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Title: Octonions and projective space: geometry without associativity

Abstract:

In this talk I shall discuss the sequence of number systems that begins with the real numbers, the complex numbers, and the quaternions, and introduce the next term, namely the octonions. On the way, I shall mention a little of their history, which is rather complicated (and, of course, features the Royal Canal!) Then I shall describe the associated projective line and plane in terms of 3×3 Hermitian matrices, which are required to deal with the lack of associativity. The set of these matrices has a particularly rich geometrical structure, including its group of symmetries F_4, which appears in certain aspects of theoretical physics. In passing, I shall touch upon linking numbers, homotopy, and cohomological invariants. My aim is to provide an overview, rather than technical details, and I hope to make the talk entertaining and accessible for a general mathematical audience.