

AUTHORS — SEPTEMBER 1983

FUSION REACTORS

THE FED-INTOR ACTIVITY

W. M. Stacey (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. **M. A. Abdou** (top left) (PhD, nuclear engineering, University of Wisconsin, 1973) is associate director of the Fusion Power Program at Argonne National Laboratory. He serves as the U.S. INTOR participant for nuclear systems. **D. Bruce Montgomery** (second from top right) (AB, physics, Williams College, 1957; BS and MS, electrical engineering, MIT, 1957; DSc, electrical engineering, University of Lausanne, 1967) is the associate director for the Engineering Systems at the Plasma Fusion Center at MIT. He is responsible for all advanced design and engineering of the confinement experiments and for engineering design aspects of reactor studies. **John M. Rawls** (center left) (PhD, physics, Brandeis University) is a physicist in the fusion organization at GA Technologies and has specialized in recent years in the design of advanced magnetic confinement devices and in the use of radio-frequency heating techniques in tokamaks. He was formerly a member of the faculty of the Physics Departments at Yale University and the University of California, San Diego. **J. A. Schmidt** (second from bottom right) (BS, physics, South Dakota State University, 1962; MS, 1964, and PhD, 1969, physics, University of Wisconsin) is head of the Applied Physics Division at Princeton University Plasma Physics Laboratory. He serves as the INTOR physics participant. **T. E. Shannon** (bottom left) (BS, 1960, and MS, 1962, engineering mechanics, Ohio University) is manager of systems engineering, Fusion Engineering Design Center, at the Oak Ridge National Laboratory. He serves as the U.S. INTOR design coordinator. **Richard J. Thome** (bottom right) (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.

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WILDCAT: A COMMERCIAL DEUTERIUM-DEUTERIUM TOKAMAK REACTOR

Kenneth Evans, Jr. (top right) (PhD, physics, University of Illinois, 1970) has been associated with Argonne National Laboratory (ANL) since 1975. He is primarily involved with conceptual designs of tokamak fusion reactors ranging from an experimental power reactor to a tenth-of-a-kind, commercial reactor (STARFIRE). He was most recently the principal investigator for the deuterium-deuterium reactor design, WILDCAT, which is the most detailed alternate fuel design to date. He has developed several significant computer codes such as PSI, TRAC-II, and EFC. **Charles C. Baker** (top left) (PhD, nuclear engineering, University of Wisconsin, 1972) has been with ANL since 1977. He is currently director of the Fusion Power Program, with overall responsibility for directing programs on fusion reactor design, system studies, materials research, magnet development, plasma engineering studies, neutronics, and blanket technology development. **Jeffrey N. Brooks** (second from top right) (PhD, electrical engineering, New York University, 1972) is a staff member with the Fusion Power Program at ANL. His current interests are in fusion plasma engineering and fusion reactor design studies. **Robert G. Clemmer** (second from top left) (PhD, chemistry, University of Wisconsin, 1977) is a chemist at ANL. His present activities include tritium and blanket technology. He is the lead engineer for the current experiment program to study *in situ* recovery of tritium (TRIO-01) from solid breeder blankets. **David A. Ehst** (center right) (ScD, nuclear engineering, Massachusetts Institute of Technology, 1975) has been with the Fusion Power Program at ANL since 1976. His research work has included anomalous transport theory, ELMO Bumpy Torus Reactor (EBTR) design, and the tokamak power reactor studies. His current interest is in advanced fusion concepts, such as steady-state tokamak reactors. **Patricia A. Finn** (center left) (PhD, physical-inorganic chemistry, University of California, 1971) has been a member of the Fusion Power Program at ANL since 1979. Her areas of expertise are tritium systems and blanket systems (materials properties and tritium recovery). She is currently assigned to the Fusion Engineering Design Center, working on tritium systems for both tokamak and mirror reactor designs. **Harold Herman** (second from bottom right) (MIEE, electrical engineering, Institution of Electrical Engineers, London, 1960) has been a project engineer at ANL since 1974. Before his current assignment, leading a fission reactor source-term experiment design group, he served as deputy manager for the Argonne Fusion Program First-Wall/Blanket/Shield Engineering Technology Program. **Jungchung Jung** (second from bottom left) (PhD, nuclear engineering, Kyoto University, Japan, 1974) is with the Fusion Power Program at ANL. His current activities include nuclear analyses for the ongoing blanket comparison and selection study, fusion materials recycle/waste management study, and lithium blanket neutronics/shielding experiment project. He is also responsible for general neutronics method/code development and nuclear data evaluation. **Richard F. Mattas** (bottom right) (PhD, metallurgical engineering, University of Illinois, 1974) is a materials scientist in the Fusion Power Program at ANL. His recent work is in the areas of impurity control and materials lifetime analysis in fusion reactors. **Balabhadra Misra** (bottom left) (PhD, chemical engineering, Columbia University, 1957) is a chemical engineer at ANL. He has in the past conducted calculational and experimental studies of heat transfer and fluid flow in conjunction with the space program, the liquid-metal-cooled fast breeder reactor program, sodium technology program, and more recently, the controlled nuclear fusion program. His recent activities

