

Enclosure D

Report of the Committee
for the
JAMES R. KILLIAN, JR. FACULTY ACHIEVEMENT AWARD
FOR THE ACADEMIC YEAR 1982-83

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CITATION OF PROFESSOR HERMANN A. HAUS
FOR THE JAMES R. KILLIAN, JR. FACULTY ACHIEVEMENT AWARD
OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY,
FOR THE ACADEMIC YEAR 1982-83

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Presented at the Faculty Meeting of May 19, 1982

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We take pride and pleasure in announcing that Professor Hermann Anton Haus will hold the James R. Killian Jr. Achievement Award for 1982-83.

Hermann Haus has been a member of the M.I.T. community for over thirty years. In that time he has distinguished himself as an engineer-scientist and is now internationally recognized for profound and influential contributions to several different research areas. He has also become known as one of the very best teachers in the Department of Electrical Engineering and Computer Science at M.I.T. where he has been responsible for important evolutionary changes in the teaching of undergraduate courses in electromagnetism and quantum electronics. There has hardly been a semester when he has not taught an undergraduate subject, either as lecturer-in-charge, or as a section instructor. In both roles -- teacher and researcher -- he is set apart by his enormous energy and contagious enthusiasm for intellectual issues and his forthright, selfless approach in dealing with students and co-workers. He is one of those rare individuals who does everything well and makes it look easy.

Dr. Haus was born in Lubljana, Yugoslavia in 1925. He attended the Technische Hochschule, Graz, and the Technische Hochschule, Wien, Austria before getting his Bachelor of Science degree from Union College, Schenectady, N.Y. in 1949. In 1951 he received the Master of Science in Electrical Engineering from Rennsalaer Polytechnic Institute and decided to come to M.I.T. Here he earned his Doctorate of Science and joined the faculty in 1954. He was promoted to Associate Professor in 1958, to Professor in 1962, and to Elihu Thomson Professor of Electrical Engineering in 1973. He has been a

Guggenheim Fellow in 1959-60 at the Technische Hochschule in Vienna; visiting McKay Professor at the University of California, Berkeley, in 1968; visiting member of technical staff at Bell Laboratories, Holmdel, N.J., in 1974-75; and visiting Professor at the Tokyo Institute of Technology in 1980.

As a graduate student, Dr. Haus became an important and respected member of the annual Microwave Tube Conference and gained national recognition. In his doctoral work, and in work that followed shortly thereafter, he produced the definitive analysis of noise fluctuations in electron streams. His classic papers on this subject were, as all his work has been since, fundamental, important, analytically sophisticated and complete, yet clear and focussed on the key issues. By 1956, two years after his Doctorate of Science, he was chairman of the Institute of Radio Engineers Sub-Committee on Noise that established standards for methods of noise measurement.

The impact of Haus' analyses and noise in circuits and electronic devices has extended well beyond the field of electron beams. He introduced the "noise measure" into engineering vocabulary and developed corollary theorems that made possible optimization of linear networks and negative resistance amplifiers. As new technologies emerged, he managed to stay a step ahead of everyone else, publishing definitive analyses of signals and noise for a variety of semiconductor devices including Gunn diodes, Impatt diodes, Metal-Semiconductor-Metal diodes, and GaAs field-effect transistors. His work on the latter is now classic and is used in everyday circuit design and noise computation. Hermann is also responsible for early and influential theories of fluctuation and relaxation phenomena in laser oscillators and amplifiers.

The hallmark of Dr. Haus' analytical work is that it goes beyond solving the question of the moment. Always eager to formulate an original, more fundamental approach to a problem, he regularly generates new insights and analytic tools with considerably wider application than the immediate. As one supporter of his nomination commented, "It seems that

in essentially every subject in which I become interested, I find there is some fundamental, important, solid, absolutely clear paper that has his name on it."

Creative and productive in applied theoretical work, Dr. Haus has always had his feet firmly planted in the real engineering world. Many of his publications represent novel and sophisticated experimental efforts, including the first measurements of noise in a laser oscillator and the first generation of picosecond pulses with semiconductor lasers. His talents enable him to bridge the gap between fundamental science and engineering applications -- regularly putting novel engineering concepts on firm theoretical ground, and where necessary, developing new methodologies to clarify and extend understanding.

During the mid-60's Dr. Haus continued to develop his analytical interest in the interaction of electromagnetic fields with matter. His studies of electrodynamics of moving media are still widely recognized and admired for their elegance and thoroughness. One important outcome was the resolution of a long-standing theoretical controversy concerning electromagnetic forces on matter. These studies also provided a basis for subsequent investigations of nonlinear optical phenomena, including his own well known theoretical and experimental analysis of self-modulation and self-focusing of laser beams.

In the 1970's Dr. Haus became interested in the modelocking of lasers for short pulse generation. Here too, he quickly identified critical issues, developed a novel, original approach, and was able to accomplish what had eluded others for many years: analytical predictions of pulse shapes and pulse durations for a variety of laser systems. His theories for active modelocking and passive modelocking with different types of saturable absorbers provide the necessary foundation for further work in this field.

On sabbatical at Bell Laboratories in 1975 Dr. Haus refined these ideas and developed a new, truly inventive proposal to extend short (picosecond) pulse technology to practical

semiconductor systems. Returning to M.I.T. he began an experimental effort that produced, in 1978, the first mode-locked semiconductor diode laser and the world's shortest light pulses from a semiconductor device. This pioneering work, widely considered to be among the most important in the field, literally triggered an explosion of interest and research activity around the world. Dr. Haus has been the driving force behind M.I.T.'s expanding activity in the area of picosecond optics. His most recent work on ultra-high speed switching in optical waveguides offers yet further promise for the application of picosecond technology to communications and signal processing.

Hermann Haus' publications include over 100 papers and four books. After 30 years, his scientific output shows no sign of slowing down. Within recent years he has been invited to present his work at virtually every major conference and symposium on laser and quantum electronics and at universities around the world. He is a member of Sigma Xi, Eta Kappa Nu, Tau Beta Pi, and the American Physical Society; is active on committees of the Institute of Electrical and Electronics Engineers; and has served on the editorial boards of several journals. He was recipient of the Western Electric Fund Award in 1970 and has been elected Fellow of the Institute of Electrical and Electronics Engineers, Fellow of the American Academy of Arts and Sciences, and Member of the National Academy of Engineering.

This brief review of Hermann Haus' accomplishments cannot possibly do justice to all of his professional activity, but it should engender some appreciation for his energy and intellectual influence. This same energy and enthusiasm for new ideas are evident in his personal interactions as well. Between scientific activities he can be found hiking, biking, skiing, eagerly discussing a new book, or dragging students and colleagues off to an art exhibit. It is with warm appreciation for these contributions to the quality of life at M.I.T., as well as for his professional achievements that we present him this award.