

AUTHORS — JULY 1986

SAFETY/ENVIRONMENTAL ASPECTS

APPROACHES TO ACHIEVING INHERENTLY SAFE FUSION POWER PLANTS

Steven J. Piet



IMPLICATIONS OF PROBABILISTIC RISK ASSESSMENT FOR FUSION DECISION MAKING

Steven J. Piet (BS and MS, 1979, and ScD, 1982, nuclear engineering, Massachusetts Institute of Technology) is currently a member of the Fusion Safety Program of EG&G Idaho at the Idaho National Engineering Laboratory. His major interests and responsibilities include risk assessments, activation product behavior, and lithium compound reactions. He had a major role in the Blanket Comparison and Selection Study. His current projects include the concept of inherent safety, system interactions, and volatile activation product behavior.

FUSION REACTORS

OPTIONS FOR COMMERCIAL TOKAMAKS

Ali E. Dabiri
Donald C. Keeton
Scott L. Thomson

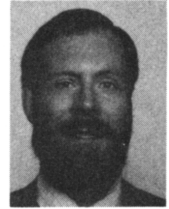


Ali E. Dabiri (right) (BS, engineering, Teheran Polytechnic, Iran, 1967; MS, 1969, and ScD, 1971, engineering, Massachusetts Institute of Technology) is a senior scientist at Science Applications International Corporation. He has worked on many aspects of fusion engineering issues, including first-wall and blanket design of alternative fusion fuel reactors. He is currently involved in advanced fusion reactor studies and ignition devices. Past work includes gas/solid interactions, energy conservation, and energy systems. **Donald C. Keeton** (photo unavailable) has many years of experience in fossil and nuclear plant design and operation, including work on the Clinch River Breeder Reactor Plant Project. Most recently he was on loan to the Electric Power Research Institute (EPRI) and assigned to the Fusion Engineering Design Center, where he represented EPRI in fusion design work. He is now assigned to the Fusion Engineering Design Center, where he is responsible for plant facilities design, reliability, availability, maintainability assessment, and overall fusion power plant economics. **Scott L. Thomson** (photo unavailable) (PhD, mechanical engineering, University of Maryland) is assigned by Bechtel to the Fusion Engineering Design Center, where he is responsible for commercial reactor programs.

PLASMA PERFORMANCE OF TOKAMAK FUSION CORE EXPERIMENT AND JOINT EUROPEAN TORUS WITH SAWTOOTHING

Lee M. Hively (top) (BS, engineering science, and BS, mathematics, 1970, Pennsylvania State University; MS, physics, 1971, and PhD, nuclear engineering, 1980, University of Illinois) is a research staff member in the Health and Safety Research Division of Oak Ridge National Laboratory (ORNL). He is responsible for large code development and implementation on the Cray computers. From 1971 to 1974, he was a member of research staff at the Western Electric Company Engineering Research Center, Princeton, New Jersey, and later obtained a U.S. patent as a result of his work on millimetre waveguide. He was a plasma systems physicist with General Electric Company at the Fusion Engineering Design Center at ORNL from 1980 to 1984. His research interests include high-energy fusion product transport and plasma performance in tokamaks. **David R. Mikkelsen** (PhD, physics, University of Washington) has been a physicist at the Princeton Plasma Physics Laboratory since 1977. He developed computational models of neutral beam injection and fast ion orbits in tokamaks.

*Lee M. Hively
David R. Mikkelsen*



BURN CONTROL BY HYDROGEN FEEDING FOR SELF-SUSTAINED PLASMA IN TOKAMAK FUSION REACTORS

Koichi Maki (BS, nuclear engineering, University of Tokyo, Japan, 1968; MS, nuclear engineering, University of Kyoto, Japan, 1971; PhD, nuclear engineering, University of Tokyo, Japan, 1985) is a researcher at Energy Research Laboratory, Hitachi, Ltd. He has worked on nuclear force and fast breeder reactor physics. His current interests are neutronics and plasma transport simulation in fusion reactors.

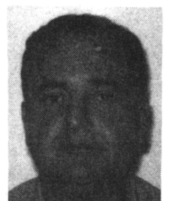
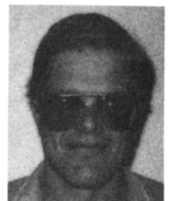
Koichi Maki



A SELF-CONSISTENT CALCULATION OF ROTATING MAGNETIC FIELDS

J. L. Sperling (top right) (PhD, plasma physics, Princeton University, 1975) is a principal scientist in the Plasma Technology Division at JAYCOR and has contributed to the development of radio-frequency (rf) heating techniques in tokamaks and bumpy tori. He was formerly associated with the fusion group at GA Technologies. **A. J. Glassman** (top left) (PhD, physics, Columbia University, 1977) is a senior scientist in the Fusion Division at JAYCOR. He has contributed to the development of rf techniques in fusion plasmas and to the understanding of ionospheric processes. He was formerly associated with Linkabit Corporation and Cubic Corporation. **K. G. Moses** (bottom right) (PhD, physics, Temple University, 1964) is the manager of the Plasma Technology Division at JAYCOR. He has contributed to exploding wire phenomena, diagnostics of confined plasmas, ion and electron cyclotron resonance plasma heating, and intense relativistic electron beams. Dr. Moses was a branch chief at MFE/DOE prior to joining JAYCOR. **B. H. Quon** (bottom left) (PhD, physics, University of California, Los Angeles, 1974) was a senior scientist in the Plasma Technology Division at JAYCOR and has contributed to the physics of the formation of potential double layers in plasma and the structure of ELMO, hot electron plasma annuli. He is currently working for AMPC, Inc., as a principal experimental scientist.

