

## **An unnatural problem with a remarkable solution**

**C. R. Johnson**

### **Abstract**

A matrix is called totally positive (TP) if all its minors are positive and a matrix is called inverse M (IM) if it is the inverse of an M-matrix. An IM matrix is further called interior IM (IIM) if it can be surrounded by a neighborhood of inverse M-matrices. Necessarily an IIM matrix is positive. We consider two "unnatural" questions: (1) is every positive matrix a sum of TP matrices and (2) is every positive matrix a sum of IIM matrices? In each case we also ask how many summands may be necessary. We describe not only the answers to these questions but also some of the ingredients in the answers.

Time permitting, some other recent results on the nonnegative inverse eigenvalue problem and on copositive spectral theory will also be mentioned.