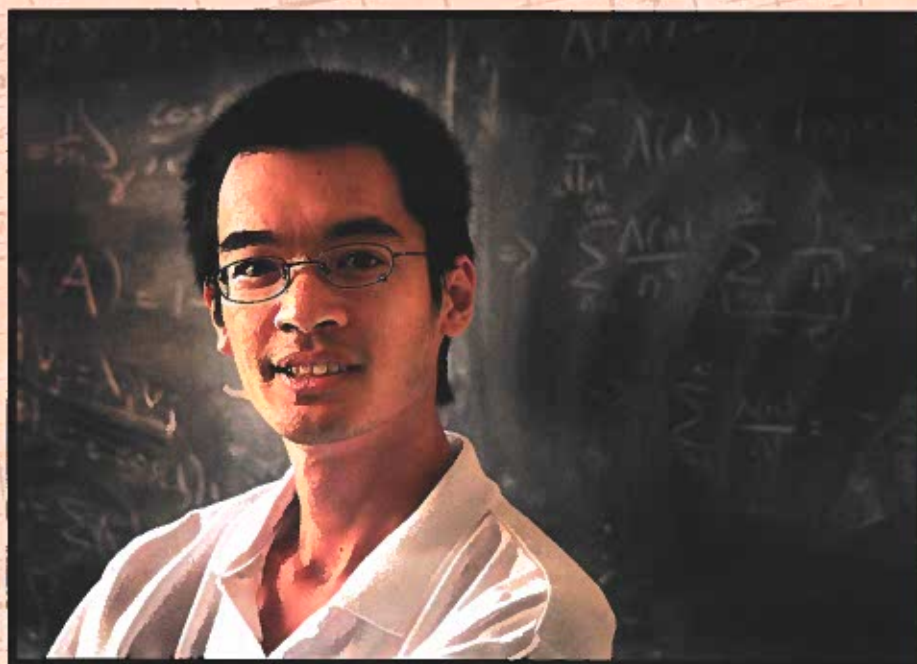# THE ALBERT LEON WHITEMAN MEMORIAL MATHEMATICS LECTURES

February 17 and 19, 2009

Terence Tao, UCLA

Structure and Randomness in the Prime Numbers

Tuesday February 17, 2009
Davidson Conference Center

3:30-4:30 pm: Reception in the Vineyard Room

4:30 pm: LECTURE in the Board Room

Short abstract:

"God may not play dice with the universe, but something strange is going on with the prime numbers" - Paul Erdös

The prime numbers are a fascinating blend of both structure (for instance, almost all primes are odd) and randomness. It is widely believed that beyond the "obvious" structures in the primes, the primes otherwise behave as if they were distributed randomly; this "pseudorandomness" then underlies our belief in many unsolved conjectures about the primes, from the twin prime conjecture to the Riemann hypothesis. This pseudorandomness has been frustratingly elusive to actually prove rigorously, but recently there has been progress in capturing enough of this pseudorandomness to establish new results about the primes, such as the fact that they contain arbitrarily long progressions. We survey some of these developments in this talk.

Compressed Sensing

Thursday, February 19, 2009

3:00-3:30 pm: Reception at the Gerontology Patio

3:30-4:30 pm: LECTURE in the Leonard Davis Auditorium

Abstract:

Suppose one wants to recover an unknown signal x in R^n from a given vector $Ax=b$ in R^m of linear measurements of the signal x. If the number of measurements m is less than the degrees of freedom n of the signal, then the problem is underdetermined and the solution x is not unique. However, if we also know that x is *sparse* or *compressible* with respect to some basis, then it is a remarkable fact that (given some assumptions on the measurement matrix A) we can reconstruct x from the measurements b with high accuracy, and in some cases with perfect accuracy. Furthermore, the algorithm for performing the reconstruction is computationally feasible. This observation underlies the newly developing field of *compressed sensing*. In this talk we will discuss some of the mathematical foundations of this field.

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