

Texas Student Receives NWRI Fellowship for Soil Physics Research

Fall 2004 – Mikhail Gladkikh is not your average Texan.

First of all, he speaks with a Russian accent. Second, his favorite sport is not football, but futbol. And third, he spends most of his time in front of the computer — simulating soil processes.

For 25 year old Mikhail, a second-year doctoral student at the University of Texas at Austin, physics has been a lifelong passion. Growing up, he was always interested in physics. He especially liked how it explained the world around him.

That love led him to study Applied Mathematics and Physics for 6 years at the Moscow Institute of Physics and Technology, which is about 200 kilometers from his hometown, the City of Tula in Russia.

Physics also brought him together with his wife, Larisa Branets, who was studying in the same department at the Moscow Institute. When it was time to earn their Ph.D.s, they both applied to the University of Texas at Austin — and both were accepted into the Computational and Applied Mathematics program at the university's Institute for Computational and Engineering Sciences.

A graduate research assistant, Mikhail spends his time at the university conducting research. "It's like a job," he says — but it's definitely not the routine 9 to 5.

Mikhail is conducting cutting-edge research on developing a model to simulate — and, ultimately — predict the behavior of soil, especially as it relates to the movement of contaminants and water underground.

Specifically, his graduate research is based on modeling soil on the microscopic level (soil being defined as little spheres that are equal in size and randomly lumped together). Since the spatial coordinates of these spheres have been measured in advance, Mikhail already knows the exact soil geometry (namely, the positions of soil grains and pore space). Combining this knowledge with modeling can, for instance, be used to determine how quickly and where surface water can infiltrate through the soil, or in which direction a contaminant, like gasoline, might flow through the earth.

Or, as Mikhail put it, "If we have a complete geometric description of soil, we can model any physical process that can occur, such as contaminant transport."

His research has direct and substantial application to the water industry, especially in the field of riverbank filtration, which uses wells located along riverbanks to force surface water through the ground and effectively filter out contaminants.

Because of the potential of his research, NWRI awarded Mikhail an NWRI Fellowship in the amount of \$15,000. He was among three new students nationwide to receive the award this year.

According to his graduate advisor, Dr. Steven Bryant of the Department of Petroleum and Geosystems Engineering at the University of Texas at Austin, Mikhail — already a published author — has “a rare gift: an extraordinary physical insight combined with computational expertise.”

“His research contributions will be useful for understanding and quantifying problems associated with freshwater environments,” Dr. Bryant added.

Mikhail defended his research dissertation, “A Priori Predictions of Macroscopic Behavior of Fluids in Simple Porous Media,” this fall and expects to graduate in May 2005. He’s not sure if he will stay in Texas — where the air conditioning is always on at home — or if he will return to Russia. His hope is to become a researcher at an institute, where he can continue to pursue his interests in the physics of soil.

Written by Gina Melin, National Water Research Institute.