

Progress Report:
JUSTIPEN – Japan U.S. Theory Institute for Physics with Exotic Nuclei
FY07

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IMPACT:

An area of programmatic interest to the Office of Nuclear Physics which has broad international appeal is the study of exotic nuclear properties. Scientifically, one may pose the following questions: What is the nature of the nuclear force that binds protons and neutrons into stable nuclei and rare isotopes? What is the origin of simple patterns in complex nuclei? What is the nature of neutron stars and dense nuclear matter? What is the origin of the elements in the cosmos? What are the nuclear reactions that drive stars and stellar explosions? These questions form the canvas on which the story of investigations of nuclei is being drawn and they are being answered in an international context of experimental and theoretical efforts. One of those efforts is the Japan-U.S. Theory Institute for Physics with Exotic Nuclei (JUSTIPEN).

The major goal of JUSTIPEN is to deliver an international venue for research on the physics of nuclei during an era of experimental investigations on rare isotopes. We are just at the beginning stages of this effort, and look forward to a productive scientific endeavor that will enhance international collaborations in the areas of the physics of nuclei and nuclear astrophysics where unstable nuclei play an important role. These unstable nuclei are being studied at various places across the world, including at the new RIBF facility at RIKEN in Waco, Japan near Tokyo. Furthermore, the U.S. continues to pursue the Facility for Rare Isotope Beams (FRIB). During the last year, FRIB science was endorsed by the National Academies of Science (through the report of the Rare Isotope Science Assessment Committee), the NSAC Report of the Rare-Isotope Beam Task Force, and the 2007 Long Range Plan (to be published). The RISAC report states that “Other countries throughout the world are aggressively pursuing rare-isotope science, often as their highest priority in nuclear science, attesting to the significance accorded internationally to this exciting area of research.” It also states that “[T]he committee concludes that the science addressed by a rare-isotope facility...should be a high priority for the United States.”

Discussions with colleagues in Japan led the proposal which now funds JUSTIPEN. The U.S. contribution through this grant provides travel and local support for U.S. scientists to visit scientists in Japan involved in the study of nuclei. A reciprocal program is being pursued through the JSPS to fund Japanese visitors to come to the U.S. for collaborations. RIKEN and the University of Tokyo have entered a cooperative agreement to host the JUSTIPEN site, which consists of office space, computer hook ups, and meeting rooms at the Nishina Institute at RIKEN. They also

provide reduced housing rates at RIKEN guest houses for U.S. visitors while in Japan. We are also developing with our Japanese counter parts a reciprocal effort to send Japanese colleagues to the U.S. to pursue rare isotope science here.

ACCOMPLISHMENTS

JUSTIPEN is now regularly receiving visitors. During this year, the following people have taken part in JUSTIPEN and were directly supported by a travel grant from JUSTIPEN:

C. Bertulani	University of Arizona	10/17/06-11/19/06	(RIKEN and Tohoku)
P. Moller	LANL	12/1/06-12/22/06	(RIKEN and Sandai)
Y. Sun	U. Notre Dame	12/9/06-12/23/06	(RIKEN and Kyushu)
B. Barrett	University of Arizona	3/22/07-4/21/07	(RIKEN and U. Tokyo)
D. Dean	ORNL	5/26/07-6/9/07	(RIKEN)
C. Hoffman	NSCL	5/28/07 – 6/29/07	(RIKEN and U. Tokyo)
J. Rotureau	U. Tennessee	6/ 1/07 – 6/21/07	(RIKEN)
O. Lisetskyi	U. Arizona	5/30/07 – 6/28/07	(RIKEN and U. Tokyo)
T. Papenbrock	U. Tennessee	5/31/07-6/27/07	(RIKEN and Kyoto)
R. Hix	ORNL	8/25/07 -9/2/07	(RIKEN)

Future 2007/2008 travelers

J. Terasaki	U. North Carolina	10/6/07-11/17/07	(RIKEN)
B. Gibson	LANL	10/28/07-11/7/07	(RIKEN and U. Tokyo)
P. Moller	LANL	12/6/07 – 12/18/07	(RIKEN and Sapporo)
W. Nazarewicz	U. Tennessee	12/8/07-12/15/07	(RIKEN)
N. Schunck	U. Tennessee	12/8/07-12/15/07	(RIKEN)
A. Afanasjev	Mississippi State U.	5/10/08 – 6/10/08	(RIKEN and Kyoto)

We are finding, in general, that our initial model of funding for travel is not exactly what is occurring on the ground. The typical trip lengths are from 2-4 weeks, with most people desiring to stay for a month at a time. JUSTIPEN's finances are fine. We approximate a \$40k surplus at the end of this reporting period. Thus far, we have not found a candidate for a longer term stay in Japan, although we believe someone will step forward in the near future.

