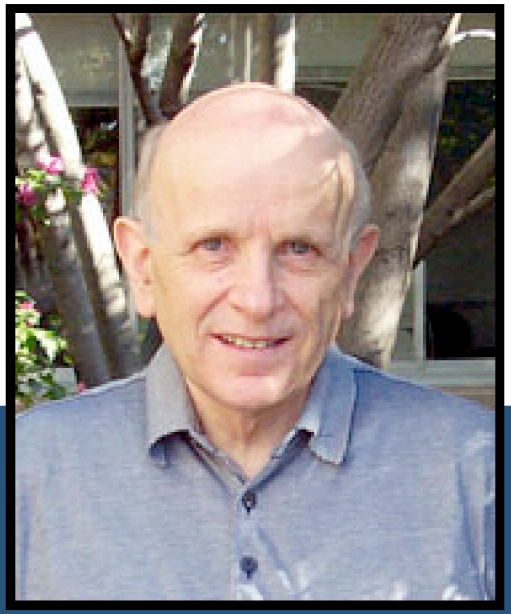
The Oliver Club

www.math.cornell.edu/~oliver/

Constructing Finite Simple Groups from Irreducible Subgroups of $GL_n(2)$

Throughout this lecture we consider finite simple groups G whose Sylow 2-subgroups S are neither dihedral nor semi-dihedral, because the classification of these (small) simple groups is well understood. In all remaining cases S contains a maximal elementary abelian characteristic subgroup A of rank $d > 1$. Let F be the field with 2 elements, $E = N_G(A)$ and $C = C_G(A)$. Then A is an FE-module, and E / C is isomorphic to a subgroup T of $GL_d(2)$.

In this lecture, we present a general algorithm constructing simple groups G with Sylow 2-subgroup S from the given subgroup T of $GL_d(2)$ and its action on the natural vector space $A = F^d$. Of particular interest is the special case where $A = C$ and A is an irreducible FT-module. As applications of the algorithm we show that everybody could have found most of the known sporadic groups like J_1 of Janko, Co_3 of Conway and TH of Thompson, but also many classical groups and the Mathieu groups. This algorithm also sheds some light on R. Brauer's remark published in the BAMS in 1979: "It is not even impossible that no classification (of the finite simple groups) exists."



Gerhard Michler

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Refreshments will be served at 3:55 PM in the Mathematics Department lounge (532 Malott Hall).

Thursday, February 22, 2007
at 4:25 PM in 406 Malott Hall