Expander graphs arising from finite groups  
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Informally, expander graphs are graphs which can not be easily disconnected. In the case of bounded degree, this property is equivalent to a spectral gap in the Laplacian matrix of the graph. Margulis was the first to find an explicit construction of expander graphs, relating expansion to Kazhdan's property $T$. I will outline this connection and construct several families of expander graphs.

Groups with property $T$ and infinitely many alternating quotients  
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I will outline several methods for showing property $T$ – one of the methods which originated in the work of Dymara and Januszkiewicz uses the geometry of Hilbert spaces. I will use an extension of the method to show that certain subgroups of $\Aut(\mathbb{F}_p[x, y, z])$ have property $T$. As a consequence for any prime $p$, we construct 3 permutations in $\Alt(p^3 - 1)$ which not only generate the group but also make the resulting Cayley graphs expanders.  
This is joint work with Pierre-Emmanuel Caprace.