

**Department of Mathematical Sciences
Colloquium**

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**MALLIAVIN CALCULUS, STEIN'S LEMMA, AND DENSITIES
AND TAILS OF RANDOM VARIABLES**

Ivan Nourdin and Giovanni Peccati have recently established results in stochastic analysis by which, for a scalar random variable X which is differentiable in the sense of Malliavin calculus ($|DX|$ is square-integrable), an important quantity to study is the random variable $G = \langle DX, -DMX \rangle$, where M is the pseudo-inverse of the so-called Ornstein-Uhlenbeck semigroup generator on Wiener space. For instance G is a random way of measuring the dispersion of X since $\text{Var}[X] = E[G]$; plus, G is constant if and only if X is Gaussian; and comparing G to a constant can yield comparisons of X to the Gaussian law, as in limit theorems or density formulas. This presentation will review such results and the required background from Malliavin calculus, explain their relation to Stein's lemma and equation, and outline their applications to suprema of Gaussian fields, and other extensions. The results represent work in various papers by Airault, Malliavin, Nourdin, Peccati, and Viens, listed here:

Airault, H.; Malliavin, P.; Viens, F. Stokes formula on the Wiener space and n -dimensional Nourdin-Peccati analysis. *Journal of Functional Analysis*, 258 no. 5 (2009), 1763-1783.

Nourdin, I.; Peccati, G. Stein's method on Wiener chaos. *Probability Theory and Related Fields*, 145 (2008), no. 1, 75-118.

Nourdin, I.; Viens, F. Density estimates and concentration inequalities with Malliavin calculus. *Electronic Journal of Probability*, 14 (2009), 2287-2309.

Viens, F. Stein's lemma, Malliavin calculus, and tail bounds, with application to polymer fluctuation exponent. *Stochastic Processes and their Applications* 119 (2009), 3671-3698.

**Friday, April 16, 2010 at 3 pm in Bell Hall 143
The University of Texas at El Paso**

Refreshments will be served in front of the colloquium room,
15 minutes before the start of the colloquium.