

Arthur Houghton Burr

May 27, 1908 — November 5, 1993

Over sixty years of dedicated service to mechanical engineering, mechanical engineering education, and mechanical engineering educators came to an end on November 5, 1993 with the death, due to congestive heart failure, of Arthur Houghton Burr, Hiram Sibley Professor Emeritus, in Austin, Texas. Art was born in Worcester, Massachusetts, where he attended schools through graduation from Worcester Polytechnic Institution in 1929, earning the degree of B.S. in Mechanical Engineering, with Distinction.

Art then accepted a position as Research Engineer at the Research Laboratories of the Westinghouse Electric Company, East Pittsburgh, Pennsylvania. His work there was primarily related to investigating the mechanisms of gear-tooth failure. His experimental study of surface pitting was particularly important in that he was the first person to obtain pitting under laboratory conditions. He began graduate study in a joint program between the Westinghouse Mechanical Design School and the University of Pittsburgh, from which he received the degree of M.S. in Mechanical Engineering in 1931. He then began the somewhat daunting task of looking, in the depth of the depression, for a teaching position at an engineering college. In 1933, he found a position as Instructor in Mechanical Engineering at the Rice Institute (now William Marsh Rice University) in Houston, Texas. This was the beginning of Art and Phyllis Burrs' love affair with the Southwest, and it was also an excellent opportunity for a beginning teacher in mechanical engineering. The school was small and Art taught practically every course in the field. He also gained valuable practical experience working part-time during the winter and full-time during the summers with local companies, such as the Emsco Derrick and Equipment Company and the Houston Lighting and Power Company. In the late 1930s, Art began part-time study towards the Ph.D. degree in Engineering Mechanics at the University of Michigan and started looking around for another teaching position, as the depression was still on in Texas. In 1941, he accepted a position as Assistant Professor at the University of Missouri, Columbia, where he taught courses in machine design, metallurgy, advanced strength of materials, and mechanical vibrations. In 1944, he was promoted to Associate Professor and took a leave of absence to join the war effort at the Aerial Measurements Laboratory at Northwestern University where, in June 1945, he was promoted to Executive Officer (Chief Engineer and Assistant Director).

The year 1947 was a time for momentous decisions for almost everyone. In Art's case, it was the perfect time for redirecting his career, since he had received his Ph.D. degree from Michigan and the Aerial Measurements

Laboratory was winding down. His move was to accept an offer from Cornell University to become Professor and Head of the Department of Machine Design in the Sibley School of Mechanical Engineering—a move that was most fortuitous for Cornell and those of us who came to Cornell to study and/or teach.

In 1947, there were still eight semi-autonomous departments in Mechanical Engineering, the result of the College of Engineering being formed in 1921 by the consolidation of the Colleges of Civil and Mechanical Engineering. The school was faced with accommodating a horde of highly-motivated veterans returning to complete their educations for the existing four-year bachelor's degree while simultaneously admitting a freshman class entering a new, not completely defined, five-year program. The department had lost four senior professors due to retirement and departing for other positions. Upon his arrival in September 1947, Art found the remaining staff, three professors and two instructors, was being augmented by the hiring of an associate professor and four instructors. The professor came from a “high-tech” industry (aircraft engines) and the instructors were veterans with one or more degrees and considerable practical experience. Instructors were hired, generally, as full-time teachers with the opportunity for doing graduate work. There were no teaching assistants. Since the four departmental required courses were upper-class courses, Art had some time for hiring the necessary additional staff.

The rapidity with which the collection of individuals with widely different interests, backgrounds, and capabilities was transformed into a cohesive educational department can only be attributed to Art's managerial style—which in essence was to be supportive in every way possible while providing the maximum practical freedom for independent thinking and action. Engineering at Cornell was a textbook example of democracy in action. Instructors were members of the faculty in all matters related to undergraduate programs and extra-curricular activities. For a number of years there were no large lecture sections and often there would be more instructors than professors teaching the multiple-section required courses. In several instances, instructors were responsible for single-section courses, and in one multiple-section course, an instructor was in charge of the course scheduling and putting together the common prelims. The main consequences of this mode of operation, encouraged by Art, were the many discussions—often heated—at lunch and at department meetings and the almost continuous, slow change in course content and emphasis.

