Microwave Equipment for College Laboratories

I should like to take advantage of this correspondence column to discuss briefly a problem which we at Clarkson College may have in common with many other private colleges.

We believe that our undergraduate curriculum should include a course in microwaves and that this course to be effective must include some laboratory work. The problem is that it is very difficult to equip a microwave laboratory on the sort of budget existing in a small college. Commercial equipment is, in general, much too expensive and is really much higher quality than is required for simple student laboratory work. We have been able to meet our needs in part by constructing our own waveguide components and in part through the generosity of several concerns which have given us used or rejected equipment or made it available to us at very low cost. We have been given a variety of microwave tubes plus some oscillators and a number of waveguide and coaxial components which make it possible for us to operate our laboratory.

In the interest of furthering study in the microwave field, would it not be possible for more companies in the field to make available for educational purposes used or rejected equipment?

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Russian Edition of "Principles and Applications of Waveguide Transmission," by George C. Southworth

(The attention of the Editor was called recently to the Editorial Preface to the Russian edition of the above book. The preface is reprinted below in the belief that the commentary will be of interest to many readers.—The Editor.)

This book was written by the well-known American specialist in the uhf field who was one of the pioneers of waveguide techniques. As the author mentions in his preface, the book does not pretend to encompass fully the subject; however, in addition to a description of the fundamentals of the theory of waveguide transmission it contains extensive material devoted to the design and operation of various waveguide components and assemblies and also of electron apparatus applied in conjunction with waveguide apparatus. A part of this material was published earlier in periodicals but is being published now for the first time in book form.

It is necessary to point out the well-known "one sidedness" of the material. The book reflects mainly the results obtained by Bell Telephone Laboratories. The extensive bibliography of the author omits many important papers of Soviet specialists and also specialists from other countries. However, no attempt has been made to introduce into the book additional material since it would cause a considerable increase in volume and it would affect the general style of the book. The reader anticipates from the Soviet scientists in the near future new manuals on uhf techniques which will give a full and objective generalization of the main achievements of the Soviet and non-Soviet engineering in this field.

The book was published in 1950 and, therefore, naturally it either does not deal at all, or deals only very superficially, with achievements obtained during recent years (new types of transmission lines, problems of application of ferrites, triodes, new types of electron equipment for amplification and generation of uhf energy, etc.). In spite of these mentioned drawbacks, the book is written in a simple and clear style and encompasses a wide range of problems and will be of great help to many engineers and physicists and also to students who are interested in uhf techniques.

Contributors

Donald R. Barthel (S'48–A'50) was born in Milledgeville, Ill., on December 2, 1923. He was graduated from the University of Illinois in 1948, receiving the degree of Bachelor of Science in electrical engineering. Since 1948, Mr. Barthel has been a member of the engineering staff of The Glenn L. Martin Company, located in Baltimore, Md. In this position, Mr. Barthel has been engaged in antenna and microwave component developments for aircraft and guided missiles.

D. R. BARTHEL

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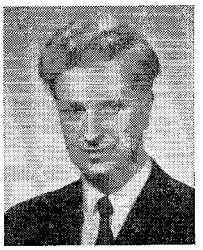
E. Folke Bolinder (A'50–M'55) was born at Uppsala, Sweden, August 11, 1922. He received the civilingenjör degree in electrical engineering at the Royal Institute of Technology, Stockholm, in 1945. After a year of military service as a special engineer in the Swedish Air Force, where he worked on uhf antennas and circuits, he worked during 1946–1951 on different microwave and pulse technique projects for the Swedish defense, combining the work with graduate studies at the Royal Institute of Technology. In 1951 he became a Fellow of the American-Scandinavian Foundation under whose auspices he worked (during 1952–1953) in transient synthesis as research assistant at the Research Laboratory of Electronics, M.I.T. He received the degree of Licenciate of Technology at the Royal Institute of Technology, Stockholm, in 1954. During the winter of 1954–55 he was a guest at Instituto Nacional de la Investigacion Cientifica, Mexico City. Since the summer of 1955 he has been a research staff member of the Research Laboratory of Electronics, M.I.T., working with geometrical methods in the microwave field.



E. F. BOLINDER

Duncan M. Bowie was born on March 12, 1923, in Tulsa, Okla. He first entered the University of Tulsa, College of Engineering, in 1940, and received the B.S. degree in geophysical engineering there in 1948. During this interval he served eighteen months in master layout work with Douglas Aircraft Co. and two years as electrical technician with the U.S. Army Air Corps. From 1949 to 1951 he worked as seismic computer with Geophysical Service, Inc., Dallas, Texas.

