For most of us, weather is the stuff of small talk. But for Eugenia Kalnay, it is a subject that inspires complex mathematical models that challenge the power of the world's fastest computers.

Kalnay, who served for 10 years as director of the National Weather Service's Environmental Modeling Center, was brought to the University of Oklahoma in 1998 after a two-year national search to fill the prestigious Robert Edwards Lowry Chair in Meteorology. Kalnay is a pioneer in the high-tech field of numerical weather prediction—an important forecasting method that takes the day's weather observations, feeds them into a computer model, then simulates the evolution of weather over the next several days.

While most of us reap the benefits of numerical weather prediction each time we watch the daily news, few are aware of what it is or the role it plays in predicting the weather, Kalnay says.

"When people talk about improved forecasts, they generally think of instruments like satellites or radar," she explains. "The public doesn't seem to be aware that advances in numerical weather prediction, including better models and faster computers, have helped double forecasting skill in the last 20 years. It's very satisfying, because improving forecasts has a tremendous impact on the economy—and it helps the whole world."

Among her many honors, Kalnay has earned the American Meteorology Society's second-highest prize, the Jule G. Charney Award. She also is the only current OU faculty member and one of the few meteorologists in the world to hold a coveted membership in the National Academy of Engineering.

While she may be a giant in her discipline, the Argentinean native is a gracious and unpretentious 55-year-old woman whose story could likely inspire an entire high school of teenaged girls to pursue careers in math and science.

The seventh of eight children, Kalnay grew up in Buenos Aires, where she attended a girls' school and developed a passion for physics. When Kalnay was in her freshman year at the University of Buenos Aires, her mother discovered a scholarship program in meteorology and enrolled her. Immediately, Kalnay was hooked.

"Meteorology is wonderful because you get to do physics, math and computer science and work for the benefit of mankind," she says in her rich native accent.

While about 40 percent of her Argentinean classmates were women, she found a much different picture when she came to the United States in the late '60s to pursue her doctoral degree at the Massachusetts Institute of Technology.

"When I came to MIT, I expected that nearly half of the meteorology students would be women," she says. "I was the only one!"

Kalnay became the first woman to receive a Ph.D. in meteorology at MIT, and later, the institution's first female meteorology professor. She recalls her student days at MIT, meeting "intelligent" women in the laundry room and discovering that many of them were busy putting their husbands through school and unable to pursue educational and career goals of their own.

"Obviously, things have changed a lot in the United States," she adds. "There are many more women in the sciences and professions in general. But, for some reason, meteorology still has a small pool of women."

While at MIT, Kalnay also created her first numerical model, simulating the turbulent weather conditions of planet Venus as part of her Ph.D. thesis. "I had a feeling that if my research on Venus wasn't very good, it would be hard to prove it was wrong," she says, laughing. In the end, her project would, to her own surprise, disprove a theory by two established scientists and teach her a valuable lesson in fundamental science. When the results of her own complex model did not support the scientists' theory, she was certain she had made a mistake.

"I was convinced that their theory had to be right, so I could not see that it wasn't working," she says. "After reviewing the results with my advisor, he said, 'Ah. Maybe they were wrong.'

Robert Taylor

Eugenia Kalnay, OU's Robert Edwards Lowry Chair in Meteorology, is an internationally renowned expert on numerical weather modeling—the science of using computer models to simulate the weather.

"I really learned from that project that you have to keep an open mind," Kalnay says. "It's easy to get blinded and just see what you want to see."

After completing her doctorate, Kalnay went back to South America to teach, but chose to stay clear of the political upheaval under way in Argentina and, instead, work as an assistant professor in Uruguay. She describes going home for a brief visit in the late '70s and fearing for her life during Argentina's "Dirty War," in which an estimated 20,000 innocent citizens, including many of Kalnay's own friends, "disappeared" under the government's military rule.

In the mid '70s, Kalnay returned to teach at MIT, and in 1978 she became a U.S. citizen. Doing so gave her an added sense of security on her trips home but also earned her the right to participate in the American political process—a sacred right for a woman who "loves politics."

Her career took a major shift in 1979, when she became senior research scientist and later head of the Global Modeling and Simulation Branch at NASA's Goddard Laboratory for Atmospheric Sciences, Modeling and Simulation Facility.

"When I moved from MIT to NASA, I felt it was a very good move for me," she says. "I was able to do numerical modeling research on a much larger scale than I would have been able to as a professor."

The pinnacle of her career came in 1987, when she was named director of the Environmental Modeling Center for the National Centers for Environmental Prediction. Under her 10-year leadership, the center helped double the forecast skill of the National Weather Service and made the United States' forecasting capabilities among the finest in the world.

"That was a tremendous opportunity," Kalnay says. "For eight or nine years, I thought I had the best job in the world. And I did. Then, during my last two years as director, we experienced major budgets cuts—even though our staff was performing essential operational duties. It was devastating!

"I managed to help the center survive by getting soft money, but," she says sadly, "I just decided I couldn't spend sleepless nights forever."

Robert Taylor

When she is not conducting weather research, Kalnay enjoys unwinding with yoga—an ancient form of exercise she says has strengthened her mind and body. She also enjoys playing Ping-Pong and bicycling to and from work each day.

In 1997, she resigned from her post as director but remained at the center as senior scientist. Not long after, the University of Oklahoma made her an offer she could not refuse—the chance to work at one of the "finest university meteorology programs anywhere" and the first opportunity in 20 years to teach young people. She was especially impressed by the strength of the meteorology community and the Oklahoma Weather Center—a group of university, state and federal entities that collaborate on state-of-the-art atmospheric research.

Fred Carr, who directs the School of Meteorology, cannot contain his excitement for successfully bringing Kalnay to OU. "She's an idea person—very ingenious."

Among the benefits of having Kalnay on campus, Carr says, will be her important work with graduate and post-doctoral students. "She is so full of good ideas that she can supply her students with good thesis topics for years to come. And those ideas will be at the forefront of our field. These students will be desired commodities."

In addition to mentoring students, Kalnay is teaching a graduate-level course and writing a companion book on numerical weather prediction—the first of its kind in 20 years. The book will have a "strong Oklahoma flavor" and feature a model developed at OU's Center for Analysis and Prediction of Storms.

One of the greatest recent developments in numerical weather prediction is Kalnay's own work in ensemble forecasting—a technique that challenges the problem of chaos, the instability of the atmosphere that makes it difficult to predict weather for more than a few days.

Ensemble forecasting anticipates the potential errors in initial weather conditions that might make forecasts go awry and incorporates them into the model, making not one, but 17 separate forecasts. This ensemble of forecasts, which then can be compared to each other, multiplies the information available to make accurate weather predictions.

Kalnay has not completely left behind her large-scale research for the federal government. She continues to hold a senior scientist position at the Environmental Modeling Center and returns to its Maryland headquarters periodically to check on projects. For now, she is happy enjoying the best of both worlds—government research and university teaching.

"I've been very lucky and had the opportunity to work with some outstanding scientists," she says. "Now I want to give something back by teaching and inspiring young people—especially women."

—*Brenda Wheelock*