

## AUTHORS — JULY 1990

### BEAM DIRECT CONVERSION

#### DIRECT ENERGY RECOVERY FROM UNNEUTRALIZED ION BEAMS IN A NEGATIVE-ION-BEAM-BASED NEUTRAL BEAM INJECTION SYSTEM

**Kiyoshi Yoshikawa** (top right) [Dr. Eng., nuclear engineering, Kyoto University (KU), Japan, 1974] is an associate professor at the KU Institute of Atomic Energy. He held a visiting appointment at Lawrence Livermore National Laboratory in 1978 and then was at Lawrence Berkeley Laboratory until March 1980. His main interests are direct energy conversion, reactor-relevant technology, and fusion reactor design. **Yoshihiko Nimura** (top left) (MS, electrical engineering, KU, Japan, 1988) has worked on beam direct energy conversion design for a negative-ion-beam-based neutral beam injection system and is currently on the staff of the electronic design department, Design and Engineering Division, of the Japan Electron Optics Laboratory. **Yasushi Yamamoto** (bottom right) (BS, electrical engineering, KU, Japan, 1981) is an instructor at the KU Institute of Atomic Energy. His current interests include beam and plasma direct energy conversion both in simulation and experiment. **Hiroshi Watanabe** (bottom left) (MS, electrical engineering, KU, Japan, 1986) has worked on three-dimensional simulation of beam direct energy conversion and is currently on the staff of the Electrical Maintenance Section at Ikata nuclear power station of the Shikoku Power Electric Company.

*Kiyoshi Yoshikawa  
Yoshihiko Nimura  
Yasushi Yamamoto  
Hiroshi Watanabe*



#### DEPENDENCE OF BEAM DIRECT ENERGY CONVERSION ON BEAM ENERGY AND CURRENT IN NEUTRAL BEAM INJECTION SYSTEMS

**Yasushi Yamamoto** (right) [BS, electrical engineering, Kyoto University (KU), Japan, 1981] is an instructor at the KU Institute of Atomic Energy. His current interests include beam and plasma direct energy conversion both in simulation and experiment. **Kiyoshi Yoshikawa** (left) (Dr. Eng., nuclear engineering, KU, Japan, 1974) is an associate professor at the KU Institute

*Yasushi Yamamoto  
Kiyoshi Yoshikawa  
Hisayuki Toku  
Tsuneyuki Haga*



of Atomic Energy. He held a visiting appointment at Lawrence Livermore National Laboratory in 1978 and then was at Lawrence Berkeley Laboratory until March 1980. His main interests are direct energy conversion, reactor-relevant technology, and fusion reactor design. **Hisayuki Toku** (top) (BS, electrical engineering, Ritsumeikan University, Japan, 1966) teaches on the technical staff at the KU Institute of Atomic Energy. He is currently interested in the development of experimental techniques in both beam and plasma direct energy conversion research. **Tsuneyuki Haga** (bottom) (MS, electrical engineering, KU, Japan, 1989) has worked on beam direct energy conversion experiments and is currently working in the area of soft X-ray reduction lithography using multilayer mirrors at LSI Laboratories of Nippon Telegraph and Telephone Companies.



#### DESIGN STUDY OF A BEAM ENERGY RECOVERY SYSTEM FOR A NEGATIVE-ION-BASED NEUTRAL BEAM INJECTOR

**Masanori Araki** (top) (BS, nuclear engineering, Kobe University of Mercantile Marine, Japan) is a research scientist in the Division of Thermonuclear Fusion Research at Japan Atomic Energy Research Institute (JAERI). He has worked on the design and development of high heat flux beam stops and plasma-facing components for the Fusion Experimental Reactor (FER). **Yoshihiro Ohara** (center) (PhD, nuclear engineering, The University of Tokyo, Japan) is a senior scientist in the JAERI Division of Thermonuclear Fusion Research. He is engaged in the development of a negative ion source and a neutral beam system for the FER as the leader of the negative ion source developmental group. **Yoshikazu Okumura** (bottom) (PhD, nuclear engineering, Osaka University, Japan) is a senior scientist in the JAERI Division of Thermonuclear Fusion Research. He has worked mainly on the development of negative ion sources.

