Joint Colloquium Lecture of Institute for Mathematical Sciences and Department of Mathematics

Perspectives of White Noise Analysis

Professor Takeyuki Hida

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Date	Wednesday, 4 April 2007
Venue	Colloquium Room A S14 03-10 Department of Mathematics
Time	2:00 pm - 3:00 pm
About the Speaker	Professor Takeyuki Hida obtained his PhD from Kyoto University in 1961. After a short stint at Kyoto University he joined Nagoya University as Professor in the Mathematics Department in 1964. He retired from Nagoya University in 1991 and moved to Meijo University where he was Professor until 31 March 2007. From 1991, he has been Professor Emeritus of Nagoya University. Professor Hida is the founder of White Noise Analysis. He has done pioneering work in developing differential and integral calculus based on the time derivative of the Brownian motion, which is now known as the Hida calculus. Beginning with his 1975 Carlton Lectures on "Analysis of Brownian Functionals", White Noise Analysis has developed into a rich area with connections in infinite dimensional harmonic analysis and applications to quantum theory and biology. It has recently been classified as a new subject under the code 60H40 in the AMS Subject Classifications. Professor Hida had written 6 books and about 130 papers. He has been invited to give lectures at leading universities and major scientific meetings in the United States, Europe and various parts of the world.
Abstract	It has been more than thirty years since white noise analysis was launched systematically. It is now a good time to have an overview of the theory and to reflect on its advantages in order to anticipate further developments of this theory. Our main interests are in the studies of random complex systems that are developing as time goes by. We first come to the reduction of the complex systems in question. White noise, that is the time derivative of a Brownian motion, is the most important, elemental system of random variables that can come from the step of the reduction. We therefore wish to discuss the analysis of functionals of white noise. The first characteristic of the analysis is the determination of generalized white noise functionals, where white noise keeps the identity and plays the role of the system of variables. Naturally, we can introduce differential operators in white noise, and further Laplacians. The second characteristic is the effective use of the infinite dimensional rotation group, under which white noise measure is kept invariant. Thus, we may say that white noise analysis has an aspect of infinite dimensional harmonic analysis arising from the rotation group. The third characteristic is that our method is applied to the case of Poisson noise functionals, where one can see similarity and dissimilarity with the Gaussian case. Because of a wider setup of the analysis, we can see various fields of applications. Among others, we propose good connections with quantum dynamics and biology in addition to those with differential equations and geometry within mathematics itself.

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