Before 1948, there were few elective courses and almost no graduate courses, in machine design at any American school. Art had become convinced that there was a need and a place for a “real” graduate program in machine design; one of his immediate goals was to set up such a program. By 1949, the existing elective course, “Advanced Machine Design”, had been augmented by five courses covering topics from creative design through kinematics

and vibrations to laboratory work in machinery development. These courses were built upon the unique areas of knowledge brought in by instructors as well as professors. The courses related to vibrations and machinery development were among the very first courses to utilize the “war-effort developed, state-of-the-art” instrumentation in college laboratory studies of machine elements and machines.

Historically, research in the department had been sporadic, at best; another of Art’s goals was to get the department involved on a continuous basis. Pure luck led to a quantum jump in research when in the fall of 1947 the National Advisory Committee for Aeronautics (NACA, now NASA) approached a number of universities with the idea of sponsoring experimental and theoretical research on high-speed journal bearings, an area of great importance in relation to the recently developed aircraft gas turbine engine. Art immediately saw that Cornell was the ideal place, because the professor just hired from the aircraft engine industry, George B. DuBois, was the ideal person to head up such a project. The selection committee wasted little time in awarding the contract to Cornell. In a few years the Department of Machine Design was recognized as one of the world’s leading centers for lubrication research. Practically everyone in the department, including Art Burr, was actively involved at some point in the eleven-year life of the project. Theoretical lubrication research continues to this day.

The turnover in staff, the returning older veterans, the influx of highly selected high-school graduates, and a legal age of eighteen for drinking alcoholic beverages combined to make Cornell a very socially active place with almost weekly meetings of student organizations and faculty groups, but they were all eclipsed by the Department’s social activities—which had to meet the standards of Phyllis and Art Burr! In effect, the Burrs adopted the entire department, including families. The fall, winter, and spring outdoor activities were wonderful opportunities for families to get to know each other and the annual Christmas party (for adults) at the Burr home was the event of the year. Phyllis and Art were the consummate party givers and party goers!

Art was highly professionally oriented. He was a registered professional engineer in Illinois and he was active, locally and nationally, in the American Society of Mechanical Engineers (ASME) and the American Society for Engineering Education (ASEE). His deep sense of responsibility carried over to the mechanical engineers working in the region around Ithaca; he was a mainstay in the operation of the Southern Tier Section of ASME throughout his years in Ithaca. Art (and the School and the College) considered participation in activities of professional societies to be significant contributions to the educational program and he strongly encouraged participation by his staff.

Art was a consultant for a number of operations, notably the Cornell Aeronautical Laboratory, the Edlund Machine Company and the Boeing Airplane Company; but his major concern, along with being department head, was the education of students for careers in the broad field of machine design—or mechanical design as it was being renamed. He loved all aspects of teaching mechanical design—from collecting broken, deformed, or worn-out parts to show students, to organizing plant visits, to writing extensive volumes of classroom notes for use as up-to-the-minute textbooks for the required courses, “Design of Machine Elements” and “Design of Machines”. The notes were published, in effect, by the department. Art was the sole author of Mechanical Design Parts I and II, which first came out in 1952, and co-author with Professor DuBois of Parts III and IV, which first came out in 1955. The McGraw-Hill Book Company approached Burr and DuBois and a contract was signed. The book was never published for the simple reason that Art, a perfectionist, never reached the point where he could conclude that this was the best he could do and turn the manuscript in for publication. Although this was unfortunate for mechanical engineering education in general, for Cornell public relations, and for the financial well-being of the authors, it was beneficial for Cornell students in that they, in effect, had a new edition to use every year or so.

In 1953, Art was appointed the Hiram Sibley Professor of Mechanical Engineering.

The Burr family spent the academic year 1953-54 on sabbatical leave in Brazil where Art was a Visiting Professor at the Instituto Tecnológico de Aeronáutica, São José dos Campos, São Paulo. Their love affair with the Southwest had really gone south!