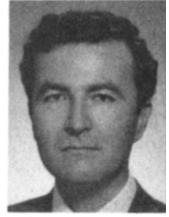
*J. L. Sperling
A. J. Glassman
K. G. Moses
B. H. Quon*



PRELIMINARY DESIGN STUDIES OF CYLINDRICAL EXPERIMENTAL HYBRID BLANKET WITH DEUTERIUM-TRITIUM DRIVER

Sümer Sahin (top) (MS, mechanical engineering, 1967, and PhD, nuclear engineering, 1970, University of Stuttgart, Federal Republic of Germany; Habilitation, physics, University of Ankara, Turkey, 1973) was a professor at the King Saud University, Riyadh, Saudi Arabia, until May 1986. Currently, he is on leave from the University of Erciyes, Kayseri, Turkey, where he is dean of the Faculty of Engineering. His research field covers neutron transport theory, fusion-fission (hybrid) reactors, thermionic spacecraft reactors, radiation shielding, and nonproliferation. **Tawfik A. Al-Kusayer** (center) (BS, electronic engineering, King Saud University, Saudi Arabia; MS, nuclear engineering, Iowa State University; PhD, nuclear engineering, Iowa State University) was an assistant professor and then head of the nuclear engineering department at King Abdulaziz University in Jeddah, Saudi Arabia, from 1982 to 1983. Since 1983 he has been an assistant professor in the electrical engineering department of King Saud University, Riyadh, Saudi Arabia, and a scientific consultant in the Nuclear Energy Division of the Saudi Arabian National Center for Science and Technology in Riyadh. His main research interests are in CANDU pressurized heavy-water reactor safety and reliability assessment and in fusion-fission (hybrid) reactors. **Muhammad Abdul Raouf** (bottom) (BS, physics, 1963, and MS, nuclear physics, 1964, Karachi University, Pakistan; MS, reactor technology, Birmingham University, England, 1968; PhD, nuclear physics, London University, England, 1973) is currently associate professor, Department of Physics, King Saud University, Riyadh, Saudi Arabia. His research interests include high resolution time spectrometry, neutron spectrometry, and neutronic studies of fusion-fission blankets.

*Sümer Şahin
Tawfik A. Al-Kusayer
Muhammad Abdul Raouf*



TIME-DEPENDENT NEUTRON-INDUCED EFFECTS IN A DEMO FUSION REACTOR BLANKET: BURNUP CALCULATIONS

Luciano Giancarli (PhD, nuclear physics, Genoa University, Italy) is currently working on neutronics for the blanket of fusion reactors at the U.K. Atomic Energy Authority Laboratory in Culham. He has previously participated in research on fusion reactor blankets at the Center of Nuclear Studies in Saclay, France, and at the Joint Research Center in Ispra, Italy.

Luciano Giancarli



FABRICATION OF POROUS LiAlO_2 CERAMIC BREEDER MATERIAL

Carlo Alvani (right) (PhD, chemistry, Parma University, Italy, 1976) has worked at the C.R.E. Casaccia, European Nuclear Energy Agency (ENEA), Rome, Italy, since 1983. From 1976 to 1980 he worked on visible and ultraviolet spectroscopy at the European Institute for Transuranium Elements, in Karlsruhe, Federal Republic of Germany. Since 1981 he has worked on the

*Carlo Alvani
Sergio Casadio
Lorenzo Lorenzini
Giovanni Brambilla*



preparation and characterization of nuclear ceramic materials for fission reactors at Kernforschungszentrum Karlsruhe. At present his interest is focused on the chemical preparation and characterization of ceramic blanket materials for fusion reactors. **Sergio Casadio** (top) (PhD, physical chemistry, Rome University, Italy, 1965) has worked at the C.R.E. Casaccia (ENEA), Rome, Italy, since 1968. He worked on molten salt and transuranic ion electrochemistry until 1974. Since 1975 he has worked on the liquid-metal chemistry for compatibility studies within the ENEA-Commissariat à l'Energie Atomique cooperative program on fast reactors. At present he is involved in the chemical aspects of the fusion technology program for the Next European Torus (NET) and in the national advanced ceramic materials project. **Lorenzo Lorenzini** (center) (PhD, chemistry science, Bologna University, Italy, 1957) worked from 1957 to 1958 at Bologna University and from 1958 to 1961 at the Nuclear Center of Ispra. Since 1962 he has worked at ENEA, C.R.E. Casaccia, Rome, and since 1981 has been head of the Chemistry Division, TIB Dep. He has worked on materials characterization, process chemistry of nuclear fuel materials, and sodium chemistry. His main technical interests are reference materials, analytical chemistry, and process chemistry. **Giovanni Brambilla** (bottom) (graduate, industrial chemistry, University of Milan, Italy, 1960) was a researcher in nuclear technology at Battelle Institute in Geneva, Switzerland, and at SNAM-LRSR (Ente Nazionale Idrocarburi group) in Milan, Italy. In 1969, after five years' work in the rare earths field at E.I.TE.R SpA in Florence, he joined AGIP Nucleare, now AGIP, where he is currently responsible for plants and materials development at their laboratories in Medicina (Bologna).



