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## Journal of Cereal Science

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## UK researchers receive prestigious award for work on wheat genomics

Joseph Rank (1854–1943) was a Yorkshire miller who revolutionised the UK wheat milling industry in mid-1880s. He introduced roller milling from Central Europe and steam power allowing his mills to be moved close to the docks facilitating the use of imported wheat. He was therefore largely responsible for enabling ordinary working people to consume white bread, which had previously been a luxury. After his death his son, J. Arthur (later Baron) Rank (1888–1972), further developed the milling and baking business and added interests in film production and distribution. He also endowed a number of charities, including in 1972 the Rank Prize Funds whose main role is to award prizes for excellence in research in the two areas which reflected his commercial interests: optoelectronics and nutrition (which includes crop production). A total of 31 prizes have since been awarded for nutrition, and it is particularly notable that five of these have been awarded for research on wheat, including the latest prize, of £80,000 to Professor Graham Moore of the John Innes Centre (Norwich, UK) and Professor Keith Edwards (University of Bristol, UK) for their work which has enabled breeders to exploit variation in the wheat genome (see Fig. 1).

Graham Moore's work has focused on two areas, with his earlier studies establishing the similarity in the organisation and sequences of the genomes of wheat and other cereal species

(Moore et al., 1995). This discovery of “genetic synteny” has allowed information from species with relatively simple genomes (such as rice) to be exploited to understand the highly complex wheat genome. Following this he has elucidated the mechanism of the “pairing locus” which stabilises the polyploid genomes of hexaploid bread wheat and tetraploid durum wheat, by preventing mispairing and exchange between related sets of chromosomes during meiosis (Griffiths et al., 2006). This has facilitated the use of mutations in the locus to transfer useful genes from related species. Finally, Graham has led the development of a public sector wheat pre-breeding programme which brings together the major wheat research groups, including that of Professor Edwards, to deliver improved lines and tools for breeders in the UK and internationally.

Keith Edwards has been at the forefront of the application of molecular and genomic tools to crop improvement and has had immense practical impacts on the global research community in both the private and public sectors. In particular, he has led the development of new DNA marker systems for wheat breeding with a pioneering commitment to establish these tools and resources in accessible public repositories. Consequently, his CerealsDB website is the most widely used global source of data on wheat genetic diversity (Wilkinson et al., 2016). To achieve this Professor Edwards developed innovative approaches to reduce the



**Fig. 1.** Left to right, Professor Graham Moore, The Guest of Honour, The Earl of Selborne, GBE, FRS, Professor Keith Edwards and the Chairman of the Rank Prize Funds, Mr. Stuart Cowen.

complexity of the wheat genome, focusing on the small part of the genome which comprises expressed genes and exploiting this information to develop high throughput methods to distinguish differences between and within the individual genomes of bread and durum wheats at the level of single DNA base changes. This now allows simultaneous determination of over 800,000 molecular markers in multiple wheat samples. He also developed a streamlined and cost-effective “Breeders’ Chip”, widely used in commercial plant breeding, which determines variation in 35,000 DNA markers (Allen et al., 2016).

The prize therefore recognises pioneering work which combines scientific excellence with real impacts on cereal improvement.

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