Algebra and Geometry Seminar

Speaker: David Wehlau (Royal Military College & Queen's University)

Title: Rings of invariants of Finite Classical Groups.

Abstract: Let V be a finite dimensional vector space of dimension n over a finite field $\mathbb{F}_q$ of characteristic p. $\mathrm{GL}_n(\mathbb{F}_q)$ denotes the group of all invertible $\mathbb{F}_q$-linear transformations of V and $\mathrm{SL}_n(\mathbb{F}_q)$ denotes the special linear group consisting of elements of $\mathrm{GL}_n(\mathbb{F}_q)$ of determinant 1. The other classical groups are the stabilizers in $\mathrm{GL}_n(\mathbb{F}_q)$ and $\mathrm{SL}_n(\mathbb{F}_q)$ of various forms on V, including non-degenerate symmetric, skew-symmetric and sesquilinear forms.

In the early 1990s David Carlisle and Peter Kropholler computed generators and relations for the ring of invariants for (the defining representation) of the finite symplectic group. In 2006, Chu and Jow computed the invariants for the unitary groups. There is also a range of comparable results for some, but not all, of the finite orthogonal groups.

Jim Shank, Eddy Campbell and I are engaged in a project to compute the invariants of these groups in an accessible and uniform manner. From the right viewpoint, the invariants of these groups display surprisingly similar structure. The major obstacle is that the characteristic p divides the order of these groups making the computation of the invariants of the p-Sylow subgroups a vital hurdle. I will describe our method to surmount this hurdle and indicate how to pass from the invariants of the p-Sylow subgroups to the invariants of the full group.

This is joint work with Jim Shank (University of Kent, Canterbury UK) and Eddy Campbell.