Mike Brannan, Texas A&M

Residual finiteness for quantum automorphism groups. A remarkable fact, discovered by S. Wang about 20 years ago, is that finite sets admit a great wealth of quantum symmetry. More precisely, the quantum symmetries of an n-point set are described by the quantum permutation group S_n^+, which is an infinite dimensional and highly non-commutative Hopf $*$-algebra co-acting on the function algebra of this set. In this talk, I will review some of the interesting operator algebraic properties of quantum permutation groups that have been discovered over the past 20 years. I will then explain how one can import results from subfactor theory to establish that quantum permutation groups are always residually finite-dimensional. On the other hand, I will show how one can use ideas from quantum information theory to construct examples of finite graphs whose quantum symmetry groups are very far from being residually finite dimensional. Parts of this talk are based on joint work with Alexandru Chirvasitu, Amaury Freslon, and David Roberson.

Scott Morrison, Australian National University

Category theory and interactive theorem proving. Interactive theorem provers are software tools that can check, and help construct, proofs of mathematical statements. (Automatic theorem provers, on the other hand, try to cut the human out of the loop entirely!) Interactive theorem provers remain quite difficult for mathematicians to use, but are getting steadily better. Explaining a "human proof" to a computer is often quite tedious; too often the computer wants fiddly little technical details spelled out for it. (On the other hand, not-infrequently at these points the human realises they didn't understand things as well as they thought they did!) A critical part of effective use of interactive theorem provers is the ability to construct new "tactics", which are little programs that build parts of the proof for you. Modern interactive theorem provers are making it easier to write new tactics, and to integrate them with the mathematics being developed.

In this talk, I'll give a short demo of one of the youngest interactive theorem provers, Lean. It already has a pretty substantial mathematics library (as examples, it knows about Noetherian rings, Borel measures, schemes, and monoidal categories), with more rapidly being written. I'll walk you through basic use of Lean, and show you some features of the category theory library in Lean. Time permitting, we might try to prove something (modules for an algebra in a monoidal category form a category?)

It's actually pretty simple to install Lean these days, so if you'd like to have a copy on your laptop so you can follow along during the talk, follow these instructions.