

Seán Tobin, 1930-2023

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Seán Tobin

Seán was born in Dublin on the 16th of January, 1930. His family moved to Carrick-on-Suir in Tipperary, where he received most of his schooling from the Christian Brothers. He spent the final two years of secondary school in New Ross, as a boarder at the

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Irish-speaking A-school run by the Augustinians. As a result of his excellent performance in the Leaving Certificate examination in 1947 he was granted one of the new and prestigious Aiken scholarships to study through Irish in UCG. Following a very successful undergraduate career he enrolled for the MSc in Mathematical Science, and he graduated with first-class honours in 1951. His performance was such that the college awarded him a special grant to enable him to work for a doctorate at the University of Manchester. His supervisor there was the eminent group-theorist Graham Higman who later became Waynflete Professor of Mathematics at Oxford. Seán received his PhD in 1954 for his thesis on groups of exponent four. And, to quote himself, ‘even more importantly, in Manchester I met Lois Brown, a Yorkshire girl then studying at the College of Domestic Science, who later became my wife’.

Having spent a post-doctoral year (1954-5) in Ohio working with the renowned group-theorist Marshall Hall, Seán returned to UCG as an Assistant in Mathematics. The following year he was appointed to a Statutory Lectureship and was elected to the Academic Council. He became the Professor of Mathematics and head of the department in 1961, and held and enjoyed both positions until his retirement in 1995.

Many warm tributes have been paid by former colleagues and students, in appreciation of the encouragement, support and advice that he gave them. Seán loved lecturing, and despite the extremely heavy teaching loads that were common at the time he was able to produce courses that challenged and inspired his students.

Bhí dúil daingean diongbháilte i gcónaí aige sa Ghaeilge, mar go bhfuair sé a chuid scolaíochta féin tré Ghaeilge, seans. Bhí sé in a bhall den Coiste Gnó as a d’fhás an Foclóir Eolaíochta, foilsithe ag an Gúm. Thug sé tacaíocht ar leith don nós lena linn léachtaí Matamaitice san árd-chúrsa a chur ar fáil tré mheán na Gaeilge. Bhí sé de phribhléid againn beirt – agus ag a lán lán eile – céim a bhaint amach faoin a chúram agus a threoir.

The main focus of Seán’s research throughout his career was on groups of exponent four. We recall that the group G has exponent m if $x^m = 1$ for all x in G and m is minimal with this property. If such a group has n generators then it is a homomorphic image of $B(n, m) = F/F^m$. Here F is the free group of rank n and F^m is the subgroup generated by all the m th powers of elements of F . $B(n, m)$ is the Burnside group of rank n and exponent m . The name and notation¹ reflect the fact that in a 1902 paper Burnside posed the following question (later called the Burnside problem): for which n and m is $B(n, m)$ finite? He also asked for the order when the group is finite.

In the 1902 paper Burnside noted that $B(n, 2)$ is elementary abelian of order 2^n and he showed that $B(n, 3)$ is finite, giving an upper bound for its order. He also proved that $B(2, 4)$ is finite and claimed that its order is 2^{12} , but his argument only showed that this is a multiple of the order.

In 1933 Levi and van der Waerden found the exact order of $B(n, 3)$, and in 1940 Sanov proved that $B(n, 4)$ is finite for all values of n .

In his thesis (1954) Seán studied the structure, the derived length and the class of groups of exponent four. In particular, he found an unexpected connection between solvability and nilpotency for such groups. Here is a sample consequence :

A group G of exponent four is solvable only if G^2 is nilpotent.

He also gave a construction for $B(2, 4)$ and showed that its order is indeed 2^{12} . Furthermore, he corrected a (mis)calculation that had been made by Philip Hall.

Seán published several papers on groups of exponent four and related topics. His expertise was acknowledged by an invitation to give a course of lectures at the Groups–St Andrews 1981 conference. The corresponding survey article [6] was a major contribution

¹*Caveat lector*: some authors use $B(m, n)$ for our $B(n, m)$!

in the field, including as it did many new results as well as significant improvements on older ones. Seán's research certainly sparked renewed interest in the use of commutator calculations and their application in combinatorial group theory.

Other contributions to the study of the Burnside problem include, for example, the following theorem of Lysenok (1996) : *$B(2, n)$ is infinite if $n > 8000$* . A nice short account of such contributions is given in a paper by M.F.Newman in Volume I of The Collected Papers of William Burnside (edited by Peter M. Neumann et al, OUP 2004).

Seán was always keen to extend the research profile of the Mathematics Department, initially in algebra (particularly group theory) and later in other areas. He instituted a regular research seminar, and the limited seminar budget was more productive than one might expect because he and Lois frequently hosted the visiting speaker in their home. Seán always encouraged colleagues to take sabbatical leave when it was due. He supported the many mathematical conferences held in UCG, notably a major international meeting on 'Group Theory and Computing' in 1973 and the 'Galway–St Andrews International Group Theory Conference' in 1993.

Seán was an active member of many academic bodies both within the college and nationally. He served several terms on the Governing Body of UCG, and was also a member of the Governing Body of the School of Theoretical Physics at the Dublin Institute of Advanced Studies. He regularly attended the Mathematical Science meetings held in DIAS every Christmas and Easter, and was a long-time member and supporter of the Irish Mathematical Society. Moreover, he was a very active member of the Irish Federation of University Teachers throughout his career and well into his retirement.

Seán and Lois were wonderful hosts and great company. They were also inveterate travellers: in addition to spending sabbaticals in several parts of Europe and North America, they visited family in England, Peru and Australia. And they continued to travel after Seán retired, making a memorable journey along the Silk Road and taking several trips with the Retired Staff Association.

Seán died on the 11th of July, 2023. Rinne sé éacht ina shaol.

Several parts of this obituary are informed by the splendid essay [9] that Seán wrote as part of a history of what is now University of Galway.

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