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**Felix Lazebnik\*** (lazebnik@math.udel.edu), Department of Mathematical Sciences, University of Delaware, Newark, DE 19716, **Stefaan De Winter** (sgdwinte@cage.ugent.be), Department of Mathematics and Computer Algebr, 9000 Gent, Belgium, and **Jacques Verstraëte** (jacques@ucsd.edu), Department of Mathematics, University of California, La Jolla, CA 92093-0112. *An Extremal Characterization of Projective Planes.*

For a given integer  $n$ , consider a family of all  $n$  by  $n$  bipartite graphs with no 4-cycles. Which graphs from the family contains the greatest number of 8-cycles? We show that if  $n = q^2 + q + 1 \geq 157$ , the incidence graph of a projective plane of order  $q$ , when it exists, has the maximum number of cycles of length eight. This characterizes projective planes as the partial planes with the maximum number of quadrilaterals. Several generalizations of this question, and related results will be discussed. (Received February 16, 2010)