JOINT INSTITUTE FOR FUSION THEORY

NEWSLETTER

April 1982

The Institute for Fusion Theory in Austin works with the International Center for Fusion Theory in Nagoya to form JIFT - the Joint Institute for Fusion Theory. The primary purpose of JIFT is to implement the exchanges and collaborations in theoretical plasma physics as applied to fusion research in the United States and Japan. The protocol for the exchange was worked out during 1980-81 and, the program has been in operation for approximately two years.

JIFT WORKSHOPS

The Joint Institute organizes special topic Workshops for the purpose of exchanging current research results not available in the literature. Recent Workshops and their organizers, along with those planned for 1982-83, are given in this Newsletter:

1. "The Theory of Non-Axisymmetric Confinement Systems"
   December 8-12, 1980, Austin, Texas
   T. Kamimura and M. N. Rosenbluth
   IFS Report #5 (1981)

2. "Long-Time Prediction for Conservative Dynamical Systems"
   March 16-19, 1981, Lakeway, Texas
   W. Horton, L. Reichl and Y. Ichikawa
   "Long-Time Prediction in Dynamics", ed. Horton et al (Wiley, to appear)

3. "3-D MHD Studies of Toroidal Devices"
   October 19-21, 1981, Oak Ridge, Tennessee
   B. Carreras and I. Kawakami
   Proceedings Conf.-8110101 (ORNL, 1982).

Institute for Fusion Theory, University of Texas at Austin, Austin, Texas. Tele (512) 471-3396, FTS 734-5340. For suggestions write to W. Horton.

4. "Nonequilibrium Statistical Physics"
   November 9-13, 1981, Kyoto, Japan
   Allan N. Kaufman, John M. Greene and Kyoji Nishikawa

5. "Stellarator Equilibrium and Stability"
   December 14-18, 1981, Nagoya, Japan
   Shoichi Yoshikawa and M. Wakatani

6. "Drift Wave Turbulence"
   Janaury 11-15, 1982, Austin, Texas
   T. Sato and M. N. Rosenbluth
   IFS Report #53 (1982).

JIFT Exchange Scientists

1. Atsushi Fukuyama, Okayama U., September 1980-March 1981

2. Daniel Barnes, IFS, March-May, 1981

3. Nat Fisch, PPPL, February-May, 1981

4. James W. Van Dam, IFS, May-October, 1981

5. Hirotada Abe, Kyoto U., September 1981-January 1982

6. Hank Strauss, NYU, July-September, 1981

7. Charles F. Karney, PPPL, November 1981-February, 1982

8. Allen Boozer, PPPL, February-May, 1982

9. Tetsuo Kamimura, IPP, Nagoya, March-July, 1982

The research and personal opportunities made possible by the U.S.-Japan cooperation are very exciting. Here are brief reports from recent visitors who have participated in this program.

Dr. Hank Strauss, N.Y.U. to Kyoto

I visited the Plasma Physics Laboratory, directed by Prof. K. Uo, at Kyoto University and worked with the theorists, Drs. M. Wakatani and K. Hanatani, on computational MHD. During my visit, they were working on a 3-D resistive MHD code, similar to those at Oak Ridge and Princeton, which they plan to extend to study stellarators. They gave me assistance with a new mirror machine MHD code which I wrote during my visit.

The major experiment at Kyoto is the Heliotron E, one of the world's largest stellarators, which was then beginning current free operation with neutral beam injection. During my stay I visited several other laboratories, where large experiments are planned or under construction: JT-60 at Tokai, which is comparable to TFTR, and Gamma-10 at Tsukuba, which is comparable to TMX Upgrade. Nagoya University is planning the R-project, a large tokamak, and the A-project, perhaps an EBT. I was impressed to see that the Japanese will soon be operating large scale experiments comparable to those in the U.S., Europe, and Russia. It is surprising that this is being done by only a few plasma physicists. The experimenters work closely with the large technology companies, building the experiments. The Japanese effort to acquire fusion technology is similar to previous efforts in electronics and other fields. The Japanese will provide competitive impetus to fusion research.

Dr. Charles Karney, PPPL to Nagoya

I was involved in four major research activities while in Japan. In collaboration with Fukuyama of Okayama University, I worked on the nonlinear stages of ion cyclotron heating. As an ion cyclotron wave damps, a non-Maxwellian distribution develops. This either can cause the wave to be regenerated or can excite other waves. At Nagoya I worked with Ichikawa and Kamimura on particle diffusion in tandem mirrors. By deriving a reduced map to describe the particle motion it was possible to obtain an analytical expression for the diffusion coefficient. Also at Nagoya, I began some work, which is still in progress, on the long-time correlations in the stochastic regime of nonlinear systems. Such correlations are caused by small regular regions which appear even well above the stochasticity threshold. Lastly, I worked in Tokyo with Ida on getting a code to model ion cyclotron heating on the Tokyo University computer. This code was written to provide input for the Princeton transport code BALDUR. At Tokyo, it will be used to help understand the ion cyclotron heating experiments on the Tokyo Non-circular Tokamak under the direction of Miyamoto.

Dr. Allen Boozer, PPPL to Nagoya

My stay as a Visiting Professor at Nagoya University is made more pleasant by the determination of people at the Institute of Plasma Physics and on the street to make me feel like a welcomed guest in Japan. Daily living is remarkably simple. Food stores are laid out much as they are at home; so they do not test one's knowledge of Japanese. Except for beef being prohibitively expensive, there is no problem cooking in American style. However, I have developed a taste for the raw tuna, green tea, and seaweed. My son David is enrolled in the Nagoya International School. The school is academically American. It even uses the American rather than the Japanese academic calendar. However, more than half the children are local Japanese and the school lunches offer such delicacies as squid.

The facilities of the Institute of Plasma Physics are excellent. The library is unusually complete. I have primarily been working on transport in three dimensional plasmas. One paper has been completed. It gives a simple, but canonical Hamiltonian, description of a particle drift motion in magnetic coordinates for arbitrary time dependent fields.

Future JIFT Workshops and Working Groups Planned for April 1982 - March 1983.

(1) Statistical Physics and Chaos for Fusion Plasmas

Organizers: Wendell Horton, Linda Reichl and Yoshi Ichikawa
Location: IFS, Austin, Texas

(2) 3D MHD Configurations

Key Persons: Tetsuya Sato and Ben Carreras
Location: ICFT, Nagoya, Japan

(3) Anomalous Transport and Critical Beta Values

Key Persons: Yoshinosuke Tereshima and Bruno Coppi
Location: ICFT, Nagoya, Japan

(4) Hot Electron Physics

Key Persons: James Van Dam and Tsuguhiro Watanabe
Location: IFS, Austin, Texas