

# Authors

## George A. Alers

B.A., 1950, Rice Institute; M.S., 1952, and Ph.D., 1954, State University of Iowa. Metallurgy Department of Westinghouse Research Laboratory, 1954-56. Joined the Scientific Laboratory of the Ford Motor Company in 1956 as a solid state physicist. Primary interest has been in the mechanical properties of metals and the use of ultrasonics as a basic research tool. Member of the American Physical Society and Sigma Xi.

## Klaus Andres

Diploma in Physics, 1958, Swiss Federal Institute of Technology (ETH). Has since carried out research in low-temperature physics. Main interests are adiabatic demagnetization and thermal expansion of metals at low temperatures.

## John Bardeen

B.S., 1928, and M.S. in Electrical Engineering, 1929, University of Wisconsin; Ph.D. in Mathematical Physics, 1936, Princeton University. Geophysicist, Gulf Research Laboratories, 1930-33. Junior Fellow, Society of Fellows, Harvard University, 1933-36. Taught physics at the University of Minnesota, 1938-41. Worked on underwater ordnance at the Naval Ordnance Laboratories during World War II. From 1945-51 at the Bell Telephone Laboratories. Joined the University of Illinois in 1951 as Professor of Physics and Electrical Engineering, and since 1959 also has been a member of the Center for Advanced Study of the University of Illinois. Research on solid state theory, particularly semiconductors and superconductivity. Fellow, American Physical Society and member, National Academy of Science.

## Ted G. Berlincourt

B.S. in Physics, 1949, Case Institute of Technology; Ph.D. in Physics, 1953, Yale University. United States Naval Research Laboratory, 1952-55. Atomics International, 1955 to present. Activities include de Haas-van Alphen studies, electron transport properties, superconductivity, and pulsed magnetic fields. Member of American Physical Society, American Association for the Advancement of Science and Sigma Xi.

## Richard D. Blaugher

B.S. in Physics, 1958, University of Pittsburgh. Research Assistant at the University of Pennsylvania, 1960-61. Consultant on cryogenics for the Martin Company, Baltimore, 1960. Associated with the Westinghouse Research Laboratories, Churchill Boro, Pa., since 1956; main interests are solid state research and superconductivity. Member of the American Physical Society and the Pittsburgh Physical Society.

## George K. Chang

A.B., 1959; M.A. in Physics, 1960, University of California, Los Angeles. Joined IBM at the Thomas J. Watson Research Center at Yorktown in 1960, investigating thermal conductivity of solids at low temperatures. Currently studying thermal contact of solids at low temperatures. Member of Sigma Pi Sigma and Physics Honor Society.

## Bryan R. Coles

B.Sc. in Metallurgy, University of Wales, 1947; D. Phil., University of Oxford, 1950. Senior Lecturer in metal physics, Physics Department, Imperial College, London. Was F.O.A. Fellow at Carnegie Institute of Technology, 1954-56. Principal interests are the electronic structures of alloys and their magnetic, electrical, and superconductive properties.

## Leon N. Cooper

B.A., M.A., and Ph.D., 1959, Columbia University. National Science Foundation Post-Doctoral Fellow and Member of the Institute for Advanced Study, 1954-55. Research Associate, University of Illinois, 1955-57. Assistant Professor of Physics, Ohio State University, 1957-58. Associate Professor of Physics, Brown University, 1958 to present. Alfred P. Sloan Research Fellow, 1959 to present.

## David H. Douglass, Jr.

Ph.D. in Physics, 1959, Massachusetts Institute of Technology. Joined Lincoln Laboratory in 1959, where he worked in the field of superconductivity. Member of the Department of Physics at the Massachusetts Institute of Technology, 1961, working in the area of low-temperature physics.

## Donald M. Ginsberg

B.A., 1952; B.S., 1955; M.S., 1956, University of Chicago; Ph.D., 1960, University of California, Berkeley. Research associate in the Physics Department of the University of Illinois, 1959-60; Assistant Professor since 1960. Engaged in research in the field of superconductivity. Member of Sigma Xi and the American Physical Society; also an Alfred P. Sloan Research Fellow.