*Masanori Araki  
Yoshihiro Ohara  
Yoshikazu Okumura*



#### MAGNETIC SUPPRESSION OF SECONDARY ELECTRON EMISSION FROM THE NEGATIVE ELECTRODE IN A BEAM DIRECT ENERGY CONVERTER

**Kiyoshi Hashimoto** (top) (MS, nuclear engineering, Osaka University, Japan, 1971) is a senior research scientist at Toshiba Corporation Research and Development Center (TRDC). He is currently engaged in the development of neutral beam injection technology. **Tohru Sugawara** (MS, applied physics, The University of Tokyo, Japan, 1970) is a chief research scientist at TRDC. His research interests include the study of plasma heating and power sources.

*Kiyoshi Hashimoto  
Tohru Sugawara*



#### CADARACHE LABORATORY STUDIES OF A NEUTRAL BEAM INJECTOR WITH ENERGY RECOVERY

**Michele Fumelli** (PhD, physics, Bologna University, Italy, 1958) has worked in controlled fusion research at Commissariat à l'Énergie Atomique since 1961. He participated in the magnetic mirror fusion program and has done developmental work on

*Michele Fumelli*



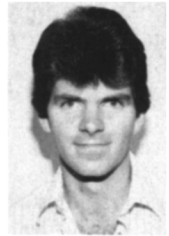
lithium and hydrogen magnetized plasma columns, multiampere ion sources and neutral beams for plasma heating, and direct beam conversion.

PLASMA ENGINEERING

**PULSE LENGTH ASSESSMENT OF COMPACT IGNITION TOKAMAK DESIGNS**

*Daren P. Stotler  
Neil Pomphrey*

**Daren P. Stotler** (top) (BA, physics, Rice University, 1981; PhD, physics, University of Texas at Austin, 1986) is a research physicist at Princeton Plasma Physics Laboratory (PPPL). He is primarily interested in transport simulations of ignited tokamak designs. His present work includes modeling of the density limit in existing tokamaks. **Neil Pomphrey** (BSc, chemical physics, Edinburgh University, United Kingdom, 1972; PhD, applied mathematics, University of London, United Kingdom, 1975) is a research physicist at PPPL. His present interests in plasma physics include magnetohydrodynamic theory and simulation.



EXPERIMENTAL DEVICES

**CHEMICAL IMPURITY PRODUCTION IN THE TOKAMAK DE VARENNES**

*Gilles Bourque  
Bernard Terreault  
Brian C. Gregory  
Guenther W. Pacher  
Horst D. Pacher  
Barry L. Stansfield  
Dennis Whyte  
W. Zuzak*

**Gilles Bourque** (top) [BS, physics, University of Sherbrooke, Canada, 1988; MS, Institut National de la Recherche Scientifique-Energie (INRS-Energie), Canada, 1990] is enrolled in the PhD program, studying microstructural effects on low kilo-electron-volt hydrogen ion ranges in solids. **Bernard Terreault** (center) (PhD, physics, University of Illinois, 1968) is a professor at INRS-Energie and coordinator of the plasma/wall interaction group, Tokamak de Varennes (TdeV). He has studied ion irradiation effects on solids, using special nuclear microanalysis techniques and Monte Carlo simulation. Since 1980 he has contributed to the planning, design, and operation of the TdeV and has developed mass spectrometry, surface probe analysis, and hydrogen flux probe diagnostics. His main interests are particle confinement and impurity production mechanisms. **Brian C. Gregory** (bottom) (BAsc, University of Toronto, Canada, 1960; PhD, University of Cambridge, 1963) is director of research at the Canadian Center for Magnetic Fusion and professor at the INRS-Energie. He has worked in the fields of electron beam design for microwave tubes, microwave interaction with plasmas, beam/plasma instabilities, atomic physics, electrical discharge physics, electrostatic stoppering of spindle cusp plasma confinement devices, vacuum ultraviolet spectroscopy of tokamak impurities, and tokamak magnetohydrodynamic equilibria. He is currently interested in tokamak impurity transport and control. Previously he worked for Thomson-CSF, France, and Trent