JUSTIPEN maintains a web page at www.phys.utk.edu/JUSTIPEN. This web is a repository of information for JUSTIPEN including visitor information, information on exit reports (to be posted soon), and detailed information on how to function at RIKEN. A small fraction of the grant (5%) goes toward covering administrative support for both the web page development and JUSTIPEN travel arrangements.

JUSTIPEN has also fostered student and lecturer exchanges between the U.S. and Japan. Specifically, two students from Japan came this year to the Sixth Summer School on Exotic Beam Physics (August 6 – 11, 2007) at Michigan State University. JUSTIPEN sent Dr. Raph Hix from ORNL as a lecturer at the 6th CNS International Summer School (Aug. 28 – Sept. 1, 2007) at the University of Tokyo.

JUSTIPEN is being mentioned in various venues. Dean discussed JUSTIPEN during the last year at various talks he gave (Plenary talk at the INPC; Symposium talk at the AAAS; RIA Users Group meeting at the DNP, Nashville; Gordon Research Conference on Nuclear Theory). Nazarewicz presented JUSTIPEN in a talk during the EURISOL Town Meeting in CERN. Prof. Motoyashi talked about JUSTIPEN during the concluding meeting of the Long Range Plan in Gal-

veston. An article on JUSTIPEN for Nuclear Physics News is being prepared by Dean and Otsuka.

JUSTIPEN has begun to see papers published as a result of U.S. visits. The first paper in this direction is:

1. *Axial and reflection asymmetry of the nuclear ground state*, P. Moller, R. Bengtsson, B. G. Carlsson, P. Olivius, T. Ichikawa, H. Sagawa, and A. Iwamoto, submitted to Atomic Data and Nuclear Data Tables (2007).
2. *Phase transition in exotic nuclei along the $N=Z$ line*, M. Hasegawa, K. Kaneko, T. Mizusaki, Y. Sun, in press, Phys. Lett. B (2007).

Excerpts from exit reports:

A list of visitors and exit reports can be found on the JUSTIPEN web site. Here we list a few of the comments received. Reports are being posted to the website.

Bertulani: “My visit to Japan was organized by Dr. Naoyuke Itagaki, who took care of my working conditions, lodging, documents and organization of meetings. Prof. Takahuru Otsuka always took part on the decisions about meetings and visits I was involved in. Finally, MS. Tomoko Iwanami and Dr. Ken-Ichiro Yoneda took care of many details of my visit. My visit to Japan with JUSTIPEN was scientifically fruitful and pleasant”.

Hoffman: “Finally, I would just like to give my warm regards for everyone involved in JUSTIPEN for an enlightening and exciting time during my stay in Japan and RIKEN. Thank you for this opportunity”.

Lisetskyi: “This project stimulated productive discussions with experimentalists (Dr. K. Yoneda) planning an experiment for ^{78}Ni as well as theoreticians (M. Honma and T. Otsuka) working on related problem. Both our and Japanese results indicate considerable softness of expected doubly-magic ^{78}Ni core that will be checked directly at RIKEN experiment on the effective interactions produced independently by two groups.”

Moller: “The travel funds associated with this visit were provided through JUSTIPEN. I appreciate very much the opportunity this grant gave me to continue my longstanding collaborations with several Japanese groups”.

Papenbrock: “I gratefully acknowledge the excellent working and living conditions at RIKEN which provided a stimulating and fruitful atmosphere for my research.”

JUSTIPEN-U.S.

In addition to our efforts to establish JUSTIPEN at RIKEN we began to think about a reciprocal Japanese exchange program that would bring our Japanese colleagues to the U.S., again to benefit research efforts physics with exotic nuclei. In the past six months (after two years of effort) we secured \$400k for a theory wing building expansion at the Joint Institute for Heavy Ion Research. Funding for this expansion will come from the State of Tennessee, ORNL, the University of Tennessee, and Vanderbilt University. The building program has been approved by the State Building Commission and we are now in the bidding process for a contractor to build the building. This

effort should result in a new building within a year. The extension to the JIHIR is a potential home for a JUSTIPEN-U.S. program.

