

## AUTHORS — MARCH 1987

### OVERVIEW

#### NEUTRAL PARTICLE KINETICS IN FUSION DEVICES

**Michael Tandler** (top) (MS, theoretical physics, Leningrad University, USSR, 1971; PhD, physics, A. I. Herzen Institute, Leningrad, USSR, 1975; Fil. Dr., Uppsala University, Sweden, 1978) is a senior research physicist at the Plasma Physics and Fusion Research Institute, Royal Institute of Technology, Stockholm. His interests include alternative approaches to fusion, plasma/neutral gas interactions in tokamaks, impurity transport, gaseous electronics, laser physics, and plasma heating and diagnostics. He has been a guest scientist at the Institut für Plasmaphysik, Garching, Federal Republic of Germany, and at the Princeton Plasma Physics Laboratory (PPPL). **Daniel Heifetz** (PhD, mathematics, Columbia University, 1982) performed his thesis work in analytic number theory. Since 1978 he has worked in the Applied Physics Division at PPPL. His areas of interest include Monte Carlo modeling of neutral particle transport, physical processes of plasma/material interactions, and the study of the influence of computer hardware design on software algorithms.

*Michael Tandler*  
*Daniel Heifetz*



### PLASMA ENGINEERING

#### PRACTICAL DESIGN OF AUTONOMOUS CONTROLS FOR PLASMA CURRENT AND EQUILIBRIUM IN TOKAMAKS

**Wennemar A. Brocke** (Dr.-Ing., electrical engineering, Technical University of Aachen, Federal Republic of Germany, 1968) is with the Central Laboratory of Electronics at Kernforschungsanlage Jülich. His current activities include control systems design for tokamak devices and biochemical fermentation processes.

*Wennemar A. Brocke*



### U.S. CONTRIBUTION TO THE PHASE 2A, PART 2 INTERNATIONAL TOKAMAK REACTOR WORKSHOP, 1983-1985, JUNE 1985

**W. M. Stacey, Jr.** (top 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) Workshop. **C. C. Baker** (top left) (PhD, University of Wisconsin, 1972) has overall responsibility for directing the Argonne National Laboratory (ANL) Fusion Power Program including activities in materials research, fusion reactor system and design studies, superconducting magnets and energy storage development, tritium technology, plasma engineering, atomic physics, and safety studies. He has been director of the program since 1977, and his responsibilities include long-range planning, program implementation, and budget administration. He serves on several advisory committees for the U.S. Department of Energy. He currently serves as manager of the STARFIRE Project, a design study of a commercial tokamak power reactor. **Patrick L. Colestock** (second from top right) [BS, electrical engineering, Michigan State University, 1970; MS, electrical engineering, 1971, and mathematics, 1973, University of Michigan (UM); PhD, plasma physics, UM, 1975] was a research associate with Rensselaer Polytechnic Institute at the Oak Ridge National Laboratory (ORNL) from 1976 to 1977. In 1977, he joined the Princeton Plasma Physics Laboratory (PPPL) where he worked on ion cyclotron range of frequency heating in tokamaks. From 1982 to 1983, he was a senior scientist with McDonnell Douglas Corporation where he worked on the development of radio-frequency (rf) heating methods for fusion. In 1983, he rejoined the PPPL where he is working on rf heating and current drive applications in tokamaks. **Charles A. Flanagan** (second from top left) (BS, Lafayette College, 1953; MBA, University of Pittsburgh, 1972) is manager, Tokamak Projects at the Fusion Engineering Design Center (FEDC) at ORNL. He is employed by Westinghouse and has 20 years of fission reactor design and nuclear engineering experience in naval reactor and commercial reactor programs. Since 1976, he has participated in both the inertial confinement 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. **Richard F. Mattas** (third from top right) (BS, physics, Yale University, 1969; PhD, metallurgical engineering, University of Illinois, 1974) coordinated impurity control engineering studies for the U.S. INTOR program during phase 2A, part 2. He is presently manager of blanket technology within the fusion power program at ANL. **Y-K. Martin Peng** (third from top left) (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. **Douglass E. Post** (bottom right) (PhD, physics, Stanford University) has been a physicist at the PPPL 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 left)

*W. M. Stacey, Jr.  
C. C. Baker  
Patrick L. Colestock  
Charles A. Flanagan  
Richard F. Mattas  
Y-K. Martin Peng  
Douglass E. Post  
Dale L. Smith  
P. T. Spampinato  
Richard J. Thome*



(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. He currently serves as deputy manager of ANL's effort on the Tokamak Power Systems Study and as ANL representative for the INTOR study. **P. T. Spampinato** (top) (BS, civil engineering, City College of New York, 1966; MBA, Adelphia 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. **Richard J. Thome** (bottom) (BS, mechanical engineering, Syracuse University, 1962; MS, 1964, and PhD, 1966, mechanical engineering, MIT) has been a senior engineer at MIT Plasma Fusion Center and the Francis Bitter National Magnet Laboratory since 1978 and an associate leader since 1979.



