



AUTHORS – JULY 1983

OVERVIEW

NOVA LASER FUSION FACILITY—DESIGN, ENGINEERING, AND ASSEMBLY OVERVIEW

*William W. Simmons
Robert O. Godwin*

William W. Simmons (top) (BA, Carleton College, 1953; MS, 1955, and PhD, 1960, physics, University of Illinois, Urbana) was a member of the technical staff at TRW Systems Group in California from 1960 to 1971. From 1968 to 1971, he was an associate professor at the University of California, Los Angeles. Since 1971 he has been with the Laser Fusion Program (LFP) at Lawrence Livermore National Laboratory (LLNL). He has been involved with the development and activation of the large solid-state laser systems used as drivers for inertial confinement fusion experiments. He is currently senior engineering manager for the Nova Laser System. **Robert O. Godwin** (BS, electrical engineering, Georgia Institute of Technology, 1958; MS, electrical engineering, University of Southern California, 1960; MBA, California State University at Fullerton, 1973) was a member of the technical staff at Hughes Aircraft Company in California. He has worked for the U.S. Army Electronic Command and Rockwell International. Since 1974 he has been with the LFP at LLNL. He was project manager for the 30-TW Shiva Laser System and since 1978 has been project manager for the Nova Laser System. He is also associate program leader responsible for the construction and operation of the LLNL fusion facilities.



ENGINEERING COMPUTATIONS AT THE NATIONAL MAGNETIC FUSION ENERGY COMPUTER CENTER

Susarla Murty

Susarla Murty [BS, Andhra University, India; PhD, physics, University of California, San Diego (UCSD), 1967] is a computer scientist at the National Magnetic Fusion Energy Computer Center at Lawrence Livermore National Laboratory. Previously, he was a research physicist at UCSD and a senior scientist at Science Applications in La Jolla, California. He has worked in the areas of high-energy physics, radiation transport, and combustion problems. His current interest is on the use of powerful computers to solve the mathematical problems arising in the modeling of fusion reactors.



MODELING AND ANALYSIS OF EROSION AND REDEPOSITION FOR LIMITER AND DIVERTOR IMPURITY CONTROL SYSTEMS

Jeffrey N. Brooks

Jeffrey N. Brooks (PhD, electrical engineering, New York University, 1972) is a staff member in the Fusion Power Program at Argonne National Laboratory. His current interests are in fusion plasma engineering and fusion reactor design studies.



PRINCETON LARGE TOKAMAK SCALING LAWS FOR THERMONUCLEAR FUSION POWER MULTIPLICATION

*L. R. Grisham
J. D. Strachan*

L. R. Grisham (top) (PhD, physics, Oxford University) has been a physicist at the Princeton Plasma Physics Laboratory (PPPL) since 1974. He has worked mainly in the application and development of neutral beam heating for magnetically confined plasmas. **J. D. Strachan** (PhD, University of British Columbia, 1972) has been a physicist at PPPL since 1975. His research interests include confinement processes and nuclear diagnostics in fusion research, especially tokamaks.



PERTURBATION SOLUTION OF THE BOUNCE-AVERAGED FOKKER-PLANCK EQUATION FOR AN ELECTROSTATIC MAGNETIC MIRROR

Taha Houssine Zerguini

Taha Houssine Zerguini [BS, nuclear engineering, University of Algiers, 1976; MS, nuclear engineering, University of Washington (UW), Seattle, 1979] is a predoctoral research associate in nuclear engineering at the UW. He has worked as part of the UW Fusion Engineering Group in collaboration with the Lawrence Livermore National Laboratory on the application of tandem mirror reactors to synthetic fuel production. He is currently finishing his PhD dissertation under the supervision of Professor Fred L. Ribe. His current research interests are centered on theoretical and computational plasma physics as applied to fusion engineering.