INTERSTITIALS IN COPPER-ZINC ALLOYS

Wolfgang Schüle (graduate, Institut für Metallkunde, University of Stuttgart, Federal Republic of Germany, 1957) was collaborator at the Institut für Festkörperphysik of the Max Planck Institut at Stuttgart until 1961. Since 1961 he has worked for the Commission of the European Communities at the Joint Research Center, Ispra (Varese), Italy, in the field of solid-state physics and metallurgy with emphasis on properties of point defects, diffusion, radiation damage, and phase transitions in metals and alloys. In 1963, he worked in the Solid State Division of the Oak Ridge National Laboratory; since 1971 he has been a teacher at the University of Frankfurt.

Wolfgang Schüle

EXPERIMENTAL DEVICES

VACUUM VESSEL EDDY CURRENT MODELING FOR TOKAMAK FUSION TEST REACTOR ADIABATIC COMPRESSION EXPERIMENTS

James DeLucia (right) (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

*James DeLucia
M. Bell
King-Lap Wong*



at the Princeton Plasma Physics Laboratory (PPPL) as a visiting scientist. He is currently visiting at the EPFL/CRPP in Lausanne, Switzerland. A photograph and a biography for **M. Bell** were not available. **King-Lap Wong** (right) (PhD, University of Wisconsin, 1975) is an experimental plasma physicist at PPPL, currently working on the Tokamak Fusion Test Reactor. His areas of interest include plasma heating and confinement of magnetized plasmas, adiabatic plasma compression, radio-frequency plasma heating, current drive, linear and nonlinear phenomena associated with plasma wave excitation, and propagation.

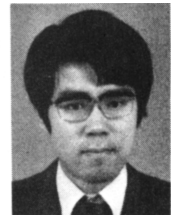


TRITIUM SYSTEMS

DESIGN CONCEPT OF CRYOGENIC FALLING LIQUID FILM HELIUM SEPARATOR

Masahiro Kinoshita (top right) (MS, 1979, and PhD, 1983, chemical engineering, Kyoto University, Japan) has worked on development of computer-aided simulation procedures and programs for stage processes both in the fuel cycle system for a fusion reactor and in other chemical engineering systems. He has also started preliminary experimental study for cryogenic distillation. **Toshihiko Yamanishi** (top left) (MS, chemical engineering, Kyoto University, Japan, 1982) has been engaged in experimental studies on hydrogen isotope separation by cryogenic distillation and gas chromatography. He is also interested in uranium beds for gettering of tritium. **John R. Bartlit** (bottom right) (BSChE, Purdue University, 1956; DEng, chemical engineering, Yale University, 1963) joined Los Alamos National Laboratory (LANL) in 1962 and is currently deputy project manager of the tritium systems test assembly. His particular responsibilities lie in fusion fuel processing systems—the deuterium-tritium (D-T) fuel cleanup system and the hydrogen isotope separation system. **Robert H. Sherman** (bottom left) (BS, chemistry, Illinois Institute of Technology, 1951; PhD, chemistry, University of California, Berkeley, 1955) is a physical chemist in the Materials Science and Technology Division of LANL. He has principal responsibility for the isotope separation and gas analysis systems, and is also collaborating on studies of muon catalyzed D-T fusion.

*Masahiro Kinoshita
Toshihiko Yamanishi
John R. Bartlit
Robert H. Sherman*



FUSION FUEL CYCLES

TIME-DEPENDENT NET CORE BREEDING GAIN OF FUSION-FISSION SYMBIOTIC SYSTEMS

G. N. Throumoulopoulos (top) (BSc, physics, University of Ioannina, Greece, 1979) is a graduate and research assistant in the physics department at the University of Ioannina in Ioannina, Greece. **G. Pantis** (Diplom Eng., electrical engineering, Technical University of Munich, Federal Republic of Germany, 1967; BSc, physics, University of South Africa, 1970; MSc, 1974; PhD, physics, McMaster University, Hamilton, Canada, 1979) is assistant professor in the physics department at the University of Ioannina. He is a member of professional engineering associations in South Africa, Greece, and Ontario, Canada.

*G. N. Throumoulopoulos
G. Pantis*

