

state & society

AEC expects fusion-power demonstration by mid-1990's

The Atomic Energy Commission, encouraged by recent successes, especially with tokamaks, believes it is now reasonable to develop a program aimed at a demonstration fusion power reactor in the mid-1990's. The previously anticipated date was the year 2000.

In hearings before the Joint Committee on Atomic Energy held on 25 July, Robert L. Hirsch, director of the AEC Division of Controlled Thermo-nuclear Research, said that earlier projections, made last year, estimated that fusion scientific feasibility would be achieved by 1980-82. The term "scientific feasibility" was applied to experiments in which a plasma would be produced in hydrogen (as opposed to deuterium and tritium) with conditions of temperature, density and confinement that would correspond to fusion-reactor conditions. This step was estimated to cost \$30-50 million per experiment. As a next stage, a Physics Test Reactor was expected to operate about 1986-87; this device would have been still larger and capable of burning deuterium and tritium.

Timetable. In a position paper formulated by the Division, the heads of the CTR efforts at the four major fusion laboratories (T. Kenneth Fowler of Livermore, Fred Ribe of Los Alamos, Herman Postma of Oak Ridge and Melvin Gottlieb of Princeton), and consultants Solomon J. Buchsbaum (Bell Labs) and Edward Creutz (National Science Foundation), it was suggested that in view of recent experimental successes, particularly in tokamak plasmas, the prospects for successful confinement look even better than they did last year. Accordingly, the position paper advocates that D-T burning experiments should take place earlier.

Hirsch explained to us that the plan now is to combine the scientific feasibility experiment with the Physics Test Reactor, thus spending more money on the machines but in the long run spending less, by combining the two steps in one. Furthermore, the timetable would be considerably advanced. Hirsch told the Committee that Physics Test Reactors burning deuterium and tritium would operate in the early 1980's and would cost about \$100 million each. In the late 1980's a prototype reactor would operate, producing electrical power.

Finally, a demonstration power reactor would operate, probably in the mid-1990's. Such a reactor would be equivalent in many ways to the Liquid Metal Fast Breeder Reactor; the contract for the construction of the LMFBF was coincidentally signed the same day as the hearings.

In the Physics Test Reactors capable of burning deuterium and tritium, the first experiments would be done with hydrogen plasmas to clarify the physics questions, and during these runs, scientific feasibility conditions would be achieved as a matter of course, Hirsch explained. Next, the experiment would be fueled with deuterium and tritium, and the appropriate physics and engineering problems would be studied. At the same time, separable physics and engineering problems would be studied in new, large experiments that operate with hydrogen plasmas.

Chet Holifield (D., Calif.), formerly chairman of the Joint Committee, *continued on page 78*



PRICE

US-Chinese exchange visits arranged

Scores of US scientists and social scientists will have the opportunity to view research in the People's Republic of China thanks to exchange agreements obtained by the Committee on Scholarly Communication with the People's Republic of China. The nine-member committee, including several scientists (Emil L. Smith, committee chairman, Harrison S. Brown, foreign secretary of the National Academy of Sciences, Robert G. Sachs, director of Argonne National Laboratory and MIT's Victor Weisskopf), also negotiated for Chinese delegations to visit the US.

The subjects of US delegations were chosen in areas where Chinese expertise is high. A group of geophysicists and earthquake engineers will form a seismology and earthquake-prediction delegation. An archeology contingent will view new finds in China since the cultural revolution, and a group in anthropology will concentrate on early man—focusing on new remains of the "Peking Man" that have been unearthed.

Four groups are planned in the biological and medical sciences. US sci-

entists will view Chinese progress in the genetics of agriculturally useful plants. Pharmacologists have several areas to investigate including the Chinese use of medicinal herbs and the development of synthetic drugs. The Chinese have been able to synthesize steroids (including contraceptive compounds) from simpler starting materials than those normally used. Another group will view Chinese progress against schistosomiasis, a debilitating disease that is spread by a parasite from snails to people. Biomedical scientists and aquatic ecologists will be among the scientists in this delegation. Another US group will look into the uses of acupuncture for anesthesia.

Two social-science groups are scheduled to visit China. Psychologists and education specialists will investigate Chinese practices relating to early childhood development including nursery and primary education and childhood learning of languages. Linguists will be able to visit and study changes in the Chinese language including character simplification.

Seven official Chinese delegations are expected to visit the US with the

sciences being well represented in comparison to other disciplines. Groups studying lasers and computers (including hard and software) have been cleared to visit. A third delegation studying seismology will visit, making this the only subject where official groups are being exchanged in both directions. Two Chinese life-sciences groups are scheduled to come, including doctors studying pulmonary and cardiovascular diseases and a group investigating photosynthesis. Other Chinese delegations will include English-language specialists (to learn methods of teaching the language to foreigners) and library scientists studying information storage and retrieval, and library formation.

