

AUTHORS — SEPTEMBER 1989

SAFETY/ENVIRONMENTAL ASPECTS

ENVIRONMENTAL EFFECTS OF FUSION POWER PLANTS. PART III: POTENTIAL RADIOLOGICAL IMPACT OF ENVIRONMENTAL RELEASES

Clay E. Easterly (right) (BS, physics, Mississippi State University; PhD, physics, University of Tennessee) is group leader of the health effects and epidemiology group, Health and Safety Research Division of the Oak Ridge National Laboratory (ORNL). Essentially all of his activities during his 16 years at ORNL have been related to some aspect of health or safety evaluation of advanced technologies. His current interest is in developing a scientifically defensible methodology for quantifying health risks from chemicals and radiation on a common scale that is also understandable by members of the public. **Gorman S. Hill** (center) (BA, Lincoln Memorial University, 1943; MS, University of Tennessee, 1951) is a retired research associate of the Health and Safety Research Division at ORNL. He has 12 years of experience as a radiological surveyor and recently has specialized in completing radiological dose assessments for environmental impact statements and other documents. **Johnnie B. Cannon** (bottom) (BS, Tuskegee Institute, 1970; MS, 1972, and PhD, 1975, California Institute of Technology) is head of the Integrated Analysis and Assessment Section of the Energy Division of ORNL. He has been with ORNL for about 11 years and has specialized in assessing the environmental impacts of energy technologies and related areas. Most recently, he led an ORNL program to prepare an environmental impact statement for the U.S. Department of Energy Magnetic Fusion Energy Program.

*Clay E. Easterly
Gorman S. Hill
Johnnie B. Cannon*



TRITIUM SYSTEMS

CONVERSION OF LOW-CONCENTRATION TRITIUM GAS TO TRITIATED WATER

H. Noguchi (right) (MS, nuclear engineering, Nagoya University, Japan, 1976) is a senior scientist in the Department of Health Physics at the Japan Atomic Energy Research Institute. He is involved in the health physics aspects of tritium safety. His interests are in experimental work and model development on the conversion of molecular tritium gas to tritiated water in building and natural environments. He was a visiting scientist at Oak

*H. Noguchi
Clay E. Easterly
M. R. Bennett*

Ridge National Laboratory (ORNL) during 1984–1985. **Clay E. Easterly** (top) (BS, physics, Mississippi State University; PhD, physics, University of Tennessee) is group leader of the health effects and epidemiology group, Health and Safety Research Division of ORNL. Essentially all of his activities during his 16 years at ORNL have been related to some aspect of health or safety evaluation of advanced technologies. His current interest is in developing a scientifically defensible methodology for quantifying health risks from chemicals and radiation on a common scale that is also understandable by members of the public. **M. R. Bennett** (bottom) (St. Lawrence University, 1948) is a research associate with the Chemistry Division of ORNL, where he has been employed since 1948. His earlier research was devoted to studies of the chemistry of uranium and plutonium fluorides. Subsequent to that, he was involved in the molten salt reactor program until its termination in 1972. Since then he had been involved with various special projects related to plutonium and uranium chemistry prior to studies of the conversion of tritium gas to tritiated water.



COMPUTER SIMULATION OF TRITIUM SYSTEMS FOR FUSION TECHNOLOGY

Eugen Gabowitsch (top) (MS, mathematics, University of Tartu, Estonia, 1962; PhD, mathematics, Leningrad Pedagogical Institute, USSR, 1967) is the leader of the mathematical modeling group of Kernforschungszentrum Karlsruhe (KfK). He has worked in such fields as algebra, combinatorial optimization, and computer simulation. He is currently engaged in mathematical modeling of phenomena of modern technology (tritium supply systems, high-voltage diodes, nuclear waste disposal) and of ecology (soil and groundwater pollution simulation). **Gert Spannagel** (PhD, physics, University of Heidelberg, Federal Republic of Germany, 1968) is a senior scientist at KfK. He has worked in several areas, including radioecology, climatology, energy conversion techniques, cosmic rays, interplanetary material, and nuclear physics. He is currently engaged in mathematical modeling.

*Eugen Gabowitsch
Gert Spannagel*



PLASMA ENGINEERING

INDUCTIVE CURRENT DRIVE OF PINCH PLASMAS

T. J. Dolan has taught nuclear engineering at the University of Missouri–Rolla and participated in the fusion research program of Phillips Petroleum Company. He is currently employed in the physics and mathematics group at the Idaho National Engineering Laboratory.

