



OHIO
UNIVERSITY

Research Communications
VICE PRESIDENT FOR RESEARCH

Force of Nature

From figuring out the force between nuclear particles to figure skating, physicist Charlotte Elster is in her element

Monday Oct 29, 2007
by ANITA MARTIN

When Charlotte Elster's skates cut through the ice, when she jumps spinning into the air, she knows exactly what she's doing — from arresting her forward velocity to gaining the vertical axis she needs to launch into upward-bound rotation.

Elster may not be a professional figure skater, but as a professor of physics at Ohio University and the director of the University's [Institute of Nuclear and Particle Physics](#), she understands the physics of her hobby.

The scientist has an international reputation in the nuclear physics field because of her research on the phenomenon called "few-body force." Although much is known about the "pair force" that interacts between two nucleonic particles (i.e. protons and neutrons), scientists have much to learn about the dynamics occurring among more than two.

"There is a genuine and distinct force that acts on all three particles," says Elster, a native of Germany. She explores this question by calculating and predicting what happens when two bound particles are bombarded by a third, an experiment that can be done in Ohio University's [John E. Edwards Accelerator Lab](#).

Few-body systems are small enough to accurately calculate, yet complex enough that they can be used to examine fundamental principles in nuclear physics. To test these systems, Elster engages in scientific high-performance computing. It calls for extremely powerful computers equipped with hundreds of processors to perform sophisticated computations and process enormous amounts of data.

"I like big machines," Elster says with a smile. Beyond that, she recognizes the practical advantage of gaining competency in high-performance computing. That's why she trains her students to do computation on supercomputers and often works with the [Ohio Supercomputer Center](#) in Columbus.

But recently, she's been spending more time in Washington, D.C. Elster's expertise in nuclear physics has landed her a spot on the 2007 Nuclear Science Advisory Committee, which will help determine the nuclear science research priorities of the National Science Foundation and the U.S. Department of Energy for the next five years. Because nuclear science infuses everything from medicine and homeland security to archaeology and alternative power, the committee has a lot to sift through.



Photo Credit: Bill Schneider

[View printer-friendly version](#)

Related News:

[Disordered Design](#)

The process began with “town meetings” of various sub-disciplines, where scientists came together to deliver short talks on different research efforts in nuclear science in the United States and exchange ideas on the future of research facilities. Then, during the first week in May, the committee met to “fight it out,” as Elster jokingly puts it.

Applications of nuclear science range from detecting explosive liquids in carry-on luggage and diagnosing Alzheimer’s disease to pinpointing the origins of air pollution. The projects, initiatives, and facilities that make the committee cut gain entry into what Elster calls “the book,” a roughly 150-page document called Opportunities in Nuclear Science that serves as a guidepost for scientists and agencies and a reference for politicians.

“It is written so that all scientists in all fields can understand,” Elster says.

A separate summary document provides a nuclear science primer for civic leaders and policy makers. Elster and her fellow committee members began drafts for the book over summer, and the entire process can take up to a year. The final result will outline specific goals and resources, often recommending additional funds for specific laboratories or research institutes.

Though she’s honored to be serving on this important national nuclear physics committee, Elster is no stranger to acting as a consultant and a mentor to her students and colleagues. From 1996 to 1998, for example, she chaired the Statewide Users Group at the Ohio Supercomputer Center. And Elster, the first woman to join the Department of Physics and Astronomy in 1991, says she’s a strong advocate for women achieving a healthy work/life balance.

She also tries to help Ohio University students understand and appreciate the big picture of their studies. “I think that one of the main responsibilities and missions of a scientist is to convey the joy involved in understanding nature, and also its relevance to our everyday life,” Elster wrote in her “Philosophy of Teaching and Learning” posted on her [Web site](#).

Scroll down her site a bit more, and you’ll find photos of her “resident cats,” quotes by Marlene Dietrich, and a comprehensive, alphabetized list of her film and documentary collections.

This online glimpse reveals a scrupulous scientist by day, studying nuclear reactions, handling supercomputers, and advising both the National Science Foundation and the Department of Energy. But she still finds time to curl up with a classic Humphrey Bogart or Anthony Hopkins flick, and, a few times per week, she straps on her figure skates to work on her 360-degree jump.

This article appears in the Autumn/Winter 2007 issue of Perspectives magazine.

Copyright © 2005-2007 **Ohio University**. All Rights Reserved.
research.news@ohiou.edu - (740) 593-0946