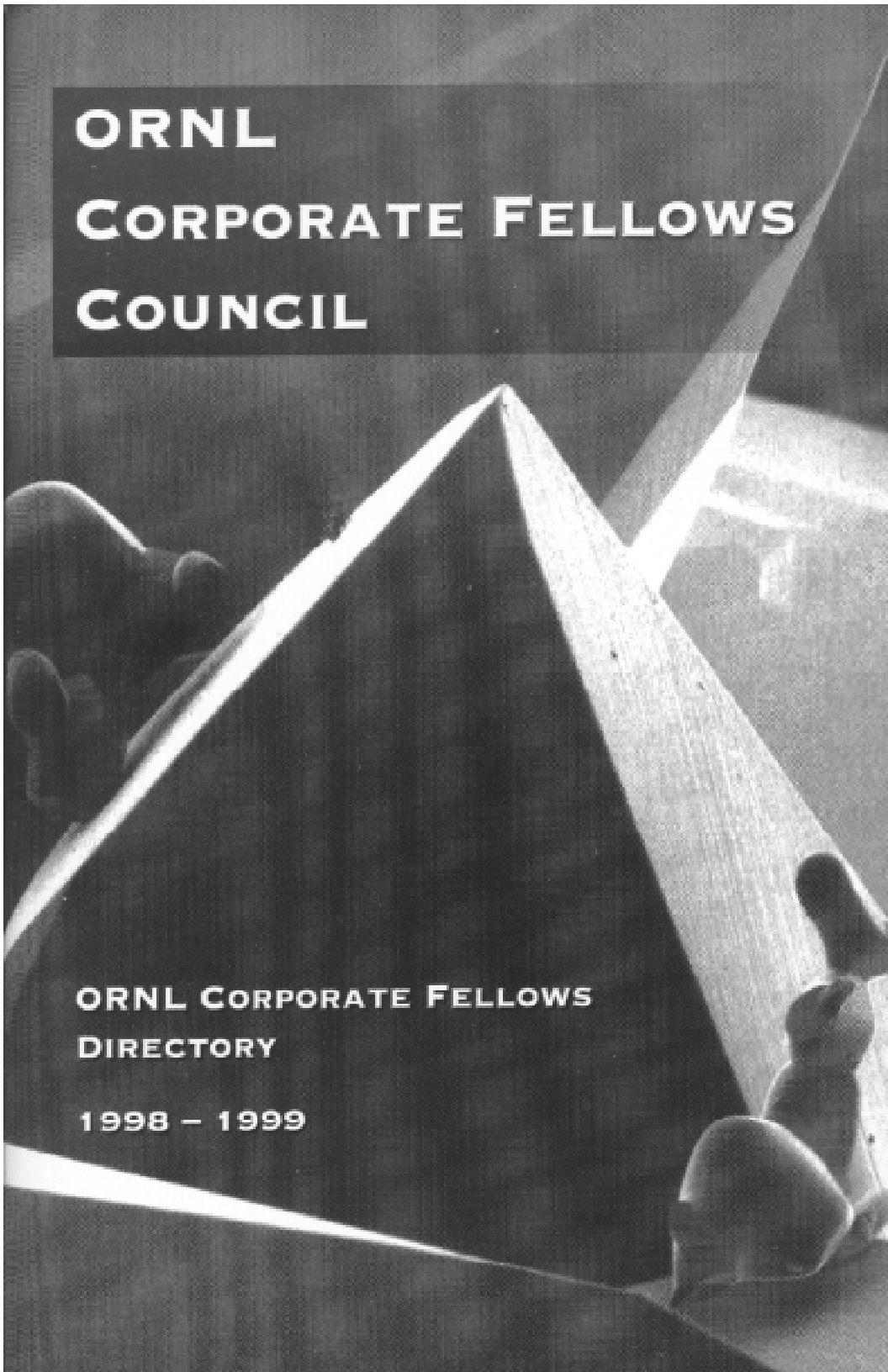
ORNL Corporate Fellows Council



ORNL Corporate Fellows Directory

1998 – 1999

***Cover**: Small single crystals of zinc oxide (ZnO) that were grown by a chemical vapor transport process are shown in a scanning electron micrograph. ZnO ceramic "varistors" are widely used as electrical surge protectors in devices ranging from computers to large power distribution systems.*

Micrograph by L. A. Boatner and Roxanne Leedy.

Cover design by Tina C. Curry.

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CORPORATE FELLOWS COUNCIL

Oak Ridge National Laboratory

The Corporate Fellows Council of the Oak Ridge National Laboratory consists of the active ORNL staff members who have been designated Lockheed Martin Energy Research Corporation corporate fellows and senior corporate fellows. Officers of the council are Lynn A. Boatner, chair, and Thomas J. Wilbanks, vice chair.

The roles of the corporate fellows are the following:

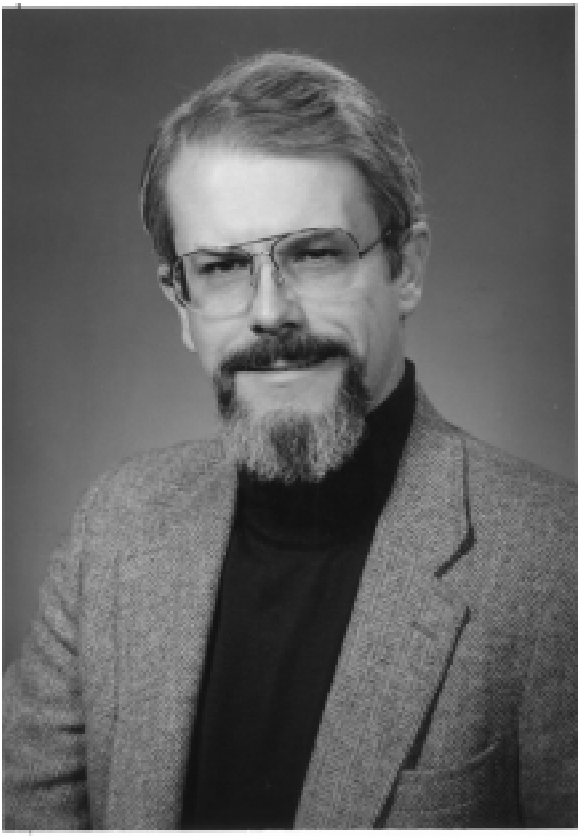
- **to articulate the ideas and concerns of the ORNL scientific and technical staff regarding objectives and directions of the Laboratory,**
- **to advise ORNL management on specific scientific and technological issues and opportunities, and**
- **to serve as a channel for communication between ORNL scientific and technical staff and ORNL senior management.**

Paul F. Becher

Paul F. Becher received his B.S. degree in 1963 and his M.S. degree in 1964, both in metallurgical engineering from the University of Missouri at Rolla. He received his Ph.D. degree in ceramics engineering from North Carolina State University in 1970.

Dr. Becher leads the Structural Ceramics Group in the Metals and Ceramics Division. Prior to that he headed the Ceramic Processing Section in the Materials Science and Technology Division at the Naval Research Laboratory. His research activities have focused on the microstructural design of ceramics, including the structure and properties of interfaces, aimed at understanding toughening mechanisms and approaches to enhance the mechanical, optical, and thermal properties of ceramics, coatings, and composites. He is the author or coauthor of more than 200 technical publications on these topics.

Dr. Becher has received a number of awards; among these are the Purdy Publication Award and the Sosman Memorial Lectureship from the American Ceramic Society, the Martin Marietta Energy Systems, Inc., Inventor of the Year Award, and a U.S. Department of Energy Materials Sciences Division Research Award. In 1991, he received the Alexander Humboldt Foundation's Research Award for Senior Scientists, which allowed him to spend a sabbatical at the Max Planck Institute for Materials Research in Stuttgart, Germany. He is a fellow of the American Ceramic Society and currently serves as the 1998–99 president-elect. He was named a corporate fellow in 1990.