DEUTERIUM PERMEATION DURING IMPLANTATION INTO TYPE 304 STAINLESS STEEL

*Rion A. Causey
Douglas F. Holland
Margaret L. Sattler*

Rion A. Causey (top) (PhD, nuclear engineering, North Carolina State University, 1977) is an assistant professor at the University of Virginia. His current research is in the area of fusion reactor materials. **Douglas F. Holland** (center) (BS, physics, Western Michigan University, 1960; MS and PhD, physics, 1968, and MS, nuclear engineering, 1975, University of Arizona) was an assistant professor of physics at Northern Arizona University and at Haile Sellassie I University, and has also served various federal agencies as a physicist and nuclear analyst. At present, he is with EG&G Idaho, Inc., working at the Idaho National Engineering Laboratory as an engineering specialist in the fusion safety program. **Margaret L. Sattler** (bottom)



(MS, materials science, University of Virginia, 1979) is currently finishing her PhD at the University of Virginia in the area of radiation damage to fusion reactor materials.

SHIELDING

INVESTIGATION OF THE TRANSPORT OF DEUTERIUM-DEUTERIUM FUSION NEUTRONS IN THICK CONCRETE

Long-poe Ku
Joseph G. Kolibal

Long-poe Ku (top) (BS, nuclear engineering, National Tsing-hua University, Taiwan, 1970; MS, 1973, and PhD, 1976, nuclear engineering, Columbia University) is a staff member at Princeton Plasma Physics Laboratory (PPPL). He has been with the tokamak fusion test reactor (TFTR) and TFM design team since 1978 where he is responsible for nuclear radiation analysis and shielding design. His current interests include neutron physics, transport theory, fusion neutronics, and fusion reactor system analysis. **Joseph G. Kolibal** (BS, chemical engineering, Carnegie-Mellon University, 1974; MS, nuclear engineering, Imperial College, University of London, 1977) is a staff member at PPPL engaged in nuclear radiation analysis and transport. He is responsible for assessment of the radiological and shielding environment for the TFTR and the TFM. His current interests include the development and application of computational techniques for transport phenomena.



BLANKET ENGINEERING

NUCLEAR ANALYSIS OF THE HEAVY-ION-BEAM-DRIVEN FUSION REACTOR HIBALL

Mohamed E. Sawan
Laila A. El-Guebaly
Gregory A. Moses
William F. Vogelsang

Mohamed E. Sawan (top right) (BS, nuclear engineering, University of Alexandria, Egypt, 1967; MS, 1971, and PhD, 1973, nuclear engineering, University of Wisconsin) is associate scientist in the Fusion Engineering Program at the University of Wisconsin (UW). He worked as assistant and associate professor in the Department of Nuclear Engineering at the University of Alexandria for seven years. Current interests are centered on design and neutronics of both magnetic confinement and inertial confinement fusion (ICF) reactors. **Laila A. El-Guebaly** (top left) (PhD, nuclear engineering, University of Alexandria, Egypt, 1979) is a member of the scientific staff in the Fusion Engineering Program at UW. Her major interests are in radiation shielding and neutronics analysis of fusion reactors. She is currently involved in analyzing the effects of radiation streaming on vital components in the mirror fusion reactor penetrations. **Gregory A. Moses** (right) (PhD, nuclear engineering, University of Michigan, 1976) is an associate professor of nuclear engineering at UW. His research interests include ICF reactor technology, radiation hydrodynamics, and transport theory. He worked for two summers at Lawrence Livermore National Laboratory and in recent years has been a visiting staff member with the Target Design Group at the Los Alamos National Laboratory. **William F. Vogelsang** (bottom left) (PhD, physics, University of Pittsburgh, 1956) is a professor of nuclear engineering at UW. He has been a participant in the efforts of the Fusion Technology Group at UW since 1971. His interests have included critical assemblies,



neutron diffraction, and nondestructive fuel assay. His current research interests are in the radioactivity and safety problems of fusion reactors.