The US delegations will have approximately 10 to 12 members each, excluding staff. A chairman will be appointed for each of the nine groups, and he, in conjunction with the scholarly communications committee, will screen requests for inclusion in the various parties. Two general selection guidelines will be followed, Harrison Brown told us: Only one member of a given institution will be selected, thereby promoting a wide geographic distribution of participants, and those who have not been to China recently will be favored.

Brown also said that an invitation is being extended to the Scientific and Technological Association of China to send a group next year to assess the progress of the exchange program and to bid for another series of exchanges. Official delegations for many disciplines are employed to alleviate the problems of providing accommodations and interpreters to individual visitors in China. The Chinese know that the US desires exchanges of individuals to work and study for longer periods, Brown said, but this will have to wait until some of the logistics problems are resolved.

—RAS

Joint astrophysics center for Smithsonian and Harvard

The Center for Astrophysics in Cambridge, Massachusetts was established on 1 July to more effectively coordinate the research activities of the Harvard College Observatory (HCO) and the Smithsonian Astrophysical Observatory (SAO). Although the two observatories will continue to be responsible to their parent institutions, one director, George B. Field, will oversee the scientific activities of both observatories. He succeeds Fred L. Whipple, the retiring Director of SAO, and Alexander Dalgarno, who was acting Director of HCO. Whipple will remain as a senior scientist at the Smithsonian and a Harvard astronomy professor. Dalgarno



FIELD

no continues as chairman of Harvard's astronomy department.

Field came to the Harvard astronomy faculty last year after serving as chairman of the astronomy department at the University of California, Berkeley. His research has dealt with the dynamics of interstellar matter, the formation of stars and galaxies, cosmology and intergalactic matter.

Commenting about the new center, Field said, "In the past the two observatories have collaborated in certain programs of common interest. Now they are entering full partnership so as to bring the resources of both to bear on a unified scientific program. The center has an exciting future, as astronomy, astrophysics and geophysics are experiencing a great renaissance."

Recently HCO has had a series of experiments on the Orbiting Solar Observatory satellites. SAO has made important contributions to satellite tracking programs and orbiting astronomical observatories.

Under the new arrangement, research will be coordinated by seven associate directors. A. G. W. Cameron, formerly at Yeshiva University, joined the Harvard faculty and Smithsonian staff on 1 July and will direct planetary sciences. He works on cosmochemistry and nuclear astrophysics. Dalgarno has been with HCO and SAO since 1967 and will oversee theoretical astrophysics for the center. He is interested in atomic and molecular processes and their relationship to planetary atmospheres and interstellar matter. Riccardo Giacconi, who joined the Harvard faculty and Smithsonian staff on 1 July, will be in charge of high-energy astrophysics. A pioneer in the detection of cosmic x-ray sources, he had been at American Science and

Engineering since 1959, most recently serving as executive vice president. A. Edward Lilley will direct the radio-astronomy program, as he has done for the past seven years, by heading a joint Smithsonian-Harvard radio-astronomy effort. His group has detected several molecules in interstellar space.

The solar and stellar physics section of the center will be headed by Robert W. Noyes. He has been at Harvard since 1962 and was associated with satellite projects to observe the sun's ultraviolet radiation. William H. Parkinson will direct the atomic and molecular physics section. He has been at Harvard since 1961 and uses spectroscopy to interpret solar spectrum data from satellites. George C. Weiffenbach will lead the geoastronomy group. He has been with the Smithsonian since 1969 and is chiefly interested in the study of the earth as a planet. For the past year he has directed a program studying earth kinematics.

Hall of Fame ceremonies for Michelson planned

Albert A. Michelson will be officially inducted into the Hall of Fame on 21 October. Michelson, who received the 1907 Nobel Physics Prize and contributed in the areas of optics, astronomy and geophysics was elected to the hall in 1970. The primary sponsor for the ceremony is the US Naval Academy Alumni Association, and the speaker will be Robert S. Shankland (Case Western Reserve University).

Those wishing to attend the ceremony may obtain free tickets by mail from Hall of Fame Office, 1 Fifth Avenue, Room 2C, New York, N. Y. 10003.

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questioned the merit of the AEC proposal, saying, "I'm concerned about your leapfrogging over the scientific feasibility experiment." He cited the Fermi reactor, which the Committee did not approve because they felt it had not progressed step by step. "They were optimistic and went ahead. It all proved to be a white elephant," he said.

Cost. The chairman of the Joint Committee, Melvin Price (D., Ill.), asked how much the accelerated effort was likely to cost. Hirsch, cautioning that his division has not made detailed studies yet, estimates that they would build up to the hundreds of millions of dollars per year level over the next five years. Over the next few months, design studies will be carried out resulting in a more complete program about the beginning of 1974.