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Lynn A. Boatner

L. A. Boatner received B.S. and M.S. degrees in physics from Texas Tech University in 1960 and 1961, and in 1966, he received his Ph.D. degree in physics from Vanderbilt University. He joined the ORNL Solid State Division in 1977, after a three-year research appointment at the *Ecole Polytechnique Federale de Lausanne* in Switzerland, and in 1989, he was recognized as a Texas Tech University Distinguished Alumnus in Physics.

Dr. Boatner's research activities have included investigations of the static and dynamic Jahn-Teller effect, electron paramagnetic resonance studies of rare-earth, iron-group, and actinide ions in crystalline materials, the growth and properties of ferroelectric materials, the development and characterization of advanced nuclear waste forms, the application of Rutherford backscattering to glass corrosion, the growth of single crystals, and ion-damage and epitaxial-regrowth studies of insulating oxides. Most recently, Dr. Boatner's research efforts have been associated with the development and characterization of "smart" surfaces, phosphate glasses, the application of resonance techniques to the study of textured ceramics, methods for the development of preferred orientations in ceramic microstructures using faceted nanophase particles, and the application of single crystals of stainless steel to investigations of the physics of solidification and microstructural development in alloys.

Dr. Boatner is a fellow of the American Physical Society, the American Association for the Advancement of Science, and ASM International. He is the author or coauthor of more than 360 research articles and holds eleven patents. Dr. Boatner has received a number of awards for his research, including R&D 100 Awards in 1996, 1985, and 1982; a U.S. Department of Energy Research Competition Award in 1984; recognition as one of *Science Digest's* 100 Top Innovators in 1985; a Federal Laboratory Consortium Award for Excellence in Technology Transfer in 1997; The Elegant Work Prize of the Institute of Materials of the United Kingdom in 1997; and the Jacquet-Lucas Award of ASM International and the International Metallographic Society in 1988. In 1998, he was named a Corresponding Member of the Academy of Sciences of Mexico.

Dr. Boatner is presently the review editor for *The Journal of Materials Research* and is an associate editor of *Optical Materials*. He is the co-chair of the Committee on International Scientific Affairs of the American Physical Society. He has served as the organizer, chair, or proceedings editor of numerous international conferences and as an officer, executive committee member, or committee chair of The Materials Research Society, the American Physical Society, and ASM International. Dr. Boatner is currently the section head for Ceramics and Interfaces at ORNL and co-leads the Novel Materials Group. He was appointed an ORNL corporate fellow in 1993.

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Benjamin A. Carreras

Dr. Carreras received the degree of *Licenciado en Ciencias* from the University of Barcelona, Spain, in 1965 followed by a Ph.D. in 1968 from the University of Valencia, Spain. He was a postdoctoral research fellow at Glasgow University, Scotland, in 1969 and in 1970 joined the staff of Daresbury Nuclear Physics Laboratory, England. He returned to Spain in 1972 as a staff member of the *Junta de Energia Nuclear*, Madrid, and an assistant professor at the Complutense University at Madrid. Since 1976 he has been in the United States, spending the first two years at ORNL as a visitor, and after that, one year as a member of the Institute for Advanced Study at Princeton. In 1980, he joined the staff of the Fusion Energy Division at ORNL.

Before 1975, his main area of research was theoretical high-energy physics. Dr. Carreras worked mainly on the phenomenology of strong interactions. In particular, he worked on phase-shift analysis and the consequences for the determination of the scattering amplitude of analyticity and unitarity. Since 1976, his research has been in the field of theoretical plasma physics. He has contributed mainly to the understanding of plasma turbulence, explaining the behavior of magnetically confined plasmas, and to the development of new magnetic confinement concepts to overcome plasma magnetohydrodynamic limitations. Dr. Carreras is continuing his studies on magnetohydrodynamic turbulence and physics optimization of magnetic confinement devices.

Dr. Carreras has published more than 130 research papers and has received four Martin Marietta publication awards. He is a fellow of the American Physical Society and a member of several other professional societies. In 1987, he was appointed a corporate fellow.

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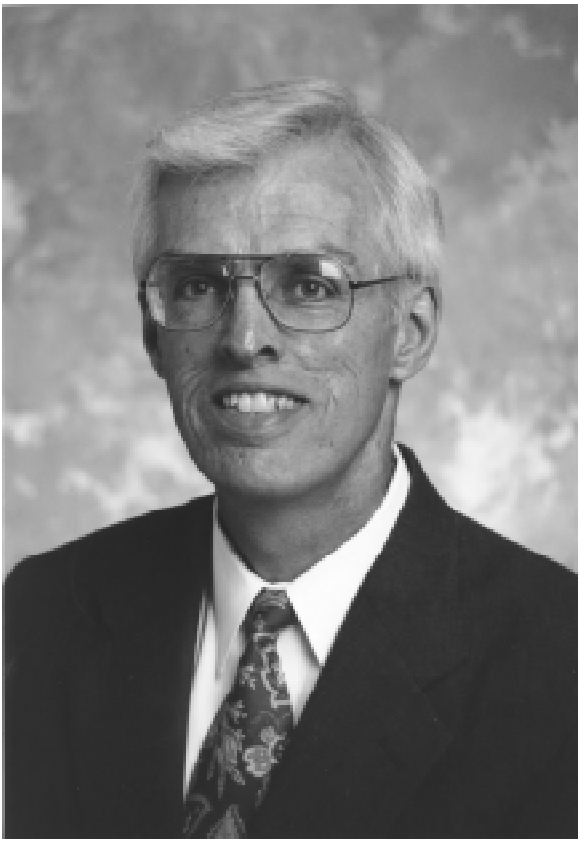
James M. Corum

Dr. Corum received his B. S. in mechanical engineering from the University of Tennessee and joined the ORNL Reactor Projects Division (now part of the Engineering Technology Division) in 1959. He subsequently earned an M.S. in mechanical engineering from the University of Tennessee in 1962 and a Ph.D. in theoretical and applied mechanics from the University of Illinois in 1965. While at Illinois, he taught mechanics courses and has subsequently taught graduate engineering courses at the University of Tennessee.

Corum's research and development career at ORNL has focused on the mechanics of materials and structures. He is recognized for playing a lead role in developing and establishing the structural design methodology that is vital to safe and reliable nuclear power. His career has been marked not only by personal research contributions, but by leadership roles in team efforts that have produced structural design analysis methods and have established design criteria that are used in the United States and around the world. He is active in efforts within the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* to establish improved elevated-temperature design rules for nuclear and nonnuclear components. He has also served the U.S. Department of Energy by chairing technology and program coordination groups and coordinating foreign exchange activities in areas relating to structural mechanics and materials. His contributions have brought him worldwide recognition in the area of structural mechanics for nuclear reactor technology. In recent years, Corum has refocused his interests and experience on advanced automotive materials. He and his group are responsible for characterizing and modeling the durability and damage tolerance of structural composites for automotive applications and for developing a design guide for automotive designers.

Corum has published some 47 papers and 43 reports related to materials and structures, one of which received the 1993 Outstanding Paper of the Year Award from the *ASME Journal of Pressure Vessel Technology*. He is a fellow of ASME and was appointed a corporate fellow in 1993.



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Sheldon Datz

Dr. Datz earned his B.S. in chemistry in 1950 and his M.A. in physical chemistry in 1951 from Columbia University. He joined ORNL in 1951 and received his Ph.D. in physical chemistry from the University of Tennessee, Knoxville, in 1960.

