

JUSTIPEN RIKEN Visit Exit Report  
29 October - 7 November 2007

Sites visited:

- 1) University of Tokyo, 29-31 October
- 2) Nara Women's University, 1-3 November
- 3) RIKEN, 5-7 November

Topics covered during this visit:

Three-body forces in nuclear physics was the primary topic of discussion during my visit to the University of Tokyo. In addition to the failure of few-body calculations by different groups (*e.g.*, Gloeckle, Witala, *et al.* and Deltuva, Fonseca, *et al.* to reproduce the differential proton-deuteron cross section data at medium energies (above 120 MeV) or to explain the so called  $A_y$  puzzle at low energies or the space-star anomaly in the breakup reaction, I spoke with Susumu Shimoura about three-body forces in neutron rich systems in which one adds two neutrons to a stable, neutron-rich core nucleus such as  ${}^6\text{He}$ . The  $T = 3/2$  three-body force is apparently significantly smaller than the  $T = 1/2$  three-body force, as evidenced by variational Monte Carlo calculations of p-shell ground-state and particle-stable excited-state binding energies. It is unclear what the strength of higher isospin three-body forces will be. I also spoke with Takahara Otsuka regarding his modeling of neutron rich nuclei far from the drip line. Three-body forces play an important role in those calculations. I expressed some skepticism regarding the physics underpinnings of the Walecka-type scalar-vector models (lack of the strong OPE component that GFMC calculations of p-shell nuclei suggest should play a major role) that appear to reproduce well the binding energy observables.

At Nara Women's University I spoke to a group of more than 30 undergraduate and graduate physics students about the physics of light nuclei and the role of hypernuclear physics in testing our sophisticated nuclear models. Prof. E. Hiyama currently serves as a strong role model for these young Japanese women who wish to enter into careers in physics. In addition to discussions with Hiyama regarding three-body force effects in hypernuclear physics calculations as well as in inelastic electron scattering from  ${}^4\text{He}$ , I spoke with Prof. S. Hirenzaki and his Ph. D. student J. Yamagata about their research involving deeply bound kaonic atoms. I discovered that Yamagata had attended the previous Hawaii joint meeting of U.S and Japanese nuclear physicists, so that we explored how to improve the experience for graduate students at the next Hawaii meeting.

During my stay at RIKEN I interacted with a number of people, including my gracious host Naoyuki Itagaki, H. Sakai, K. Sekiguchi, Y. Yamaguchi, T. Uesaka, T. Otsuka, S. Shimoura, and H. Sakurai. I gave a seminar on light nuclei and hypernuclei, suggesting that RIKEN expertise be used to make a precision measurement of the  $\Lambda n$  scattering length, using the radiative capture of stopped kaons on a deuterium target. The response was encouraging, even though the one counter proposal (to utilize kaon photoproduction from a deuteron target at JLab) is not truly competitive. Dr. Sakurai provided an excellent tour of the new RIBF facility. Otsuka and I discussed more about the issue of three-body forces in neutron-rich systems. Shimoura and I discussed his efforts to observe a tetra-neutron system. Sekiguchi and Saki explained the deuteron beam program they envision at RIKEN.