczyk
Nikolaos Papachatzis
Sheridan Parker
Angeleau Scott
Siena Senatore
Michael Servais
Taylor Wilson

2021-2022 Vaya Stergiou Distinguished Scholarship in Biomechanics:

Johanna Bustamante-Salgado

2021-2022 NASA Nebraska Space Grant Fellowship:

Kolby Brink

2021-2022 College of Education, Health, and Human Services Outstanding Graduate Student Award-Biomechanics

Fall: Kaitlin Fraser
Spring: Kayla Kowalczyk

2021-2022 Elton S Carter Award for Excellence in a Master's Thesis

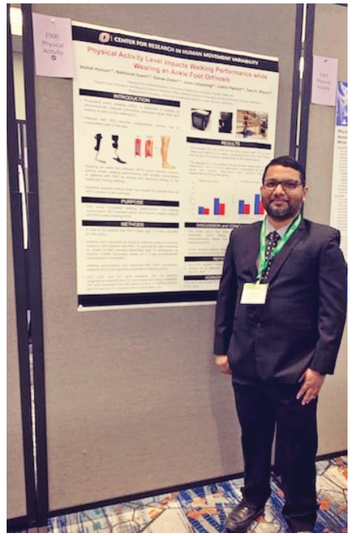
Christopher Copeland

Johannah Bustamante-Salgado, Vaya Stergiou Scholarship Receipient

Christopher Copeland, Elton S. Carter Award Receipient

OTHER CONFERENCES

During the 2021-2022 academic year, three of our staff received professional development grants from UNO's Staff Advisory Council (SAC) to attend national conferences to learn about topics related to their positions! Conferences attended were the Society of Behavioral Medicine's Annual Meeting in Baltimore, MD, MIT Sloan Sports Analytics Conference in Boston, MA, and NAGAP Graduate Enrollment Management Summit in Chicago, IL.

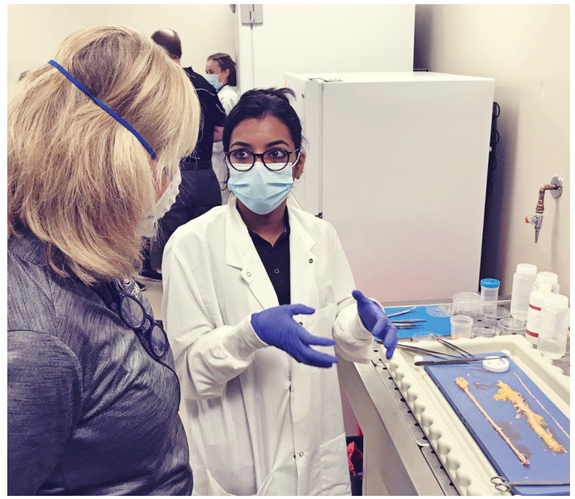


2022 MAY COMMENCEMENT WAS FINALLY IN PERSON

We were so happy to finally have an in-person commencement. Our Biomechanics graduates even wore a special ribbon!

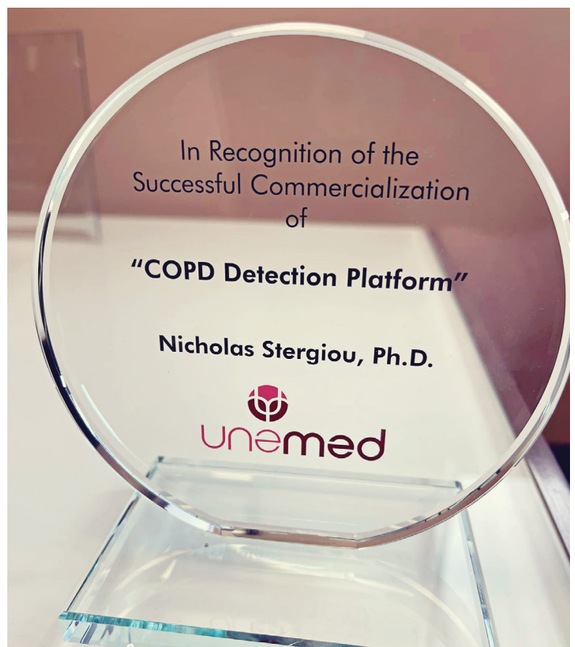
COMMUNITY ENGAGEMENT ACTIVITIES

Tours are back. Our Open House was a great success. Our participation in the National Biomechanics Day is always fun.



PATENT IS COMMERCIALIZED

One of our patents, the "COPD Detection Platform" was commercialized, and it is coming to a hospital close to you!



CAMPAIGN for NEBRASKA
UNIVERSITY of NEBRASKA FOUNDATION

For over 26 years, the revolutionary research taking place at UNO's Biomechanics Research Building (BRB) has led to a new understanding of human movement—how we stand, walk, and physically interact with our environment.

The only facility of its kind in the world, UNO's BRB has earned an international reputation for excellence in basic and clinical research. For example, its research in cerebral palsy and peripheral arterial disease has influenced the treatment and therapy options available to persons living with these disabilities. UNO's BRB has patented the wireless Gait-O-Gram, a biomedical instrument designed to measure an individual's walking parameters. Current research efforts are underway in the areas of robotic assisted surgery, chronic obstructive pulmonary disease, Autism, stroke and mobility issues facing elderly populations.

These achievements bring additional opportunities to advance biomechanics research in ways that aren't even known today. However, this continued growth requires private support beyond what State of Nebraska funding can provide.

Private support for new equipment, student scholarships/fellowships and faculty support is critical to continue building upon the work taking place at the BRB. Your gift to any of the areas indicated on the corresponding pledge card will help advance these efforts now and into the future.

Join us in our efforts by making a gift today.

Yes, I/we would like to support the Nebraska Biomechanics Core Facility with a gift to the Nebraska Biomechanics Excellence Fund # 01103240 by choosing one of the three options below.

☐ My check for $_____ is enclosed, payable to the University of Nebraska Foundation.

☐ Please charge $_____ to my: ☐ VISA ☐ MasterCard ☐ Discover ☐ AmEx

Card Number:_____Exp. Date:_____

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

_____
Signature (for credit card payment or to establish a pledge) Date

Name _____

Address _____

City _____ State _____ Zip_____

Phone_____ Email_____

☐ My company, _____, will match this gift. (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.

☐ Please send information about making a planned gift. You may also call 1.800.432.3216 to speak with a planned giving professional.

PLEASE RETURN TO:
University of Nebraska Foundation
2285 South 67th Street, Suite 200
Omaha NE 68106
For more information, call 800.432.3216 or visit our website nufoundation.org.

Since 1936, the University of Nebraska Foundation has played a significant role in the success of the University of Nebraska. As a nonprofit, independent corporation, the University of Nebraska Board of Regents designated the Foundation as the primary fundraiser and manager of private gifts to the university. The Foundation exists to raise and manage gifts to further advance all campuses of the University of Nebraska.

University of Nebraska Omaha

CONNECT WITH THE UNIVERSITY OF NEBRASKA AT OMAHA BIOMECHANICS RESEARCH BUILDING

6160 University Drive South | Omaha, NE 68182-0860 cehhs.unomaha.edu/brb

unobiomechanics@unomaha.edu 402.554.3228 /unobrb /unobrb @UNOBiomechanics /uno_biomechanics