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Dale L. Smith
Herbert C. Stevens
Larry R. Turner
Robert B. Wehrle
Kevin M. Barry
Albert E. Bolon
Robert T. McGrath
Lester M. Waganer*



involve tritium technology and design/analysis of first-wall/blanket systems. **Dale L. Smith** (top right) (PhD, Iowa State University, 1966) is coordinator for fusion materials programs at ANL. He has also been responsible for materials selection and has served as task manager for several first-wall/blanket design studies, including the STARFIRE first-wall/blanket design study and the International Tokamak Reactor first-wall design study. **Herbert C. Stevens** (top left) (BSME, Purdue University, 1949) interests are in fusion reactor mechanical design. **Larry R. Turner** (second from top right) (PhD, Carnegie Institute of Technology, 1964) has been with the Superconducting Magnet Group at ANL since 1975, working on the design and testing of large superconducting magnets for magnetohydrodynamic research and investigating eddy-current effects and superconducting magnet safety for fusion reactors. **Robert B. Wehrle** (second from top left) (MS, physics, DePaul University, 1967) has been involved with the fusion power, acceleration research, GEM, and IPNSP programs at ANL. **Kevin M. Barry** (second from bottom right) (BS, physics, Manchester University, England, 1960; MBA, University of Southern California, 1983) is manager of power and nuclear technology for The Ralph M. Parsons Company, Pasadena, California, where he has worked since 1972. His responsibilities have included project management, project engineering, and design of conventional nuclear power, nuclear fusion, and oil and coal gasification plants. He currently manages a group of process engineers, power and nuclear technical specialists, and plant startup engineers working on several power plant and nuclear facility projects. **Albert E. Bolon** (second from bottom left) (PhD, nuclear engineering, Iowa State University, 1965) is an associate professor and reactor director at the School of Mines and Metallurgy, University of Missouri-Rolla. His field of specialization includes basic and applied research on materials problems, fusion engineering, and licensing and economics of present fission power plants and future energy systems. **Robert T. McGrath** (bottom right) (PhD, nuclear engineering, University of Michigan, 1980) is an assistant professor of nuclear engineering at Pennsylvania State University. Current research activities include plasma/surface interactions with applications to impurity control for magnetically confined plasmas and fuel cycle optimization methods for fusion-fission hybrid and light water reactor applications. **Lester M. Waganer** (bottom left) (MS, mechanical engineering, University of Missouri, 1963) has been with McDonnell Douglas Astronautics Company-St. Louis, Missouri, since 1970 where he is a senior design specialist and is currently the project leader on an Electric Power Research Institute project to assess the technical risks of developing a deuterium-tritium fuel system for a commercial fusion power plant. Previously he was the project engineer on the EBTR and power plant conceptual design study for Los Alamos National Laboratory, and was in charge of project engineering and system analysis activities for the STARFIRE reactor design study.

OPTIMIZATION OF STEADY-STATE BEAM-DRIVEN TOKAMAK REACTORS

David R. Mikkelsen (top) (PhD, physics, University of Washington) has been a physicist at the Princeton Plasma Physics Laboratory (PPPL) since 1977. He developed computational models of neutral beam injection and fast ion orbits in tokamaks. **Clifford E. Singer** (FBIS, PhD, University of California, Berkeley) has worked on the theory and applied physics of plasma transport in tokamak experiments and reactors at PPPL.

*David R. Mikkelsen
Clifford E. Singer*



since 1977. He has published studies of space and planetary physics, interstellar propulsion and communication, and molecular biology and evolution.

BLANKET ENGINEERING

AN ASSESSMENT OF CRITICAL THERMAL-HYDRAULIC PROBLEMS IN A DEUTERIUM-TRITIUM SOLID BREEDER BLANKET

Balabhadra Misra (top) (PhD, chemical engineering, Columbia University, 1957) is a chemical engineer at Argonne National Laboratory (ANL). In the past, he has conducted calculational and experimental studies of heat transfer and fluid flow in conjunction with the space program, the liquid-metal-cooled fast breeder reactor program, sodium technology program, and more recently, the controlled nuclear fusion program. His recent activities involve tritium technology and design/analysis of first-wall/blanket systems. **Robert G. Clemmer** (center) (PhD, chemistry, University of Wisconsin, 1977) is a chemist at ANL. His present activities include tritium and blanket technology. He is the lead engineer for the current experimental program to study *in situ* recovery of tritium (TRIO-01) from solid breeder blankets. **Dale L. Smith** (bottom) (PhD, Iowa State University) is coordinator for the Fusion Materials Programs at ANL. He has also been responsible for materials selection and has served as task manager for several first-wall/blanket design studies, including STARFIRE and INTOR.