University, Canada. **Guenther W. Pacher** (top right) (BS, engineering physics, University of Manitoba, Canada, 1967; PhD, astrophysical sciences, Princeton University, 1971) was staff scientist from 1971 to 1982 at the Max-Planck-Institut für Plasmaphysik, Federal Republic of Germany, where he participated in stellarator and tokamak experiments, especially in the joint French-German tokamak-stellarator WEGA (1973-1981), devoted to the study of high-frequency plasma heating. He joined Hydro Québec in 1982 as a senior researcher on the TdeV, where, as technical coordinator, he was responsible for the overall technical concept and operation of the tokamak. In 1989, he was seconded to the Next European Torus (NET) team to participate in the design of NET and International Thermonuclear Experimental Reactor (ITER). **Horst D. Pacher** (top left) (BS, engineering physics, University of Manitoba, Canada, 1966; PhD, astrophysical sciences, Princeton University, 1970) was staff scientist from 1970 to 1982 at the Max-Planck-Institut für Plasmaphysik, where he participated in stellarator and tokamak experiments, especially in the joint French-German tokamak-stellarator WEGA (1973-1981), devoted to the study of high-frequency plasma heating. In 1982, he became a professor at INRS, where he became group leader of the magnetic confinement studies program at INRS-Energie as well as scientific coordinator of the TdeV. He was responsible for the scientific tokamak program. In 1989, he was seconded to the NET team to participate in the design of NET and ITER. **Barry L. Stansfield** (bottom right) (BASc, University of Toronto, Canada, 1965; PhD, University of British Columbia, Canada, 1971) is a professor at the INRS-Energie and coordinator of the magnetic confinement group. He is also leader of the edge plasma team on the TdeV. His research interests are in plasma physics, especially plasma/surface interactions, plasma spectroscopy, and particle transport. **Dennis Whyte** (bottom left) (BS, physics, University of Saskatchewan, Canada, 1987; MS, INRS-Energie, Canada, 1989) is a PhD candidate, investigating the confinement of laser-ablated impurities. A photograph and a biography for **W. Zuzak** were not available at publication time.



## BLANKET ENGINEERING

### HEAT TRANSFER IN PEBBLE BEDS FOR FUSION BLANKETS

**Mario Dalle Donne** (top) (PhD, engineering science, Bologna University, Italy, 1956) worked from 1956 to 1959 at Agip Nucleare, Italy, and from 1959 to 1963 at the Dragon Project, England. Since 1963, he has worked at Kernforschungszentrum Karlsruhe (KfK) Institut für Neutronenphysik und Reaktortechnik (INR). Since 1976, he has been a professor at Karlsruhe University. He has worked on gas-cooled, water, and liquid-metal fission reactors and on blankets for fusion reactors. His main technical interests are thermohydraulics, safety, and reactor assessment. **Giancarlo Sordon** (MS, nuclear engineering, Bologna University, Italy, 1983; Dr-Ing., mechanical engineering, Karlsruhe University, FRG, 1988) worked at the KfK INR from 1985 to 1989. He has been involved in fusion reactor blanket development, specializing in heat transfer in packed beds and thermohydraulic and stress calculations.

*Mario Dalle Donne  
Giancarlo Sordon*





### ACCIDENT SAFETY COMPARISON OF ELEMENTS TO DEFINE LOW-ACTIVATION MATERIALS

**Steven J. Piet** (top) [BS and MS, 1979, and ScD, 1982, nuclear engineering, Massachusetts Institute of Technology (MIT)] 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 International Thermonuclear Experimental Reactor (ITER), activation product behavior, and risk assessments. He has had a major role in the Blanket Comparison and Selection Study, the TIBER-II conceptual design, and the Senior Committee on Environmental, Safety, and Economic Aspects of Magnetic Fusion Energy study. He is currently part of the permanent ITER team, focusing on enhancing and optimizing safety in the ITER conceptual design to improve the chances of constructing and siting ITER. **Edward T. Cheng** (center) (PhD, nuclear engineering, University of Wisconsin, 1976) has been a member of the development and technology group in the Fusion Division of GA Technologies 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 neutronics, radioactivity, and blanket engineering. He is currently coordinating the nuclear data needs activities for the magnetically confined fusion energy development. **Lisa J. Porter** (bottom) (BS, nuclear engineering, MIT, 1989) interned with the fusion safety group at EG&G Idaho as part of MIT's Engineering Internship Program. Her research with the fusion safety group resulted in her bachelor's thesis, "Upgrade of a Fusion Accident Analysis Code and Its Application to a Comparative Study of Seven Fusion Reactor Designs." She is currently enrolled in the PhD program in applied physics at Stanford University.