In 1951, he began work on the application of molecular beam techniques to the study of chemically reactive collisions. The result of this study, which was the first successful effort in this field, helped to lay the foundation for the present field of chemical dynamics, which is concerned with the dynamic properties of reactive atomic and molecular collisions. In 1964, he initiated work in the channeling of energetic heavy ions in crystals that led to the determination of crystal potentials and of states of energetic particles penetrating solids. In 1978, he initiated work on channeling of relativistic positrons and electrons, which yields radiation in the X-ray region. In 1990, he initiated studies of atomic collisions at ultrarelativistic energies at CERN and, in 1992, he initiated studies of molecular ion recombination in ion storage rings. In addition, he has contributed to studies in high-energy atomic collision phenomena and particle-surface interactions. He is an author of 300 articles and has edited four books on collision processes. He has chaired five major conferences, served on the editorial boards of several journals, and has been a member of the Committee for Atomic and Molecular Sciences of the National Academy of Sciences. In 1962–63, he was a Fulbright senior research fellow. He has been appointed “guest professor” at the FOM Institute of Amsterdam, Aarhus University in Denmark, the University of Paris, Texas A&M University, and the University of Chicago. He was awarded the Swedish Tage Erlander National Science Professorship for 1990–1991. In 1997, he was awarded Doctor *Honoris Causis* by Stockholm University. In 1998, he was awarded the Davison-Germer Prize for Atomic Physics by the American Physical Society. He is a fellow of the American Physical Society and the American Association for the Advancement of Science.

Dr. Datz is now the section head for atomic physics at ORNL, where he continues his studies in atomic and molecular collision physics. He was appointed corporate fellow in 1979 and senior corporate fellow in 1988.

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Stan A. David

Dr. David received his Ph.D. degree in metallurgical engineering from the University of Pittsburgh. He currently holds adjunct professorships at the University of Pittsburgh and the Colorado School of Mines.

In 1977 he joined ORNL, where he is currently leader of the Materials Joining and Nondestructive Testing Group in the Metals and Ceramics Division. He is a fellow of American Association for the Advancement of Science, ASM International, and the American Welding Society. He is the editor-in-chief of a new journal, *Science and Technology of Welding and Joining*, published by the Institute of Materials, London.

In 1998, he was the recipient of the Warren F. Savage Memorial Award from the American Welding Society, and in 1997 he was awarded the Elegant Work Prize of the Institute of Materials, London, for his publication on single-crystal welding. In 1996 Dr. David was the recipient of the William Irrgang Memorial Award from the American Welding Society. In 1994 he was the recipient of the Champion H. Mathewson award from The Minerals, Metals, and Materials Society. He served as the general chairman of the International Conference on Trends in Welding Research, sponsored by ASM International in 1986, 1989, 1992, 1995, and 1998. He is the recipient of the 1992 Honorary Membership Award from the American Welding Society. In 1990 he was the recipient of the American Welding Society's Charles H. Jennings Memorial Award for the most valuable contribution to welding metallurgy. He was also awarded the 1987, 1988, and 1990 Jacquet-Lucas Gold Medal Award by the International Metallographic Society and ASM International. He received the Martin Marietta Energy Systems, Inc., Technical Achievement Award in 1987 and 1989 and the Publication Award in 1988. He was awarded the 1981 Lincoln Gold Medal by the American Welding Society for best technical contribution of the year. He received the McKay-Helm award in 1980 from the American Welding Society for significant contributions in the field of welding.

He developed the Basic Energy Sciences welding program at ORNL and was appointed task leader and national coordinator of the Welding Science Program. His current interests include solidification behavior of welds, welding inter-metallic alloys, phase stability, process modeling, and residual stresses in weldments.

Dr. David is a member of The Metallurgical Society, the American Institute for Mining, Metallurgical, and Petroleum Engineers, ASM International, the American Welding Society, and the American Association for the Advancement of Science. He has contributed to more than 200 papers in the fields of solidification and welding metallurgy and is the editor of seven international conference proceedings. He serves on several national committees of professional societies and industrial advisory boards. He was appointed a corporate fellow in 1992.

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Elias Greenbaum

Elias Greenbaum is the leader of ORNL's Biotechnology Research Group and is an adjunct professor at the University of Tennessee. He is a fellow of the American Physical Society and the American Association for the Advancement of Science. He received his B.S. degree in physics from Brooklyn College in 1965 and his Ph.D. in physics from Columbia University in 1970. His Ph.D. thesis, in experimental nuclear physics, was performed under the guidance of Prof. Chien-Shiung Wu. In 1970 he joined the biophysics research group of Prof. Hans Fraunfelder at the University of Illinois, Urbana-Champaign, as a postdoctoral research associate. In 1972, he was appointed assistant professor of biophysics and biochemistry at the Rockefeller University, where he started his research program in photosynthesis in collaboration with Prof. David Mauzerall. He was appointed staff scientist at the Union Carbide Corporate Research Laboratory in Tarrytown, New York, and adjunct associate professor at the Rockefeller University in 1977. In 1979, Union Carbide Corporation transferred him to Oak Ridge National Laboratory following closure of its Tarrytown laboratories.

Dr. Greenbaum's main area of research is the biophysics of photosynthesis and photobiological conversion and storage of solar energy. Greenbaum received the 1995 U.S. Department of Energy Biological and Chemical Technologies Research Program Award and several Lockheed Martin Energy Research Corporation awards. He is editor-in-chief of the Springer/American Institute of Physics biological physics series and served as associate editor of the *Biophysical Journal* (1989–1994). He is a member of the Publications Committee of the Biophysical Society as well as a member of the American Institute of Physics Publications Policy Committee. In 1991 Greenbaum was appointed Watkins Visiting Professor, Wichita State University, where he presented a series of lectures on photosynthesis, biotechnology, and renewable energy production. His research articles appear regularly in competitive peer-reviewed journals such as the *Biophysical Journal*, *Nature*, *Science*, and *Proceedings of the National Academy of Sciences*. He was appointed a corporate fellow in 1997.

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Fred C. Hartman

Dr. Hartman received his B.S. in chemistry from the University of Memphis (formerly Memphis State University) in 1960 and his Ph.D. in biochemistry from the University of Tennessee Medical Units in 1964. Subsequent to completion of his postdoctoral studies in protein chemistry at the University of Illinois, he joined ORNL in 1966. He served as section head for Molecular and Cellular Sciences in the Biology Division from 1975 to 1988 and as director of the Biology Division from 1988 to 1997.

During his research career with the Biology Division (recently merged with the Health Sciences Research Division to form the Life Sciences Division), Dr. Hartman has made significant contributions to the understanding of enzyme mechanisms and protein structure. To characterize the catalytic site of enzymes, he has designed and exploited novel affinity labeling reagents, the mode of action of which offers rational approaches to chemotherapeutic agents. He has also been at the forefront of site-directed mutagenesis, whereby recombinant DNA technology allows systematic substitution of amino acids of proteins to elucidate structure-function relationships. In 1979, Dr. Hartman received the Pfizer-American Chemical Society Award in Enzyme Chemistry for his achievements in characterizing enzymes of carbohydrate metabolism, and in 1991 he was a featured speaker at a Nobel symposium on photosynthetic carbon assimilation. Dr. Hartman has published 140 research papers and book chapters and has served on several editorial boards, including two five-year terms with the *Journal of Biological Chemistry*. Professional society memberships include the American Chemical Society, the American Society of Biochemistry and Molecular Biology, the Protein Society, the American Society of Plant Physiologists, and fellow of the American Association for the Advancement of Science.

Dr. Hartman was appointed a corporate fellow in 1989.