## Bruce B. Goodman

Studied physics at the University of Cambridge; after research on superconductors below 1°K, under the guidance of Dr. D. Shoenberg, received Ph.D. in 1952. Worked in the Westinghouse Research Laboratories, 1953-57, principally in establishing the exponential temperature dependence of the electronic specific heats of superconductors. Since 1957, Professeur Associé and

Maître de Recherches in the University of Grenoble. Member of the American Physical Society and Fellow of the Physical Society (of London).

**Karl-Ulrich von Hagenow**

Graduate of the University of Göttingen. Worked at Institute of Mathematical Sciences, New York University and Institut für theoretische Physik, München. Presently at Max Planck Institut für Physik und Astrophysik, München.

**Richard R. Hake**

B.S. in Physics, 1950, University of Colorado; Ph.D. in Physics, 1955, University of Illinois. Research associate, University of Illinois, 1955-56. Atomics International, 1956 to present. Concerned with isotope, pressure, and alloying effects on superconductors, low temperature calorimetry, and electron transport properties of metals and alloys. Member of Tau Beta Pi and the American Physical Society.

**Pierre Huard**

Licence es Sciences 1949; Doctorat d'Etat es Sciences Mathématiques, 1956. Chargé de Recherches (analog computation) at the Centre National de la Recherche Scientifique (Institut Blaise Pascal), 1951-57. Engineer at the group of Operational Research of Pétroles SHELL BERRE, 1958-59. Since 1960, mathematician engineer at the Service des Etudes et Recherches Mathématiques, Direction des Etudes et Recherches, ELECTRICITE DE FRANCE. Member of Association Française de Calcul et de Traitement de l'Information, Société Française de Recherche Operationnelle, Société Mathématique de France, and the Association for Computing Machinery. Chairman of the group AFCALTI-SOFRO "Mathématique des Programmes Economiques."

**John K. Hulm**

B.A., 1943; M.A., 1945; Ph.D., 1949, Cambridge University. Scientific officer, Royal Air Force, 1943-46; worked on microwave radar receivers and crystal detectors. At Cambridge, made first single crystals of barium-titanate and studied their ferroelectric properties; measured thermal conductivity of superconducting metals. Research Fellow and Assistant Professor at the Institute for the Study of Metals, University of Chicago, 1949-54; field emission microscopy at low temperatures, properties of superconducting compounds and alloys. Joined Westinghouse Research Laboratories in 1954 as advisory physicist in charge of cryogenics; 1956, Manager of Solid State Physics Department; 1960 to present, Associate Director, solid state research.

**Robert E. Jones**

A.B. in Chemistry, 1953, Columbia University; Ph.D. in Physical Chemistry, 1957, University of California. Research assistant E. O. Lawrence Radiation Laboratory, 1957. Joined IBM in 1957. Worked on superconducting alloys and low-temperature thermal problems. Now at the Cryogenics Department, Thomas J. Watson Research Center at Yorktown. Member of Tau Beta Pi.

**Heinz Walter Koppe**

Graduate of Technische Hochschule, Danzig, and University of Berlin. Worked at Max Planck Institut für Physik, Göttingen, University of British Columbia, Vancouver, and University of Heidelberg. Presently at Institut für theoretische Physik, München.

**Marcel A. R. LeBlanc**

M.A., 1954, University of Saskatchewan, Canada; Ph.D., 1959, University of British Columbia, Canada. Recipient of a World University Service of Canada Scholarship at the Max Planck Institute for Physics, Göttingen, Germany, 1954-55. Research Associate at Stanford University since 1959, studying superconductivity and nuclear orientation.

**Don H. Leslie**

Graduate of Northrup Aeronautical Institute, 1949. Subsequently worked in the non-ferrous extractive metallurgy group at Battelle Memorial Institute and in the cryogenic field with Herrick L. Johnston, Inc. Joined Atomics International in 1956, where engaged in experimental low-temperature solid state physics.

