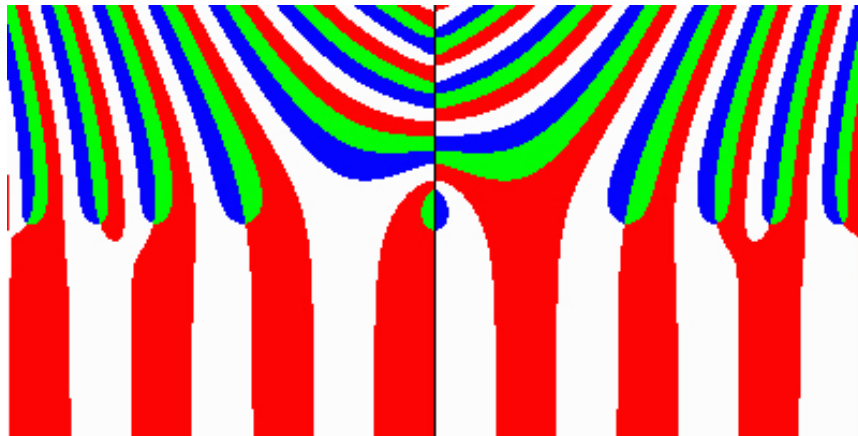


# COLLOQUIUM

MATHEMATICS AND STATISTICS  
QUEEN'S UNIVERSITY



## 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.

234 JEFFERY HALL  
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