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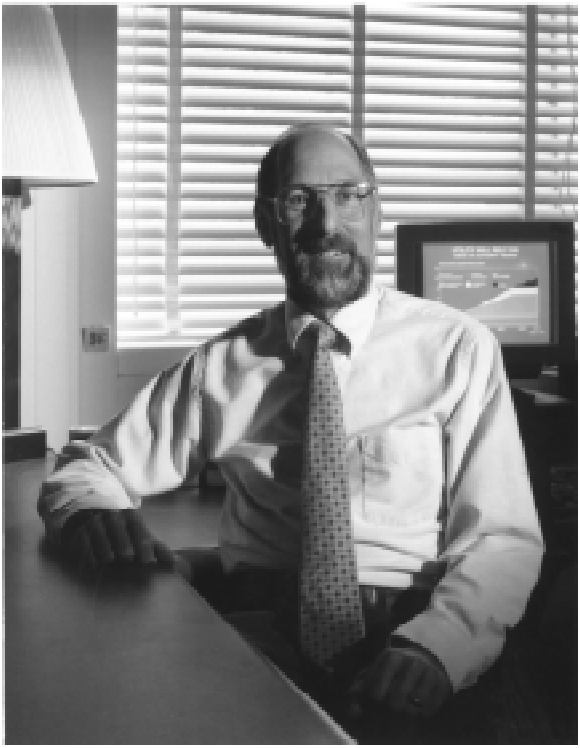
Eric Hirst

Eric Hirst has been at ORNL since 1970. His research focuses on electric-industry restructuring. Projects deal with unbundling generation and transmission services (ancillary services), bulk-power reliability, formation and operation of independent system operators, stranded (transition) costs, and the effects of changes in bulk-power markets on environmental quality. During the past 25 years, Hirst was on assignment for a year or more with Land and Water Fund of the Rockies (1992–93), Puget Sound Power & Light (1986–87), the Minnesota Energy Agency (1979), and the Federal Energy Administration (1974–75).

Dr. Hirst holds a Ph.D. degree in mechanical engineering from Stanford University. Hirst has published almost 400 reports, journal articles, and book chapters.

He was appointed a corporate fellow in 1985.



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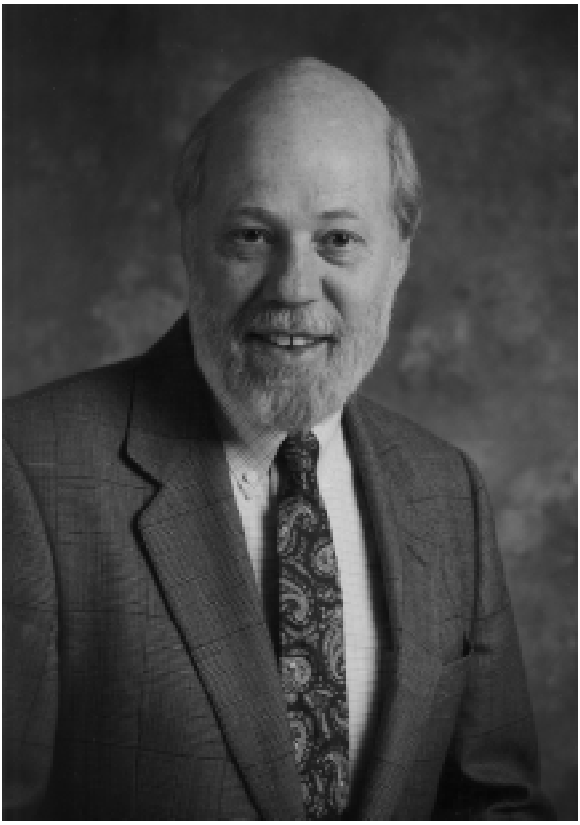
F. F. (Russ) Knapp, Jr.

Following the completion of his Ph.D. in biochemistry at the St. Louis University School of Medicine in 1970, Russ Knapp was a National Institutes of Health (NIH) postdoctoral fellow from 1970 to 1972 in the Biochemistry Department at the University of Liverpool, England, and he then spent the 1972–1975 three-year period as a senior research scientist in the Biochemistry Department at Rice University in Houston before joining ORNL in 1975. He has headed the ORNL Nuclear Medicine Program since 1977. His research interests include the development and *in vivo* and *in vitro* evaluation of new diagnostic and therapeutic radiopharmaceuticals for use in nuclear medicine, with particular emphasis on nuclear cardiology and cancer therapy, the reactor production and processing of medical radioisotopes, and the development of radionuclide generator systems. Current research areas include the application of reactor-produced radioisotopes for introvascular brachytherapy, bone pain palliation, and cancer therapy. His other principal responsibility involves establishing collaborative programs for the clinical evaluation of new agents developed in the ORNL program. He has authored more than 290 publications, has 17 patents, and has lectured widely internationally. He serves on the editorial boards of the *European Journal of Nuclear Medicine* and *Applied Isotopes and Technology*, is a member of Phi Beta Kappa, and was the recipient of a Senior American Scientist Award from the Alexander von Humboldt Foundation for his research during 1991–1992 at the Clinic for Nuclear Medicine, University of Bonn, Germany, where he also conducted research during the 1985–1986 period.

Dr. Knapp was appointed a corporate fellow in 1998.



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C. T. Liu

Dr. C. T. Liu received his B.S. degree in mechanical engineering from National Taiwan University and his M.S. and Ph.D. degrees in materials science from Brown University. He has been employed at ORNL since 1967, where he is currently the leader of the Alloying Behavior and Design Group in the Metals and Ceramics Division. During his career, he carried out both basic and applied research on advanced structural materials. Because of his outstanding contributions to this field, he was named the Scientist of the Year by Martin Marietta Energy Systems, Inc., and appointed as a corporate fellow in 1985. He was appointed a senior corporate fellow at ORNL in 1997.

Dr. Liu is an author or coauthor of more than 270 technical publications, including several conference proceedings and handbook and encyclopedia articles. He shared the 1995 Best Paper Award from the *Journal of Materials Characterization* and the Paper of the Year Award from the Japan Institute of Metals in 1996. His papers have been cited extensively by the materials community. In terms of the impact of his scientific papers, Dr. Liu was identified by the Institute for Scientific Information in 1995 as one of the top five individuals in the world whose papers were highly cited in journals of materials sciences and engineering. He has given numerous invited talks at international and national conferences and workshops, including several keynote lectures. He won three I•R 100 awards and received 19 U.S. patents for his innovative work on the development of new high-temperature structural materials. At present, he is an editor of the *Journal of Intermetallics*, an associate editor of *Materials Letters*, and an editor of the *Journal of the Chinese Institute of Engineers*. In 1990, he was named a principal editor of the *Journal of Materials Research*. He was also honored by Brown University as a distinguished alumnus in 1985 for his scientific and technological accomplishments.

Dr. Liu is very active in professional society activities. He is a fellow of three societies: The Minerals, Metals, and Materials Society (TMS), ASM International, and the International Precious Metals Institute. TMS has limited its living fellow members to less than 100 in the world. He has been involved in organizing more than 23 international and national conferences sponsored by TMS, the Materials Research Society (MRS), ASM International, and the North Atlantic Treaty Organization. He has chaired three TMS committees (Alloy Phases Committee, *Acta Met.*/Hume Rothery Award Committee, and the Fellow Award Committee) and served as a member of many ASM/NRC councils, panels, and committees for TMS, MRS, ASM International, and the National Research Council.

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Douglas H. Lowndes

Dr. Lowndes received his B.A. degree with honors in physics from Stanford University in 1961 and his Ph.D. degree in physics from the University of Colorado in 1968. He was a National Science Foundation postdoctoral fellow at the University of Sussex (England) from 1968 to 1970. He then served as an assistant professor, associate professor, and professor of physics at the University of Oregon until 1979, when he joined the ORNL Solid State Division.

Dr. Lowndes' current research activities are focused on thin-film growth, with particular emphasis on pulsed laser ablation for growth of compound semiconductors, amorphous diamond, high-temperature superconductors, and ceramic materials. Closely related research interests include physical and chemical mechanisms for low-temperature energetic beam-assisted film growth and doping (laser molecular-beam epitaxy and ion-beam-assisted deposition); the enhancement of physical properties using superlattice, quantum confinement, or reduced dimensionality techniques; and pulsed-laser processing for enhanced metal-ceramic bonding and adhesion. His earlier research interests have included time-resolved measurements of ultrarapid melting and solidification, pulsed lasers and pulsed-laser processing of semiconductors, Landau quantum oscillation methods for determining the electronic structure of metals and high-temperature superconductors, and measurements of electron-impurity scattering rates in metals and alloys.

