Memorial to Ralph Alger Bagnold 1896–1990

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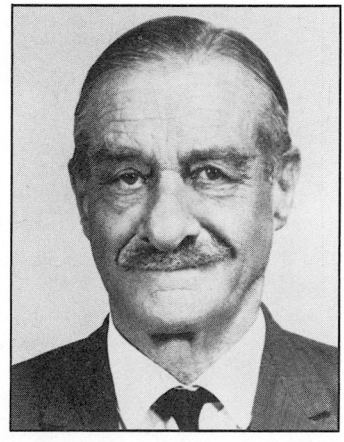

A persceptive intellect; a ready acceptance of "the irresistible challenge"; inspiration from "the thrill of the unknown"; and a rugged, independent, self-sufficient, yet modest, character were the hallmarks of R. A. Bagnold's colorful, fruitful, and varied life.

Ralph Alger Bagnold was born on April 3, 1896, at Stoke, Devonport, England.

Bagnold's father was Colonel Arthur Henry Bagnold, of the Royal Engineers.

Even before attending school, Ralph Bagnold voyaged by sea to Jamaica and acquired an early taste for exploration. Also, while living in Jamaica, in a large converted coffee-mill in the Blue Mountains, Bagnold (then five years old) undertook his first recorded hydraulic experiments. These included the construction of a working model of the household drainage system; the diversion of part of the mill-stream through a rock channel; and even the observation of a flood flow into the house. This inquisitive, logical, and practical outlook was carefully nurtured by his father and was later fostered by others such as Charles E.S. Philips (a family friend, and later Secretary of the Royal Institution), by E. C. Bullock (at Malvern College) and by F.J.M. Stratton (in France, Flanders, and Cambridge).

Commissioned in 1915, Bagnold spent much of his army life in the Corps of Signals, originally with the Royal Engineers, in France and Flanders, Cambridge, and Ireland, and eventually (after 1923) with the Royal Corps of Signals, in England, Egypt, India, and Hong Kong. However, Bagnold's zest for life and his explorative nature led to voyages into the Atlantic from Ireland; to forays into the Libyan desert and the Sinai from Egypt; to Kashmir from the northwest frontier; and to Siam and Cambodia from Hong kong.

The challenge of driving Model-T Fords for the whole length of Sinai was succeeded by that of driving a Ford truck from India to Egypt, via the Baluchistan Desert, Persia, and the Syrian Desert. Later, Bagnold accepted the "irrestible challenge" of crossing the Egyptian-Libyan sand sea, "where the careless might well get lost."

During such desert forays, he perfected techniques of dead-reckoning navigation by sun compass, and position finding from the stars, together with the logistics related to self-sufficiency.

While in Hong Kong, Bagnold wrote his first book, *Libyan Sands* (which has been republished). After retiring from the army in 1935, Bagnold carried out wind-tunnel experiments in the hydraulics laboratory at Imperial College, University of London, and later spent "an interesting eight days entirely alone" waiting for a sandstorm in the desert, in order to get some really reliable field measurements. His second book, *The Physics of Blown Sand and Desert Dunes*, was published in 1941. In 1936 he participated in a solar eclipse expedition to Japan, before heading for Tanganyika in order to climb up to the crater lip of Mount Kilimanjaro.

The conception and production of an appropriate array of instruments was incidental to Bagnold's various exploits. The "desert-sun compass," the "instant-reading, multi-tube manometer," and the "piezoelectric pressure gauge" are examples.

Just prior to World War II Bagnold extended his interests to include the motions of solids by water flows, and he undertook some experimental work in the hydraulics laboratory at Imperial College. These studies were resumed after the war.

In 1939 he was recalled immediately after war broke out. He was posted to East Africa, but due to a maritime accident, he landed in Cairo. There, he was astonished to find at army headquarters a "total ignorance of the desert country beyond the Nile cultivation." Despite some strong opposition, Bagnold was given carte blanche to design, create, and train within six weeks a small, private, self-contained army capable of operating anywhere in the uninhabited interior of Libya. Thus was founded the Long Range Desert Group, which Bagnold then proceeded to command, sustain, and navigate deep into hostile territories, behind the enemy lines.

Bagnold's zest for exploration caused him to make an unorthodox visit to Chad, with the result that "Chad Province came in openly and voluntarily on the Allied side, the only French overseas dependency to do so."

After World War II Bagnold undertook a two-year stint as Director of the Shell Research Centre at Thornton, near Chester, England. During this period he was also, in part, instrumental in establishing the Hydraulics Research Station at Wallingford, England. However, he soon regained his independence in order to be able to contemplate further the physics of the movement of solids by water. Working in his home office-workshop at Rickwoods in Kent, at Imperial College, London, or elsewhere, he continued with care and insight the experiments that resulted in his pioneering papers on flow over granular beds. He then turned his attention to the problem of sediment transport by rivers, and he was soon invited by Luna Leopold, then head of the Water Resources Division of the U.S. Geological Survey, to help "stir the pool of complaisant tradition with the stick of inquiry." He spent one month a year in the United States as a consultant to the Survey. A series of outstanding and often quoted papers resulted during the 1960s. The earlier work on granular beds and waves also led to research into the mechanics of sediment transport in the oceans. Again, "classic" papers resulted, dealing with sediment transport by waves and currents and the fundamental concept of the equilibrium beach profile. Together, these papers provided the starting point for studies of sediment transport processes in nearshore waters.

Bagnold's interest in sediment transport persisted and, virtually coinciding with his 90th birthday, culminated with the paper, published in the Royal Society Proceedings, "Transport of solids by natural water: Evidence for a world-wide correlation."

Bagnold claimed that he "was never a 'keen soldier' in the sense of having high rank as a primary objective," and that he "would rather become a Fellow of the Royal Society than a major general." He was pleasantly surprised to find, in 1944, that he had been elected a Fellow, without even knowing he had been proposed or considered.

In 1934 he was awarded the Gold Medal of the Royal Geographical Society, in London, for exploration in northeast Africa. Other distinctions included the G. K. Warren Prize by the U.S. Academy of Sciences, in 1969; the Penrose Medal by the Geological Society of America, in 1970; the Wollaston Medal (in palladium) from the Geological Society of London, in 1971; the Fellowship of Imperial College, London, in 1971; an honorary D.Sc. by the University of East Anglia, in 1972; the Sorby Medal from the International Association of Sedimentologists, in 1978; an honorary D.Sc. by the Danish University of Aarhus, in 1978; and the David Linton Award from the British Geomorphological Research Group, in 1981.

Bagnold's sister, Enid (born in 1889) is well-known in her own right as an author and playwright (*National Velvet*, *The Chalk Garden*). Enid was also responsible for re-introducing her brother Ralph to Dorothy Plank, whom he married in 1946. Their son Stephen was born in 1947, followed, in 1948, by their daughter, Jane. The Bagnold's also had five grandchildren.

Ralph Bagnold died on May 28, 1990, aged 94.

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