

# Hadamard's maximal determinant problem

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## Abstract

I will report on a number of recent results concerning the problem of maximizing determinants of  $\{-1, 1\}$ -matrices. In the case that the size of the matrix is divisible by 4, matrices whose determinants achieve Hadamard's upper bound (Hadamard matrices) are known for many orders, but when the size is not a multiple of 4, upper bounds that improve on Hadamard's have been found. Nevertheless, there are many orders for which even these improved bounds cannot be attained. I will focus on these cases, exhibiting constructions for matrices with very high determinant. Some of these are plausibly maximal, while others improve on previously known lower bounds. In order 15, I will give a proof of maximality of the best known determinant. In orders congruent to 1 modulo 4, I will describe a general construction method, obtained in collaboration with Bruce Solomon, which gives the biggest known determinant in many orders.