*Steven J. Piet  
Edward T. Cheng  
Lisa J. Porter*



### POTENTIAL HIGH-Q, NONINDUCTIVE CURRENT DRIVE IN TOKAMAKS VIA ACCELERATED COMPACT TOROIDS

**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. **L. John Perkins** (center) (BS, physics, 1974; MS, nuclear engineering, 1975; and PhD, physics, 1978, University of Birmingham, United Kingdom) is a physicist in the MFE Division at LLNL. His primary interests include plasma engineering, fusion reactor design, advanced fusion energy conversion concepts, advanced tokamak fueling methods, and physics and engineering scoping studies of tokamak engineering test reactors. **J. H. Hammer** (bottom) (BS, physics, Arizona State University, 1973; PhD, physics, University of California, Berkeley, 1979) is currently a physicist at LLNL.

*S. K. Ho  
L. John Perkins  
J. H. Hammer*



## ADVANCED FUSION FUEL CYCLES

*Robert W. B. Best*

**Robert W. B. Best** (Dr, Eindhoven University of Technology, The Netherlands, 1970) is a senior member of the theory department of the Institute for Plasma Physics (Rijnhuizen), The Netherlands. His main interests are in free electron laser research.



## COLD FUSION

### CALORIMETRIC MEASUREMENTS OF THE PALLADIUM/DEUTERIUM SYSTEM: FACT AND FICTION

*Stanley Pons  
Martin Fleischmann*

**Stanley Pons** (top) (BS, chemistry, Wake Forest University; PhD, University of Southampton, United Kingdom) began his career at Oakland University. In 1980, he moved to the University of Alberta, Canada, and in 1983 joined the staff of the Department of Chemistry at the University of Utah, where he is currently head of the department. **Martin Fleischmann** (PhD, London University, United Kingdom, 1951) was a research fellow and Imperial Chemical Industries research fellow at Kings College (University of Newcastle-upon-Tyne, United Kingdom) and then lecturer and reader in physical chemistry from 1950 to 1967. From 1967 to 1983, he was professor of electrochemistry at the University of Southampton, where he held the prestigious chair originally endowed by the Electricity Council. Since 1989 he has been a research professor at the University of Southampton and at the University of Utah.



### ELECTROLYTIC TRITIUM PRODUCTION

*Edmund Storms  
Carol Talcott*

**Edmund Storms** (no photograph available) (PhD, radiochemistry, Washington University) has worked at the Los Alamos National Laboratory (LANL) for the past 32 years where his work has involved mainly high-temperature materials research for space power. His studies have included a wide range of chemical and physical properties including superconductivity with a major emphasis on thermodynamics and materials science. **Carol Talcott** (right) (MS, physical chemistry, University of Colorado, 1984) has worked at the LANL for the last 5 years. Her work has involved research on the palladium hydride-hydrogen system using all isotopes of hydrogen. In particular, the studies focused on the effect of surface contamination on kinetic uptake rates, pressure-composition isotherms, conversion of alpha to beta hydride, and diffusion of hydrogen in the beta phase.



## ENHANCED FUSION INDUCED BY AFFILIATED MUONS

**Paul du T. van der Merwe** (PhD, physics, University of California, Berkeley, 1965) is a theoretical physicist on the research staff of the Atomic Energy Corporation, Pretoria, South Africa. He has recently worked on collective features in light atomic systems and exotic atoms involving muons. His current research centers around muon-catalyzed fusion. Previous activities include particle physics, field theory, nonlinear science, and superfluids.

