INTEGRALS OF CHARACTERISTIC POLYNOMIALS
OF UNITARY MATRICES, AND APPLICATIONS
TO THE RIEMANN ZETA FUNCTION

Abstract. In recent research on the Riemann zeta function and the Riemann Hypothesis, it is important to calculate certain integrals involving the characteristic functions of \( N \times N \) unitary matrices and to develop asymptotic expansions of these integrals as \( N \) goes to infinity. In this talk, I will derive exact formulas for several of these integrals, verify that the leading coefficients in their asymptotic expansions are non-zero, and relate these results to conjectures about the distribution of the zeros of the Riemann zeta function on the critical line. I will also explain how these calculations are related to mathematical statistics and to the hypergeometric functions of Hermitian matrix argument.

Donald Richards (Pennsylvania State University)

Donald Richards is since 2002 a professor of Statistics at Penn State University. He has held faculty positions at the University of Virginia (1987-2002), the University of North Carolina (1981-1987), and the University of the West Indies (1979-1981) where he received his Ph.D. in mathematical statistics. Richards has held visiting positions at the University of Wyoming (1983-1984), the Institute for Advanced Study (2000-2001), and the University of Heidelberg (2013-2014). Richards has served on the Board of Directors of the Institute for Mathematics and its Applications, the Board on Mathematical Sciences, and on numerous journal editorial boards, and is a Fellow of the Institute of Mathematical Statistics and a Fellow of the American Mathematical Society. Richards’ research is in the areas of multivariate statistical analysis, applied probability, harmonic analysis and special functions, and actuarial science.