At the same time, our Japanese colleagues are working toward establishing funding opportunities to send Japanese to this venue. Just before the Nuclear Structure 2006 meeting in Oak Ridge a number of Japanese colleagues discussed with us how to make the reciprocal exchanges more efficient and further planning for JUSTIPEN activities.



The discussions resulted in an exchange activity in March, 2007. The Joint JUSTIPEN-LACM Meeting was held at the Joint Institute for Heavy Ion Research (JIHIR) at Oak Ridge National Laboratory from March 5-8, 2007. The meeting was a merger of two workshops: (i) the annual NNSA-JIHIR meeting on the nuclear large amplitude collective motion (LACM) with an emphasis on fission, and (ii) the US-Japan theory meeting under the auspices of JUSTIPEN. It was jointly organized by the JUSTIPEN Governing Board and by the UT/ORNL theory group.

The meeting brought together about 60 scientists (theorists and experimentalists) with about 20 researchers from Japan. It consisted of about 50 talks on physics of radioactive nuclei, LACM, and theoretical approaches related to the SciDAC-2 UNEDF project. One discussion session the meeting addressed future collaborations with Japanese groups (under JUSTIPEN). The meeting featured interesting new scientific results, and fostered the exchange between US and Japan based scientists. The picture above includes local organizers of the workshop and the Japanese colleagues visiting us during the week. The Tandem of the HRIBF stands in the background. The talks presented at the meeting can be found at the meeting's website: www.phy.ornl.gov/theory/papenbro/march07.htm.

We have begun preparations for the second JUSTIPEN-LACM meeting to be held during the last week of January 2008. We will also fold in a visit of members of the UNEDF SciDAC collaboration as a satellite meeting.

APPENDIX

JUSTIPEN POLICIES (August, 2007)

The purpose of JUSTIPEN is to deliver an international venue for research on the physics of nuclei during an era of experimental investigations on rare isotopes. The JUSTIPEN board of directors has set forth several policies in order to facilitate JUSTIPEN's purpose.

1. U.S. scientists seeking to visit JUSTIPEN should fill out the application form as posted on the web. The applications will be discussed by the board of Directors on a monthly basis. Decisions on acceptance of the application will be made in a timely manner. To facilitate planning, application should be made early.
2. The JUSTIPEN grant will cover round-trip travel (coach fares) from the U.S. to Japan, train and subway travel between Narita airport and Waco (the location of RIKEN).
3. The U.S. grant will pay for housing at the RIKEN Guest Houses. This housing is also subsidized through RIKEN and the University of Tokyo. A flat per diem of \$50.00/day will be paid to all travelers. JUSTIPEN will also pay for hotel lodging at other cities visited at up to \$70.00/day.
4. Housing in RIKEN needs to be arranged 2 months prior to the start of the visit to JUSTIPEN. Travelers should contact the Japanese Coordinator for RIKEN housing arrangements.
5. Travelers should plan to spend at least 50% of their time in RIKEN. Office space and computer hookups (for laptops) are available. If funds are available through JUSTIPEN, the traveler may visit one other site outside Tokyo during his trip. JUSTIPEN would continue to pay for local expenses at sites other than RIKEN (up to \$70.00/day hotel in addition to the \$50.00/day per diem).
6. Travelers should contact the U.S. Coordinator concerning reimbursements. Travelers are responsible for their own travel arrangements. All travel and train receipts should be sent to the U.S. Coordinator for reimbursement.
7. Travelers are expected to write a 1 page exit report describing their work in Japan. This information will help us track JUSTIPEN's success. The report should be sent with travel receipts to the U.S. Coordinator.
8. JUSTIPEN's web site will be used to advertise Japanese and U.S. post-doctoral opportunities as well as Japanese and U.S. conferences and schools in the area of physics with exotic nuclei.
9. While JUSTIPEN cannot fund workshop travel, it can entertain proposals for funding of small collaboration meetings at JUSTIPEN to discuss 'hot topics' relevant to the RIBF experimental program or to highly topical discussions with Japanese colleagues.
10. The University of Tokyo and RIKEN will supply funding for Japanese colleagues to visit RIKEN when their American colleagues are present.
11. JUSTIPEN support should be acknowledged in publications resulting from visits to or work at JUSTIPEN. The phrase: "this work was supported partially through JUSTIPEN (Japan-U.S. Theory Institute for Physics with Exotic Nuclei) under grant number DE-FG02-06ER41407 (U. Tennessee)," or something similar should be used for this purpose.

JUSTIPEN

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