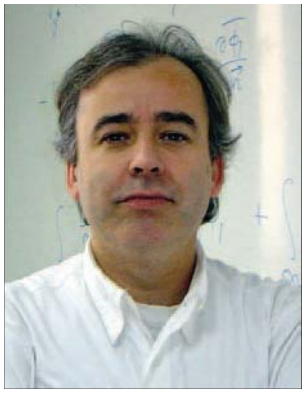


Research in Probability Theory

JAIME SAN MARTÍN ***is Professor of Mathematical Engineering, Universidad de Chile, Santiago, Chile.***

I was born in Santiago, Chile, and studied at Universidad de Chile,my country's most important university. My subject was mathematical engineering, which is mathematics with an orientation toward the mathematical aspects of engineering problems. After earning a doctorate in the United States, I returned to an academic career at Universidad de Chile.

My main work, in addition to teaching, is research in probability theory. That is, I work to discover new mathematical facts about systems governed by the laws of chance. One of my interests is Brownian motion. In physics, Brownian motion is the rapid jittery movement of small particles, such as pollen grains suspended in water—that's the setting in which Robert Brown first observed it in 1828. Einstein showed that the movement results from constant collisions with randomly moving water molecules. In probability theory, Brownian motion loses its physical meaning and becomes a very important class of mathematical models for random behavior. These models can describe phenomena far from physics, such as the movement of prices on a stock exchange. The random paths traced out by Brownian motion have unusual and subtle properties. I use advanced mathematics to learn more about these properties.

The mathematics of probability is a powerful tool for describing realworld phenomena. I have complemented my theoretical research with applied work in the area of forestry. In 1986, the pine shoot moth entered Chile. This moth attacks our pine plantations, one of the most important sectors of our economy. Researchers at Universidad de Chile work with one of Chile's largest forestry companies to model different aspects of this plague. At first, we were interested in modeling the way the moth infestation evolves in time and space. Now we are concentrating on giving amathematical description of how the deformations caused by the moth in the trunks of pine trees evolve, in order to decide whether a tree will recover from the attack or should be harvested immediately. The mathematics of probability theory is the basis for our models, but we also use statistics to design experiments and to fit our models to data.