**James D. Leslie**

B.A. Sc. in Engineering Physics, University of Toronto, 1957; M.S. in Physics, University of Illinois, 1960. Taught in Physics Department, University of Waterloo, 1957-58. Was research assistant in the Digital Computer Laboratory, University of Illinois, 1958-60. Presently a research assistant in the Physics Department of the University of Illinois.

**Arwin B. Lindquist**

B.S.E.E., 1958; M.S.E.E., 1959, University of Illinois. Joined IBM in 1959. Presently exploring associative memory applications and design in the Advanced Technical Development Department of the Data Systems Division, Poughkeepsie. Member of Eta Kappa Nu, Sigma Tau, IRE and ACM.

**William A. Little**

Ph.D., 1953, Rhodes University, South Africa; Ph.D., 1955, Glasgow University, Scotland. Post-Doctoral National Research Fellow, University of British Columbia, Vancouver, 1956-58. Joined the faculty of Stanford University in 1958. At present, Associate Professor at Stanford University with interests in nuclear magnetic resonance, Mossbauer effect, and low temperatures.

**Dillon E. Mapother**

B.S., Mechanical Engineering, 1943; D.Sc. in Physics, 1949, Carnegie Institute of Technology. Westinghouse Research Laboratories, 1943-46. Since 1949, staff member of the Physics Department at the University of Illinois at Urbana. Early work at Carnegie Institute of Technology was on ionic transport in alkali halides. At University of Illinois worked on experimental problems of low-temperature physics, particularly the thermodynamic properties of superconductors. Member of Sigma Xi and American Physical Society.

**Paul M. Marcus**

A.B., Columbia University, 1940; Ph.D., in Chemical Physics, Harvard University, 1943. Worked on waveguide theory and the "Waveguide Handbook" at Radiation Laboratory, Massachusetts Institute of Technology, 1943-48. Scientific liaison officer in London for U. S. Office of Naval Research, 1948-50. Member of Physics Department of University of Illinois, 1950-52, and Carnegie Institute of Technology, 1952-59. Joined IBM in 1959 and has worked on superconductivity, energy bands and vibration spectra of solids. Now at the Thomas J. Watson Research Center at Yorktown. Member of the American Physical Society, and The Physical Society, London.

**Yoshika Masuda**

M.S. in Physics, Osaka University, Japan, 1949; Dr. Sc. in Physics, Osaka University, 1953. Associate Professor in Physics, Kobe University, Japan, 1953-59. Came to IBM Watson Laboratory as Fulbright Scholar and Q.W. Boese Fellow at Columbia University, 1959-60. Member of the nuclear magnetic resonance group of the Watson Laboratory, 1960-61; worked on nuclear magnetic resonance in superconducting metals and alloys. Now Professor of Physics, Kobe University, Kobe, Japan. Member of the American Physical Society and Physical Society of Japan.

**Hans Meissner**

Doctorate at the University of Munich, Germany, 1948. From 1948-52 worked as research assistant at the Low Temperature Laboratory of the Bavarian Academy of Sciences. In 1952, joined the Heat Transfer Laboratory of the Illinois Institute of Technology. Accepted an Assistant Professorship at Johns Hopkins University, Baltimore, Md., 1953. In 1959, accepted an Associate Professorship at Stevens Institute of Technology. Fellow of the American Physical Society and a member of Sigma Xi.

**Kurt Alfred Georg Mendelssohn**

Graduate of Goethe-School, Berlin; M.A., Oxford University; M.A., D.Phil., Berlin University. Research and teaching appointments: Berlin University, 1930; Breslau University, 1932; Oxford University, 1933; Visiting Professor, Rice Institute, Texas, 1952; Purdue University, 1956; Tokyo University, 1960. Reader in Physics, Oxford University, since 1955. Vice-President Physical Society, 1957-60. Fellow Royal Society.