T. J. Dolan



ALPHA-PARTICLE LOSSES IN COMPACT TORSATRON REACTORS

S. L. Painter (right) (MS, nuclear engineering, University of Tennessee) is on the staff of the Fusion Energy Division of the Oak Ridge National Laboratory (ORNL) and a doctoral candidate in nuclear engineering at the University of Tennessee. His research interests include computational plasma engineering and

*S. L. Painter
J. F. Lyon*



stellarator reactor systems studies. **J. F. Lyon** (right) (PhD, University of Tennessee, 1970) is stellarator program coordinator in the Fusion Energy Division of ORNL. His current activities are in stellarator confinement and reactor studies. He has worked in the mirror and tokamak programs at ORNL and on tokamaks and stellarator programs in the Soviet Union, France, England, Japan, and Germany.



ASSESSMENT OF THE IMPACT OF CYCLOTRON EMISSION ON THE PERFORMANCE OF NEXT-GENERATION TOKAMAKS IN THE PRESENCE OF AN ABSORBING WALL

Kurt Borrass

Kurt Borrass [Dipl.-Phys. and Dr. rer. nat., Universität München, Federal Republic of Germany (FRG), 1974] has worked at the Institut für Plasmaphysik, Garching, FRG, since 1975 on plasma transport, plasma control, and systems codes. In 1983 he joined the Next European Torus (NET) Team, where he has been involved with the NET scoping studies and the assessment of the NET-related physics data base.



THERMALLY STABLE OPERATION OF ENGINEERING TEST REACTOR TOKAMAKS

*S. K. Ho
Max E. Fenstermacher*

S. K. Ho (top) (PhD, nuclear engineering, University of Illinois, 1987) is presently a physicist in the Magnetic Fusion Energy (MFE) Division at Lawrence Livermore National Laboratory (LLNL) under a U.S. Department of Energy MFE postdoctoral fellowship. His current research interests include theoretical and computational studies in plasma engineering and tokamak reactor system studies. **Max E. Fenstermacher** (BA, mathematics/physics, Kalamazoo College, 1978; MS, 1980, and PhD, 1983, nuclear engineering, University of Michigan) is presently a physicist in the MFE Division at LLNL supporting the microwave tokamak experiment. From 1983 to 1988, he was a plasma physicist in the energy development group of TRW, Inc., working at LLNL on tandem mirror reactor analysis. His research interests include plasma power balance, noninductive current drive for tokamaks, propagation and absorption of electromagnetic waves in hot plasmas, and tokamak plasma transport.



GENERALIZED SADDLE POINT CONDITION FOR IGNITION IN A TOKAMAK REACTOR WITH TEMPERATURE AND DENSITY PROFILES

*Osamu Mitarai
Akira Hirose
Harvey M. Skarsgard*

Osamu Mitarai (top) (MS, mechanical engineering, 1977, and PhD, nuclear engineering, 1979, Kyushu University, Japan) is an associate professor of electrical engineering at Kumamoto Institute of Technology, Japan. He worked in the Department of Physics, University of Saskatchewan, Canada, from 1981 to 1984 and built the STOR-1M tokamak. He often visits the University of Saskatchewan to cooperate on STOR tokamak projects. His current interests are in the areas of ac tokamak, current drive, ignition studies for the deuterium-tritium and D-³He tokamak reactor, spin-polarized fusion, transport studies, and cosmology based on plasma physics. A photograph and a biography for **Akira Hirose** were not available at publication time. **Harvey M. Skarsgard** (bottom) (BE, engineering physics, 1949, and MSc, physics, 1950, University of Saskatchewan, Canada; PhD, nuclear physics, McGill University, Canada, 1955) spent a year at the Atomic Energy Research Establishment, Harwell; another at the European Organization for Nuclear Research, Geneva; then joined the faculty of the physics department, University of



Saskatchewan, where he started a plasma physics research laboratory. He has worked mainly on plasma heating experiments with the Plasma Betatron and the STOR tokamaks.

THERMAL ENERGY CONVERSION SYSTEMS OVERVIEW FOR FUSION REACTORS

Ali E. Dabiri

Ali E. Dabiri (BS, engineering, Teheran Polytechnic, 1967; MS, 1969, and ScD, 1971, engineering, Massachusetts Institute of Technology) is a chief engineer at Science Applications International Corporation. He has worked on many aspects of fusion engineering issues, including first-wall and blanket design of alternative fusion fuel reactors. He is currently involved in accelerator technology studies. Past work includes gas/solid interactions, energy conservation, and energy systems.