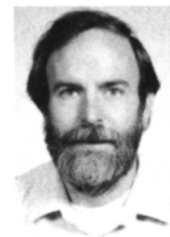
*Paul du T. van der Merwe*



## THE BEHAVIOR OF ELECTROCHEMICAL CELL RESISTANCE: A POSSIBLE APPLICATION TO COLD FUSION EXPERIMENTS

**Kenneth A. Ritley** (top right) is a member of the positron/solids interaction group in the physics department at Brookhaven National Laboratory (BNL). In addition to his recent interest in palladium-deuterium electrochemical systems, his professional interests have included models of the cohesive energy in high-temperature superconductors. He is currently investigating the application of a monoenergetic positron beam to the study of liquid metals. **Peter M. Dull** (top left) has spent a year visiting at BNL from Valparaiso University in Indiana. In addition to his recent research on cold fusion phenomena, he has recently completed a comparative study of positron moderator designs. **Marc H. Weber** (photo not available) is currently on the faculty of the University of Bielefeld, Federal Republic of Germany. In addition to work in the specular reflection of positronium, he has recently designed a system for low-level neutron emission studies and is currently interested in utilizing the high-intensity positron source for  $e^+$ -H studies at BNL. **Michael Carroll** (center right) is a member of the positron/solids interaction group at BNL. His professional interests include designing and evaluating electronics for use in experimental physics, and he maintains a strong interest in the detection of gravitational radiation. **James J. Hurst** (bottom left) is a senior materials science associate in the Department of Applied Science at BNL. In addition to his recent interest in the metallurgical properties of palladium, his research interests have included studies of crystal growth. **Kelvin G. Lynn** (bottom right) is a physics group leader and head of the Applied Physics Division at BNL. His interests have included surface physics and the use of positrons in studying surface and near-surface defects. He has been actively involved with cold fusion research since the first reports of this phenomenon in March 1989.

*Kenneth A. Ritley  
Peter M. Dull  
Marc H. Weber  
Michael Carroll  
James J. Hurst  
Kelvin G. Lynn*



## THEORETICAL AND EXPERIMENTAL STUDIES ON THE COLD NUCLEAR FUSION PHENOMENA

**Mohamed Abdel Harith** (right) is a professor in the physics department at Cairo University. His interests are laser-driven shock waves in gases and water, mach reflection, spherical pinch, and cold fusion. **Vincenzo Palleschi** (left) (physics, Pisa University, Italy, 1984) is a researcher at the Istituto di Fisica Atomica e Molecolare (IFAM)-CNR. His interests are first passage time problems in bistable potentials, applications of the Fokker-Planck equation to stochastic physics, and experimental studies of shock

*Mohamed Abdel Harith  
Vincenzo Palleschi  
Azenio Salvetti  
Giuseppe Salvetti  
Dharm Pal Singh  
Moreno Vaselli*



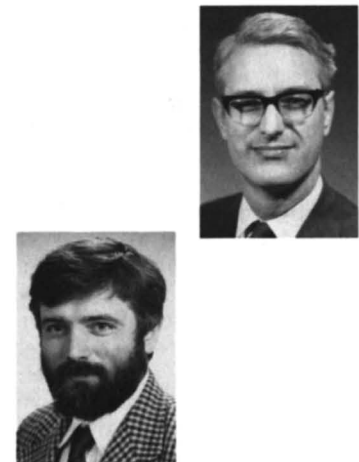
wave production and propagation in fluids. **Azenio Salvetti** (top right) has been a laboratory assistant at IFAM-CNR since 1970. **Giuseppe Salvetti** (top left) is a researcher at IFAM-CNR, where he works on phase transitions, dielectric properties of hydrogen-bonded liquids, and microcalorimetry. **Dharm Pal Singh** (bottom right) (PhD, plasma physics, Indian Institute of Technology, India, 1979) is a scientist at IFAM-CNR. His research interests include self-focusing of laser beams and parametric instabilities in plasma, profile steepening and core-corona coupling in laser-irradiated targets, spherical pinch, laser-produced shock waves in gases and water, mach reflection, and cold fusion. **Moreno Vaselli** (bottom left) (physics, Pisa University, Italy) is the director of IFAM-CNR. His interests include high-intensity laser/matter interaction, laser gas breakdown, self-focusing and filamentation, laser-produced shock waves, and spherical pinch.



#### BLOCH-SYMMETRIC FUSION IN Pd<sub>x</sub>

**Talbot A. Chubb** (top) (AB, physics, Princeton University, 1944; PhD, physics, University of North Carolina, 1951) has worked at the Naval Research Laboratory and as a consultant to Bendix Field Engineering Corporation. His current interests include radiation detectors and electrical discharges, ultraviolet and X-ray emission from the sun and stars, solar activity, and thermochemical energy transport. **Scott R. Chubb** (BA, physics, Princeton University, 1975; MA, 1978, and PhD, 1982, physics, State University of New York at Stony Brook) is employed in the space technology department at the Naval Research Laboratory. His current interests include microwave sensing of the ocean, the importance of atomic clocks and precision time in the global positioning system, and the recent observation of anomalous effects in deuterated metals (commonly referred to as "cold fusion" and "cluster impact fusion").

