RESEARCH NEWS

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tritium, and deuterium ions of a reactor plasma, they produce bremsstrahlung radiation and leak energy much faster than the fusion ions can produce it. They could quickly radiate away enough energy to cool the plasma below the ignition temperature. A complicated scheme for modifying the magnetic field near the first wall was incorporated in UWMAK and is used in most reactor design studies. This is an extra system, called a divertor, added to the tokamak to trap 90 percent of the plasma ions before they hit the wall and 90 percent of the impurities knocked off the wall before they can get into the plasma. Tokamak experiments are just beginning to test various divertor types. In the second and third UWMAK studies a woven carbon curtain is placed in front of the first wall, to make a false first wall with an atomic number as low as possible ($Z=6$). Divertors add considerably to the complexity of fusion reactors (the divertor also collects 250 Mw of power in the UWMAK design), and if their effectiveness is less than hoped for the buildup of impurities in the plasma could put a basic limitation on the length of time for which ignition can be maintained.

The conceptual reactor studies have uncovered a number of crucial problems for which it is uncertain whether a solution exists—such as impurity control, refueling, extending the life of the first wall, and effective maintenance. They have also identified a long list of requirements that will necessitate major extrapolations of the present technology.

Fusion reactors built with present-day materials would seem to have many of the problems that fission reactors have, made much less manageable in some cases by the complexity of the reactor. The most optimistic fusion researchers argue that such a comparison is unfair, because a fusion reactor will be built with much improved future materials. But solutions suggested lightly, such as choosing a new material for the first wall, often roll a 30-year development program into a single sentence. A different approach to the technical problems appears to be needed. Finally, fusion is still a basic research enterprise. No device, tokamak or other type, has yet produced the plasma conditions (temperature and confinement time) needed for a practical reactor. It sometimes seems necessary to suspend one's normal critical faculties not to find the problems of fusion overwhelming.

—WILLIAM D. METZ

AAAS NEWS

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of life" was the conference theme. The presidential address by Professor Kosonike Thomas, professor of engineering at the University of Sierra Leone, pointed out that the theme reflects three important convictions held by WASA: (i) that the improvement of the general well-being of the people depends on the planned conservation, systematic development, and rational utilization of natural resources; (ii) that much too little has been done with natural resources for the countries' own good; and (iii) that it is long overdue for persons in the field of science in the various West African countries to start improving the situation.

Although the conference plenary sessions addressed a variety of themes, they stressed the application of scientific research to pressing national development problems. They included talks on the scourge of natural disasters, the place of indigenous technologies in the development process, aims and objectives of the teaching of science, health problems in the development process in West Africa, and increasing livestock production.

Many of the papers of the "ordinary sessions," which included 15 to 20 talks lasting 10 to 15 minutes each, could reasonably be interpreted as being potentially related to development problems. They covered such topics as land use, plant resources, chemical and mineral resources, and physical environment, life sciences, and human resources. Among the papers were those on solar energy radiation, computer-controlled telephone exchanges for developing countries, utilization of natural energy resources, the ecology of schistosomiasis transmission in the Volta Lake complex, ecological effects of slash and burn agriculture in the Freetown peninsula and its consequences for development, scope and requirements of a modest nuclear medicine unit, variability of the tropical environment and its significance to land resource development, education for appropriate technology development, the interaction of science and education for environmental quality, and manpower training for the application of relevant technology to development.

As can be seen from these sessions, there appeared to be a general recognition at all levels that African science must be applied to national needs even though the countries have yet to develop any systematic mechanisms for channeling efforts in this direction and bringing a variety of organizational resources to bear upon the activity.

Notes from Other Offices

Chautauqua-Type Short Courses for College Teachers: Forty-five courses with places for over 3000 college teachers of the natural and social sciences will be held at 13 short course centers during the 1976–77 academic year. The 13 centers are grouped into three circuits—Western, Central, and Eastern. The program, which is administered by AAAS, is a cooperative enterprise with the National Science Foundation. The primary objective of the program is to make available to college teachers as quickly as possible new knowledge about topics and fields of current interest that will be directly useful in current or planned educational programs. The format of the program consists of 2-day sessions in late fall and early spring with a course-related project during the interim.

The courses range widely in content and thrust. Cosmology and Five Topics in Physics are included among the disciplinary courses; Genetics and Society, Perspectives in Bioethics, and Social Impact Assessment are among the interdisciplinary topics; while Mathematical Modeling in the Biological Sciences, Microcomputers Applied to Science Education, and Patterns of Problem Solving provide treatment of science applications.

A bulletin board poster listing the courses and course directors is now available. A brochure with course descriptions, schedules, and application form will be available this month. For further information write to the Office of Science Education, Dept. A, AAAS, 1776 Massachusetts Avenue, NW, Washington, D.C. 20036.

New Publications

Energy, Water, and the West, papers and discussion summaries from a workshop focusing on the impact of energy development on western water resources, has just been published. Cosponsored by AAAS and the National Conference of State Legislatures, the workshop was held 2–5 November 1975 in Albuquerque. Participants whose talks appear in the report include Governors Jerry Apodaca of New Mexico and Thomas Salmon of Vermont. Copies of the report are available at $5 each from the National Conference of State Legislatures, Office of Science and Technology, Executive Tower Inn, 1405 Curtis Street, Denver, Colorado 80202.