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# History of the Fluids Engineering Division

*The 90th Anniversary of the Fluids Engineering Division (FED) of ASME will be celebrated on July 10–14, 2016 in Washington, DC. The venue is ASME's Summer Heat Transfer Conference (SHTC), Fluids Engineering Division Summer Meeting (FEDSM), and International Conference on Nanochannels and Microchannels (ICNMM). The occasion is an opportune time to celebrate and reflect on the origin of FED and its predecessor—the Hydraulic Division (HYD), which existed from 1926–1963. Therefore, the FED Executive Committee decided that it would be appropriate to publish concurrently a History of the HYD/FED. Accordingly, they commissioned Paul Cooper, C. Samuel Martin, and Timothy O'Hern to prepare this paper, which would document the division's past. A brief work in this direction had appeared in the 2010 FED Newsletter (Moogan, W. B., 2010, Brief History of ASME's Hydraulic/Fluids Engineering Division, Fluids Engineering Division Newsletter, New York, pp. 6–7), and the research by Martin for the present paper had been under way for several years prior to that (Cooper, P., 2010, "History of the FED," FED Executive Committee at the ASME-CSME Fluids Engineering Summer Conference (FEDSM-2010), Montreal, QC, Canada, Aug., p. 14). [DOI: 10.1115/1.4003976]*

## 1 Introduction

Of interest and importance prior to the official establishment of the HYD was the state-of-the-art of hydraulics within ASME between its founding in 1880 and the establishment of HYD in 1926 (Figs. 1–3). There were many articles on fluid-related topics in the *ASME Transactions* and *Mechanical Engineering* (ME) between 1880 and 1930, as listed in Table 1 from Refs. [1] and [2]. The 1930 paper in ME “Fifty Years’ Progress in Hydraulics” by Moody (Fig. 1) and Van Leer [3] had numerous articles, including theoretical hydraulics, water hammer, fluid metering, the Pelton wheel, American hydraulic turbines, and pumping machines.

The development of hydroelectric power stations necessitated the understanding of hydraulic turbine performance. This technology was a major element in design of hydraulic turbines—Francis, Kaplan, and Pelton designs. Moreover, there were issues beyond the design of turbines, namely, water hammer, cavitation, and flow measurement, and technical areas of interest to mechanical engineers (principally ASME). Because of the promise of power output from hydroelectric power stations, flow measurement was critical, resulting in improvement of various techniques including impulse-momentum (Gibson Method, Fig. 2), salt-velocity method attributed to Allen (Fig. 3), and venturimeter for smaller pipes enhanced by Herschel for smaller piping systems.

John R. Freeman (Fig. 4) was the star in the hydraulic activity over the 50-year period from 1880 to 1930, conducting experiments on head loss in pipes and determining the characteristics of fire nozzles. He was aware of the fact that European hydraulic laboratories were far more advanced than those in the U.S. He set out to remedy the deplorable situation by visits to Europe and the encouragement of these laboratories to encourage visitors from the U.S. as well as write reports of their investigations. This effort led to a comprehensive report [4], an article in German, which was later translated into English [5].

The ASME Freeman Fund was established in 1926 by John R. Freeman, noted Hydraulic Engineer and Scholar, Honorary Member, 24th President of ASME, and recipient of the Society’s Gold Medal. Mr. Freeman’s active life was crowded with achievements

in many fields. To an unusual degree, he brought the benefits of engineering to humanity in many lands, giving his energy and his money unselfishly to meritorious causes and directing his talents to business and to engineering with an enthusiasm and thoroughness that made his pursuit of both these professions successful. Exemplifying his unselfish character, Mr. Freeman suggested a flexible program for utilization of the ASME Freeman Fund when he gave in trust to the Society securities, valued at \$25,000. It was stipulated that income be devoted in general to research. Mr. Freeman expressed his wish that, for the moment, part of the income from the gift be used to guarantee the publication of the translation and printing of the German work on Hydraulics (representing extraordinary research in that field). He also recommended traveling scholarships for engineering students. In early years, it supported fellowships for the study of hydraulic laboratory practice in Europe, later it supported publication of important hydraulic research data, and lately, it has been granted to support research programs in hydraulics and fluid mechanics. Up until 1938, an article entitled “Progress in Hydraulics” was published periodically in ME and in the *ASME Transactions*.

Mention should also be made of Robert Henry Thurston, who was the first president of ASME, as well as an educator and an accomplished mechanical engineer. Little is known about his expertise in the design of steam piping systems for heating in cities and for power plant applications. Moreover, he published an article in *ASME Transactions* in 1883 regarding water hammer in steam lines that, due to inactivity for a period of time, allowed the formation of condensate [6]. Introduction of hot steam in a dormant line with condensate is a current issue and is termed condensation-induced water hammer. Although the application was for single-phase water hammer, it should be noted that the first technical committee established under HYD auspices in 1931 was the Water Hammer committee. The Thurston Lecture is an annual society level award recommended by Basic Engineering Group (BETGGB).

## 2 Establishment of the HYD

For nearly 46 years, ASME members with an interest in hydraulics had no home of their own but still met at least once annually at the Winter Annual Meeting (WAM) or with other divisions—mainly with the Power Division. There was, however,

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# Fluids Engineering Division 2003 Proceedings

**Michael Hoelscher**



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