**SIMULATION OF THE DIAGNOSTIC NEUTRAL BEAM FOR ACTIVE CHARGE-EXCHANGE MEASUREMENTS ON THE TOKAMAK FUSION TEST REACTOR**

*Sidney S. Medley*

**Sidney S. Medley** (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 the Princeton Plasma Physics Laboratory (PPPL) in 1977. He is currently branch head for particle diagnostics on the Tokamak Fusion Test Reactor at PPPL. His plasma/tokamak experimental work includes application of laser interferometry, ion spectrometry, magnetic probe, infrared thermography, fusion gamma, and charge-exchange diagnostics.



FUSION REACTORS

**PROPOSAL OF POWER PLANT BY LIGHT ION BEAM FUSION**

*K. Niu  
S. Kawata*

**K. Niu** (top) (Dr. Sci., physics, Kyoto University, Japan, 1962) is a professor in the Department of Energy Sciences, The Graduate School at Nagatsuta, Tokyo Institute of Technology. He is a principal investigator of the theory for inertial confinement fusion (ICF) by using light ion beams. **S. Kawata** (Dr. Eng., energy sciences, Tokyo Institute of Technology, Japan, 1985) is an associate professor in the Department of Electrical Engineering, Technological University of Nagaoka. His activities include theoretical and numerical analyses for light ion beam ICF.



## STUDIES ON HEAVY-ION BEAM FUSION REACTORS

**Günther Kessler** (top) [diploma, engineering, University of Aachen, Federal Republic of Germany (FRG), 1962; PhD, engineering, University of Karlsruhe, FRG, 1968] has been active mainly in fast breeder design and safety analysis. He was leader of the fast breeder project at Karlsruhe until 1978. Currently he is director of the Institute for Neutron Physics and Reactor Technology of the Nuclear Research Center Karlsruhe. **Ulrich von Möllendorff** (diploma, physics, University of Hamburg, FRG, 1966; PhD, University of Basel, Switzerland, 1971) worked in nuclear physics research at Laval University, Quebec City, Canada. At the Karlsruhe Nuclear Research Center, he did experimental work in fast breeder development and participated in a heavy-ion beam fusion power plant design study. His current interest is in an experiment on fusion reactor blanket neutronics problems.

*Günther Kessler  
Ulrich von Möllendorff*



## SAFETY/ENVIRONMENTAL ASPECTS

## THE RADIOLOGICAL HAZARDS OF MAGNETIC FUSION REACTORS

**Steve Fetter** (SB, physics, Massachusetts Institute of Technology, 1981; MS, 1983, and PhD, 1985, energy and resources, University of California, Berkeley) is a postdoctoral fellow at Lawrence Livermore National Laboratory. His research interests include radiological assessment of nuclear energy sources, arms control, and the interaction of science and public policy.

*Steve Fetter*



## PLASMA HEATING SYSTEMS

## PHOTODETACHMENT OF NEGATIVE ION BEAMS IN THE PRESENCE OF A BACKGROUND GAS

**Joel H. Fink** (BSEE, Polytechnic Institute of Brooklyn, 1943; MEE, Cornell University, 1963; PhD, plasma physics, Carnegie-Mellon University, 1969) is currently a consultant on negative ion/neutral beam technology at Lawrence Berkeley Laboratory. He has been involved with neutral beam system development for more than 10 years.

*Joel H. Fink*



## BLANKET ENGINEERING

## COMPARISONS OF CALCULATED AND MEASURED SPECTRAL DISTRIBUTIONS OF NEUTRONS FROM A 14-MeV NEUTRON SOURCE INSIDE THE TOKAMAK FUSION TEST REACTOR

**R. T. Santoro** (right) (MS, University of Tennessee, 1967) is a member of the Engineering Physics Division at Oak Ridge National Laboratory (ORNL). His current interests are in neutron transport and neutron interactions with matter related to fusion reactor design. He is currently involved in the neutronic

*R. T. Santoro  
J. M. Barnes  
R. G. Alsmiller, Jr.  
Margaret B. Emmett  
James D. Drischler*



investigations of reactor blanket and shield design, neutron beam injectors (NBIs), radiation streaming from penetrations, radiation effects in materials, and the analysis of integral experiments for fusion reactor shields. **J. M. Barnes** (top right) (BS, University of Arkansas, 1965) is a member of the Computer Sciences Division at ORNL. He is involved in the neutronic analysis of fusion reactor blankets and shields, NBIs, radiation effects in materials, and the analysis of integral experiments for fusion reactor shields. **R. G. Alsmiller, Jr.** (top left) (PhD, University of Kansas, 1957) is leader of the Applied Physics and Fusion-Reactor Analysis Group of the Engineering Physics Division at ORNL. For several years he has directed the theoretical research in this division in the areas of high-energy nuclear reactions, high-energy nuclear transport, and fusion reactor neutronics. **Margaret B. Emmett** (bottom right) (BS, mathematics, Tennessee Technological University; graduate study, applied mathematics, University of Tennessee) is a computing consultant in the nuclear engineering applications department of the Computing and Telecommunications Division at ORNL. Her primary work area is in the development and application of Monte Carlo radiation transport codes, such as 05R, OGRE, MORSE-CG, DOMINO, BREESE, and DOTTOR. She is involved in shielding calculations for liquid-metal fast breeder reactor design (Fast Flux Test Facility and Clinch River Breeder Reactor Project), in military calculations of dosages and radiation protection factors, and in Tokamak Fusion Test Reactor calculations. **James D. Drischler** (bottom left) (AS, electrical technology, Virginia Western University; studied electrical engineering, Virginia Polytechnic Institute and Virginia Commonwealth University) is an engineer in the Systems Analysis and Shielding Section of the Engineering Physics and Mathematics Division at ORNL. He is the principal experimentalist for the magnetic fusion energy integral experiment program at ORNL.



