

## AUTHORS — SEPTEMBER 1990

### OVERVIEW

#### THERMAL, FLUID FLOW, AND TRITIUM RELEASE PROBLEMS IN FUSION BLANKETS

**Mohamed A. Abdou** (top) (PhD, University of Wisconsin, 1973) is a professor in the Department of Mechanical, Aerospace, and Nuclear Engineering at the University of California, Los Angeles (UCLA). He is also the leader of the Fusion Engineering Program. His research interests include fusion neutronics, thermal hydraulics, blanket technology, fusion reactor design, and system studies. **M. S. Tillack** (center) (PhD, nuclear engineering, Massachusetts Institute of Technology, 1984) is a principal development engineer at UCLA in the Fusion Engineering Program. His research interests are in the area of fusion nuclear technology and testing, with a special interest in liquid-metal blankets. **A. René Raffray** (bottom) (D. Eng., mechanical engineering, University of California, Davis, 1985) is a senior development engineer in the Fusion Engineering Program at UCLA, where he is responsible for the solid breeder activities. His research interests are in fusion reactor technology and heat transfer. He is currently focusing on modeling of tritium transport in solid breeders and in the thermal mechanics of packed beds.

*Mohamed A. Abdou  
M. S. Tillack  
A. René Raffray*



### PLASMA ENGINEERING

#### TOKAMAKS APPROACHING IGNITION CONDITIONS

**R. Giannella** (top) (PhD, physics, University of Rome, Italy, 1973) has performed research on the physics of magnetic plasma confinement devices with different European institutions including ENEA, the Italian National Research Council, and the Commissariat à l'Energie Atomique. His activities have focused on the diagnostics of such devices, using interferometric techniques, on spectroscopy of emission lines from visible to X-ray ranges in the electromagnetic spectrum, and on particle transport and the physics of the suprathermal populations. He is the leader of the spectroscopy and impurity physics group at the Joint European Torus project. **M. Roccella** (PhD, physics, University of Rome,

*R. Giannella  
M. Roccella*



Italy, 1964) has performed research at the ENEA since 1965. He has been concerned with health physics problems, and recently his work has dealt mainly with fusion problems in the inertial and magnetic confinement fields. Since 1984 he has dealt with electromagnetic and plasma theoretical problems (eddy currents, plasma disruptions, plasma equilibrium and stability, and reactor parameter scalings) more strictly related to the reactor design for magnetic confinement devices.

#### TRANSPORT SIMULATIONS OF OHMIC PELLET EXPERIMENTS ON THE TFTR, ASDEX, AND ALCATOR-C TOKAMAKS

**Martha H. Redi** (top right) [BS, physics, Massachusetts Institute of Technology (MIT); PhD, physics, Rutgers University] has worked in applied physics at Princeton University since 1976. Her interests include superconductivity theory, theoretical biophysics, oceanography, and plasma physics. Since joining the Princeton Plasma Physics Laboratory (PPPL) in 1982, she has primarily worked in the area of computational modeling of tokamak transport. **W. M. Tang** (top left) is a principal research physicist in the Theory Division at PPPL and a professor in the Department of Astrophysical Sciences at Princeton University. His primary interests involve theoretical studies of anomalous transport and experimental tests of theoretically predicted confinement trends. **D. K. Owens** (center right) is a research physicist at PPPL. His interests have included Poloidal Divertor Experiment tokamak operation, fueling studies, limiter and divertor thermal deposition measurements, and probe measurements of plasma edge conditions. He is currently interested in Tokamak Fusion Test Reactor operation and pellet injection fueling studies. **M. Greenwald** (center left) (PhD, physics, University of California, Berkeley) is a principal research physicist at MIT. His interests include energetic ion transport, energy and particle transport, and pellet fueling. He is responsible for transport studies, pellet injection, data acquisition, instrumentation, and control for the Alcator C-Mod tokamak. **O. Gruber** (bottom right) [PhD, plasma physics, Technische Universität Munich, Federal Republic of Germany (FRG)] is a principal research physicist at the Max-Planck-Institut für Plasmaphysik, Garching. His current interests are transport studies (analysis, simulation), tokamak plasma performance, and tokamak operation. **M. Kaufmann** (bottom left) (PhD, plasma physics, Technische Universität Munich, FRG) is a principal physicist and member of the Board of Directors of the Max-Planck-Institut für Plasmaphysik. His interest is in pellet injection physics and tokamak physics.

