

## Zachary Fisk, "Metallurgic Magician", joins UCSD Physics Department

**August 14, 1991**

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### "METALLURGIC MAGICIAN" JOINS UCSD PHYSICS DEPARTMENT

One of the world's leading authorities in the study of exotic materials that exhibit superconducting behavior has joined the faculty of the University of California, San Diego.

Zachary Fisk, a professor of physics, has a joint appointment with UCSD and the Center for Materials Science at the Los Alamos National Laboratory.

Fisk, a graduate of Harvard College who earned his Ph.D. physics from UCSD in 1969, recently was awarded the prestigious "International Prize for New Materials" from the American Physical Society, the top award in his field. He has been called a "metallurgic magician" for his ability to grow large single crystals that have confounded many other experimenters.

"My ultimate hope is that we discover fundamentally new physics in these materials," Fisk said.

Added Roger Dashen, chairman of UCSD's physics department: "Zach's presence at UCSD will push forward our efforts in materials to the point that we have one of the best, and perhaps the best, group(s) in the nation."

Combined with the addition of Robert C. Dynes to the physics department in 1990, Dashen noted, the physics department now claims two of the leading experts anywhere in the field of condensed matter physics -- the study of the crystallographic, electronic and magnetic properties of liquids, some gases and solids.

Dynes, who joined the physics department in 1990 from AT&T Bell Laboratories, is a leading authority in the physics of superconductivity: the process where certain materials lose all their resistance to electricity when cooled to a low enough temperature. Researchers in this field hope to develop new materials, including ceramics, that would exhibit superconductivity at temperatures high enough to become commercially practical. Some predict that room-temperature superconductivity, the elusive Holy Grail of the field, would usher in a new era of super-efficient power transmission.

In his work, Fisk is conducting experiments with exotic materials called heavy-electron (or heavy-fermion) metals. Normally, electrons are quite light, having about one-eighteen hundredth the mass of a proton -- the positively charged particle found in the atom's nucleus. In heavy-fermion metals, electrons behave as if they were about a thousand times heavier than normal, especially for specific heat. (Specific heat is the amount of heat necessary to raise the temperature of a given mass of a substance.)

Even more peculiar, some of these substances have been shown to turn into superconductors at temperatures near absolute zero. However, the materials retain their magnetic properties -- a fact that defies superconductivity theory and for which there is no explanation.

At Los Alamos, Fisk collaborated with a team of scientists to create and study high-quality crystals for two types of heavyfermion metals.

Dashen said Fisk is "one of the few people in the world" capable of making these high-quality crystals. Because of this, he is in great demand as a collaborator," he said.

At UCSD, Fisk said he plans to set up a materials laboratory to synthesize new materials and measure their properties. He also expects to conduct research to find out what causes superconductivity in these unique materials. "Obviously, one hopes to discover fundamentally new phenomenon at low temperatures," he said. "But that's like Santa Claus coming. I believe there are going to be surprises out there."

Fisk, who joined Los Alamos National Laboratories in 1981 became a Fellow of the American Physical Society in 1985. Prior to his tenure at Los Alamos, Fisk was a research physicist and adjunct professor at UCSD for about 10 years, and also served as a consultant with AT&T Bell Laboratories.

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