

# Gerard Cornuejols

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## Lehman Matrices

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### Abstract for the Colloquium and Combinatorics Seminar 2009 July 27

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Two square 0,1-matrices,  $A$  and  $B$ , such that  $AB = E + kI$  (where  $E$  is the  $n \times n$  matrix of all 1's and  $k$  is a positive integer) are called "Lehman matrices". These matrices figure prominently in Lehman's seminal theorem on minimally nonideal matrices.

There are two choices of  $k$  for which this matrix equation is known to have infinite families of solutions. When  $n = k^2 + k + 1$  and  $A = B^T$ , we get the point-line incidence matrices of finite projective planes, which have been widely studied in the literature. The other case occurs when  $k = 1$  and  $n$  is arbitrary, but very little is known in this case. I will discuss this class of Lehman matrices.

The work is joint with Bertrand Guenin and Levent Tuncel.

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Last update: **2020/01/29 19:03**