*Martha H. Redi  
W. M. Tang  
D. K. Owens  
M. Greenwald  
O. Gruber  
M. Kaufmann*



#### DIVERTOR SYSTEMS

#### EROSION/REDEPOSITION ANALYSIS OF THE INTERNATIONAL THERMONUCLEAR EXPERIMENTAL REACTOR DIVERTOR

**Jeffrey N. Brooks** (PhD, electrical engineering, New York University, 1972) is a staff member in the fusion power program at Argonne National Laboratory. He is interested in fusion plasma engineering and fusion reactor design.

*Jeffrey N. Brooks*



## A SLOT DIVERTOR FOR TOKAMAKS WITH HIGH DIVERTOR HEAT LOADS

**William L. Barr** (top) (PhD, physics, University of California, Berkeley, 1957) is a member of the advanced mirror systems (fusion) group at Lawrence Livermore National Laboratory (LLNL), where he is currently analyzing end plasma and direct energy recovery for the Mirror Advanced Reactor Study. He has developed and tested plasma direct energy converters for mirror end-loss plasma and beam direct converters for the ions from neutral beam injectors. **B. Grant Logan** (BS, physics, New Mexico State University; MS, nuclear engineering, University of California, Berkeley; PhD, engineering science, University of California, Berkeley) is a deputy associate director and the program leader for the fusion reactor technology and conceptual design program in the Magnetic Fusion Energy Division at LLNL. His main interests are the design of magnetic fusion systems, including experiments, engineering test reactors, and advanced commercial power reactors.

*William L. Barr  
B. Grant Logan*



## MODELING OF A TOROIDAL FIELD DIVERTOR IN A REVERSED-FIELD PINCH

**Philip L. Matheson** (top) (BS, physics, Arizona State University, 1981; PhD, plasma physics, Brigham Young University, 1989) is currently a postdoctoral researcher with the Lunar and Planetary Laboratory at the University of Arizona. In addition to divertor plasmas, his current work is in Jovian magnetospheric plasmas. **Richard A. Nebel** (center) (BS, 1975, general engineering; MS, 1976, and PhD, 1980, nuclear engineering, University of Illinois) is a member of the plasma theory group at Los Alamos National Laboratory. His research interests are in plasma engineering, plasma transport, and magnetohydrodynamic stability theory. **Grant W. Mason** (bottom) (PhD, physics, University of Utah, 1969) is a professor of physics and astronomy at Brigham Young University, where he has been since 1970. He is currently dean of the College of Mathematical and Physical Sciences. He worked in cosmic-ray physics before becoming interested in plasma physics research.

*Philip L. Matheson  
Richard A. Nebel  
Grant W. Mason*



## PLASMA HEATING SYSTEMS

## ION CYCLOTRON RESONANCE HEATING INDUCED MINORITY ION TRANSPORT IN STELLARATORS

**Edward F. Splitt** (top) (PhD, nuclear engineering, University of Illinois, Urbana-Champaign, 1988) is a senior nuclear engineer with ANSER. His research interests include fusion technology, space nuclear power systems, and neutral particle beam technology. He is currently a project leader in the Strategic Defense Technology Division and is responsible for analyses of kinetic energy weapons systems and technology. **Won-Ho Choe** (PhD, nuclear engineering, Massachusetts Institute of Technology, 1985) is an assistant professor in the nuclear engineering department at the University of Illinois, Urbana-Champaign. His interests include tokamak plasma theory, magnetically insulated inertial confinement fusion, and laser-driven magnetic field compression.

