

DEHMELT'S WORLD OF SUB-ATOMIC PARTICLES

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Nobel Prize winner and University of Washington professor Hans Dehmelt works with the smallest of subjects - atoms and sub-atomic particles.

For example, he has kept individual electrons and other sub-atomic particles trapped for months, permitting measurements of unprecedented precision.

The physics professor also has used his trap to observe a single atom of barium make quantum jumps, actually change its energy state. He has trapped a positron, the antimatter twin of an electron, and studied it at leisure.

And during more than 30 years at the UW, Dehmelt has guided many generations of post-doctoral students in one of physics' most exquisite lines of research.

These are some of the achievements that led to today's awarding of the Nobel Prize in physics to Dehmelt.

The work has been amazing. Electrons in nature are held in orbit around their atomic nucleus by electrical forces, orbiting at rates approaching 7 quintillion times a second. (That's 7 followed by 18 zeroes.)

Dehmelt and his fellow workers have cooled atoms to near absolute zero, hundreds of degrees below zero Fahrenheit, and then applied a strong electrical field to knock loose individual particles.

The result is a sub-atomic particle held nearly motionless in a vacuum permitting measurements more refined than anyone else has achieved.

Dehmelt's work is at the opposite end from the glamorous, expensive research in accelerators where atoms are propelled to great speed and then smashed to knock loose exotic, short-lived sub-atomic particles.

In contrast, Dehmelt's equipment is small. And, instead of studying particles that disappear after a millionth of a second, his work involves study of atomic particles that have been held as long as 10 months in a trap.

Dehmelt's subtle humor is evident in his automobile license plate, which reads SEPARIS. Those are the initials of the category of National Science Foundation grants that have supported his work: single elementary particle at rest in space.

His office door in the UW's Physics Building has a painting representing a trapped barium atom, a light-blue circle on a dark-blue field.

"This work has opened a whole new realm of possibilities in precision measurements of individual particles," said Mark McDermott, chairman of the UW's Physics Department.

"These are elegant techniques. Others have done these measurements in other forms, but he's pushed the precision by many orders of magnitude."

Dehmelt's measurements are accurate to 1 part in a million million.

"The search at the big accelerators has been for elusive, exotic particles," McDermott said. "You won't see those particles here, but Hans' work is an interesting complementary approach to the high-energy research. It's sort of elementary-particle physics in a small laboratory."

Dehmelt began his work in 1958. In 1974, the American Physical Society took the unusual action of devoting an entire session to a discussion of his work. At that time, Dehmelt had kept individual electrons confined for several days, millions of times longer than anyone had reported previously.

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