*Talbot A. Chubb  
Scott R. Chubb*



#### PRELIMINARY TESTS ON TRITIUM AND NEUTRONS IN COLD NUCLEAR FUSION WITHIN PALLADIUM CATHODES

**Pier Giorgio Sona** (top) is scientific assistant to the Department of Materials and Technologies of CISE SpA - Segrate, Milano, Italy. From 1965 to 1985 he was an associate professor of physical experimentations at the Università Studi, Milano. His interests include theoretical and experimental low-energy nuclear physics on particle accelerators and polarized ion sources. **Adriano Battaglia** (bottom) is a scientific assistant to the Chemistry Section of the Environment Division of CISE. He was with the health physics group of CISE in 1965 and in 1968 joined the radioanalytical laboratory group and became its leader in 1984. He is a specialist in radiometric techniques for low-level counting of artificial and naturally occurring radionuclides applied to environmental problems. Biographies and photographs of **Fulvio Parmigiani**, **Franco Barberis**, **Renza Berti**, **Giovanni Buzzanca**, **Aldo Capelli**, **Davide Capra**, and **Marco Ferrari** were not available at the time of publication.

*Pier Giorgio Sona  
Fulvio Parmigiani  
Franco Barberis  
Adriano Battaglia  
Renza Berti  
Giovanni Buzzanca  
Aldo Capelli  
Davide Capra  
Marco Ferrari*



**FURTHER MEASUREMENTS ON ELECTROLYTIC COLD FUSION WITH D<sub>2</sub>O AND PALLADIUM AT GRAN SASSO LABORATORY**

**Francesco Celani** (top right) (MS, physics, University of Rome, Italy, 1975) is an expert in digital and analog electronics for nuclear particle detectors. He has worked on superconducting tunnel junctions for high-resolution particle detectors, on very low neutron flux measurements at Gran Sasso Laboratory, and on high-temperature superconductivity. His current interest is cold nuclear fusion research. **Antonio Spallone** (top left) (MS, physics, University of Rome, Italy, 1986) has worked in experimental high-energy particle physics and has taught high-school electronics. He is interested in high-temperature superconducting materials and cold nuclear fusion research. **Sandro Pace** (second from top right) (MS, physics, University of Rome, Italy, 1971) is an expert in theoretical and experimental superconductivity. His interests include superconducting tunnel junctions for high-resolution particle detectors, high-temperature superconducting materials, and cold nuclear fusion research. **Basilio Polichetti** (second from top left) (MS, physics, University of Napoli, Italy, 1959) is an associate assistant professor of physics at the University of Salerno. His interests include Hall effect measurements and high-temperature superconductivity. **Aniello Saggese** (third from top right) (MS, physics, University of Salerno, Italy, 1983) is an expert in low-temperature superconductivity, thin film development, and superconducting radio-frequency cavities. His current interests include high-temperature superconductors. **Lorella Liberatori** (third from top left) (MS, physics, University of Rome, Italy, 1986) has worked on an experimental study on a new particle detector based on "limited streamer" tubes. She is currently working on magnetic effects in high-temperature superconductors. **Vittorio Di Stefano** (bottom right) (MS, chemistry, University of Florence, Italy, 1961) has worked in quantitative assessment of nonmetallic phases in metals by chemical and electrochemical means, active carbon production and restoration processes, phenol and cyanide removal from coke oven waste water, and quality control of organic protective coatings on large-diameter pipes. **Paolo Marini** (bottom left) (MS, chemistry, University of Rome, Italy, 1966) is an expert in analytical chemistry, phase analysis, cracking processes and aging of materials, and high-temperature superconductors.

*Francesco Celani  
Antonio Spallone  
Sandro Pace  
Basilio Polichetti  
Aniello Saggese  
Lorella Liberatori  
Vittorio Di Stefano  
Paolo Marini*