Dr. Lowndes is a fellow of the American Physical Society and a senior member of the Institute of Electrical and Electronics Engineers. He also is a member of the Materials Research Society and the American Section of the International Solar Energy Society. He is the author or coauthor of more than 225 research articles, including numerous invited papers at national and international conferences, and five book chapters. He holds four patents and has received a number of awards for his research at ORNL, including the Scientist of the Year Award in 1995 and six other achievement and publication awards.

Dr. Lowndes is currently the group leader for Semiconductor Physics, Thin Films, and Photovoltaic Materials in the ORNL Solid State Division. In 1986 he was appointed Professor of Materials Science and Engineering at The University of Tennessee, Knoxville, where he has continued to teach and supervise graduate student research.

He was appointed a corporate fellow in 1994.

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Peter Mazur

Dr. Mazur received his A.B. magna cum laude from Harvard University in 1949 and his Ph.D. in biology from Harvard in 1953. After four years with the Air Force's Research and Development Command, he spent two years at Princeton University as a National Science Foundation postdoctoral fellow before joining the staff of the Biology Division in 1959.

His field is cryobiology, the branch of biology that is concerned with the response of living cells to freezing and very low temperatures. All living cells require liquid water and appropriate temperatures to function. Freezing constitutes a dramatic perturbation of these conditions, and consequently a study of how cells respond to this perturbation may help elucidate the role of liquid water in living cells. Furthermore, the response of cells to freezing involves fundamental physiological processes like osmotic flow, and freezing injury primarily involves damage to the cell outer membrane, a vital, complex, and poorly understood component of living cells.

In addition to these fundamental aspects of cryobiology, Dr. Mazur is concerned with the applications of cryobiology to medicine, agriculture, and genetics. For example, his laboratory was the first to freeze early mammalian embryos, a finding that is having substantial impact in all three areas.

Currently the leader of the fundamental and applied cryobiology group, he is a past president of the Society for Cryobiology and a current member of the editorial board of the society's journal. Dr. Mazur has authored more than 120 scientific papers, four of which have been named "Citation Classics." He has served on a number of advisory panels, including the Harvard University Board of Overseers Visiting Committee to Biology and the National Academy of Sciences Space Science Board and Germplasm Resources Committee. In 1985 he was named Author of the Year by Martin Marietta Energy Systems, Inc. A member of Phi Beta Kappa, he is a fellow of the American Association for the Advancement of Science and was a John Harvard Fellow and a Sigma Xi National Lecturer. In 1993 he received an R&D 100 Award and the Distinguished Service Award from the American Association of Tissue Banks. In February 1998, he was appointed Research Professor in the Department of Biochemistry and Cellular and Molecular Biology at the University of Tennessee, Knoxville. In May 1998, he was awarded an honorary Doctor of Science degree from Wilson College in Chambersburg, Pennsylvania.He was appointed a corporate fellow in 1985.

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John T. Mihalczo

Dr. Mihalczo received his B.S. in mathematics from New York University in 1953, his M.S. in physics from New York University in 1956, and his Ph.D. in nuclear engineering from the University of Tennessee in 1970. In 1957 he completed studies at the Oak Ridge School of Reactor Technology. In 1970 he was appointed a Ford Foundation Professor at the University of Tennessee. His association with the university continues, and he is now a professor in the Nuclear Engineering Department and mentors students on assignment at ORNL. Dr. Mihalczo is a fellow of the American Nuclear Society.

Dr. Mihalczo worked at the Curtiss Wright Corporation from 1953 to 1958 on nuclear propulsion and on a wide variety of other nuclear reactor applications. He joined the Neutron Physics Division of ORNL in 1958 as a researcher at the Oak Ridge Critical Experiments Facility until 1973, at which time he joined the Instrumentation and Controls Division. At the Critical Facility, he performed a wide variety of experiments related to reactor design, nuclear criticality safety, and reactor physics. At the Instrumentation and Controls Division, his work focused on development of measurements for subcritical fissile systems and led to a subcriticality measurement method known in Japanese literature as “the Mihalczo Method.” His current work is focused on development of a measurement method for nuclear criticality safety, nuclear material safeguards, and radiation detection developments for Arms Control and Nonproliferation. He has served since 1989 on a U.S. Department of Energy Advisory Panel for the Office of Arms Control and Nonproliferation. Recent work has led to a fissile mass flowmeter for monitoring the blend-down of enriched uranium from Russian nuclear weapons to low enriched uranium for reactor fuel, and a nuclear weapons identification system (NWIS). NWIS is employed at the Oak Ridge Y-12 Plant for verification of nuclear weapons components in containers and is being transferred to two Russian scientific institutes.

Although much of his work has been and is still in classified areas, Dr. Mihalczo has published 53 journal papers, presented 241 papers at scientific meetings, and published 92 reports, which have led to 376 citations by others. His work has also resulted in several patents.

Dr. Mihalczo was appointed a corporate fellow in 1998.

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Herb A. Mook, Jr.

Dr. Mook received his B.A. degree from Williams College in 1960 and his M.S. and Ph.D. degrees in physics in 1961 and 1965 from Harvard University. He joined the Solid State Division staff at ORNL in 1965.

Throughout his career at ORNL, Dr. Mook has conducted neutron scattering research on a broad spectrum of topics. He is best known for his pioneering research on the magnetic excitations of transition-metal ferromagnets and the observation of itinerant electron effects in these materials. He has had a longstanding interest in quantum fluids and is well known for his experiments establishing the presence of Bose Einstein condensation in ^{4}He. Dr. Mook was the first to establish the coexistence of superconductivity and magnetism in the rare-earth rhodium borides, for which he received the U.S. Department of Energy's 1982 Award for Outstanding Scientific Accomplishments in Solid State Physics.

His present research activities are mostly concerned with neutron studies of high-temperature superconducting materials. He and his collaborators were the first to observe the vortex lattice in the high-T_c materials by neutron scattering and the first to directly observe vortex lattice melting. He has also used neutrons to probe the interaction between superconductivity and magnetism and to directly observe the opening of a superconducting gap in the spin excitation spectra. He has given 23 invited talks at international conferences on superconductivity since 1991.

He is the author of about 200 professional journal articles and book chapters and has been a fellow of the American Physical Society since 1979. He has served as the chairman of several conferences, including the International Conference on Neutron Scattering held in Toronto in 1997. He is head of the Neutron Scattering Group in the Solid State Division and has served as the scientific coordinator for the Spallation Neutron Source Project.

Dr. Mook has also been interested in the discovery of new neutron scattering techniques and instrumentation. He received I•R 100 awards in 1984 and 1989 for his innovations in neutron spectrometry and holds three patents for neutron instrumentation. He was appointed a corporate fellow in 1987 and senior corporate fellow in 1995.

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Robert V. O'Neill

Dr. O'Neill came to ORNL as a Ford Foundation Fellow in 1967 after completing his Ph.D. in ecology at the University of Illinois. He has pioneered a number of research areas, including ecosystem modeling, risk analysis, hierarchy theory, and landscape ecology. He has more than 220 publications, including 4 books.

His early work produced the first nonlinear ecosystem models. With colleagues, he studied error propagation in complex models. The significance of this work was acknowledged in 1994, when the International Association for Statistical Ecology awarded their highest award, Distinguished Statistical Ecologist, to Dr. O'Neill.

