

**MEMORIAL RESOLUTION OF THE FACULTY
OF THE UNIVERSITY OF WISCONSIN-MADISON**

ON THE DEATH OF PROFESSOR EMERITUS ARTHUR SCOTT LODGE (1922-2005)

Arthur Scott Lodge was born on 20 November 1922 in Liverpool, United Kingdom, and spent his childhood there. He attended Oxford University during the period 1941 to 1948, earning his B.A. in mathematics and his M.A. and D.Phil. in theoretical nuclear physics. He did experimental work with radar for the Admiralty at the Clarendon Laboratory.

He spent a year (1945-1946) in the theoretical physics section of the Atomic Energy Division of the National Research Council in Montréal, Canada. This was followed by twelve years at the British Rayon Research Association in Manchester (UK), initially with Karl Weissenberg. Arthur had been introduced to Dr. Weissenberg by his thesis adviser Professor Maurice Pryce, and for this Arthur had been especially grateful; this introduction enabled him to enter the field of rheology when it was just beginning to blossom—the field that occupied his entire research and teaching career. From 1961 to 1968 he held a lectureship in the Department of Mathematics at the University of Manchester Institute of Science and Technology (UMIST). During that period he took time out (1965-1966) to lecture and do research at the University of Wisconsin in Madison. This resulted in his being invited to return to Madison in 1968 as professor of rheology in the Department of Engineering Mechanics, a position that he held until retirement in 1991. From 1969 until 1991, he served as founding chairman of the Rheology Research Center Executive Committee at the University of Wisconsin. Even in retirement, he took an active part in the Friday seminars of this Rheology Research Center. While at Manchester and at Madison, he directed the research of a total of 18 graduate students.

One reason that he was invited to the University of Wisconsin was the appearance in 1964 of his first book *Elastic Liquids*, published by Academic Press (Russian edition, 1969; Japanese edition, 1975). In the view of Professor R. B. Bird, this book was the first on rheology to clarify the structure of the subject and establish the aims of the discipline. In this book, the “Lodge rubberlike liquid” constitutive equation was introduced, and used to solve a wide variety of flow problems. For the linear viscoelasticity of polymeric liquids, this equation explained everything that could be reliably measured at the time, and for years to come. Furthermore, an exhaustive study of recoil was presented. Professor Lodge also showed how other more complicated constitutive equations could be developed and tested.

His second book *Body Tensor Fields in Continuum Mechanics, with Applications to Polymer Rheology* (Academic Press) developed further the notion of “body tensors,” which had been introduced in his earlier book. The techniques introduced here enable one to solve classes of problems that would be otherwise difficult. The body-tensor formalism is closely related to the convected-component formalism of J. G. Oldroyd (presented in 1950). The relation between the two types of notation were stated by Lodge in 1951 and proven in 1972.

Later he published the modest book *An Introduction to Elastomer Molecular Network Theory* (The Bannatek Press, Madison, Wisconsin), in which he presented some of his original ideas dealing with the molecular foundations of elastomer network theory. In the preface he states: “The distinctive aim of the present textbook is to develop these tools from first principles, in as short, yet complete and self-contained, a form as possible to allow one to illustrate their use by presenting the assumptions and deriving the equations for the simplest form of the molecular network theory of elastomer elasticity.” By “these tools” he meant vector and tensor analysis, thermodynamics, and statistical mechanics. In this text, Lodge has gone out of his way to define all terms and to choose his words carefully. He liked to quote Lewis Carroll (1872), who wrote: “When *I* use a word,” Humpty Dumpty said, in a rather scornful tone, “It means just what I choose it to mean—neither more nor less.”

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Besides the above three single-authored books he edited a volume entitled *Viscoelasticity and Rheology* along with Michael Renardy and John A. Nohel of the Mathematics Research Center at the University of Wisconsin.

A measure of Arthur Lodge's influence on the field of rheology is the number of terms that bear his name: the Lodge rubberlike liquid; the Lodge network model; the Lodge stressmeter; the Lodge-Meissner relation; the Higashitani-Pritchard-Lodge equation (for the hole-pressure error); Lodge body tensors.

Arthur Lodge's talents and scientific contributions have been acknowledged in many ways:

- 1965 Fellow of the Institute of Physics, London (UK)
- 1971 Bingham Medal, The Society of Rheology
- 1975 Visiting Professor, University of Stuttgart Institute of Plastics Technology
- 1980 Byron Bird Award, College of Engineering, University of Wisconsin
- 1981 "Citation Classic" for *Elastic Liquids*
- 1982 Gold Medal, British Society of Rheology
- 1991 Olaf Hougen Visiting Professor, Department of Chemical Engineering, University of Wisconsin
- 1992 Elected to the National Academy of Engineering

Lodge's efforts were also appreciated in connection with a variety of activities. From 1970 on, he was a member of the editorial board of *Rheologica Acta*, and in the period 1973-1984 he was a member of the working party on "Structure and Properties of Commercial Polymers," IUPAC Macromolecular Division. In 1981, he formed the Bannatek Company, Inc., to manufacture "stressmeters" (USP 4,454,765, 4,141,252, 3,777,549). He developed these instruments to monitor polymer properties by cleverly using the normal stresses of the polymers. This development is a great tribute to his skill as an experimentalist.

Most of his friends have at one time or other been victimized by Arthur's side-splitting limericks, which were invariably cleverly constructed. He could synthesize these literary gems in very short order, much to the enjoyment of all. Arthur's special hobby was piano, and particularly performing works by Schubert and other romantic composers. He also enjoyed chamber music, frequently collaborating with other musicians.

Arthur also maintained a web page devoted to controversial subjects. He particularly enjoyed challenging Darwin-like theories. Other topics he has discussed are comparisons of science and religion, types of laboratory experiments, compost temperatures, zero-recoil for the "tube type" of polymer kinetic theories, and "unlikely events" theories.

Arthur and his wife, Helen, had three children: Keith (a professor of chemical engineering at the University of Minnesota-Duluth), Timothy (a professor of chemistry at the University of Minnesota in the Twin Cities), and a daughter, Alison, living in England. Their home in Madison was the location of a number of delightful get-togethers for rheologists and their students, for musical groups, and for literary events. The Lodges were always warm-hearted hosts, and their friends enjoyed many an afternoon or evening in their company. With Arthur's passing 24 June 2005, we lost a solid scholar, a humorous and kindly gentleman, and a thoughtful teacher.

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