*Edward F. Splitt  
Won-Ho Choe*



## DESIGN OF THE COMPACT AUBURN TORSATRON

**R. F. Gandy** (top right) (PhD, physics, University of Texas, 1981) is an associate professor of physics at Auburn University. His research interests lie in the areas of stellarator physics and electron cyclotron emission diagnostics. **M. A. Henderson** (top left) (MS, Auburn University, 1987) is currently working on his PhD at Auburn University. His dissertation involves the design and construction of the Compact Auburn Torsatron (CAT) and the investigation of the CAT's magnetic flux surfaces. **J. D. Hanson** (center right) (PhD, physics, University of Maryland, 1982) is an associate professor of physics at Auburn University. His current research interests are in theoretical plasma physics and chaos, both classical and quantum. **S. F. Knowlton** (center left) (PhD, physics, Massachusetts Institute of Technology, 1984) is an assistant professor of physics at Auburn University. He has worked in the area of radio-frequency (rf) heating and current drive on the Alcator and Joint European Torus tokamaks and is currently involved in Auburn's torsatron experiment and in space plasma physics research. **T. A. Schneider** (bottom right) (BS, Auburn University, 1987) is the research technician for the Auburn Torsatron Laboratory. He has worked on beam-plasma experiments and is currently involved in the design and construction of the new CAT. **D. G. Swanson** (photograph not available) (PhD, physics, California Institute of Technology, 1963) is a professor of physics at Auburn University. His research interests are in rf heating theory and stellarator physics. **J. R. Cary** (bottom left) (PhD, physics, University of California, Berkeley, 1979) is an associate professor in the Department of Astrophysical, Planetary, and Atmospheric Sciences at the University of Colorado, Boulder. His research interests are in non-linear dynamics applied to plasma physics and accelerator physics.

*R. F. Gandy  
M. A. Henderson  
J. D. Hanson  
S. F. Knowlton  
T. A. Schneider  
D. G. Swanson  
J. R. Cary*



## MEASUREMENT AND ANALYSIS OF INDUCED ACTIVITIES IN CONCRETE COMPONENTS IRRADIATED BY 14-MeV NEUTRONS

**Koji Oishi** (top) (MS, nuclear engineering, Tokyo Institute of Technology, Japan, 1982) is a research scientist at the Institute of Technology, Shimizu Corporation. He worked in the Department of Reactor Engineering at Japan Atomic Energy Research Institute (JAERI) as a visiting researcher from 1984 to 1987. He has worked under the collaborative program between JAERI and Shimizu Corporation since 1988. His research interests include radiation shielding and the induced activity of fusion materials. **Yujiro Ikeda** (center) (PhD, nuclear engineering, Nagoya University, Japan, 1981) is a research scientist in the Department of Reactor Engineering at JAERI. He has worked in the areas of the fusion neutronics experiments, fusion dosimetry, and cross-section measurements. **Chikara Konno** (bottom) (MS, physics, Kyoto University, Japan, 1985) is a research scientist in the Department of Reactor Engineering at JAERI. He has worked

*Koji Oishi  
Yujiro Ikeda  
Chikara Konno  
Tomoo Nakamura*



in the areas of fusion neutronics experiments, cross-section measurements, and neutron spectrum measurements using a proton recoil counter. **Tomoo Nakamura** (right) (BS, nuclear physics, Kyoto University, Japan, 1957) is head of the Fusion Reactor Physics Laboratory in the Department of Reactor Engineering at JAERI. He has been working in the area of experimental research on fusion neutronics using a 14-MeV neutron source, FNS, and is the leader of the JAERI/U.S. Department of Energy collaborative program on fusion blanket neutronics.



