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Bridging the Colleges: One Foot at a Time

Georgios Stylianides, Ph.D., (second from right) associate professor of exercise science and sport at The University of Scranton, works with students in the Jesuit institution's biomechanics laboratory, analyzing human motion. In the spirit of academic cooperation, Dr. Stylianides has teamed with the University's biology department to share resources, expand on ideas and create a stronger learning environment.

Research is viewed by some as falling into two categories: applied and basic. Applied research is used to solve practical problems and, in the end, improve the human condition. Basic research is used to expand knowledge for its own sake; it generally has no commercial value, although it also improves the human condition through enhancing our understanding of our world. In academics the two types of research exist in tension with one another. The exercise science department's course in biomechanics and the biology department's comparative biomechanics course are two very different courses that deal with the same principles. Although one tends to emphasize applied research and the other basic research, the knowledge from both courses enlightens students, through different means, to the nature of motion.

Georgios Stylianides, Ph.D., teaches the biomechanics courses in the exercise science department. He came to The University of Scranton two years ago after working at Tulane University and in the National Biodynamics Lab at the Michoud NASA Facility, analyzing movement in varying environments for the Navy and NASA. In his previous work and here at the University, his focus was and is on how to apply engineering and physics to a biological system, such as the human body. In his short tenure here, he has created a biomechanics laboratory where his students can analyze movement for the purpose of improving sport dynamics or analyzing gait problems so as to correct anatomical problems.

The biomechanics lab is equipped with high-speed digital cameras to satisfy a real-time, three-dimensional environment, a forceplate, electromyography (EMG) equipment, and some powerful software and computers. It is here that Dr. Stylianides' students learn the basics of human motion, and at the same time, how complicated that motion can be. He has the students place specially made reflectors on certain joints of their test subjects' (usually themselves) bodies along with surface electrodes to pick up information on muscular activity. Then the 3-D system allows them to recreate the human body's motion in real time and in three dimensions on the computer. Students can then see the differences and similarities of motion in humans from multiple angles. They analyze the data created in the lab so that one day they may be able to improve the wrist action of a basketball player to produce a better shot; or guide a surgeon on how to rearrange damaged or misaligned muscles in order to produce a stronger, more efficient gait; or how best to design an orthopedic prosthesis to make movement better for wounded soldiers and civilians; or how to develop more realistic animation for films or video games. The biomechanics lab opens the students to many possibilities for future studies and careers. Indeed, many of Dr. Stylianides' students will pursue master's, Ph.D., or Doctor of Physical Therapy programs.

Janice Voltzow, Ph.D., is the chair of the biology department and has been at the University since 1996. Dr. Voltzow also teaches a biomechanics course that analyzes animals and plants using a multi-level approach ranging from individual molecules and cells to whole organisms and their ecological systems. Her comparative biomechanics course, an upper-level course for biology majors, examines the mechanics of how slugs crawl, how flowers open and close, how birds fly, how kangaroos jump, and how fish swim. The course applies physics and engineering principles to biology to give students a greater understanding of the functions of organisms. Many of her students, like Dr. Stylianides', will also pursue degrees beyond the bachelor's level, generally in biology or in medicine. On a recent field trip to the biomechanics lab, Dr. Voltzow and her class discovered common ground between basic and applied research.

In the spirit of academic cooperation between departments (exercise science and biology) and schools (Panuska College of Professional Studies and the College of Arts and Sciences), Professor David Hair, chair of the exercise science department, suggested that Dr. Stylianides and Dr. Voltzow combine their knowledge and utilize the biomechanics lab together. Dr. Stylianides, who thrives on collaborative efforts, contacted Dr. Voltzow and invited her class into the biomechanics lab. Dr. Voltzow's students' experience in the lab brought an added dimension to the application of the principles they had been investigating. In the lab students learned that at a certain speed on the treadmill it is easier to run than to walk and that while running both legs are off the ground. The experience highlighted a video they had examined in class of the motion of a horse running. (If you are interested, you can find this video at http://www.horseloocomotion.com/horse_motion_capture_data_faq.html.) According to Dr. Voltzow, the "students really enjoyed the visit." She added that the next time she offers the class, she will take her students earlier in the semester to allow for more interaction between the classes, which will also create more opportunities for research collaboration.

Dr. Stylianides and Dr. Voltzow's professional research could not be more different. Dr. Stylianides and his colleagues from a Veteran Affairs hospital in Florida have just finished a three-year study entitled, "Effect of Type of Exercise on Gait and Balance in Peripheral Neuropathy," and recently presented their findings at a national conference. Dr. Voltzow has also conducted research on gaits – the gaits of marine snails such as conch, whelks and abalone. Both Stylianides and Voltzow's studies integrate structure and function, yet the goals of their studies emphasize the difference between applied and basic research. While their research has different ends, their teaching and the principles of biomechanics overlap and this commonality allows them to share their resources and ideas with their students.

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