Abstract: A Hadamard matrix is a square matrix with entries 1 and -1 such that its columns are mutually orthogonal. The circulant Hadamard conjecture states that circulant Hadamard matrices exist only of orders $n=1$ and $n=4$. The conjecture, which dates back to a book of Ryser (1963), was partially proved in the symmetric case (Johnsen 1964); the general case, however, remains open to this day.

In the talk, we consider an extension of circulant Hadamard matrices by introducing a parameter $d$ on the diagonal, while keeping the orthogonality condition. Analyzing the existence of such matrices, we generalize the theorem of Johnsen (1964) and at the same time a theorem of Stanton and Mullin (1976) on circulant conference matrices. On the basis of our findings, we conjecture that the order of the circulant matrices with a parameter $d$ on the diagonal must be $n=2d+2$ for any odd integer $d$.

The talk is based on a joint work with D. Goyeneche.