ERROR ANALYSIS OF A PROBE ARRAY USED FOR TRANSIENT RADIO-FREQUENCY IMPEDANCE MEASUREMENT IN ION CYCLOTRON RESONANCE HEATING EXPERIMENTS

*Zhaoshen Wang
Yiamin Wang
Dezheng Xu*

Zhaoshen Wang (top) (engineering degree, 1966) is an associated professor and the director of the microwave diagnostic and heating department of the Institute of Plasma Physics (IPP), Academia Sinica. His present research activities are mainly in the engineering and physics of the HT-6M ion cyclotron resonance heating (ICRH) experiment. He has also worked on microwave diagnostic experiments, ICRH antenna design, plasma fluctuation signal analysis, millimetre-wave quasi-optical receiving systems and spectrometers, microwave tube and component design, and digital techniques. **Yiamin Wang** (center) is an assistant professor at IPP, Academia Sinica, where he does research on control engineering, plasma diagnostics, and ICRH heating in plasmas. **Dezheng Xu** (bottom) (BS, applied mathematics, An Hui University, China, 1976) is a research associate at IPP, Academia Sinica. He currently works on radio-frequency transmission and leakage and on shielding for the HT-6M ICRH experiment. He has also worked in the areas of electronics circuits and microcomputer applications.



COLD FUSION

VIRTUAL-STATE INTERNAL NUCLEAR FUSION IN METAL LATTICES

Robert W. Bussard

Robert W. Bussard (BS, 1950, and MS, 1952, engineering, University of California at Los Angeles; AM, 1959, and PhD, 1961, physics, Princeton University) is engaged in the development of new and novel energy sources and in studies of advanced power systems for strategic defense.



ON THE POSSIBILITY OF A NUCLEAR MASS-ENERGY RESONANCE IN D + D REACTIONS AT LOW ENERGY

J. Rand McNally, Jr. (PhD, physics, Massachusetts Institute of Technology, 1943) is retired from the senior research staff in the Fusion Energy Division of Oak Ridge National Laboratory. His research interests include atomic physics, plasma physics, and nuclear fusion in which fields he has published well over 100 technical articles. He is now a fusion energy consultant.

J. Rand McNally, Jr.



ADVANCED ENERGY CONVERSION METHODS FOR COLD FUSION

Mark A. Prelas (PhD, nuclear engineering, University of Illinois, 1979) is an associate professor of nuclear engineering at the University of Missouri-Columbia (UMC). He joined the UMC faculty after completing his PhD on a direct energy conversion technique (nuclear-pumped lasers). His research interests are in the areas of direct energy conversion, gaseous electronics, and plasma engineering.

Mark A. Prelas



ON THE POSSIBILITY OF DEUTERON DISINTEGRATION IN ELECTROCHEMICALLY COMPRESSED D⁺ IN A PALLADIUM CATHODE

Magdi Ragheb (top) [PhD, nuclear engineering and computer science, University of Wisconsin (UW), Madison] is an associate professor of nuclear engineering at the University of Illinois, Urbana-Champaign. He has collaborated with the Fusion Engineering Program at UW, the Division of Engineering Physics at Oak Ridge National Laboratory, the Departments of Applied Science and Nuclear Energy at Brookhaven National Laboratory, the National Center for Supercomputing Applications at the University of Illinois, Cray Research Inc., Idaho National Engineering Laboratory, and the Illinois Department of Nuclear Safety. His current theoretical interests are the fields of computational methods, applied artificial intelligence, anticipatory systems synthesis, coupled probability-possibility theory, and risk assessment and safety analysis. His current technical interests are in the analysis of alternate fusion cycles, knowledge engineering and expert systems, and monitoring and fault-diagnosis systems. **George H. Miley** (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.

