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Obituary

Warin Foster Bushell

Warin Foster Bushell, M.A., F.R.A.S., died at Birkenhead on 21 November 1974 in his ninetieth year. His father, the Revd. William Done Bushell, was a founder member of our Association (then the A.I.G.T.) in 1870–71; the son joined it in 1906. The father was a housemaster and honorary chaplain at Harrow School; the son was born there, went to school at Charterhouse and entered King's College, Cambridge in 1903, at the same time as William Hope-Jones. He published a biography of his father in 1919 (published by Cambridge University Press (74 pp.) at 3 shillings); it was well reviewed by W. J. Greenstreet in *Gazette* **10**, 235 (1921). Volume **6**, 87 (1911) had carried a plea from W.F. that, without returning to Euclid, "the absolute elements of geometry should be taught according to *one recognised order*". Characteristically the plea was based on the plight of pupils who, in moving from one school to another, were faced with different sequences.

Bushell was President of the Mathematical Association in 1946–47. His presidential address (*Gazette* **31**, 69–89 (1947)) gives a full account of the state of school mathematics teaching prior to and at the time of the founding of the A.I.G.T. It also recalls his feeling of outrage as a good Euclidean when, in his last year as a pupil at Charterhouse, his mathematics master, C. O. Tuckey, "produced a ruler with strange markings on it. It was, of course, a protractor." Many years later, in 1968, he was to provide the obituary notice of Tuckey in *Gazette* **52**, 281.

In 1959 the first pages of the *Gazette* carried a scholarly paper which Bushell had read to the Liverpool Astronomical Society (of which he was Patron at the time of his death) on Jeremiah Horrocks, who in 1639 had become the first man known to have observed a transit of Venus across the Sun. In 1961 an article from Bushell (**45**, 117) evinced strong feelings on calendar reform, while a comment (p. 341) on A. Thom's article on *The geometry of megalithic man* recalled how 60 years earlier he had accompanied his father in mapping some of the Prescelly stones in Pembrokeshire.

In *Who's who* his recreations were given as "travelling and the usual school games" until he was sixty. On his 60th birthday he competed in a seven-mile cross country run of the Wirral Athletic Club; thereafter his sole recreation was "travelling". He had also a remarkable private library, and was an authority on local history in the Wirral. He was a schoolmaster all his working life—at Gresham's School, Holt and at Rossall and Solihull and (1927–30) in Natal; from 1930 to 1946 he was headmaster of Birkenhead School. He was for many years a staunch supporter of the Liverpool Mathematical Society (later a branch of the M.A.). To be driven back to Birkenhead by him through the Mersey tunnel after attending a meeting of that society was a memorable experience—not least for the running commentary maintained in his great voice above the roar of the traffic.

The photograph of W. F. Bushell in *Gazette* **31** suggests a bulldog personality but less clearly his large-heartedness, loyalty and uninhibited friendliness. His last days were much marred by rheumatism and arthritis which rendered him almost immobile; they were relieved by the care and attention of his devoted housekeeper, Mary, until about two years ago when her own health compelled her to make way for another no less careful of his comfort.

I am indebted to Professor A. G. Walker, F.R.S. and to two other members of our Liverpool branch for help in preparing this obituary notice.

J. T. COMBRIDGE

Notes

59.3 The irrationality of $\sqrt{2}$

The following proof of the irrationality of $\sqrt{2}$ seems to me simpler than that which is usually attributed to Pythagoras.

Let S be the set of those natural numbers n for which $n\sqrt{2}$ is an integer. If S were not empty, it would have a least element k, say. Consider the number $(\sqrt{2}-1)k$. Then

$$(\sqrt{2}-1)k\sqrt{2} = 2k - k\sqrt{2},$$

and, since $k \in S$, both $(\sqrt{2}-1)k$ and $2k - k\sqrt{2}$ are natural numbers. So, by definition $(\sqrt{2}-1)k \in S$. But $(\sqrt{2}-1)k < k$, contradicting the assumption that k is the least element of S. Hence S is empty, which means that $\sqrt{2}$ is irrational.

If in this proof we replace 2 by any natural number h whose square root is not an integer, and replace 1 by the greatest integer less than $\sqrt{h}$, we obtain a proof that the square root of any natural number is either an integer or irrational.

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