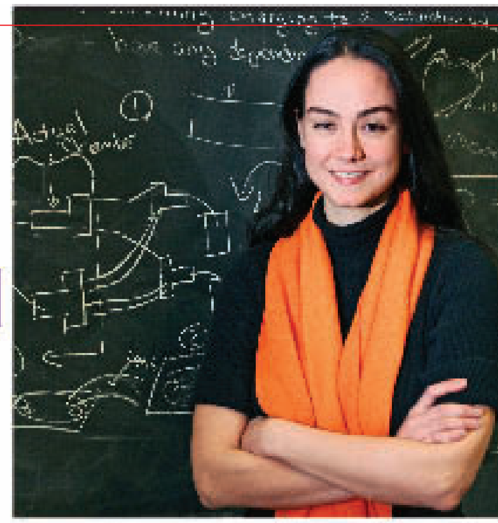
re: action

Azadeh Samadani



Cellular Sensibility

By Laura Gardner

Azadeh Samadani used to spend a lot of time trying to build the perfect sandcastle. More recently, she's become fascinated by slime molds, groups of single-celled amoebae. The newly minted assistant professor's interests lay at the margin where the mundane meets the mysterious.

"I get fascinated by simple problems, and I like to touch and poke things," says the Iranian experimentalist-turned-biophysicist. In the realm of Samadani's research, surface simplicity belies a vast uncharted landscape. The physics underlying the behavior of wet sand is incompletely understood, while the secret lives of cells in slime molds may hold clues that could help us demystify cancer metastasis.

Her doctoral work received considerable attention because she and her colleagues at Clark University developed a model to explain and predict the stability conditions for wet granular materials (think sand and grain). Up to that point, physicists had only a model to describe stability in dry sand.

As Samadani's team discovered, just the right amount of water added to sand enables liquid bridges to form at the contact points between the grains. The liquid bridges produce an attractive force that holds the grains together and increases the stability of a sand pile. If this contribution lacks the sizzle of finding a new subatomic particle or a new force, consider that silos collapse, retaining walls crumble, landslides and avalanches devastate, and even getting pharmaceuticals to mix properly in manufacturing is a big problem.

Typical of many scientists at Brandeis, Samadani is comfortable crossing the boundaries of disciplines to maximize traction in researching fundamental questions. Her current research uses quantitative experimental approaches to study basic biological questions.

"I want to be able to understand what's happening in the cell and be able to explain that with a mathematical model," says Samadani.

Her goal is to understand the complex interaction between cells and their external environment both at the level of the single cell and the level of the population. She says, "To me, the question is, how do cells sense their environment, and how do they sense the chemical gradients around them?"

Answering these questions in a predictive mathematical model could reveal how organisms such as the slime mold *Dictyostelium* and the bacteria *E. coli* find their food and move toward it. Such a model might decode how white blood cells know to move toward invading bacteria in a mission to destroy them. Directional sensing mechanisms in eukaryotic cells govern critical cellular behavior yet represent a largely unexplored area of biophysics.

Samadani also researches cell-to-cell variation among genetically identical cells and the implications for the fitness of a population.

"Every single cell has a mind of its own," she says, explaining, for example, that two sister cells in a genetically identical population respond differently to the same chemical gradients.

"What accounts for this cellular individuality, which is everywhere in biology?" she asks with the excitement of an explorer about to go on a long journey.

Right at home investigating the earthbound in her new lab at Brandeis, Samadani is well positioned to raise the curtain on some of the most interesting of cellular behaviors.