# WABASH
## EXTRAMURAL MODERN ANALYSIS
# SEMINAR

### February 22

### 2:00 p.m.
### at
# Wabash College
### in rooms 114 and 118 Baxter Hall

*Times given are Eastern Time,*
*which is currently local time for Central Indiana and Ohio.*

**2:00–2:30**   *Refreshments and conversation*

**2:30–3:30**   **K-theory of operator algebras and higher index theoretic invariants**
*ZHIZHANG XIE, Texas A&M University*

**3:30–4:00**   *More refreshments and conversation*

**4:00–5:00**   **Brown measures of free Brownian motions with spectral initial conditions**
*CHING WEI HO, Indiana University*

**5:00–...**   *Refreshments and farewells*

The purpose of Wabash Seminar talks is to present surveys of interest to all analysts, including graduate students and scholars working in areas far from the speaker's specialty. Come and meet your fellow analysts, learn what's going on, and spread the word.

Next Meeting: April 25

*For further information contact*

Thomas Sinclair, Purdue University
E–mail: tsincla@purdue.edu
Web: http://www.math.purdue.edu/~tsincla/wabash/

## K-theory of operator algebras and higher index theoretic invariants

### ZHIZHANG XIE

K-theory of operator algebras has played a fundamental role in the developments of various branches of mathematics during the last thirty years or so. In particular, its applications to geometry and topology have greatly advanced some of the most important problems in those areas of mathematics, such as the Novikov conjecture, the Baum-Connes conjecture and the Gromov-Lawson-Rosenberg conjecture. One of the most fruitful interactions of K-theory of operator algebras with geometry and topology is through higher index theoretic invariants. In this talk, I will give a brief introduction to some of the most recent advances in K-theory of operator algebras and it applications to geometry and topology, such as the positive scalar curvature problem in geometry and the manifold rigidity problem in topology.

## Brown measures of free Brownian motions with spectral initial conditions

### CHING WEI HO

Let $c_t$ be a circular Brownian motion in a $W^*$-probability space $A$ and $x_0$ be a Hermitian random variable freely independent from $c_t$. In this talk, I will give a description of the Brown measure $\rho_t$ of $x_0 + c_t$. The support is related to the subordination function $F_t$ on the upper half plane satisfying

$$\tau[(F_t(z) - x_0)^{-1}] = \tau[(z - x_0 - s_t)^{-1}]$$

where $\tau$ is the trace in $A$, and $s_t$ is the free semicircular Brownian motion freely independent from $x_0$. The measure $\rho_t$ is absolutely continuous with a density that is constant along the vertical direction inside the support. Furthermore, the push-forward of $\rho_t$ by a natural map is the law of $x_0 + s_t$.

The circular Brownian motion has a multiplicative analogue — the free multiplicative Brownian motion $b_t$. The process $b_t$ is a one-parameter family in $A$ defined by the free stochastic equation

$$db_t = b_t \, dc_t, \quad b_0 = 1.$$

In this talk, I will also give a description of the Brown measure $\mu_t$ of $ub_t$, where $u$ is a unitary operator in $A$, freely independent from the free multiplicative Brownian motion $b_t$.