D. M. BOWIE

From 1951 to 1954 he served as teaching fellow at the University of Utah, and there conducted research in nuclear physical measurements. He received the M.S. degree in Physics in 1954, and in that year joined the staff of Melpar, Inc., at Falls Church, Va., where he has worked principally with artificial dielectric materials and microwave measurement techniques. He is a member of Sigma Pi Sigma and Sigma Xi.

John C. Cacheris (SM'56) was born on May 18, 1916, in Chicago, Ill. He graduated from the Capitol Radio Engineering Institute in 1941, received the B.S. degree in electrical engineering from Carnegie Institute of Technology in 1946, and the M.S. degree from Maryland University in 1953.

J. C. CACHERIS

From 1941 to 1946 Mr. Cacheris was employed as a radio engineer in the Test Department of the Radio Division of the Westinghouse Electric Corporation, Baltimore, Md. From 1946 until 1949, as an electronic scientist with the Naval Ordnance Laboratory in White Oak, Md. he designed circuits and instruments for ultra high and microwave frequency ranges.

He joined the staff of the Ordnance Development Division of the National Bureau of Standards, Washington, D.C., in 1949, where he engaged in microwave antenna and diffraction studies, and in investigations of the microwave properties of ferrites. He is continuing the latter investigations at the Diamond Ordnance Fuze Laboratories, Department of the Army, to which the functions and staff of the Ordnance Development Division were transferred on September 27, 1953. Mr. Cacheris is chief of the Ferrite Research Section of the Supporting Research Laboratory.

Mr. Cacheris is a member of the American Physical Society and Eta Kappa Nu, and is a registered professional engineer in the District of Columbia.

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Robin M. Chisholm (S'52–A'54) was born in London, Can., in January, 1930. He attended Queen's University in Kingston, Ontario, where he received the B.Sc. degree in engineering physics in 1952. Since then he has been a full-time graduate student at the University of Toronto, where he received the M.A.Sc. degree in 1954 and where, at present, he is working towards a Ph.D. degree in electromagnetic theory.

R. M. CHISHOLM

Since graduation he has worked summers for the National Research Council of Canada at Ottawa, Ontario, in radar development work.

He is a member of the Association of Professional Engineers for the Province of Ontario.

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Herbert Dropkin (A'50) was born in Brooklyn, N.Y., on July 29, 1929. He received his B.E.E. degree from the Cooper Union School of Engineering in 1950, and is now attending the Maryland University Graduate School, in College Park.

H. DROPKIN

In 1950, Mr. Dropkin was employed by the Ordnance Development Division of the National Bueau of Standards as an electronic scientist in the Electromechanical Devices Section.

In 1951 he transferred to what has subsequently become the Supporting Research Laboratory of the Diamond Ordnance Fuze Laboratories. There, he was first engaged in the development of cw altimeters. He is presently in the Ferrite Research Section studying microwave properties and applications of ferrites.

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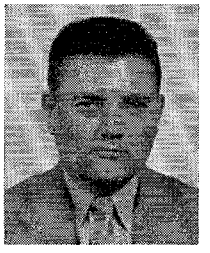
E. T. Jaynes (SM'54) was born in Waterloo, Iowa, on July 5, 1922. He attended Cornell College and Iowa State University, receiving the B.A. degree in physics from the latter in 1942. He studied in the graduate school of the University of California in Berkeley and at Princeton University from which he received the M.A. degree in 1948 and the Ph.D. degree in theoretical physics in 1950.



E. T. JAYNES

From 1942 to 1946 he was engaged in microwave research and development as a project engineer at the Sperry Gyroscope Co., in Garden City, N. Y., and in the combined research group of the Naval Research Laboratory.

Since 1950, he has been on the faculty of Stanford University, and at present holds the titles of associate professor in the microwave laboratory and lecturer in physics.

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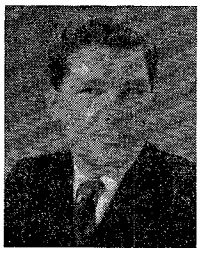
Kenneth S. Kelleher was born on December 25, 1922, in Richmond, Va. He received the Bachelor of Arts degree in Mathematics from the University of North Carolina in 1943 and the Master of Arts degree in Mathematics from the University of Maryland in 1948.

K. S. KELLEHER

From 1943 to 1953 he was engaged in the design and development of antennas at the Naval Research Laboratory. In 1953, he left his position as head of the Microwave Optics Section at the Naval Research Laboratory to accept his present position as head of the Antenna Section at Melpar, Inc.

