

Probabilistic Operator Algebra Seminar

Organizer: Dan-Virgil Voiculescu

March 29 **Michael Magee**, Durham University

Title: *Random Unitary Representations of Surface Groups*

The 1991 theorem of Voiculescu on the asymptotic $*$ -freeness of Haar unitary matrices can also be interpreted as a statement about the behaviour of random n -dimensional unitary representations of a fixed free group, as $n \rightarrow \infty$. From this point of view it is natural to replace the fixed free group by a more general infinite discrete group. One simple choice is the fundamental group of a closed surface of genus $g \geq 2$; this group is called a surface group and denoted by Γ_g . While for finite-dimensional unitary representations of free groups, a natural law of a random unitary representation comes from a product of Haar measures, for random unitary representations of Γ_g the picture is a little more complicated. Nevertheless, there is a natural way to define a random n -dimensional unitary representation of Γ_g that arises from the works of Atiyah-Bott and Goldman. I will state precisely a theorem that describes the large n behavior of these random n -dimensional representations of surface groups. I'll discuss the proof of this theorem that involves some topological arguments as well as some new ideas in and around the Weingarten calculus. The talk is based on the two preprints: 'Random Unitary Representations of Surface Groups I' arXiv:2101.00252 'Random Unitary Representations of Surface Groups II' arXiv:2101.03224