*Magdi Ragheb
George H. Miley*



PRELIMINARY EXPERIMENTAL STUDY ON COLD FUSION USING DEUTERIUM GAS AND DEUTERIUM PLASMA IN THE PRESENCE OF PALLADIUM

Albert G. Gu (top) (PhD, nuclear engineering, University of Missouri-Columbia, 1987) is an assistant professor in the Department of Mechanical and Nuclear Engineering at Mississippi State University. He has done research on nuclear theory and calculation methods, and reactor core physics, fuel cycle, and design analysis. His current interests include fusion, space nuclear power systems, and nuclear-pumped lasers. **Robert K. F. Teng** (bottom) (PhD, electrical engineering, Purdue University, 1986) is an

*Albert G. Gu
Robert K. F. Teng
Mark S. Miller
Wayne J. Sprouse*



associate professor of electrical engineering at California State University. He has been involved in the research of microelectronic devices and materials for the last 6 years. His current interests are electrostatic metallization for photovoltaics, multichip packaging, superconductive materials, ion beam processing technology, and nuclear "cold fusion." **Mark S. Miller** (top) (BS, nuclear engineering, Mississippi State University, 1983) tested and operated pressurized water reactors as part of naval reactor plant construction from 1983 to 1987. He worked in various system and compliance engineering roles at Comanche Peak steam electric station from 1987 to 1988. He is currently completing his master's degree in nuclear engineering at Mississippi State University. His current interests are in integrated plant simulation. **Wayne J. Sprouse** (bottom) is studying for a bachelor's degree in nuclear engineering at Mississippi State University and is assistant radiation safety officer there. From 1982 to 1986, he was a mechanical systems operator in the U.S. Navy's nuclear power program.



A NOVEL APPARATUS TO INVESTIGATE THE POSSIBILITY OF PLASMA-ASSISTED COLD FUSION

David N. Ruzic (top) (PhD, physics, Princeton University, 1984) is an associate professor in the material science and engineering department at the University of Illinois at Urbana-Champaign. His work involves experimental and computational plasma/material interactions relating to plasma processing of semiconductor material and the edge regions of fusion devices. **Kenneth D. Schatz** (photo not available) (MS, physics, University of Illinois, 1988) is a PhD student at the University of Illinois at Urbana-Champaign. His interests are in plasma deposition of hard carbon films. **Phi Long Nguyen** (bottom) (BS, nuclear engineering, University of Illinois, 1988) is a graduate student in the Department of Nuclear Engineering at the University of Illinois, currently working on processing plasma diagnostics.

*David N. Ruzic
Kenneth D. Schatz
Phi Long Nguyen*



ISOTOPIC HYDROGEN FUSION IN METALS

Vern C. Rogers (top) [PhD, Massachusetts Institute of Technology (MIT), 1968] is the president of Rogers and Associates Engineering Corporation, which he founded in 1980. He is a certified health physicist. **Gary M. Sandquist** has been a professor and director of nuclear engineering at the University of Utah since 1964. He was a National Science Foundation postdoctoral fellow in fusion at MIT in 1969-1970.

*Vern C. Rogers
Gary M. Sandquist*



ELECTROCHEMICALLY INDUCED DEUTERIUM-TRITIUM FUSION POWER REACTOR—PRELIMINARY DESIGN OF A REACTOR SYSTEM

D₂O-FUELED FUSION POWER REACTOR USING ELECTROCHEMICALLY INDUCED D-D_n, D-D_p, AND DEUTERIUM-TRITIUM REACTIONS—PRELIMINARY DESIGN OF A REACTOR SYSTEM

Y. Oka (right) (Dr. Eng., nuclear engineering, University of Tokyo, Japan, 1974) is a professor at the Nuclear Engineering

*Y. Oka
S. Koshizuka
S. Kondo*



Research Laboratory at the University of Tokyo. He is currently working on neutron transport and shielding, nuclear design and analysis of advanced reactors such as fusion-fission hybrids, and inertial confinement fusion reactors. **S. Koshizuka** (top) (MS, nuclear engineering, University of Tokyo, Japan, 1986) is an assistant professor in the Department of Nuclear Engineering at the University of Tokyo. His major research area is numerical fluid dynamics. **S. Kondo** (bottom) (Dr. Eng., nuclear engineering, University of Tokyo, Japan, 1970) is a professor in the Department of Nuclear Engineering at the University of Tokyo. He has been working on reactor safety, human factors, and design of fusion reactors.



REACTOR PROSPECTS OF MUON-CATALYZED FUSION OF DEUTERIUM AND TRITIUM CONCENTRATED IN TRANSITION METALS

Weston M. Stacey, Jr. (BS, physics, 1959, and MS, nuclear science, 1963, Georgia Institute of Technology; PhD, nuclear engineering, Massachusetts Institute of Technology, 1966) is Callaway Regents' Professor and chairman of the Nuclear Engineering Program at Georgia Institute of Technology. He has worked in fusion reactor design and applied plasma physics.

Weston M. Stacey, Jr.

