

AUTHORS — JULY 1989

ECONOMICS

ON THE ECONOMIC PROSPECTS OF NUCLEAR FUSION WITH TOKAMAKS

Dieter Pfirsch (top) [PhD, theoretical nuclear physics, University of Frankfurt, Federal Republic of Germany (FRG), 1952] has worked in the fields of solid-state physics at the University of Frankfurt and at Siemens, fission reactors as head of the reactor physics group of the Fried. Krupp Company, and astrophysics and theoretical plasma physics at Max-Planck-Gesellschaft. Since 1967 he has been a scientific fellow of the Max-Planck-Gesellschaft and since 1968 a member of the Board of Scientific Directors and director of Theory Division I of Max-Planck-Institut für Plasmaphysik at Garching. Since 1976 he has also been an honorary professor at the Technical University of Munich. **Karl H. Schmitter** (Dipl. Ing., Technical University of Braunschweig, FRG, 1950) has been emeritus scientific fellow of Max-Planck-Institut für Plasmaphysik since 1986, where he was previously a member of the Board of Scientific Directors and director of the Technology Division. He was one of the original founders of this research establishment in 1960. His professional career began in industry, where he was involved in high-power radio-frequency development at Siemens from 1950 until 1955. Subsequently, he joined CERN, the European Organization for Nuclear Research, in Geneva, Switzerland, working there in high-energy particle accelerator development, finally as senior staff member.

*Dieter Pfirsch
Karl H. Schmitter*



FUSION REACTORS

U.S. CONTRIBUTION TO THE INTERNATIONAL TOKAMAK REACTOR WORKSHOP, PHASE 2A, PART 3, 1985-1987

W. M. Stacey, Jr. (right) [BS, physics, 1959, and MS, nuclear science, 1963, Georgia Institute of Technology (GIT); PhD, nuclear engineering, Massachusetts Institute of Technology (MIT), 1966] is Callaway Professor of Nuclear Engineering at GIT and serves as senior U.S. participant to the International Atomic Energy Agency International Tokamak Reactor (INTOR)

*W. M. Stacey, Jr.
David A. Ehst
Charles A. Flanagan
Y.-K. Martin Peng
N. Pomphrey
Douglass E. Post
Dale L. Smith
P. T. Spampinato*



Workshop. **David A. Ehst** (top right) (ScD, nuclear engineering, MIT, 1975) has been with the Fusion Power Program at Argonne National Laboratory (ANL) since 1976. His research work has included anomalous transport theory, ELMO bumpy torus design, and the tokamak power reactor studies. His current interest is in advanced fusion concepts, such as steady-state tokamak reactors. **Charles A. Flanagan** (top left) (BS, Lafayette College, 1953; MBA, University of Pittsburgh, 1972) is manager, Tokamak Projects, at the Fusion Engineering Design Center (FEDC) at Oak Ridge National Laboratory (ORNL). He is employed by Westinghouse Electric Corporation and has 20 years of fission reactor design and nuclear engineering experience in naval and commercial reactor programs. Since 1976, he has participated in both the inertial and magnetic confinement fusion programs, primarily in fusion systems and next-generation design activities. He has been a U.S. participant in the INTOR program since 1980. **Y.-K. Martin Peng** (center right) (BS, electrical engineering, National Taiwan University, 1967; MS, 1971, and PhD, 1974, applied physics, Stanford University) is a member of the Fusion Energy Division at ORNL and the manager of the Plasma Engineering Branch of FEDC. His research efforts include plasma engineering studies of both advanced tokamak and tandem mirror reactor concepts. A photograph and a biography for **N. Pomphrey** were not available at publication time. **Douglass E. Post** (center left) (PhD, physics, Stanford University) has been a physicist at the Princeton Plasma Physics Laboratory since 1975. He has worked primarily in the computational modeling of tokamaks and the application of atomic processes to fusion research. **Dale L. Smith** (bottom right) (PhD, Iowa State University, 1966) is the associate director of the Fusion Power Program at ANL, assisting in directing and planning all fusion activities at ANL. He also serves as program manager for the ANL Fusion Materials Program. He served as program manager for a multilaboratory blanket comparison and selection study and as ANL representative for the INTOR study. **P. T. Spampinato** (bottom left) (BS, civil engineering, City College of New York, 1988; MBA, Adelphi University, 1976; and numerous graduate engineering courses at the University of Tennessee) is an employee of the Grumman Aerospace Corporation who was first assigned to the ORNL fusion reactor studies group in 1976 and then to the FEDC when it was formed in 1979. He was principal investigator for remote maintenance systems and configuration development for tokamak and tandem mirror conceptual design, U.S. delegate to the INTOR studies since 1983, and principal investigator for INTOR maintenance and configuration issues.



PLASMA ENGINEERING

A PERSONAL-COMPUTER-BASED PACKAGE FOR INTERACTIVE ASSESSMENT OF MAGNETOHYDRODYNAMIC EQUILIBRIUM AND POLOIDAL FIELD COIL DESIGN IN AXI-SYMMETRIC TOROIDAL GEOMETRY

William P. Kelleher (right) [BS, 1982, and PhD, 1987, nuclear engineering, Rensselaer Polytechnic Institute (RPI)] is a staff member in the Analysis and Assessment Division at Los Alamos National Laboratory. His current research activities include

*William P. Kelleher
Don Steiner*



radiation transport and both magnetic and inertial confinement fusion reactor designs. **Don Steiner** (right) (BS, chemical engineering, 1960; MS, 1962, and PhD, 1967, nuclear engineering, Massachusetts Institute of Technology) is professor of nuclear engineering at RPI. Since 1968 he has been involved in fusion power systems analysis and design. His current interests include plasma engineering, blanket development, and reactor design.