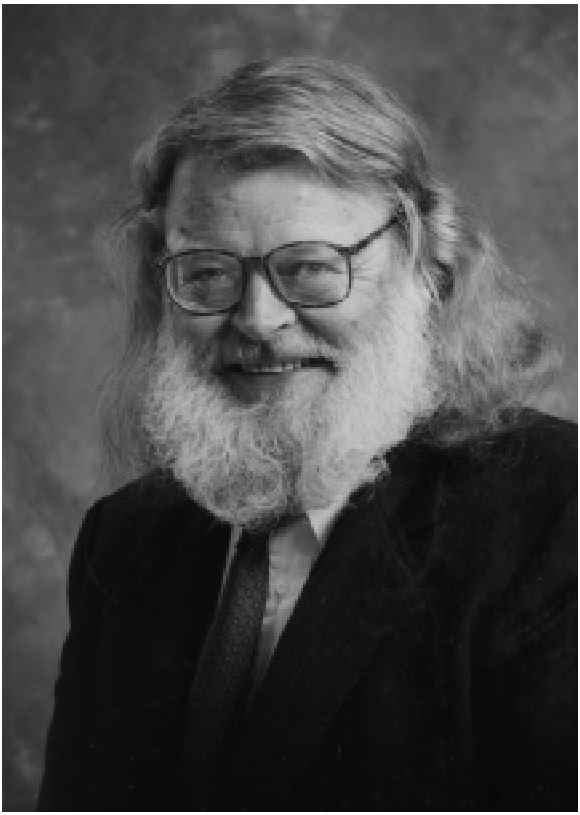
His theoretical work includes an empirical theory of ecosystem function, consumer control of ecosystem stability, and nutrient cycling in stream ecosystems. Dr. O'Neill was the lead author on a book on Hierarchy Theory that has been very influential in ecology.

Landscape ecology deals with the interaction between large-scale spatial patterns and ecological processes. Dr. O'Neill's team laid the analytical and quantitative basis for most of the current research in the field. His contributions were acknowledged in 1995 by the International Association for Landscape Ecology, which awarded him their highest honor, Distinguished Landscape Ecologist.

He has presented lectures at many universities, including Harvard, Cornell, Berkeley, and Wisconsin. He is in demand to serve on advisory committees for the National Academy of Sciences, the National Science Foundation, and interdisciplinary programs at major universities. He has been a visiting scientist at the University of New Mexico and at the Ecosystem Research Center at Cornell. Internationally, he has presented talks in England, Belgium, Sweden, Austria, Germany, Denmark, Venezuela, and Israel.

His current challenges involve developing a continental monitoring system based on landscape principles and interdisciplinary work in economic ecology.

He was appointed a corporate fellow in 1996.



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Stephen J. Pennycook

Stephen J. Pennycook obtained his B.A. degree in natural sciences from the University of Cambridge, England, in 1975, and his M.A. and Ph.D. degrees in physics from the same institution in 1978. He then continued at the University of Cambridge Cavendish Laboratory in postdoctoral positions until moving to the ORNL Solid State Division in 1982, where he is now the leader of the Electron Microscopy Group.

His main research interest is the study of materials through the technique of *Z*-contrast scanning transmission electron microscopy (STEM). This technique provides a directly interpretable image of materials at the atomic scale, in which higher atomic numbers (*Z*) show brighter. It overcomes the phase problem associated with conventional electron microscopy and diffraction techniques by establishing incoherent imaging conditions, the electron equivalent of incoherent imaging in the optical microscope first described by Lord Rayleigh in 1895. Currently, the Solid State Division's 300-kV STEM produces the world's smallest electron probe, just 1.3 angstroms in diameter.

The development of the *Z*-contrast technique has earned Dr. Pennycook an R&D 100 Award, the Heinrich Award from the Microbeam Analysis Society, a U.S. Department of Energy (DOE) Award for Outstanding Achievement in Solid State Sciences, and the Materials Research Society Medal. Recently, his research has focused on grain boundaries in ceramics, which resulted in a DOE Award for Outstanding Achievement in Metallurgy and Ceramics, as well as applications to optoelectronic materials, catalysts, and nanoparticles.

Dr. Pennycook is a fellow of the American Physical Society and a member of the Microscopy Society of America. He was appointed a corporate fellow in 1996.

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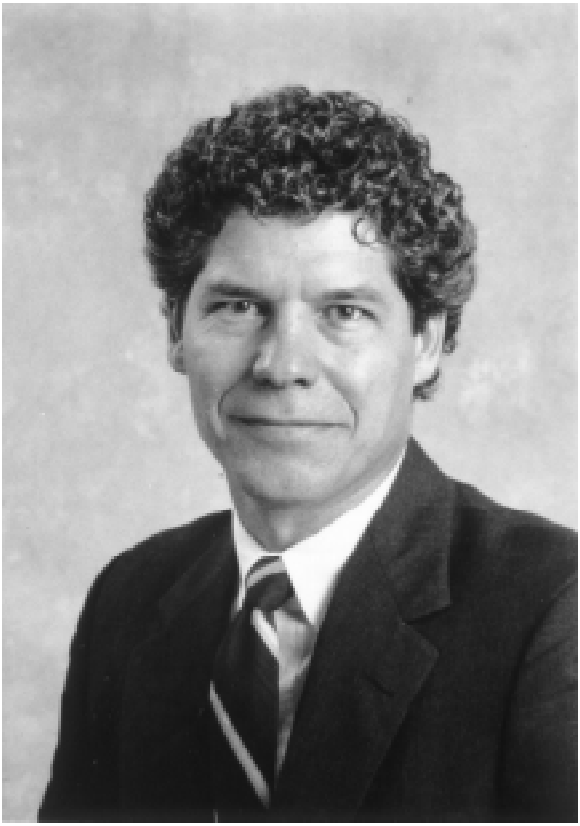
J. Michael Ramsey

Dr. J. Michael Ramsey received his B.S. in chemistry from Bowling Green State University in 1974 and his Ph.D. in chemistry from Indiana University in 1979. After completion of graduate school, he was awarded a Eugene P. Wigner Distinguished Postdoctoral Fellowship at ORNL. He became a permanent staff member at ORNL in 1981 and is presently leader of the Laser Spectroscopy and Microinstrumentation Group in the Chemical and Analytical Sciences Division at ORNL. His research interests include miniature chemical instrumentation, ultrasensitive laser-based detection techniques, resonant multiphoton ionization, nonlinear spectroscopies, diode laser–based chemical instrumentation, and real-time chemical characterization of aerosol particles. Dr. Ramsey has been active in the area of single-molecule detection in liquids for a number of years. The microdroplet format for single molecule detection through laser-induced fluorescence was developed in his laboratory. This approach has led to unprecedented detection capabilities for single fluorophores in liquids. Moreover, the microdroplet format has led to the discovery of cavity quantum electrodynamic effects for molecular transition moments within spherical resonators. These effects result in enhanced fluorescence yields over those observable under free-space conditions and ultimately enhanced detectability. Dr. Ramsey is best known for his pioneering efforts in demonstrating microfabricated chemical measurement devices, or what has become to be known as “laboratory-on-a-chip” technology. These devices have allowed conventional laboratory measurements to be made with performance enhancements of several orders of magnitude over conventional laboratory-scale experiments. The technology is presently being adapted by a number of research institutions and corporations throughout the world and promises to be a major paradigm shift for chemical and biochemical experimentation. Dr. Ramsey has published more than 150 papers and presented more than 225 invited and plenary lectures internationally in his areas of interest. He has also won several corporate technical achievement awards for his research activities, including the ORNL “Scientist of the Year” and a Lockheed Martin NOVA Award in 1996. He is a fellow of the Optical Society of America, a member of the editorial advisory board of *Electrophoresis*, and *Biomedical Microdevices*, chair of the American Chemical Society’s Division of Analytical Chemistry, and chair of the 1999 Gordon Research Conference on Analytical Chemistry. He is a past member of the editorial advisory board of *Spectrochimica Acta Reviews* and the editorial and instrumentation advisory boards for *Analytical Chemistry*. Dr. Ramsey has also been a member of a U.S. Department of Energy advisory panel that provides technical counsel affecting national policy on global environmental monitoring issues.

He was appointed a corporate fellow in 1997.



