1056-11-2118 **Ciarán Mac an Bhaird*** (ciaranmacanbhaird@gmail.com), Department of Mathematics, National University of Ireland Maynooth, Maynooth, Co Kildare, Ireland, and **Pat McCarthy**.

Gauss' Method for determining cyclotomic numbers.

It is commonly believed that Gauss' method for the determination of Cyclotomic Numbers, and thus the determination of the minimal polynomial of Gaussian Periods, is unwieldy for the general case.

We have shown that Gauss' method leads to a series of functional equations. We have necessary and sufficient conditions for these equations to have integer solutions. This leads to a purely Diophantine system of equations, the number of equations is independent of the prime p, where p is congruent to 1 modulo l. The system has precisely $\phi(l)$ solutions, which correspond to the cyclotomic numbers of order l.

This is, in fact, the first purely Diophantine characterisation of the cyclotomic numbers and the coefficients of the minimal polynomial of the Gaussian periods and the problem is solved for all orders. Using this method, we will go through the cyclotomic numbers of order 3, 5 and 7 and discuss some interesting aspects of these and further orders. (Received September 23, 2009)