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Critical sets of rays in four dimensions proving the Bell-Kochen-Specker theorem P.K. ARAVIND, Worcester Polytechnic Institute — In recent years several sets of rays have been discovered in four and more dimensions that provide illustrations of the Bell-Kochen-Specker (BKS) theorem. These demonstrations acquire additional significance through the fact that they provide proofs of Bell's nonlocality theorem as well if used in conjunction with the right kind of entanglement. This talk will provide a brief overview of this field and then concentrate on two 60-ray sets in four dimensions recently discovered by the author. Both sets embed a geometrical structure within them, known as Reye's configuration, that permits the identification of smaller subsets ("critical sets") that provide noncoloring proofs of the BKS theorem. (Reye's configuration is a set of 12 points and 16 lines with the property that four lines pass through every point and three points lie on every line. A "critical set" of rays is one that provides a minimalist noncoloring proof of the BKS theorem in the sense that the deletion of even a single ray from it makes the proof fail). This talk will discuss the "quantum geometry" of the two 60-ray sets and their relationship to each other. The application of these results to quantum information processing will be briefly considered.

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