

PREFACE

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This conference series is dedicated exclusively to tritium science and technology. It draws together scientists, engineers, and technologists from various disciplines to discuss the state of the art in tritium, fosters practical information exchange between individuals working in the field, provides a modest training ground for neophytes, and explores the developments required in industrial applications and power programs. The evolution of this conference series has been closely coupled to aspirations in the industrial and power arenas.

One of the earliest symposia on tritium was cosponsored in 1971 by the University of Nevada and the U.S. Environmental Protection Agency. The organizers hoped “to encourage discussions between scientists of various disciplines and eliminate misconceptions” in the field of tritium science. Additionally, they wanted the proceedings to provide a useful reference for specialists and beginners in the field. The symposium attracted approximately 400 participants and drew an international audience. The 800-page proceedings contained 84 refereed papers and included topics in tritium production, detection, measurement, chemical and biological effects, environmental monitoring and impact, applications, and health physics.

The U.S. Atomic Energy Commission (AEC) hosted the second tritium conference of note, entitled “Tritium Control Technology,” in December 1973 in response to the growing importance of tritium usage within the United States. The meeting summarized the current practices of the day for handling tritium in government laboratories and reactors, in commercial power reactors, in fuel-reprocessing plants, and in waste disposal facilities. The AEC recognized the disparity in tritium control technologies between different facilities and strove to improve tritium-handling practices among all users. The meeting was more national in character and provided an effective communicative tool between users under the auspices of the AEC.

The Dayton, Ohio, conference, sponsored by the American Nuclear Society, generally considered the seminal meeting of the Tritium Science and Technology

Conference series, was held in 1980 and boasted an attendance of nearly 300 and a portfolio of 78 papers. At that time, the first tritium-burning, magnetic confinement fusion device, the Tokamak Fusion Test Reactor (TFTR), was under construction at Princeton Plasma Physics Laboratory. The Joint European Torus (JET), the second tritium-burning machine, was on the drawing board while the International Tokamak Reactor (INTOR) loomed on the horizon. The international consensus was that the tokamak represented the flagship of the next major magnetic confinement fusion device and that the tritium fuel cycle stood as one of several major technological issues requiring attention. Against this backdrop, the organizers of the Dayton conference subdivided the agenda to encourage discussion on topics covering environmental issues, tritium management in fusion and fission reactors, tritium-material interactions, inventory, and containment.

The conference series began its transformation into an international forum over the subsequent five conferences. The second “Tritium Technology in Fission, Fusion, and Isotopic Applications” conference was cosponsored by the Canadian Nuclear Society; the third was cohosted by the Canadian Fusion Technology Project and Ontario Hydro; and the fifth, sponsored by the European Commission, was hosted in Italy by the Joint Research Center–ISPRA. The sixth conference in this series, sponsored by the Atomic Energy Society of Japan and hosted by the Japan Atomic Energy Research Institute, saw a name change to the “International Conference on Tritium Science and Technology” and the appointment of an international steering committee. During the span of these five conferences, TFTR and JET successfully demonstrated controlled D-T plasma burning. Research facilities supporting the fusion program were constructed in Canada, China, Germany, Japan, Russia, South Korea, and the United States. INTOR had transformed into the International Thermonuclear Experimental Reactor (ITER). Fusion programs relying on magnetic, inertial, and muon-catalyzed confinement schemes used notable quantities of tritium. The topics covered by these

conferences broadened to elucidate tritium processing, production, safety, environmental impact, analysis, accountancy, properties, interaction with materials, system design, and waste management.

The seventh conference, hosted by Forschungszentrum Karlsruhe in 2004, featured the Tritium Laboratory Karlsruhe (TLK), the lead European laboratory dedicated to the development of tritium systems at scales relevant to ITER. TLK expanded its role to support KATRIN, an international project aimed at measuring the mass of neutrinos.

Papers in the current conference, the Eighth International Conference on Tritium Science and Technology, reported on activities in Canada, the European Union, India, Japan, Russia, South Korea, and the United States. This conference stands on the brink of exciting developments and, as such, challenges its successor. ITER has been approved; ground has been broken. Design work to demonstrate breakeven in magnetic confinement fusion is progressing at a hectic pace.

The National Ignition Facility at Lawrence Livermore National Laboratory in the United States is poised to

explore ignited plasmas in 2012. The Laser MegaJoule (LMJ) in France is expected to follow suit shortly after. OMEGA, a direct-drive inertial fusion device using cryogenic D-T targets, has provided the inertial fusion community with a reactor-relevant test bed. Finally, nuclear power is experiencing a renaissance. Since 1988, this conference series has attracted approximately 200 to 300 attendees and yielded 150 to 200 published papers per conference. It has been very effective at disseminating information in this unique and cross-disciplinary field. However, this conference series will be tasked not only with expanding our understanding of tritium management to unprecedented scales through the handling of kilograms rather than grams of tritium but also with becoming a training ground for the legions of new personnel required to meet the rising needs in both the fission and fusion environments.

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The next conference in this series will be held in the fall of 2010 in Japan.