Probabilistic Operator Algebra Seminar

Organizer: Dan Virgil Voiculescu

Monday, 9:00–10:30 am, to attend via Zoom email David Jekel (daj@math.ku.dk) remote

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Jun 22 **Andrew Campbell**, Institute of Science and Technology Austria
Polya-Schur problems and free probability

Polya-Schur problems, named after a classical result of Polya and Schur, aim to characterize linear operators, T, on polynomials which preserve the property of all the zeros being in a specified domain. For univariate polynomials with real roots, this problem was fully resolved by Borcea and Branden (2009), over a century after some of the earliest progress of Hermite and Laguerre. A natural extension is to then consider how the roots of $T[p]$ are distributed, now that the question where they are distributed is resolved. For operators of the form $T = f(\partial_a)$ for some f in the Laguerre–Polya class, i.e. those described by the Polya–Benz theorem, we will see that applying T amounts to free convolving with a free stable law and taking a convolution power of the empirical zero measure in the large degree limit. This generalizes and unites the recent progress on repeated differentiation and the backwards heat flow. In fact, by allowing T to vary in the degree any free infinitely divisible distribution can be realized this way. Time permitting, we will discuss the key steps of the proof and versions of this result for the free multiplicative convolution and free rectangular convolution. Based on joint work with Jonas Jalowy (https://arxiv.org/abs/2605.31356)