1011-15-262 **Brenda K. Kroschel*** (bkkroschel@stthomas.edu), University of St. Thomas, Mail # OSS 201, St. Paul, MN 55042, and **Charles R. Johnson** and **Emily B. Dryden**. *The Totally Nonnegative Completion Problem.*

A partial matrix is a matrix in which some entries are specified and some entries are left unspecified. A matrix completion problem asks if one can choose values for the unspecified entries so that the matrix has a desired property. In particular, we will discuss the totally nonnegative matrix completion problem. An m-by-n matrix is totally nonnegative (TN) if every the determinant of every square submatrix, principal or otherwise, is nonnegative. We first answer the question: which patterns of specified and unspecified entries allow a totally nonnnegative completion, regardless of the values of the specified entries (beyond some obvious necessary conditions)? These patterns of specified and unspecified entries are described by graphs. When a partial matrix does not have the required pattern or graph, extra conditions on the data are required. We discuss these additional conditions and for what graphs they suffice. For 3-by-3 partial matrices a complete solution is given, and the "adjacent edge conditions" that arise in the 3-by-3 case are shown to suffice for certain other classes of graphs. Known conditions on the data for paths and cycles are also discussed. (Received August 29, 2005)