April 22: Bertram Kostant (MIT), "Exotic finite subgroups of E_8 and T. Springer's regular elements of the Weyl group." (Joint work with N. Wallach). Let $\mathfrak{g}$ be a complex

simple Lie algebra and let G be the adjoint group of $\mathfrak{g}$. Let h be the Coxeter number of $\mathfrak{g}$. Some time ago I conjectured that if $q = 2h + 1$ is a prime power then the finite simple group $L_2(q)$ embeds into G. With the help of computers, in a number of the cases, this has been shown to be true. The most sophisticated case is when $G = E_8$. Here $q = 61$. This embedding was first computer established by Cohen-Griess and later without computer by Serre. Griess-Ryba also later (computer) proved that $L_2(49)$ and $L_2(41)$ embed into E_8.
Write the three prime powers 61, 49, 41 as q_k where $k = 30$, 24, 20 so that $q_k = 2\,k + 1$. In a 1959 paper I related, for any simple $\mathfrak{g}$, the Coxeter element with the principal nilpotent element in $\mathfrak{g}$. Tonny Springer, in a 1974 paper, extending my result in the special case of E_8, established a similar connection, between three nilpotent elements, $e_k \in \mathfrak{g}$, and three (regular) elements σ_k of the Weyl group. The order of σ_k is k. Using some beautiful properties of σ_k the main result in our presentation this week is the establishent of a clear cut connection between Springer's result, on one hand, with the Griess-Ryba embedding $L_2(q_k)$ in E_8 on the other.