ICF CHAMBER ENGINEERING

PROPAGATION OF IONS THROUGH CONDUCTING FLUIDS WITH IMBEDDED MAGNETIC FIELDS

Ihor O. Bohachevsky (top) (BAE magna cum laude, New York University, 1956; PhD, applied mathematics, New York University, 1961) is a staff member in the Analysis and Assessment Division of the Los Alamos National Laboratory (LANL). His current work is in the area of inertial confinement fusion (ICF) systems and applications studies with particular emphasis on the identification and solution of technical problems associated with the utilization of fusion energy. His previous work in the areas of fluid mechanics, numerical analysis, magneto-hydrodynamics, and mathematical modeling was carried out at Cornell Aeronautical Lab, Buffalo, New York; Avco-Everett Research Lab, Everett, Massachusetts; and Bell Telephone Lab, Murray Hill, New Jersey. **John C. Goldstein** (center) (PhD, Massachusetts Institute of Technology, 1971) is a staff member in the Laser Fusion Theory Group of the Theoretical Design Division of LANL. Current interest in problems of ICF reactor cavity plasma phenomena complements his continuing work in laser theory, particularly problems associated with the generation and propagation of short pulses in molecular lasers. **Donald O. Dickman** (bottom) (BS, mathematics and physics), staff member in Design Engineering Division of LANL, specializes in the development of large computer codes and computer graphics for various applications in energy-related areas, such as ICF, laser pulse propagation, and ventilation. His previous work was in nuclear weapons effects simulation.

*Ihor O. Bohachevsky
John C. Goldstein
Donald O. Dickman*



THERMIONIC POWER PRODUCTION FOR DRY-WALL INERTIAL CONFINEMENT FUSION SYSTEMS

James F. Stubbins (BS, nuclear engineering, University of Michigan, 1970; MS, nuclear engineering, University of Cincinnati, 1972; PhD, materials science and metallurgical engineering, University of Cincinnati, 1975) is an assistant professor of nuclear engineering at the University of Illinois, Urbana-Champaign. His major research interest is in the area of reactor materials performance and engineering.

James F. Stubbins



FUSION REACTORS

PARAMETRIC STUDIES FOR THE FUSION ENGINEERING DEVICE

R. Lowell Reid (right) (BS, physics, University of Alabama, 1969; MS, mechanical engineering, University of Florida, 1969) is currently responsible for fusion power system analysis at the Fusion Engineering Design Center (FEDC) at Oak Ridge National Laboratory (ORNL). Since 1975 he has been involved

*R. Lowell Reid
Don Steiner*



in computer modeling of fusion systems and in performing sensitivity analyses to define the performance, cost, and configuration of proposed fusion reactors. **Don Steiner** (BS, chemical engineering, 1960; MS, nuclear engineering, 1962; PhD, nuclear engineering, 1967, Massachusetts Institute of Technology) is professor of nuclear engineering at Rensselaer Polytechnic Institute. Since 1968 he has been involved in fusion power systems analysis and design. From 1978 to 1982 he was manager of the FEDC at ORNL.



NUCLEAR DESIGN AND ANALYSIS OF A DEUTERIUM-DEUTERIUM TOKAMAK REACTOR, WILDCAT

Jungchung Jung

Jungchung Jung (PhD, nuclear engineering, Kyoto University, Japan, 1974) is in the Applied Physics Division at Argonne National Laboratory with the Fusion Power Program. 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.



