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PROFESSOR ALEXANDER LOUIS LONDON

On his 65th Birthday

THE 65th birthday of Professor A. Louis London of the Department of Mechanical Engineering at Stanford University, Stanford, California was on 31 August 1978.

Professor London was born in Nairobi, Kenya. His Lithuanian father and German mother brought the family (four sisters and a brother) to the U.S.A. in 1921. His father, after 25 years of ostrich raising and coffee exporting, decided to retire at the age of 45 and raise the family in the country to which he immigrated in 1876. Professor London received his primary and secondary education in the Oakland, California grade schools and Oakland Technical High School, graduating in 1931 and entering the University of California shortly thereafter.

After receiving his B.S. at the University of California in 1935, he worked for a year at the Standard Oil Company of California and then taught for a year at Santa Clara University. In 1938, he received his M.S. at the University of California prior to coming to Stanford.

Professor London has been at Stanford since 1938, except for three years during the Second World War, when he was at the Bureau of Ships, Washington, DC, working on new developments in marine propulsion machinery and power auxiliaries. He was Director of a 24 year program (1947–1971) sponsored by the Office of Naval Research, concerned with many heat transfer and thermodynamic investigations. He taught graduate and undergraduate courses in heat transfer, thermodynamics, and propulsion systems at Stanford and a course on compact heat exchangers at various A.S.M.E. conferences.

Leaves of absence from Stanford included experience in nuclear reactor engineering at the Argonne National Laboratories and vehicular gas turbine research and development at General Motors Research Laboratories. His participation in A.S.M.E. activities include the Heat Transfer and Gas Turbine Divisions, leading to chairmanship of the Gas Turbine Division in 1966–1967.

Professor London demanded a lot of work from his students. He insisted on relating analysis to basic principles, he provided insight into engineering utility and emphasized problem solving methodologies. His insistence on rigor and completeness was backed up by a limitless supply of red ink! He became famous as a 'tough' teacher at Stanford. Even those who complained about the work appreciated the careful thought that Professor London put into the grading of each problem set. From personal experience, I say that a course from Professor London was an unforgettable experience. The influence of his teaching can be found clearly in the textbooks written by some of his students, such as *Convective Heat and Mass Transfer* by W. M. Kays, *Thermodynamics* by W. C. Reynolds, *Engineering Thermodynamics* by W. C. Reynolds and H. C. Perkins, and *Conduction Heat Transfer* by G. E. Myers.

In choosing graduate students for research, he urged that they complete an Engineer degree first (1–2 years beyond M.S.) before deciding on further work leading to a Ph.D. degree. Many of his students are now well known in the heat transfer field. The following is a list of his Ph.D. students: W. M. Kays (1951), C. R. Garbett (1952), J. E. Coppage (1953), P. F. Pucci (1955), L. S. Tong (1956), M. Larson (1961), F. Tippets (1962), J. Bush (1963), J. W. Mitchell (1963), D. E. Metzger (1964), R. K. Shah (1972) and A. Montakhab (1978). The following is a list of his Engineer degree students: J. T. Brewster (1940), E. Gallagher (1941), D. Lockwood (1941), W. Rafert (1950), A. L. Johnson (1955), W. H. Comtois (1956), D. Johnson (1959), J. W. Mitchell (1959), D. Pefley (1960), J. C. Schulz (1961), D. E. Metzger (1962), T. Sorlie (1962), H. Fandrich (1964), D. Walz (1965), R. J. Moffat (1966), T. Wheeler (1968), D. W. Kearney (1968), I. Correa (1969), J. C. LaRue (1969), G. Klopfer (1969), M. B. O. Young (1969), A. Montakhab (1970), R. K. Shah (1970), H. Watanabe (1970), J. Stang (1971), P. G. Parikh (1971), F. G. Borns (1975), O. B. Koropey (1975), M. A. Ait-Ali (1975), K. M. Peery (1976), J. C. Eastwood (1976), R. Iregui (1978) and K. Abachi (1978).

Professor London has authored, or co-authored with his students, 52 technical papers which have been published in various journals (listed at the end). In addition to heat transfer papers, his papers include free piston engines, combined cycles of gas turbines with free piston engines, air coolers for high power vacuum tubes, and energy recovery from geothermal reservoir. He has co-authored two monographs, *Compact Heat Exchangers* with Professor W. M. Kays and *Laminar Flow Forced Convection in Ducts* with Dr. R. K. Shah. He was also the Project Supervisor of 80 technical reports prepared for the Office of Naval Research 24 year program at Stanford.

Professor London received a Gas Turbine Power Division award Testimonial of Appreciation in 1958 for his efforts in the advancement of the gas turbine art. He received an A.S.M.E. Heat Transfer Division Memorial Award in 1962 in recognition of his contributions to the design and analysis of compact heat exchangers. He was the first recipient of the A.S.M.E. Gas Turbine Power Award in 1964 for his three-part series best paper on compact heat exchangers published in *Mechanical Engineering* in May, June and July 1964. He has also received the R. Tom Sawyer Award of the A.S.M.E. Gas Turbine Division in 1977 for his contributions in gas turbine technology and leadership in the activities of the Division.

Professor London is a registered professional engineer in the State of California. He is a Fellow of the American Society of Mechanical Engineers, and a Member of the American Society of Engineering Education, American Association of University Professors, and American Society of Naval Engineers. He has been recently elected as a member of the National Academy of Engineering.

As I visualize, in addition to the above list of impressive accomplishments, the success of Professor London's career is based on his foresight as to future important engineering problems, involving himself in all technical details of a problem, and his persistence in finding a satisfactory solution. He has earned an outstanding reputation in both industrial and academic circles for his ability to provide sound technical guidance and understanding through personal dedication and a desire to really help people. His contributions to mechanical engineering and in particular compact heat exchanger literature have had a far reaching influence on engineers and industry. He is the proponent of the widely known effectiveness-number of heat transfer units ($\varepsilon - N_{tu}$) method of heat exchanger design. His 1942 unpublished paper with Professor Ralph Seban on this subject is included after this article for its historical significance.

The Mechanical Engineering Department at Stanford recognized Professor London's long years of service and his unique contributions to Stanford and engineering community by celebrating A. L. London Day at Stanford on 12 May 1978. The day was organized with a morning and afternoon technical program followed by a banquet. Over 150 faculty members and former students from all over the country attended this program. The A. L. LONDON FUND was established to maintain important values he seeded in the Stanford program in mechanical engineering. In keeping with the wishes of the founding contributors, income from the fund will be made available to Professor London to assist him in his postretirement writing, research, and other professional activities. Thereafter, the fund income will be used in perpetuity to provide fellowship support in his name to outstanding graduate students.

Since September 1978, Professor London has retired from active teaching and is devoting his efforts to a backlog of unfinished projects. We hope he continues active research for many years to provide his expertise to industry and the mechanical engineering profession. We also expect that he will spend more time on his hobbies of golf and gardening. We wish continued good health to him and his family including his dear wife Charlotte Marie, his sons Charles Alexander and Allan Paul, and his daughter Deborah Marie.

R. K. SHAH

LIST OF THE PUBLICATIONS BY PROFESSOR LONDON

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