Robin I. Primich (S'48–A'50–M'55) was born in Johannesburg, South Africa, on June 17, 1927. He received the B.S. degree in electrical engineering from the University of the Witwatersrand in 1949.



R. I. PRIMICH

From 1950 to 1954 he studied at Imperial College, London, Eng., on a scholarship from the Witwatersrand University and with financial assistance from the Department of Scientific and Industrial Research, England.

In 1954 he was awarded the diploma of Imperial College and the Ph.D. degree from the University of London. Since the beginning of 1955, he has been with the Radio Physics Laboratory, Defence Research Board, Ottawa, Can., engaged in microwave work.

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Peter D. Strum (A'45–SM'55) was born in Brunswick County, Va., on April 25, 1922. He received the B.E.E. degree with honors from North Carolina State College in 1945 and the M.S. degree in electrical engineering from Stanford University in 1947.

P. D. STRUM

Mr. Strum was an instructor at North Carolina State College in 1944 and 1945, following the completion of his undergraduate studies.

In 1947 he joined the engineering staff of Airborne Instruments Laboratory in Mineola, N.Y., where he participated in receiver research and the development of receivers, beacons, automatic direction finders, and test equipment. In 1952, he was appointed assistant supervising engineer of the newly-formed Applied Electronics Section of the Laboratory.

In May, 1955, Mr. Strum joined the staff of National Company, Malden, Mass., as chief engineer of the Receiver Department, concerned with the development of communication receivers.

Since October, 1955, he has been with Ewen Knight Corp., Needham, Mass., as director of the Radio Astronomy Engineering Division, concerned with the development of radio astronomy receivers.

Mr. Strum is a member of Sigma Xi, Tau Beta Pi, and Eta Kappa Nu.

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R. D. Tompkins was born on July 27, 1926 in Paterson, N.J. After serving as an electronics technician in the Navy during World War II, he attended Case Institute of Technology where he received the B.S. degree in electrical engineering in 1950.

From 1950 to 1952 Mr. Tompkins was employed by the Radar Division of the Naval Research Laboratory. In 1952 he left the Naval Research Laboratory to accept a position as electrical engineer for the Bethlehem Chile Iron Mines Company in El Tofo, Chile. Returning to the United States in 1954, he rejoined the staff of the Naval Research Laboratory, where he is working currently on microwave systems and techniques for the Tracking Branch of the Radar Division.

R. D. TOMPKINS

He is a member of Eta Kappa Nu.

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For a photo and biography of P. H. Vartanian, see p. 63 of TRANSACTIONS OF THE IRE, Vol. MTT-4, No. 1; January, 1956.

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James R. Wait (SM'56) was born in Ottawa, Can., in January, 1924. He attended McGill University for a brief period before enlisting in the Canadian Army in 1942. By the end of the war he was in charge of a radar maintenance group at Kingston, Ontario.

He received the B.A.S. and M.A.S. degrees in engineering physics from the University of Toronto in 1948 and 1949 respectively. At this time he was employed as a junior research engineer at the Hydro Electric Power Commission of Ontario, where he assisted in the development of an infra-red bolometer. Returning to further graduate work to the University of Toronto, he obtained a Ph.D. degree in electromagnetic theory in 1951.

J. R. WAIT

From 1949 to 1952 Dr. Wait was associated with Newmont Exploration Limited of Jerome, Ariz., where he conducted theoretical and experimental research in electrical prospecting. From 1952 to 1955 he was a section leader in the Defence Research Telecommunications Establishment in Ottawa where he was mainly concerned with theoretical problems in radiation. He has been associated briefly with McGill University during 1954 and Colorado University in 1955 where he taught graduate extension courses in electrical engineering. At present he is a consulting theoretical physicist to the Radio Propagation Engineering Division of the National Bureau of Standards in Boulder, Colo.

Dr. Wait is a member of RESA and the Canadian Association of Physicists and an associate member of the Society of Exploration Geophysicists.

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Frederick L. Wentworth (S'54–A'55) was born in Cumberland, Md. on July 30, 1924. He attended classes in McCoy College of the Johns Hopkins University, Baltimore, Md., from 1947 to 1955, when he was awarded the Bachelor of Science degree in electrical engineering.

F. L. WENTWORTH

In 1952 he joined the Radiation Laboratory of The Johns Hopkins University as a research assistant, working with problems of the proximity fuse.

In 1954 he was employed by The Glenn L. Martin Company, Baltimore, Md. as an engineer in the radio frequency section.