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Items for the Info Sheet should reach Anne (burnsa@mast.queensu.ca) by noon on Monday. The Info Sheet is published every Tuesday.

**Wednesday, October 28, 3:00 p.m. Jeffery 319**

**Curves Seminar**

**Speaker:** Tony Geramita  
**Title:** Waring-like Decompositions for Homogeneous Polynomials (Talks I and II)

**Abstract:** The well known Waring Problem in Number Theory asks for a minimal decomposition of an integer $n$ into a sum of $d^{th}$ powers. E.g. LaGrange’s famous Four Square Theorem asserts that every integer is a sum of $\leq 4$ squares of integers, and those integers $\equiv 7 (mod\ 8)$ can not be written as a sum of fewer than 4 squares. There is also the theorem that every integer is a sum of $\leq 9$ cubes of integers. Such bounds exist for all powers, as was proved by Hilbert.

Let $R = \mathbb{C}[x_0, \ldots, x_n] = \oplus_{i=0}^{\infty} R_i$ ($R_i$ the vector space of homogeneous polynomials of degree $i$) be the standard graded polynomial ring. If $F \in R_2$ then $F$ can be represented by a symmetric $(n+1) \times (n+1)$ matrix. That matrix, in turn, is congruent to a diagonal matrix of rank $= r \leq n+1$ with 1’s on the main diagonal. Another way to say that is that

$$F = L_1^2 + \cdots + L_r^2$$

where the $L_i$ are linear forms. I.e. every quadratic polynomial is a sum of at most $n + 1$ squares of linear forms. Waring’s Problem for homogeneous polynomials asks for decompositions of forms of degree $d > 2$ as sums of $d^{th}$ powers of linear forms.
After a brief introduction to the history of the (mostly) successful attacks on Waring's Problems for polynomials, I will begin a discussion of some generalizations of these problems and of recent work I have done in dealing with these generalizations.

It is anticipated that there will be two weeks of talks on this subject.

**Thursday, October 29, 4:30 p.m. Jeffery 110**
**Seminar on Free Probability and Random Matrices**
Speaker: Josué Daniel Vázquez Becerra
Title: Second order freeness: a free probability study of fluctuations of random matrices

**Abstract:** Second order freeness is a feature exhibited in the large limit by random matrix ensembles such as the orthogonal Gaussian random matrices and the orthogonal Wishart random matrices. Its main purpose is to help determine the asymptotic behaviour of the covariance of traces of products of random matrices; this is comparable to the description of the asymptotic behaviour of the expectation of the trace of products of random matrices that we get from freeness.

Seminar website: http://www.mast.queensu.ca/~mingo/seminar/

**Friday, October 30, 11:00 a.m. Jeffery 422**
**Number Theory Seminar**
Speaker: Siddhi Pathak
Title: On a conjecture of Livingston

**Abstract:** In 1965, as an attempt to resolve a folk-lore conjecture of Erdős, Livingston conjectured the linear independence of logarithms of certain algebraic numbers over \( \mathbb{Q} \). In this talk, we disprove this conjecture of Livingston, highlighting that a new approach is required to settle Erdős's conjecture.

**Friday, October 30, 2:30 p.m. Jeffery 234**
**Department Colloquium**
Speaker: Ikemefuna Agbanusi
Title: The Laplacian Plus a Large potential

**Abstract:** It is a fairly well known fact that if one perturbs the Laplacian by a potential function that is "large", localized in a particular region, and has jumps across a reasonably smooth interface, one essentially "recovers the Dirichlet Laplacian" in the exterior of this region. The Dirichlet Laplacian here refers to imposing Dirichlet boundary conditions on the interface.

This invariably has implications for quantum mechanics, diffusions, obstacle scattering and other time dependent processes, i.e. semigroups, "generated" by the Laplacian. In these contexts, the potential controls the interactions in the system --- be they "quantum particles", particles undergoing Brownian motion or Waves --- and one usually speaks of large or strong coupling.

In this talk we will review and describe several approaches to the problem. We will also discuss our own recent approach which uses (rather well-known) pseudodifferential techniques to get some precise results on the rate and mode of convergence to the Dirichlet Laplacian.

I will labour to make this talk accessible to anyone with only a smattering knowledge of PDE and functional analysis. In particular, if you are somewhat familiar with the heat equation then this talk is up your alley.