NONELECTRICAL APPLICATIONS

A SCOPING NUCLEONICS STUDY FOR FUSION HIGH-TEMPERATURE BLANKET DESIGNS

*E. T. Cheng
C. P. C. Wong*

E. T. Cheng (top) (PhD, nuclear engineering, University of Wisconsin, 1976) has been a member of the Development and Technology Group in the Fusion Division of GA Technologies, Inc. (GA) since 1978. He has been involved with various fusion blanket and reactor design studies including fusion breeder and chemical production applications. His interests are primarily in the areas of neutronics, radioactivity, and blanket engineering. **C. P. C. Wong** (BS and MS, nuclear engineering, University of Wisconsin; PhD, nuclear engineering, University of Texas) has been involved in the design of blankets on several different fusion reactor studies since joining GA in 1977. His research interests are in the areas of fusion reactor blanket thermal-hydraulics and magnetohydrodynamics effects and the assessment of tritium breeding materials. He has coordinated the blanket designs on the small reactor, tandem mirror hybrid reactor, and moving ring reactor studies. He led the material and design selection for the Lithium Blanket Module Study. Currently, he is the principal investigator, representing GA for the Fusion Breeder Program Reactor Study, and the Blanket Comparison and Selection Study.



MAGNET SYSTEMS

PLASMA-EXTERNAL CIRCUIT INTERACTION IN THE BURN CONTROL WITH VERTICAL FIELD

*Federico R. Casci
Ettore Minardi*

Federico R. Casci (right) (Laurea in Ingegneria Meccanica, Politecnico of Milan, Italy, 1982) has been a research scientist at Max-Planck-Institut für Plasmaphysik in the Federal Republic of Germany since the early 1981. He is currently working on



burn control problems in tokamaks and on magnetohydrodynamic equilibria in tokamaks with application to feedback systems. **Ettore Minardi** (Laurea in Fisica, University of Milan, 1951; Libera Docenza, University of Turin, 1959) is presently working at the Consiglio Nazionale delle Ricerche in Milan on the development of a one-dimensional model for burn control in a tokamak with a feedback vertical field. His main work concerns the development of a thermodynamic theory for the non-Maxwellian equilibria and their global stability.



BLANKET ENGINEERING

MULTILAYERED BLANKET CONCEPT FOR TRITIUM BREEDING ASSEMBLIES

*Vijay R. Nargundkar
Om Prakash Joneja*

Vijay R. Nargundkar (top) (MSc, physics, Karnataka University, 1956; PhD, pulsed neutron studies, University of Bombay, 1966) has been working at Bhabha Atomic Research Centre (BARC) since 1957. He has worked in the field of fission physics at Atomic Energy of Canada, Limited, Chalk River, Canada (1961 and 1962), pulsed fast reactors at the Joint Institute for Nuclear Research, Dubna, Soviet Union (1972), and fusion blanket neutronics at the Institute of Reactor Development, Jülich, Federal Republic of Germany (FRG) (1977 and 1978). He has been the facility supervisor of the Purnima Critical Facility. His current interest is theoretical and experimental studies of fusion blanket neutronics. **Om Prakash Joneja** (MSc, Punjabi University, 1966; Graduate BARC Training School, 1967; PhD, physics, University of Bombay, 1972) has been actively working on fast neutron spectrometry and development of Monte Carlo codes. His present interest includes development of new experimental techniques for on-line measurement of tritium breeding in fusion blankets. He has worked at the Institute of Reactor Development, Jülich, FRG, from 1972 to 1974 in the field of fast neutron spectrometry and recently, from 1979 to 1980 in the same institute on LiAlO₂ blanket assembly for measuring tritium production.



PLASMA ENGINEERING

ON THE KINETICS OF FUSION CHAIN REACTIONS

*Ehud Greenspan
George H. Miley*

Ehud Greenspan (top) (BSc, mechanical engineering, Technion; PhD, nuclear science and engineering, Cornell University) was a visiting professor in the Nuclear Engineering Program of the University of Illinois from 1979 to 1981, on leave from the Nuclear Research Center and the Ben-Gurion University of the Negev, Israel. He held visiting appointments at the Princeton Plasma Physics Laboratory and Oak Ridge National Laboratory. His professional interests include the conception and analysis of novel fusion and fission energy systems, transport processes in fission and fusion reactors, reactor physics, and methods development. **George H. Miley** (PhD, University of Michigan, 1958) is professor and chairman of the Nuclear Engineering Program at the University of Illinois in Urbana-Champaign. In addition to research on fusion, he is well known for his research on energy conversion and nuclear-pumped lasers.

