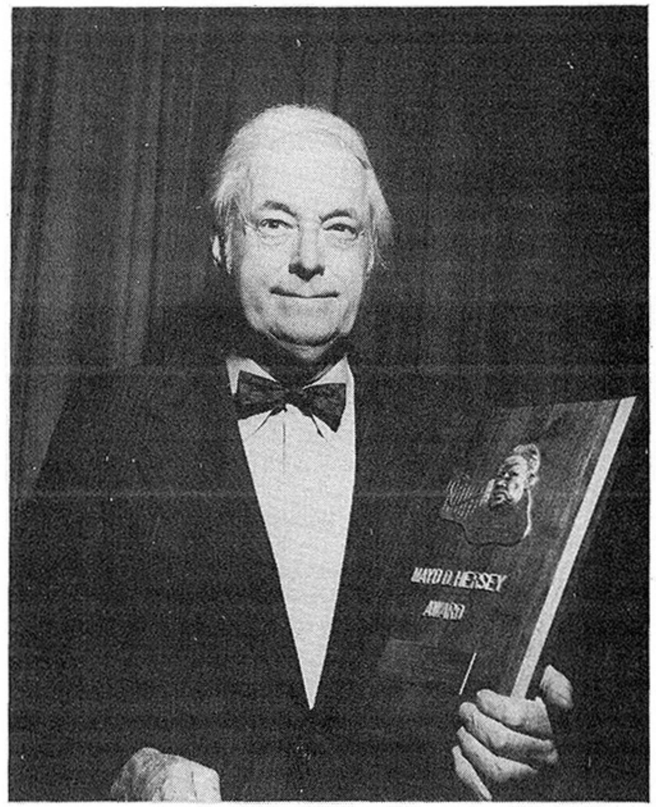
# MAYO D. HERSEY AWARD

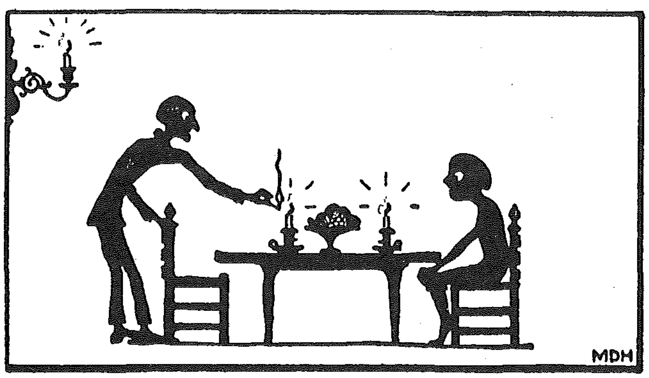
*Mr. John Boyd received the Mayo D. Hersey Award at the 97th ASME Winter Annual Meeting. It was presented at the President's Luncheon. The Technical Editor asked Mr. Boyd to write an article on the highlights of his career in the field of lubrication and to present a short history of his work and of his involvement in professional societies in which he was most active and innovative. We are grateful to Mr. Boyd for this material on his long and distinguished career and on the honors that he has received "For his pioneering and sustained contributions to the theory and practice of lubrication engineering."*




JOHN BOYD

My first association with Mayo D. Hersey, the man whom we honor through this award, was towards the end of World War II. At the Oak Ridge Laboratories as well as at other places, the shortage of tin and its replacement with lead arsenic babbitt had given rise to babbitt corrosion problems. Mayo Hersey was called in as a consultant. A trip was made to the highly secret plant at Oak Ridge. However, it was not until after the atomic bombs had fallen on Hiroshima and Nagasaki a few days later that the underlying purpose of the extensive installation at Oak Ridge was revealed.

After the war, my contacts with Mayo Hersey continued largely through the ASME Special Research Committee on Lubrication and more recently through his practice of drawing, printing, and illuminating his Christmas cards as shown by the example taken from his card of 1929.




Merry Christmas and a Bright New Year
from Frances and Mayo Hersey

**Recollections**

Some of the highlights of my connection with the field of lubrication related to the projects in which I was associated at Westinghouse.

In early 1945 we were interested in applying molybdenum disulfide and other solid lubricants to special lubrication problems. The properties of these remarkable materials were little known at the time. We were among the first to determine the shear strengths of these materials under high pressure loadings. This was done by placing the material in hardened anvils and rotating one surface relative to the other while recording the torque.

At about the same time, we became quite interested in the basic phenomena and mechanics of lubricating films. We found that the basic characteristics such as the formation of the pressure distribution, the film thickness, and fluid friction could be demonstrated and studied using transparent plastic models. We built many of these and gave many lectures on lubrication mechanics using these models for emphasis. I also found them useful in the lectures that I gave at the University of Pittsburgh on principles of lubrication while acting as an adjunct professor. This was way back when few, if any, other colleges or universities recognized the importance of this science which now goes under the rather sophisticated name of tribology. This pioneering effort in transparent models also led to one of the first movies ever made to explain and instruct basic lubrication principles. I recall making this in-house with my own camera using my colleagues as actors.