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Liane B. Russell

Dr. Russell received her A.B. in chemistry from Hunter College, New York City, in 1945, and completed her Ph.D. in zoology (genetics) from the University of Chicago in 1949, about two years after joining the Biology Division of ORNL. She has conducted and supervised research in that division ever since and was a section head from 1975 to 1995.

Dr. Russell has achieved international recognition for her contributions to basic mammalian genetics, and for her pioneering research in mutagenesis, which provides a broad basis for assessing genetic risk to humans from radiation and chemicals. Several of the genetic tests developed by her are now widely used around the world. Dr. Russell has also contributed to the area of teratology and carried out a classical study to identify which periods during embryogeny were critical for the normal development of various parts of the body. Among her discoveries in basic genetics are the findings that the mammalian Y chromosome is male-determining and that only one of two or more X chromosomes is active. She has also analyzed the nature of numerous induced and spontaneous mutations, and has characterized deletion complexes that served to generate early functional maps for several regions of the mouse genome. These have provided the framework for coordinated functional/physical mapping now being carried out by the use of molecular techniques at ORNL and elsewhere.

Dr. Russell served as scientific advisor for the U.S. delegation at the first Atoms for Peace Conference held in Geneva in 1955, and in 1973 was the first woman to receive the internationally awarded Roentgen Medal. She was elected to the Hunter College Hall of Fame in 1979. In 1986, she was elected to the National Academy of Sciences. In 1987 she received the U.S. Department of Energy's (DOE's) Distinguished Associate Award, and in 1994 the Fermi Award, DOE's highest research honor.

Dr. Russell has been a member of various committees and boards of the National Academy of Sciences, of the International Commission for Protection Against Environmental Mutagens and Carcinogens, of the National Council on Radiation Protection and Measurement, and of the U.S. Environmental Protection Agency's Gene-Tox Program. She has served on the editorial boards of *Mutation Research* and *Environmental and Molecular Mutagenesis*. She is a fellow of the American Association for the Advancement of Science, past president of the Environmental Mutagen Society, and the 1993 recipient of the Society's EMS Award. Dr. Russell has more than 150 publications. She is continuing to conduct research in mammalian genetics.

She was appointed a corporate fellow in 1983 and a senior coporate fellow in 1988.

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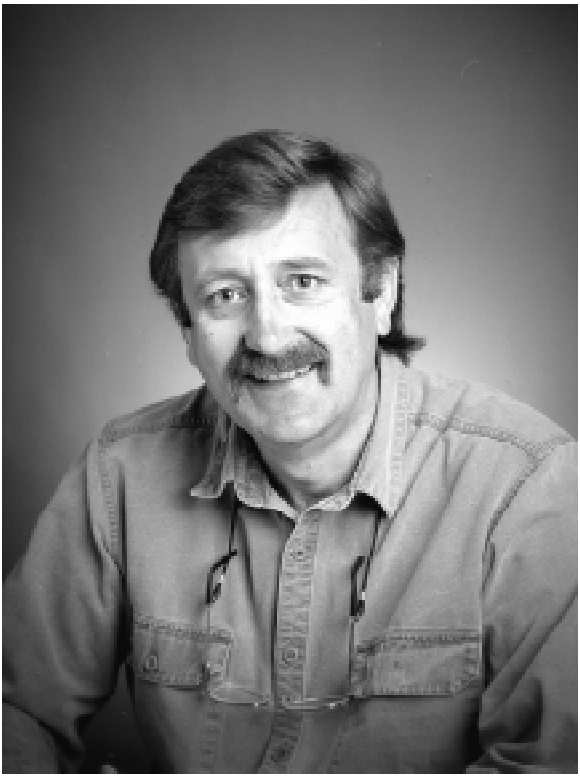
G. Malcolm Stocks

Malcolm Stocks is a Lockheed Martin Corporate Fellow in the Theory Group of ORNL's Metals and Ceramics Division. He holds a Ph.D. degree in condensed matter physics from Sheffield University. Prior to joining ORNL in 1976, he was a lecturer at the University of Bristol, U.K., from 1972 to 1976. His research interests include materials science, high-performance heterogeneous scientific computing, and the development of scalable first-principles electronic structure algorithms and parallel algorithms. He has published more than 200 papers in materials science, high-performance computing, and parallel processing and has edited four books. He has also won several high-performance computing awards, including the Gordon Bell Prize, the Cray Research Award, and a High-Performance Computing Challenge Award.

Stocks is internationally known for his work on the theory of metallic alloys. He developed a quantum mechanical method for calculating the electronic structure and properties of disordered alloys. This theory subsequently was used by Stocks and his collaborators as the basis for developing theories of alloy phase stability and the magnetic phase transitions in metals. Recently, he has been heavily involved in developing new methods for applying the computational power of parallel Intel Paragon supercomputers at ORNL's Center for Computational Science.

Stocks is a fellow of the American Physical Society and a member of ASM International, the Materials Research Society, and the Minerals, Metals, and Materials Society (formerly the Metals Society). He has received a Martin Marietta Energy Systems, Inc., award for outstanding research and has twice been presented a U.S. Department of Energy award for outstanding sustained research.

Dr. Stocks was appointed a corporate fellow in 1995.



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Tuan Vo-Dinh

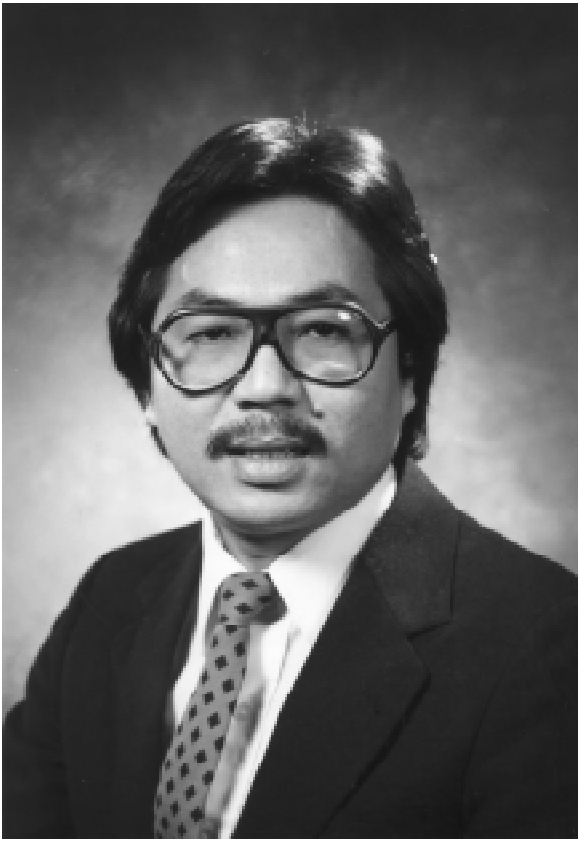
Tuan Vo-Dinh received a Ph.D. degree in physical chemistry in 1975 and is currently a corporate fellow and group leader of the Advanced Monitoring Development Group at ORNL. His research interests include monitoring techniques for process, environmental control and environmental analysis, laser techniques for trace analysis using luminescence and surface-enhanced Raman spectroscopy, cancer detection and biomedical diagnostics, and environmental and biomedical sensors (antibody biosensors, gene probes, biochips for HIV, TB, p53, cancer diagnosis).

Dr. Vo-Dinh has received five R&D 100 Awards (1996, SERS gene probe; 1994, spot test for PCB; 1992, SERS optical data storage; 1987, fluoro-immunosensor; and 1981, PNA dosimeter). He has also received the Lockheed Martin Technology Commercialization Award (1998); the BER-50 Award for Biological and Environmental Research, U.S. Department of Energy (DOE) (1997); the Inventor of the Year Award, Inventors Club of America and Tennessee Inventors Association (1996); two Federal Laboratory Consortium Awards for Excellence in Technology Transfer, (1995, 1986); the Thomas Jefferson Award, Martin Marietta Corporation (1992); the Languedoc-Rousillon Award (France) (1989); and the Gold Medal Award of the Society for Applied Spectroscopy (1988).