## VACUUM SYSTEMS

### EDDY CURRENTS IN A NONPERIODIC VACUUM VESSEL INDUCED BY AXISYMMETRIC PLASMA MOTION

**James DeLucia** (PhD, plasma physics, Princeton University, 1983) performed his thesis work in linear and nonlinear studies of resistive instabilities in the spheromak. From 1983 to 1985, he worked in the Department of Applied Physics and Nuclear Engineering at Columbia University. He spent 6 months at the Princeton Plasma Physics Laboratory as a visiting scientist. He is currently visiting at the EPFL/CRPP in Lausanne, Switzerland.

*James DeLucia*



## MEETING SUMMARY

### ADVANCED FUELS IN A FIELD-REVERSED CONFIGURATION

**Hiromu Momota** (right) (PhD, plasma physics, Kyoto University, Japan, 1966) is a professor at the Institute of Plasma Physics (IPP). He has been working on the microinstabilities and stochastic phenomena of confined plasmas, and the development of superconducting coils. He is now interested in the advanced

*Hiromu Momota  
Masao Okamoto  
Yasuyuki Nomura  
Masami Ohnishi  
Kiyoshi Yoshikawa  
Yasushi Yamamoto  
Herbert L. Berk  
Toshiki Tajima*



fusion fuel cycles using the field-reversed mirror configuration and the stabilization of its magnetohydrodynamic (MHD) modes by means of energetic particle beams. **Masao Okamoto** (top right) (Dr. Eng., nuclear engineering, Kyoto University, Japan, 1971) is an associate professor at the IPP, Nagoya University, and holds the portfolio of an associate professor at the Institute of Atomic Energy, Kyoto University. His current interests include magnetohydrodynamics and transports in magnetic fusion. **Yasuyuki Nomura** (top left) (PhD, plasma physics, Nagoya University, Japan, 1985) is an assistant professor at the IPP. He has been working on the stochasticity of magnetic field lines, performance analysis of advanced fusion fuel cycles, and dissipative effects on reversed-field pinches. He is now interested in the sustainment of compact toroid configurations and the stabilization of their MHD modes by energetic particle beams. **Masami Ohnishi** (second from top right) (Dr. Eng., electrical engineering, Kyoto University, Japan, 1979) is a research associate at the Institute of Atomic Energy, Kyoto University. He was a visiting assistant professor in the Nuclear Engineering Program of the University of Illinois from April 1979 for 6 months and held a visiting appointment at Lawrence Livermore National Laboratory (LLNL) from October 1979 to April 1980. His current interests include alpha-particle transport in magnetic fusion, dynamics and control of fusion reactors, and reactor design studies of open-ended systems. **Kiyoshi Yoshikawa** (second from top left) (Dr. Eng., nuclear engineering, Kyoto University, Japan, 1974) is an associate professor at the Institute of Atomic Energy, Kyoto University. He held a visiting appointment at LLNL from October 1978 for 1 year and then stayed at Lawrence Berkeley Laboratory, University of California, until March 1980. His main interests are direct energy conversion, reactor relevant technology, and reactor design in nuclear fusion. A photograph and a biography for **Yasushi Yamamoto** were not available at publication time. **Herbert L. Berk** (third from top right) (PhD, Princeton University) has worked as a physicist at Lawrence Berkeley Laboratory and LLNL. He is currently a professor of physics at the University of Texas at Austin. **Toshiki Tajima** (third from top left) (PhD, plasma physics, University of California, Irvine, 1975) is associate professor of physics at the University of Texas at Austin. His research is on physics of advanced fusion concepts, ultrahigh energy accelerator physics, and computational physics. Photographs and biographies were not available for **Akio Ishida** and **Kunihiro Sato** at publication time. **Shoichi Ohi** (bottom right) (Dr. Eng., welding engineering, Osaka University, Japan, 1972) is an associate professor at Plasma Physics Laboratory, Faculty of Engineering, Osaka University. His research is on formation, translation, and transport of field-reversed configuration plasmas. **George H. Miley** (bottom left) (PhD, University of Michigan, 1958) is a professor in the Department of Nuclear Engineering at the University of Illinois. In addition to research on fusion, he is well known for his research on energy conversion and nuclear-pumped lasers.

*Akio Ishida  
Kunihiro Sato  
Shoichi Ohi  
George H. Miley*

