Department of Physics & Astronomy

PHYSICS NEWS FLASH

Now You See Them; Now You Don't

New Japanese-U.S. Institute Funded to Study Exotic Nuclei

March 22, 2006

David Dean isn't afraid of the unusual. A nuclear physicist with a penchant for the exotic, he will take that fearlessness with him when he travels to Japan to begin working with the newly-funded Japan-U.S. Theory Institute for Physics with Exotic Nuclei (JUSTIPEN).

The Department of Energy announced in March that it will provide a grant to support this new center. JUSTIPEN will provide an international hub for scientists intrigued by out-of-the-ordinary nuclei, specifically rare isotopes. Isotopes, of course, are atoms of the same element that have different numbers of neutrons but the same number of protons. Rare isotopes are those that occur naturally (after the explosion of supernovae, for example) but exist only briefly before they decay. Because their nuclei are so far from stability, they are generally categorized as "exotic nuclei." Using powerful accelerators to create such rare isotopes here on Earth can help physicists better understand the structure of nuclei and the microphysics of the universe, as well as give them an interesting avenue to test the Standard Model. JUSTIPEN will support this work within an international framework.

"The idea was to generate some international collaborations between the Japanese and U.S. scientists who are interested in this kind of physics," says Dr. Dean, who is a distinguished R&D staff member at Oak Ridge National Laboratory with an adjunct position in the UT Physics Department.

The timing couldn't be better. RIKEN (short for Rikagaku Kenkyusho: the Institute of Physical and Chemical Research) is a Japanese institution devoted to science and technology. In 2007, they will bring online a new Rare Isotope Beam Factory to generate rare isotopes for study. JUSTIPEN will be located at this facility, which is in Wako, near Tokyo, Japan.

“It’s a very big facility, and having a theory institute there was an idea that came from both experimentalists and theorists,” Dr. Dean explains.

So interesting was the potential project that in late 2004 the Department of Energy asked him to “put something together” for a proposal. At the time, Dr. Dean was the chair of the Rare Isotope Accelerator Theory Group Executive Committee. Working with colleagues including Dr. Witold Nazarewicz (a professor of physics at UT with a joint appointment at ORNL), he sketched out a plan following conversations with several members of the Office of Science, Office of Nuclear Physics, including Associate Director Dr. Dennis Kovar, and Dr. Sidney Coon, the Program Manager for Nuclear Theory.

“That’s when we sort of laid out the parameters of the proposal,” he said. “We had a lot of encouragement from Rick Casten, chair of the DOE/NSF Nuclear Science Advisory Committee and also Baha Balantekin, chair of the American Physical Society Division of Nuclear Physics; Baha is also co-principal investigator on this.” Dr. Casten directs Yale’s Wright Nuclear Structure Laboratory. Dr. Balantekin is the Eugene P. Wigner Professor of Physics at the University of Wisconsin.

The basic premise is that each year, the institute will support American scientists as they visit Japan to help untangle the mysteries of exotic nuclei. A short-term visit will be one to four weeks, while a long term visit can last from three to six months. The plan is for 12 short-term visitors for 2006 and as many as twice that number in subsequent years. JUSTIPEN hopes to fund two or three long-term visitors each year. While the U.S. provides travel and local support for the researchers, Japan will provide the infrastructure (offices, computers, networking, etc.).

In the future, U.S. scientists may get to return the hospitality, as Dr. Dean says the Japanese researchers “are working on their end for reciprocal grants to travel to the U.S., and it’s likely that we will host some of them at the Joint Institute for Heavy Ion Research” in Oak Ridge.

Dr. Takaharu Otsuka of the University of Tokyo will serve as the institute’s managing director. Dr. Dean, one of two associate directors, is the principal investigator on the U.S. side and will administer the grant through the University of Tennessee. He plans to visit Wako in April or May to get things started. A steering committee that includes Drs. Dean and Nazarewicz will review the applications of the physicists (both theorists and experimentalists) interested in going to JUSTIPEN.

When asked if students could apply, Dr. Dean’s answer is a whole-hearted “Yes.”

“I’d like to see a good mix of young people and senior people going over,” he says. “I think it’s important that students, post-docs and junior faculty have exposure to international science. When you have that exposure, you actually learn how other communities do science, and . . . that’s a refreshing point of view.”