BLANKET ENGINEERING

**NEUTRONIC PERFORMANCE OF CANDIDATE NEUTRON MULTIPLIERS BERYLLIUM AND LEAD IN A STAINLESS STEEL FIRST WALL**

*Om Prakash Joneja  
Vijay R. Nargundkar*

**Om Prakash Joneja** (top) [MSc, Punjabi University, India, 1966; graduate, Bhabha Atomic Research Centre (BARC) Training School, India, 1967; PhD, physics, University of Bombay, India, 1976] 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 worked at the Institute for Reactor Development (IRD), Jülich, Federal Republic of Germany, from 1972 to 1974 in the field of fast neutron spectrometry, and from 1979 to 1980 on the LiAlO<sub>2</sub> blanket assembly for measuring tritium production. **Vijay R. Nargundkar** (MSc, physics, Karnataka University, India, 1956; PhD, pulsed neutron studies, University of Bombay, India, 1966) has worked at BARC since 1957. He worked in the field of fission physics at Atomic Energy of Canada, Ltd., 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 IRD (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.



**SUBCOOLED WATER FLOW BOILING TRANSITION AND THE L/D EFFECT ON CHF FOR A HORIZONTAL UNIFORMLY HEATED TUBE**

*Ronald D. Boyd, Sr.*

**Ronald D. Boyd, Sr.** (BS, mechanical engineering, Tuskegee Institute, 1968; PhD, mechanical engineering, University of Michigan, 1976) is chairman of the Department of Mechanical Engineering at Prairie View A&M University. He is currently conducting research on high heat flux removal from fusion reactors, space cold plate, and electronic components. Additional fundamental research is being conducted on natural convection in enclosures and mixed convection. For the past 14 years, he has been a principal investigator and heat transfer consultant for high heat flux materials and fusion component development, liquid-metal fast breeder reactor spent-fuel transportation, waste isolation pilot plant, and reactor safety programs. From 1968 to 1971, he was a research engineer at Los Alamos National Laboratory. His interests include theoretical and experimental (including optical) analyses of thermal transport processes.



## THERMONUCLEAR REACTION LISTING WITH CROSS-SECTION DATA FOR FOUR ADVANCED REACTIONS

**Larry T. Cox, Jr.** (top) is a student trainee co-oping at the Air Force's Astronautics Laboratory (AFSC) at Edwards Air Force Base (AFB). His work is centered around advanced fusion propulsion, with emphasis on cross-section and reactivity data collection. To a lesser degree, he is involved with nuclear thermal propulsion and solar thermal propulsion. He is in his junior year of studies at Purdue University, where his major is nuclear engineering. **Franklin B. Mead, Jr.** (center) (BS, mechanical engineering, University of Michigan; MS, mechanical engineering, Purdue University; PhD, aerospace engineering, The Pennsylvania State University) is an advanced concepts specialist working for the Air Force at AFSC, Edwards AFB, where he is section chief in charge of nuclear thermal propulsion, solar thermal propulsion, fusion propulsion, and advanced studies. He also has experience with liquid, hybrid, and electric rocket propulsion. **Chan K. Choi** (bottom) (BS, physics, Sogang Jesuit College, Korea, 1965; MS, 1969, and PhD, 1973, physics, Southern Illinois University) is currently an associate professor and the graduate chairman of nuclear engineering at Purdue University and serves as a consultant on controlled fusion research at Los Alamos National Laboratory.

*Larry T. Cox, Jr.  
Franklin B. Mead, Jr.  
Chan K. Choi*



## COLD FUSION

### AN ATTEMPT TO REPLICATE COLD FUSION CLAIMS

**Š. Miljanić** (top right) (BS, 1972, and PhD, 1981, physical chemistry, Beograd University, Yugoslavia) worked on the vibrational relaxation of hydrides of group VI of the periodic table. He is currently head of the isotope chemistry group at the Boris Kidrič Institute of Nuclear Sciences (IBK), Vinča. His research concerns laser isotope chemistry and hydrogen isotope separation. **N. Jevtić** (top left) (BS, applied physics, Beograd University, Yugoslavia, 1979; MS, plasma physics, Yale University, 1982) works in plasma heating, ion source modeling, and first-wall phenomena within the national fusion program at the Institute for Thermal Engineering and Energy Research at IBK. **S. Pešić** (center right) (BS, applied physics, Beograd University, Yugoslavia, 1964; PhD, plasma physics, University of Paris, France, 1973) coordinates the National Fusion Research Program, is head of the Center for Fusion Research at IBK, and lectures at the Beograd University graduate school on plasma confinement and heating. His many research interests include plasma dynamics, electron cyclotron resonance ion sources, helium cryogenics, superconducting magnets, and heavy-ion acceleration. **M. Ninković** (bottom left) (BS, 1959, and PhD, 1971, physics, Beograd University, Yugoslavia) currently heads the radiation protection department at IBK. His primary interest is radiation detection. **D. Nikolić** (bottom right) (BS, applied physics, Beograd University, Yugoslavia, 1983) is currently at the Institute of Nuclear Engineering