In the late 1940's, aircraft jet engines were in their embryonic stages. There were no rolling contact bearings which could operate for more than a few minutes at the speeds and loads which were required at that time. At first, sliding type bearings were used, while research was undertaken to develop suitable ball and roller bearings. We ran many tests to develop oil flow and temperature characteristics of both sleeve and tapered land thrust bearings for these engines. They worked quite well but were limited by their inability to function with a temporary interruption of lubricant as would occur in combat conditions. However, the problem was resolved with the design of special cage and roller materials, working closely with an antifriction bearing manufacturer.

In 1951 it became clear that basic design data for applying bearings was rather scarce and extension of the work of Kingsbury, Needs, and Howarth was required. We prepared initial design charts for journal bearings using approximate correction factors to account for side leakage. Work was done to improve these correction factors by applying resistance network techniques. However, these were abandoned with the advent of the digital computer and numerical solutions were obtained. These led to the publication of basic design charts for both journal and thrust bearings.

Later we carried out similar design and analysis of pivoted pad journal bearings. This was the first time that this bearing was ever analyzed and its properties compared with more conventional types. The peculiar property of spragging of the unloaded pads was identified and techniques for preventing its occurrence presented.

As nuclear power came into the industrial scene, the need for lubrication with the process fluid became important. With Westinghouse concentrating on a pressurized water system, it was necessary to develop water lubricated bearings. We did an extensive amount of work on bearing design and materials. Carbon graphite proved to be an excellent material for both sleeve and thrust bearings. The small film thickness with which these bearings operated required careful attention to such design characteristics as the surface profile and pivot position in thrust bearings. We published several papers stressing these points. Basic work was also done at this time concerning the design of hydrostatic journal bearings. Circumferential leakage and shaft rotation effects were found to be very important. Much of the technology on process fluid lubrication was applied in the development of the first atomic submarine Nautilus. This ship made the first traverse of the polar ice cap. In 1961 the companion submarine Triton circumnavigated the globe.

I recall several problems associated with the SS United States which captured the Atlantic Blue Ribbon in 1950. I participated in sea trails of this great ship in which she developed speeds "in excess of 40 knots." The wiping and crazing of the high pressure turbine bearings was a severe problem but was resolved by an improvement in the bearing design. Later in life I encountered her in the Caribbean while traveling on the SS Argentina. It was truly a great experience.

Another naval experience which stands out is the work on the warship USS Saratoga. The journal and thrust runner of the main propulsion turbine were worn to an alarming degree. The wear was diagnosed as wire-wooling, now usually and aptly described as machining-type wear. Some rather basic work which we conducted showed the strong interaction between the material-lubricant couple in the presence of debris or contaminants which led to successfully resolving the problem.

In the late 1950's, we became interested in damage to bearings caused by stray electrical currents. These currents were always prevalent in motors and generators, unless special design precautions were made. An extensive amount of work was done to identify the typical damage wrought by stray currents, and to determine the causes and techniques for their control. A basic series of papers were published on this phenomena that are probably still useful today.

I have always been an active participant in Society activities such as those carried out by ASME and ASLE. I recall joining ASLE in 1945, only one year after the Society was founded, and immediately became involved in its embryonic activities. In 1949, as a member of the Education Committee, I helped compile a glossary of lubrication terms and one year later became Chairman of the Bearings and Bearing Lubrication Committee, which was a unit of the new technical committee structure of the Society. From 1951 to 1954, I served as both a Director of ASLE and Chairman of the Pittsburgh Section.

In 1954 I became President of ASLE. We started the ASLE-ASME Lubrication Conferences and arrangements were made with McGraw-Hill for publication of the *Standard Handbook of Lubrication Engineering*. In 1956, we assisted in developing and promulgating a viscosity classification system for industrial lubricants which resulted in the present ASTM recommended practice. During my tenure as the first editor of the Society, *ASLE Transactions* and Special Publications were initiated; also the *Handbook* was completed.

Upon retirement from Westinghouse, I signed up with the International Executive Service Corporation to provide technical assistance to developing countries and in September 1974 was asked to go to the Korea Bearing Company in Souel, Korea, to assist them in developing a new line of tapered roller bearings. It was an interesting experience. I found that the people in South Korea like Americans and appreciate what the Americans had done for them.

**John Boyd**

*EDITOR'S NOTE:* Mr. Boyd was an employee of Westinghouse Electric Corporation for 42 years and held the position of Manager, Bearings and Lubrication Section, at the Westinghouse Research Laboratories in Pittsburgh. For the last three years he served with the Electro-Mechanical Division and as a consultant on special problems.

Mr. Boyd received the ASLE Hunt Award in 1959; in 1960 he received the National Award; and in 1969 he became a Fellow of ASLE. Soon after this he was elected a Fellow of ASME.