nuclear technology/fusion

AUTHORS — JULY 1982

OVERVIEW

THE STELLARATOR APPROACH TO TOROIDAL PLASMA CONFINEMENT

John L. Johnson

John L. Johnson (BS, engineering physics, Montana State University, 1949; MS, 1950, and PhD, 1954, physics, Yale University) is a consulting physicist in the Research and Development Center of Westinghouse Electric Corporation, assigned to the Plasma Physics Laboratory at Princeton University, where he serves as a visiting principal research physicist. Since coming to Princeton in 1955, he has worked on many aspects of toroidal confinement theory but his major emphasis has been on magnetohydrodynamic equilibrium and stability problems in stellarators and tokamaks.

PLASMA HEATING SYSTEMS

OPTIMIZED SYSTEM FOR D^- PRODUCTION FROM CHARGE-EXCHANGE IN ALKALI METALS

E. B. Hooper, Jr.,
Peter Poulsen
Oscar A. Anderson

E. B. (Bickford) Hooper, Jr. (top) (BS, physics, 1959, and PhD, physics, Massachusetts Institute of Technology) is a physicist in the Magnetic Fusion Energy (MFE) Division at Lawrence Livermore National Laboratory (LLNL). He is presently working on the experimental plasma physics of tandem mirrors (TMX-U experiment) and on the physics and design of advanced tandem mirrors. He has worked on a variety of topics in plasma physics and magnetic fusion including low frequency instabilities, confinement and heating of toroidal plasmas, diagnostics, and intense negative ion beams. He spent a postdoctoral year at the Royal Institute of Technology (Sweden), has been employed as assistant professor of applied science at Yale University, and has taught graduate physics courses at the University of California, Davis, Livermore Extension. **Peter Poulsen** (center) (BS, Drexel University, 1966; MS, Purdue University, 1968; PhD, University of California, San Diego, 1976) is a physicist in the MFE Division at LLNL. He is presently involved in plasma confinement studies and experiments. Past work includes research on rocket engines and nozzle flows, physical chemistry research using molecular beam-scattering techniques, and high energy neutral beam development. **Oscar A. Anderson** (bottom) (BS, Stanford University, 1949; PhD

University of California, Berkeley, 1969) is a staff physicist in the Accelerator and Fusion Energy Division at Lawrence Berkeley Laboratory. His main professional interest is plasma physics, which he finds very enjoyable because of its rich diversity. He has to his credit over 30 published papers and 6 patents. He is involved with a number of problems in the MFE neutral beam program, for example, high performance systems based on positive ions delivering a wide range of currents at fixed energy, and efficient modular systems based on surface production of negative ions that provide neutral beams of 5 A/module in the energy range of 200 to 500 keV.

DIVERTOR SYSTEMS

CONSTRAINED RIPPLE OPTIMIZATION OF TOKAMAK BUNDLE DIVERTORS

Lee M. Hively
James A. Rome
Vickie E. Lynch
James F. Lyon
R. H. Fowler
Martin Peng
R. A. Dory

Lee M. Hively (top right) (BS, engineering science, BS, mathematics, 1970, Pennsylvania State University; MS, physics, 1971, and PhD, nuclear engineering, 1980, University of Illinois) is a fusion plasma physicist employed by General Electric Company at the Fusion Engineering Design Center (FEDC) at Oak Ridge National Laboratory (ORNL). From 1971 to 1974 he was a member of the research staff at Western Electric Company, Princeton, New Jersey, and later obtained a U.S. patent (#3,944,963) as a result of his work in millimetre waveguide processing. His current research interests include high energy fusion-product transport in tokamaks, bundle divertor optimization, and plasma performance in the Fusion Engineering Device. **James A. Rome** (top left) [BS, MS, PhD, Massachusetts Institute of Technology (MIT)] has been a member of the Fusion Energy Division at ORNL for ten years. Previously, he was an instructor of electrical engineering at MIT. He is a member of the Institute of Electrical and Electronics Engineers, a fellow of the American Physical Society (APS), and an associate editor of the *Physics of Fluids*. **Vickie E. Lynch** (center right) (MS, mathematics, University of Tennessee, 1979) is a computer analyst in the Computer Sciences Division (CSD) of ORNL. She is involved in magnetic configuration and particle orbit studies for tokamaks and helical devices and also resistive magnetohydrodynamic studies. **James F. Lyon** (center left) (BS, 1960, MS, 1962, and EE, 1964, electrical engineering, MIT; PhD, physics, University of Tennessee, 1970) is a senior research staff member in the Fusion Energy Division of ORNL. He has worked on the magnetic mirror experiments DCX-2, INTEREM, and IMP, and on the ORMAK, T-10, TFR-600, JFT-2, and ISX-B tokamaks. Lyon is currently physics coordinator for the ATF-1 torsatron program, responsible for ripple studies on the ISX-B tokamak, and is on the FEDC management board and the executive committee of the APS Division of Plasma Physics. **R. H. Fowler** (bottom right) (BS, physics, University of Georgia, 1963; MS, 1965, and PhD, 1968, physics, Clemson University) is head of the Computational Physics Department of the CSD at ORNL. For several years he was involved in the computation of the properties of gases and liquids from intermolecular interactions. Currently, his primary area of work is in the computational modeling of energetic particle effects in tokamaks. **Martin Peng** (bottom left) (BS, electrical engineering, National Taiwan University, 1967; MS, 1971, and PhD, 1974, applied physics,