EXPERIMENTAL DEVICES

SURVEY OF FEATURES IN RADIATIVE POWER LOSS PROFILES IN THE TOKAMAK FUSION TEST REACTOR

John F. Schivell (top right) (PhD, physics, Harvard University, 1968) worked at Fermi National Accelerator Lab from 1968 to 1973, where he developed and tested main-ring magnets and did precision alignment of the accelerator, as well as joining in bubble chamber and scattering experiments. He then joined the Princeton Plasma Physics Laboratory (PPPL), where he worked on the construction of, and experiments with, the Princeton Large Torus. He spent 3 years designing data analysis software. Since 1980 he has been responsible for the bolometer design and radiative power loss measurements on the Tokamak Fusion Test Reactor (TFTR). **Charles E. Bush** (top left) (PhD, University of Wisconsin, 1972) is a research physicist working on TFTR. He is on assignment from the Fusion Energy Division of Oak Ridge National Laboratory. His work is primarily in the area of power balance in tokamaks, using bolometric and infrared camera measurements. He is also interested in heating, confinement, and applications of detached plasmas. **D. K. Mansfield** (center right) (PhD, physics, Rutgers University, 1977) is a research physicist at PPPL and is presently working in the area of plasma diagnostics. In addition, he has done work in the fields of infrared and far infrared lasers as well as modern optics. **Sidney S. Medley** (center left) (PhD, physics, University of British Columbia, Canada, 1968) performed plasma diagnostics at the U.K. Atomic Energy Authority's Culham Laboratory from 1969 to 1970, and at the Fusion Research Center, University of Texas-Austin, from 1971 to 1976 prior to joining the research staff of PPPL in 1977. He is currently branch head of particle diagnostics on the TFTR at PPPL. His plasma/tokamak experimental work includes application of laser interferometry, ion spectrometry, magnetic probe, infrared thermography, fusion gamma, and charge-exchange diagnostics. **Hyeon K. Park** (bottom right) (PhD, University of California, Los Angeles, 1984) did his thesis work on far infrared laser scattering. At PPPL, he is working with the multi-channel interferometer/polarimeter and has developed a new asymmetric Abel inversion technique for tokamak plasmas. **F. J. Stauffer** (bottom left) (PhD, physics, University of Maryland, 1976) designed and operated the TFTR Michelson interferometer electron temperature diagnostic while he was an assistant research scientist at the University of Maryland. He currently is a senior engineer with AT&T Microelectronics.

*John F. Schivell
Charles E. Bush
D. K. Mansfield
Sidney S. Medley
Hyeon K. Park
F. J. Stauffer*



DIRECT ENERGY RECOVERY FROM HELIUM ION BEAMS BY A BEAM DIRECT CONVERTER WITH SECONDARY ELECTRON SUPPRESSORS

Kiyoshi Yoshikawa (top right) [Dr. Eng., nuclear engineering, Kyoto University (KU), Japan, 1974] is an associate professor at the KU Institute of Atomic Energy. He held a visiting appointment at Lawrence Livermore National Laboratory in 1978 and then was at Lawrence Berkeley Laboratory until March 1980. His main interests are direct energy conversion, reactor-relevant technology, and reactor design in nuclear fusion. **Yasushi Yamamoto** (top left) (BS, electrical engineering, KU, Japan, 1981) is an instructor at the KU Institute of Atomic Energy. His current interests include beam and plasma direct energy conversion both in simulation and experiment. **Hisayuki Toku** (center right) (BS, electrical engineering, Ritsumeikan University, Japan, 1966) teaches on the technical staff at the KU Institute of Atomic Energy. He is currently interested in the development of experimental techniques in both beam and plasma direct energy conversion research. **Akira Kobayashi** (bottom left) (MS, electrical engineering, KU, Japan, 1986) has worked on beam direct energy conversion experiments and is currently on the staff at the Electronics Technology Center of Kobe Steel, Ltd. **Toru Okazaki** (bottom right) (MS, electrical engineering, KU, Japan, 1987) has worked on beam direct energy conversion experiments and is currently on the staff at the Osaka Research Laboratories of Sumitomo Electric Industries, Ltd.

*Kiyoshi Yoshikawa
Yasushi Yamamoto
Hisayuki Toku
Akira Kobayashi
Toru Okazaki*



STRESS-RELATED PROBLEMS IN TOKAMAK FUSION REACTOR FIRST WALLS

Saurin Majumdar (top) (PhD, University of Illinois, 1973) has been responsible for conducting stress and lifetime analyses of various fusion reactor blanket design studies conducted at Argonne National Laboratory (ANL) since 1974. **Bipin K. Pai** (PhD, University of Rochester, 1978) is an associate professor in the Department of Mechanical Engineering at Purdue University. From 1986 to 1987 he was on a sabbatical leave at ANL, where he worked on finite element stress analysis of tokamak fusion reactor first walls.

*Saurin Majumdar
Bipin K. Pai*

