



Gavin Brown Best Paper Prize
2020

John Bamberg, Michael Giudici & Gordon F. Royle

Every flock generalized quadrangle has a hemisystem
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In 1965, Beniamino Segre showed that the Hermitian generalized quadrangle $H(3, 9)$ has up to isomorphism a unique *hemisystem*; that is, a set of lines that contains exactly half of the lines on each point. All attempts to construct hemisystems in other Hermitian generalized quadrangles $H(3, q^2)$ (with q an odd prime power) had failed over the course of many decades until the appearance of this paper in 2010. In this paper, Bamberg, Giudici and Royle show that every flock generalized quadrangle of order (s^2, s) with s odd has a hemisystem.

This paper is considered a “genuine paradigm shift” in its field. The methods used in the paper are described as a clever mix of geometric and algebraic techniques. This work both settles the problem of whether every such generalised quadrangle has a hemisystem, and is an enormous step beyond what was known previously. The construction behind the main theorem also produces exponentially many hemisystems, not just one per prime power q .

The assessors were uniform in their high praise for this paper, judging it to be, “very influential in the area of Finite Geometry”, “innovative and excellent research which solves a significant problem in its field”. This paper “has unquestionably had a big impact on the field. So completely have the authors answered the question they tackled, that there have been almost no publications on the subject since their paper appeared. In other words, rather than opening up an area, this has closed one down.”