**Simon Middelhoek**

M.S. in Physical Engineering, Technical University of Delft, Holland, 1956; Ph.D. in Physics, University of Amsterdam, Holland, 1961. Joined IBM in 1956 as physicist in the Research Laboratory, Zurich, Switzerland. Present field of interest is ferromagnetic domains in thin Ni-Fe films. Member of the Dutch Physical Society, Royal Institute of Engineers, and the German Study Group on Ferromagnetism.

**John L. Miles**

B.S. in Physics, Bristol University, England, 1951; Ph.D. in Physics, Bristol University, 1954. Senior Research Fellow, New York State College of Ceramics at Alfred University 1954-57. Joined Arthur D. Little, Inc. in 1957, and as a member of the Advanced Research Division has been engaged in studying the properties of metal and insulating films deposited in high vacuum for use in cryogenic computer circuits. Recently collaborated in the investigation of the properties of laminar superconductors and the development of suitable dielectric films for tunneling between superconducting metals.

**Robert W. Morse**

B.S., 1943, Bowdoin College; Sc.M., 1947, Ph.D., 1949, Brown University. Appointed to faculty at Brown University in 1949; now Professor of Physics and Chairman of the Physics Department. 1954-55, a Howard Foundation Fellow at Cambridge, England. Fellow of the American Physical Society, the Acoustical Society of America, and the American Academy of Arts and Sciences.

**James Nicol**

B.S. in Physics, St. Andrew's University, Scotland, 1948; M.S. in Physics, Union College, 1949; Ph.D. in Physics, Ohio State University, 1952. Research Associate and Instructor, Ohio State University; Associate Professor of Physics, Amherst College, 1953-57, engaged in fundamental research into the properties of paramagnetic salts below 1°K and the thermal conductivity and specific heats of metals between 4.2°K and 1°K. Since joining the Advanced Research Division of Arthur D. Little, Inc. in 1957, has been concerned with problems involving refrigeration, instrumentation and solid state phenomena below 1°K. Recently investigated superconductivity and electron tunneling and the properties of laminar superconductors. Member of American Physical Society and Sigma Xi.

**Jorgen Lykke Olsen**

B.A., 1948; M.A., D.Phil., 1952, Oxford. Joined Swiss Federal Institute of Technology (ETH) in Zurich to help start a new low-temperature laboratory. Winter 1960-61, visiting associate professor at Ohio State University. Now "ausserordentlicher Professor" for low-temperature physics at ETH. Research interests have been the electronic properties of metals, both normal and superconducting.

**Heinrich Rohrer**

Diploma, 1955, and Dr. sc. nat., 1960, Swiss Federal Institute of Technology (ETH). Joined Physics Department at Rutgers University, 1961. Research concerned with volume changes at the superconducting transition.

**Robert R. Seeber**

A.B. in Mathematics, 1932, Harvard University. Ten years' experience in actuarial computations. Worked in anti-submarine warfare, Operations Research Group during World War II. Joined IBM in 1945; work has included design, construction, testing and operation of

the IBM Selective Sequence Electronic Calculator. Inventor of the Wordwriter. Now at the Data Systems Division in Poughkeepsie, working in associative logic systems. Member of the ACM, Operations Research Society of America, Mathematical Society of America and American Mathematical Society.

**Donald P. Seraphim**

B.A. Sc., 1951, M.A. Sc., 1952, University of British Columbia; D.Eng., 1957, Yale University. Aluminum Company of Canada, 1952-54, working on magnesium castings for jet engines and surface chemistry research. Joined IBM in 1958; investigating effects of impurities and lattice defects and elastic strain on superconductivity. Now at Thomas J. Watson Research Center at Yorktown. Member of American Institute of Metallurgical Engineers, American Physical Society, and Sigma Xi.

**Sidney Shapiro**

B.A. in Physics, Harvard University, 1953; M.A. in Applied Physics, 1955; Ph.D. in Applied Physics, Harvard University, 1959, where he had been associated with Prof. Bloembergen in research on the solid state maser and on relaxation effects in paramagnetic crystals at low temperatures. Joined Advanced Research Division of Arthur D. Little, Inc. in 1959; investigation of the interaction of microwaves with superconductors and magnetic resonance work. Recently concerned with the research program which led to the discovery of tunneling between superconducting metals and laminar superconductors. Member of American Physical Society.

