

Memorial Resolution On Behalf of William Hill Reid

Prof. **WILLIAM HILL REID**, a prominent physical applied mathematician, passed away on January 31, 2016 at age 89 with his loving family by his side. Prof. Reid is recognized worldwide for his many lasting contributions to the fields of fluid dynamics and hydrodynamic stability, especially for his pioneering development of elegant asymptotic techniques for the analysis of the stability of shear flows. Prof Reid was a Fellow of the Cambridge Philosophical Society and the American Physical Society. He was also a life-long member of the Society for Industrial & Applied Mathematics, and a member of the editorial board of the *SIAM Journal of Mathematical Analysis* from 1973 to 1981.

Born on September 10, 1926 in Oakland, CA to the late William MacDonald and Edna (Hill) Reid, Prof. Reid graduated from the University of California, Berkeley in 1949 with a B.S. degree in Electrical Engineering. His undergraduate study was interrupted by his service in the Merchant Marine in the Pacific from 1945 to 1947. After receiving his M.S. degree in 1951 from Berkeley, he embarked on his doctoral study at Trinity College, Cambridge University, where he joined a group of young researchers and graduate students from all over the world doing research in the then emerging field of turbulence. He worked on the geometrical and statistical theories of isotropic turbulence under the direction of Ian Proudman.

After completing his doctoral thesis at Cambridge, and before he was formally awarded the Ph.D. degree in 1955, Prof. Reid was drafted by the U.S. Army in 1954 and spent the next two years at the Aberdeen Proving Ground in Maryland, where he continued his scientific research work “in between KP duty” and lecturing at Johns Hopkins University at the invitation of Stanley Corrsin. It was around this time that he also decided that there was no more theoretical advance he could help make in turbulence. As Keith Stewartson, one of the most distinguished British applied mathematicians of his generation, once remarked in 1980, “Bill Reid’s work on isotropic turbulence dealt the field a body blow from which it never recovered.” His last paper on the subject was the article “Turbulent flow, theoretical aspects” that he co-wrote with C. C. Lin for *Handbuch der Physik* (1963).

In 1958, Prof. Reid began his academic career at Brown University after spending the previous year as a NSF Postdoctoral Fellow at Yerkes Observatory, Williams Bay, WI. His interaction with S. Chandrasekhar at Yerkes marked the beginning of his work on hydrodynamic stability. In 1963, Prof. Reid was recruited to the University of Chicago with a joint appointment in the departments of Mathematics and Geophysical Sciences. Prof. Reid spent the next 26 years at Chicago where he did much of his pioneering research in the stability of shear flows.

The analytical study of shear flow stability has a long and illustrious history, beginning with Werner Heisenberg’s 1924 doctoral thesis in which he attempted to obtain (for large values of the Reynolds number) asymptotic approximations to the solutions of the governing Orr-Sommerfeld equation. Subsequently, Heisenberg’s work was improved upon by W. Tollmien (1929) and further clarified by C. C. Lin (1944). These analyses all share a significant limitation—the approximations they obtained lack uniformity which in turn led to considerable controversy on the validity of their use in stability calculations. Lin himself was well aware of this limitation and devoted a great deal of effort in the 1960s working on this problem. In a series of groundbreaking papers published in the 1970s, Prof. Reid developed a systematic approach to obtaining uniform asymptotic approximations to the solutions the Orr-Sommerfeld equation as

well as to the eigenvalue relation used in stability calculations. More importantly, his work provided an elegant framework for obtaining uniform asymptotic approximation to the solutions of a large class of higher-order ordinary differential equations of the hydrodynamic type of which the Orr-Sommerfeld equation is an important example. It also led to the development of the compound matrix method, now a widely used shooting technique for the numerical solution of unstable eigenvalue and boundary value problems.

During his career, Prof. Reid published more than 70 research papers. His book, *Hydrodynamic Stability* published in 1981 by Cambridge University Press, which he co-authored with the late P. G. Drazin of Bristol University, remains an authoritative classic of the subject.

Following his retirement from the University of Chicago in 1989, Prof. Reid accepted a position in the Department of Mathematical Sciences at Indiana University–Purdue University at Indianapolis where he continued his teaching and research. He remained in Indianapolis until his move to Jacksonville, FL in 2007.

Prof. Reid is survived by his wife of 53 years, Elizabeth, and daughter, Margaret F. Reid.

Adopted by the IUPUI Faculty Council at their meeting on May 2, 2017.