*Balabhadra Misra
Robert G. Clemmer
Dale L. Smith*



EXPERIMENTAL DEVICES

MEASUREMENTS OF THE $D(d,n)$ AND ${}^3\text{He}(d,p)$ REACTION YIELDS FOR THE 1-MJ PLASMA FOCUS DEVICE OPERATING WITH A D_2 - ${}^3\text{He}$ GAS MIXTURE

Jan. S. Brzosko (top) [MSc, PhD, DSc, nuclear physics, Warsaw University (WU)] is assistant professor of physics at WU and has served as director of the Physics Institute, dean of the science faculty, and head deputy for science and research in the Bialystok Division of WU. He has worked in neutron physics and, in particular, on nuclear reactions induced by fast neutrons. During the last few years, his research was devoted to fusion physics and technology, mainly nuclear diagnostics of plasmas and nuclear technology of the fusion reactor blanket. He spent 2 yr at the Joint Institute of Nuclear Research, Dubna, USSR, and since 1981 has been on a sabbatical leave at the ENEA—Frascati Center (Italy). **Jean Pierre Rager** (center) (Ecole Nationale Supérieure Ingénieur Arts et Métiers (France), 1964; Doctorat de Spécialité, Paris Université, 1967) was stagiaire at Office National d'Etudes et de Recherches Aérospatiales. After 1 yr at the Centre National d'Etudes Sociales in planning and programming activities, he returned to basic research and moved to the Association Euratom-Comitato Nazionale per l'Energia Nucleare (CNEN) at Frascati (1969) where his long acquaintance with plasma focus research started. With the launching of the 1-MJ plasma focus device, he became responsible for the experimental activities on this device and then group leader in 1978. He is presently at the fusion program headquarters of the CEE in Brussels. **B. V. Robouch** (bottom) (DesSc, nuclear

*Jan S. Brzosko
Jean Pierre Rager
B. V. Robouch
Achim H. Bähr
Hans Volker Klapdor
Erling Andersson
Peter Herges*



physics, Université de Lyon, France) is presently responsible for the Fusion Reactor Blanket Program at the ENEA Frascati Center. After having been at the European Council for Nuclear Research (CERN)-Geneva in the Accelerator Research Group, he has been engaged since 1962 as the Euratom-ENEA Association Frascati Center (Italy) as a CCE staff, in plasma physics research. His scientific activity has been centered on plasma focus physics and numerical methods applied to fusion plasmas. **Achim H. Bähr** (top) (Heinrich-Heine-Universität, Dusseldorf, 1974 to 1981) participated at a high-energy physics experiment at CERN-Geneva through the summer student program in 1978. He worked on his diplom-thesis with a Euratom fellowship at the Associazione Euratom-CNEN sulla Fusione in Frascati (Italy) during 1980 and 1981. Since 1982, he has been working on a PhD thesis in the Plasma Wall Interaction Group of the Max-Planck-Institut für Plasmaphysik in Garching near Munich. **Hans Volker Klapdor** (bottom) (PhD, physics, University of Hamburg, 1969) has been a member of the Max-Planck-Institut für Plasmaphysik in Heidelberg, and since 1980 he has also worked as professor of physics at the University of Heidelberg. He received the Physics Prize of 1982 presented by the German Physical Society. His current research is concentrated on the structure of nuclei far from stability, in particular on beta decay, and consequences for astrophysical, neutron oscillation, and nuclear power applications. **Erling Andersson** (photo not available) (Diplom-Ingenieur, Technical University of Lund, Sweden, 1979; PhD, physics, University of Heidelberg, 1981) is presently at the Institute of Nuclear Physics in Stockholm. **Peter Herges** (photo not available) (graduate, University of Heidelberg, 1980) he has been employed at Daimler-Benz in Stuttgart since 1981.



OVERVIEW

FUSION REACTOR BREEDER MATERIAL SAFETY COMPATIBILITY STUDIES

David W. Jeppson (top) (BES, chemical engineering, Brigham Young University, 1968) is a senior engineer at Westinghouse Hanford Company. He has provided engineering support for nuclear fuel reprocessing and high-level waste encapsulating facilities. He is currently working on identifying and characterizing safety concerns associated with use of fusion reactor, tritium breeding materials and developing mitigation methods for minimizing these concerns. **Lewis D. Muhlestein** (center) (PhD, physics, Iowa State University, 1966) is manager of Safety Systems Development at Westinghouse Hanford Company. He has been involved for the past 6 yr with research and development regarding the safety of light water, breeder, and fusion reactors for postulated beyond-the-design basis accident conditions. **Sydney Cohen** (bottom) (BS, chemical engineering, 1948) has been a staff member of the Fusion Safety Program, EG&G Idaho, at the Idaho National Engineering Laboratory since 1957. His current work is in the area of accident studies describing mobilization and release of radioactive material from magnetic fusion devices. His previous work included analytical activities, safety studies, and concept development for a variety of fission reactor systems.

*David W. Jeppson
Lewis D. Muhlestein
Sydney Cohen*

