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**John B. Cosgrave** and **Karl Dilcher\*** (dilcher@mathstat.dal.ca), Department of Math. & Stats., Dalhousie University, Halifax, NS B3H 4R2, Canada. *The multiplicative orders of certain Gauss factorials.*

This talk deals with the multiplicative orders of  $\left(\frac{n-1}{M}\right)_n! \pmod{n}$  for odd prime powers  $n = p^\alpha$ ,  $p \equiv 1 \pmod{M}$ , where the Gauss factorial  $N_n!$  denotes the product of all integers up to  $N$  that are relatively prime to  $n$ . Considering the connection between the orders for  $p^\alpha$  and for  $p^{\alpha+1}$ , we obtain new criteria for exceptions to a general pattern, with particular emphasis on the cases  $M = 3$ ,  $M = 4$  and  $M = 6$ . In the process we also obtain some results of independent interest. Most results are based on generalizations of binomial coefficient congruences of Gauss, Jacobi, and Hudson and Williams. (Received August 17, 2014)