*Š. Miljanić  
N. Jevtić  
S. Pešić  
M. Ninković  
D. Nikolić  
M. Josipović  
Lj. Petkovska  
S. Bačić  
T. Šutej  
S. Matic*



and Applied Physics at IBK. Her research focuses on experimental reactor physics and primary neutron spectrometry. In 1989 she spent 6 months at Imperial College, London, working on radiation dosimetry (microcalorimetric method) in mixed neutron and gamma-ray fields. **M. Josipović** (top right) (BS, 1982, and MS, 1990, mechanical engineering, Beograd University, Yugoslavia) is employed at the Institute of Thermal Engineering and Energy Research at IBK. His fields are thermal hydraulics and fusion reactor thermal engineering. **Lj. Petkovska** (top left) (BS, 1977, and MS, 1984, chemical engineering, Beograd University, Yugoslavia) does research in laser photochemistry and the hydrogen isotopes at IBK. **S. Bačić** (bottom right) (BS, 1976, and PhD, 1990, physical chemistry, Beograd University, Yugoslavia) has done research at Moscow University and at the University of Illinois, Urbana-Champaign. Currently she works at the radiation protection department of IBK. Her research interests include chemical cocrystallization of supersaturated solutions, tritium compound specific activity assay, and low-level water tritium measurement. **T. Šutej** (bottom left) (BS, technical physics, Ljubljana University, Yugoslavia, 1984; MS, industrial ecology, Maribor University, Yugoslavia, 1989) is at the reactor physics department of the Jožef Stefan Institute, Ljubljana, doing work on solid-state nuclear track detectors, radon monitoring, and neutron measurements. **S. Matić** (photograph not available) is head of the metallurgy department of the Copper Institute in Bor, Yugoslavia.



#### RELAXATION TOWARD EQUILIBRIUM IN PLASMON-ENHANCED FUSION

Photographs and biographies for **M. Baldo**, **R. Pucci**, and **P. F. Bortignon** were not available at publication time.

*M. Baldo  
R. Pucci  
P. F. Bortignon*

#### HEAT FLOW CALORIMETER WITH A PERSONAL-COMPUTER-BASED DATA ACQUISITION SYSTEM

**Omourtag Alexandrov Velev** (top) (MS, lasers and plasma physics, Sofia University, Bulgaria, 1981) is currently on leave from the Central Laboratory of Electrochemical Power Sources, Bulgarian Academy of Sciences. His main interests include physicochemical processes at the liquid/solid interphase, batteries, cold fusion, and *in situ* scanning tunneling microscopy of electrochemical processes. **Ramesh C. Kainthla** (PhD, physics, Indian Institute of Technology, Delhi, India, 1980) is currently with RBC Universal. His research interests include deposition and characterization of thin films, fabrication of photoconducting, photovoltaic, and photoelectrochemical devices, electrode kinetics, *in* and *ex situ* characterization of electrode surfaces, and batteries.

*Omourtag Alexandrov Velev  
Ramesh C. Kainthla*



#### OBSERVATION OF NEW PARTICLES EMITTED DURING COLD FUSION

**Takaaki Matsumoto** (MS, nuclear engineering, Kyoto University, Japan, 1966) studied neutron and nuclear reactor physics at the Kyoto University Research Reactor Institute from 1966 to 1973. Since 1973 he has been with Hokkaido University as an associate professor of nuclear engineering. His interests include nuclear transmutation of radioactive wastes and nuclear industry.

*Takaaki Matsumoto*