**Paul H. Smith**

B.S. in Physics, Arizona State University, 1957; graduate study in physics, Massachusetts Institute of Technology, 1960-61. Industrial affiliations: General Transistor Corporation as physicist, concerned with problems of dielectric materials and transistor technology; Motorola, Semiconductor Products Division; and Vitro Research Laboratories as electronics engineer. Joined Advanced Research Division of Arthur D. Little, Inc. in 1960; active in the research program concerned with laminar superconductors and with electron tunneling between superconducting metals. Member of American Physical Society.

**Peter F. Strong**

B.A. in Physics, Harvard University, 1948. Employed by Harvard Computation Laboratory, 1948-53; activities included analysis and coding of scientific problems for solution on the Mark I calculator. Later concentrated on research in switching theory and on design of the Mark IV calculator. Since joining Arthur D. Little, Inc. in 1954, has been associated with operations research and mathematical analysis problems, including work on inventory control and production-distribution problems, and especially design of business information-handling systems. Recently has concentrated on development of general purpose computer programs for solution of

engineering problems. Member of Operations Research Society of America.

**Clayton A. Swenson**

B.S. in Physics, Harvard University, 1944; D.Phil. in Physics, Oxford University, 1949. Instructor in Physics, Harvard University, 1949-52. Staff member of the Cryogenic Engineering Laboratory, Massachusetts Institute of Technology, 1952-55. Joined the Iowa State University Physics Department and Ames Laboratory staff in 1955; now Professor of Physics at Iowa State University and Senior Physicist in the Ames Laboratory.

**James C. Swihart**

B.S. in Chemical Engineering, 1949; M.S. in Physics, 1951; Ph.D., 1954, Purdue University. Attended Institute for Theoretical Physics, University of Copenhagen, 1955. Associated with Argonne National Laboratory, 1956, working in field theory. Joined IBM in 1956. Presently working in theory of superconductivity at the Thomas J. Watson Research Center at Yorktown. Member of the American Physical Society.

**Abraham Taylor**

B.Sc., 1933, M.Sc., 1934, Ph.D. in physics, 1936, Manchester University, England. Head of Physics Department of Mond Nickel Company of England, 1947-52. Scientist at Horizons, Inc. in Cleveland, 1952-54; 1954 to present, Westinghouse Research Laboratories, Churchill Boro, Pa.; now Manager of the Physics Technology Group. Primary interest is X-ray metallography. Fellow of the American Physical Society and the Institute of Physics of England; also member of American Society of Metals and American Crystallographic Association.

**Michael Tinkham**

A.B., Ripon College, 1951; M.S., Massachusetts Institute of Technology, 1951; Ph.D. in Physics, Massachusetts Institute of Technology, 1954; Post-Doctoral Fellow of N.S.F. at Clarendon Laboratory, Oxford University, 1954-55. Joined the University of California, Berkeley, 1955; now Professor of Physics. Areas of special interest include superconductivity, magnetic resonance, and far-infrared studies of solids. Member of Sigma Xi and the American Physical Society.

**Arnold M. Toxen**

B.S., 1952, George Washington University; Ph.D., 1958, Cornell University. Joined IBM in 1958; engaged in studies of superconductors. Now at the Thomas J. Watson Research Center at Yorktown. Member of Phi Beta Kappa, Sigma Xi, and the American Physical Society.

**David L. Waldorf**

B.S., 1953, Montana State College; M.S., 1957, Purdue University. Joined the Scientific Laboratory of the Ford Motor Company in 1957; primary interests centered on studies of single crystals with X-rays and ultrasonics. Now at Ohio State University. Member of the American Physical Society, Tau Beta Pi, Phi Kappa Phi, and Sigma Xi.