Stanford University) has joined the Fusion Energy Division of ORNL as a scientific staff member in the Theory Section. During the last two years he has devoted his effort to plasma engineering studies of tokamak reactor concepts at FEDC. **R. A. Dory** (right) (PhD, physics, University of Wisconsin, 1962) is a senior research staff member in the Fusion Energy Division at ORNL, as well as section head for the Plasma Theory Section.

PLASMA ENGINEERING

SIMULTANEOUS HEATING AND CONFINEMENT OF TWO ION SPECIES FOR FUSION BY ION CYCLOTRON RESONANCE

U. K. Roychowdhury
M. Venugopalan
M. L. Pool
Robert Graham

U. K. Roychowdhury (top right) (PhD, physical chemistry, Indian Institute of Technology, Kanpur, India, 1978) was visiting assistant professor of research at the College of Arts and Sciences, Western Illinois University (WIU) from 1978 to 1981. Currently he is a postdoctral fellow in chemistry at Dalhousie University, Halifax, Canada. His research interests are in the fields of spectroscopy and nuclear fusion. **M. Venugopalan** (top left) (PhD, physical chemistry, Banaras Hindu University, India, 1957) is professor of physical chemistry at WIU. His research interests are in the areas of plasma chemistry and physics. **M. L. Pool** (bottom right) (PhD, physics, University of Chicago, 1927) is professor of chemistry and physics at WIU. He is also an emeritus professor of Ohio State University. His research interests are in the fields of nuclear spectroscopy, plasma physics, and nuclear fusion. **Robert Graham** (bottom left) (AB, Michigan State University, 1931; BSc, applied optics, Ohio State University, 1937) is the founder and for 25 years president of Armorlite Lens Company, Inc., and the originator and major producer of hard resin opthalmic lenses. He is vice-president of Intra-Science Research Foundation, Carlsbad, California. His interests are in the fields of optics, plasmas, and magnetic fusion.

EXPERIMENTAL DEVICES

DESIGN OF THE PRETEXT TOKAMAK

Jay F. Benesch
Roger D. Bengtson
George L. Cardwell
Stephen A. Eckstrand
Rex F. Gandy
Paul Wildi

Photographs and biographies were not available at publication time.

TRITIUM SYSTEMS

SEPARATION CHARACTERISTICS OF CRYOGENIC DISTILLATION COLUMN WITH A FEEDBACK STREAM FOR SEPARATION OF PROTIUM AND TRITIUM

Masahiro Kinoshita
Yuji Naruse

Masahiro Kinoshita (top) (MS, chemical engineering, Kyoto University, 1979) is a research engineer at the Tritium Engineering Laboratory of the Division of Thermonuclear Fusion Research at the Japan Atomic Energy Research Institute (JAERI). His current work is on the development of mathematical simulation models and computer codes for the equilibrium stage processes in the fuel cycle system for fusion reactors, such as cryogenic distillation columns, falling liquid film condensers, water/hydrogen exchange columns, water distillation columns, and multicomponent separating cascades. **Yuji Naruse** (BS, chemical engineering, Kyoto University, 1959) is the chief of the Tritium Engineering Laboratory at JAERI. He has been engaged in engineering works related to uranium enrichment by the porous membrane method. He is now involved with the design work of tritium facilities.

BLANKET ENGINEERING

SOURCE-TO-INCIDENT FLUX RELATION FOR A TOKAMAK FUSION TEST REACTOR BLANKET MODULE

G. R. Imel

G. R. Imel (PhD, nuclear engineering, Pennsylvania State University, 1977) is currently an assistant professor of nuclear engineering at Pennsylvania State University. Prior to this position, he worked for five years for EG&G, Idaho (which included one year on loan to the Princeton Plasma Physics Laboratory). His interests are neutron transport, radiation effects on materials, and plasma physics.