The appearance of Sputnik (and the resulting flood of U.S. government money for research), the development of the digital computer, and changes in the deanship of the college resulted in many educational and structural changes in engineering at Cornell. By 1965, when the undergraduate program was changed back to a four-year program, the number of departments in the Sibley School had decreased to three and the Department of Machine Design had become the Department of Machine Design and Manufacturing Processes. Several structural changes occurred in 1967 when administrative appointments were changed to term appointments from “lifetime” appointments, the Department of Industrial Engineering and Operations Research became the School of Industrial Engineering and Operations Research, and the remaining two departments—Machine Design and Manufacturing Processes and Thermal Engineering—became more autonomous than before. Professor Burr relinquished being Head of the Department and in 1969 the Department was renamed Mechanical Systems and Design. In 1972, the departments disappeared completely when the Schools of Aerospace and Mechanical Engineering combined to become the Sibley School of Mechanical and Aerospace Engineering.

Upon his return from Brazil, Art had foreseen many of the approaching changes and he began to concentrate his efforts on the upper-class/graduate level courses, “Advanced Mechanical Analysis” and “Mechanical Vibrations”. He had already concluded that at least at the graduate level, a course in mechanical design should be organized in terms of the principles of mechanics involved rather than in terms of named machine elements. The first edition of his new notes, *Advanced Mechanical Analysis*, was privately published in 1967 and the third edition in 1972.

Art spent the summer of 1966 as a Visiting Professor at the Pontificia Universidade de Catolica, Rio de Janeiro, Brazil. In August 1968, the Burrs began a long-delayed sabbatical leave that became an extended trip around the world with sightseeing intermixed with visits with past students and active teaching and consulting at several major universities; His appointments during this period were: (a) from August 1968 to December 1969, as Ford Foundation Visiting Professor at the Universidad de los Andes, Bogata, Colombia; (b) from January to April 1970, as Visiting Professor at the Indian Institute of Science, Bangalore, and (c) from April to June 1970, as Professor and Consultant at the Indian Institute of Technology, Bombay, and the P.S.G. College of Technology, Coimbatore, India.

With retirement approaching, Art and Phyllis began looking for the ideal situation in the ideal place—considering they wanted to be “South of the Border” and Art wanted to keep active professionally, with his major effort being directed towards preparing an expanded version of *Advanced Mechanical Analysis* for publication by a major publishing company. The newly established Universidad de los Americas at Puebla, Mexico appeared to offer everything the Burrs had hoped. Upon arrival, Art was appointed head of the department as well as Professor of Mechanical Engineering and thus was faced with all of the start-up problems of a new school. This was a time of student unrest in Mexico, too, and the University was essentially an armed camp. Art, and Phyllis, decided this was not really “Eden” and in 1976 he resigned from the University and they moved to Guadalajara, Mexico.

In 1981, his book, *Mechanical Design and Analysis*, was published by Elsevier. Although quite respectable, the response was not up to what Art had hoped for; the idea and the book were ahead of the times. However, the University of Texas, Austin was more forward looking and Art was contacted by a professor—who had received his Ph.D. at Cornell, with his dissertation in the area of lubrication—to see if he would be interested in an appointment as an adjunct professor. Art was delighted! This would be his first opportunity to teach using his new “hardcover” book, there would be no more trips back to the States for access to the quality of technical library needed for his work on the second edition of his book and for access to quality medical care, he would have an office and daily professional and social contact with friends of many years, and there would be no more hassles with the Mexican

bureaucracy. The Burrs moved to Austin in 1983 and Art served as an Adjunct Professor from 1984 to 1992. Always looking ahead, Art decided that a co-author would be a good idea for the second edition of *Mechanical Design and Analysis* and his choice was Professor John B. Cheatham, William Marsh Rice University. The new edition was scheduled for publication by Prentice-Hall in the spring of 1995.

Art was a Life Fellow of ASME, a Life Member of ASEE and a member of the honor societies Sigma Xi, Tau Beta Pi, Pi Tau Sigma, and Phi Kappa Phi.

He is survived by his wife Phyllis (Carter) Burr of Austin, Texas; three children; six grandchildren; and a sister. His son, Arthur H., Jr., is a biology professor at Simon Fraser University, Vancouver, British Columbia, Canada; daughter, Merrill (Burr) Hille, is a biology professor at the University of Washington, Seattle; and son, T. Shepard, is a certified public accountant in Orlando, Florida.

Art Burr will be remembered for his stellar performances as mechanical engineer, department head, teacher, author and colleague, but those who worked most closely with him will always think of him first as a true best friend.

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