Dr. Vo-Dinh has authored more than 220 publications in peer-reviewed scientific journals. He is the author or editor of seven books. He holds 16 U.S. patents, five of which have been licensed by DOE to private companies for commercial development. Dr.Vo-Dinh has presented more than 100 invited lectures at international meetings in universities and research institutions. He has organized and chaired over 10 national and international conferences in environmental and biomedical research areas. He served as the Honorary Chairman of two International Symposia on Analytical Sciences held in Deauville, France in 1993 and in Montreux, Switzerland in 1994.

Dr. Vo-Dinh is a fellow of the American Institute of Chemists and editor of the international journal *Polycyclic Aromatic Compounds*. He also serves or has served as an associator editor of *ANALUSIS*, and as a member on the editorial and advisory board of *Applied Spectroscopy*, *Talanta*, *Spectrochimica Acta Reviews*, and the *Journal of Biomedical Optics.* He is also the editor of the book series on *Advances in Environmental and Process Control Technologies*. Dr.Vo-Dinh serves as chairman of Commission on Optical Detection Methods for the International Union of Pure and Applied Chemistry (IUPAC), chairman of the ASTM Subcommittee on Fiberoptics, and the U.S. delegate to the North Atlantic Treaty Organization Industrial Advisory Group.

Dr. Vo-Dinh was appointed a corporate fellow in 1994.



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Thomas J. Wilbanks

Dr. Wilbanks received his B.A. degree in social sciences from Trinity University in 1960 and his M.A. and Ph.D. degrees in geography from Syracuse University in 1967 and 1969. He served on the faculties of Syracuse University and the University of Oklahoma before joining ORNL in 1977.

Trained as a geographer, Dr. Wilbanks has focused his research on relationships between utilization of technology and social and economic development, both in the United States and in developing countries. Topics in his publications include attention to energy and environmental choices and impacts, decision-making and institution-building, and such cross-cutting issues for science as relationships between macroscale and microscale processes. He is the author or coauthor of six books and monographs, more than ninety journal articles and book chapters, and more than one hundred papers presented at universities and professional meetings in twelve countries.

In 1986, Dr. Wilbanks was awarded Honors by the Association of American Geographers (AAG), geography's highest honor, and in 1985 he was elected a fellow of the American Association for the Advancement of Science (AAAS). In 1993 he was named Distinguished Geography Educator of the year by the National Geographic Society for his contributions to the scientific content of national education standards for geography, and in 1995 he was awarded the James R. Anderson Medal of Honor in Applied Geography by the AAG.

In January 1988 he spoke at a special symposium celebrating the 100th Anniversary of the National Geographic Society. From 1992 to 1993, he served as president of the Association of American Geographers, and during the period 1993 to 1997, he served as chair of both of geography's committees of the National Academy of Sciences/National Research Council (NAS/NRC), the U.S. National Committee for the International Geographical Union, and an NAS committee that produced *Rediscovering Geography: New Relevance for Science and Society* (1997), which assessed a scientific discipline from the standpoint of external needs and expectations.

At ORNL, Dr. Wilbanks is manager of Global Change and Developing Country Programs. Current activities are focused on biodiversity protection and environmental institution-building in Guatemala, industrial ecology in India, and both national and international responses to global climate-change issues, including several leadership roles in the first U.S. National Assessment of Consequences of Climate Variability and Change. He also serves as adjunct professor of geography at the University of Tennessee and on a variety of national committees and panels. In previous years, his activities included assisting in the preparation of U.S. National Energy Plan II (1978–79) and the USAID Global Climate Change Initiative (1997–98). He was appointed a corporate fellow in 1986.

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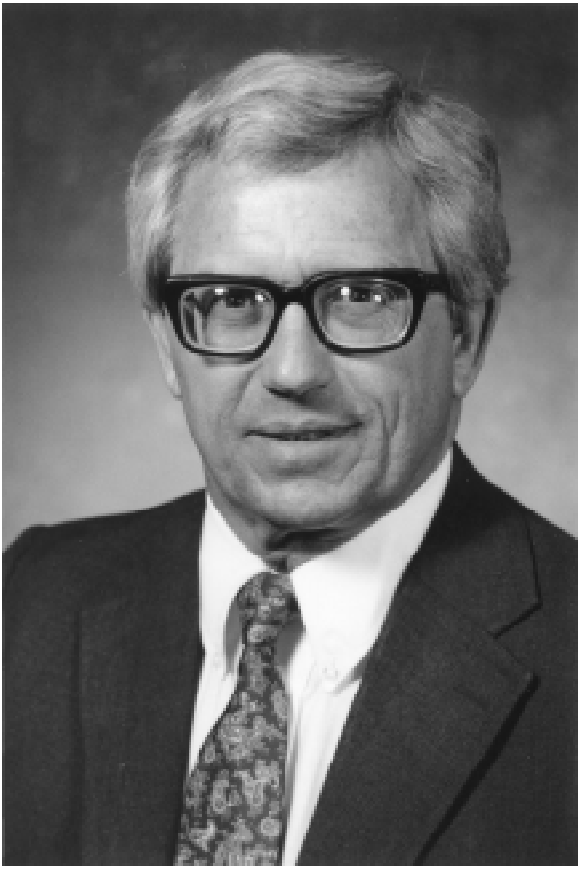
Richard F. Wood

R. F. Wood received his Ph.D. in theoretical solid state physics from Ohio State University in 1959. He held Fulbright and National Science Foundation fellowships at Göttingen, Germany; Uppsala, Sweden; and Cambridge, England before joining the Solid State Division at ORNL in 1962. He was head of the Theory Section from 1968 until 1984 and was the group leader for the Semiconductor Physics Group from 1974 until 1988. He has been a visiting research professor at Uppsala and Gothenburg, Sweden, and at the University of Erlangen-Nürnberg, where he was a recipient of a Distinguished Senior Scientist Award from the Alexander von Humboldt Foundation.

Dr. Wood's research interests have been concentrated in the areas of electronic and vibrational properties of defects in crystals, lattice dynamics and neutron scattering, optical properties of solids, superconductivity, the effects of laser radiation on semiconductors, the use of lasers to fabricate high-efficiency solar cells and other devices, and the formation of metastable materials by ultrarapid solidification. He has published extensively in these areas; given numerous invited talks; and served on various conference organizing committees in different capacities, including chair of the 1977 International Conference on Defects in Insulating Crystals and co-chair of the First International Conference on Neutron Transmutation Doping. He was the 1980–81 national lecturer for the Institute of Electrical and Electronics Engineers Electron Devices Society. He has received several awards and patents for his work on transmutation doping and laser processing of semiconductors. Dr. Wood is a fellow of the American Physical Society and the American Association for the Advancement of Science and is a senior member of the Institute of Electrical and Electronics Engineers.

Dr. Wood's present research activities lie in the areas of laser processing of materials, solar energy conversion, mathematical modeling of ultrarapid melting and solidification phenomena, molecular dynamics, electronic structure of solids, and high-temperature superconductivity.

He was appointed a corporate fellow in 1984.



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Emeritus Corporate Fellows

Engineering Fellows

Arthur Fraas (1976)
Graydon Whitman (1987)

Senior Research Fellows

L. G. Christophorou (1990)
Robert N. Compton (1994)
Rufus H. Ritchie (1990)
William L. Russell (1976)
Charles D. Scott (1986)

Corporate Research Fellows

Thomas Carlson (1985)
George Samuel Hurst (1979)
Richard F. Kimball (1979)
Wallace C. Koehler (1979)
Samuel H. Liu (1988)
Ralph Livingston (1979)
R. M. Moon (1990)
Lester C. Oakes (1986)
Francis G. J. Perey (1979)
G. Ray Satchler (1976)
John B. Storer (1983)
Curtis C. Travis (1996)
James E. Turner (1987)

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