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# Seminar

# *Non-homogeneous harmonic analysis, Geometric Measure Theory and fine structures of harmonic measure*

## *Professor Alexander Volberg*
## *Michigan State University*

### *Abstract*

One of the goals of harmonies analysis is to study singular integrals. Singular integrals are ubiquitous objects in PDE and in Mathematical Physics, and as it turned out recently, play an important part in Geometric Measure Theory. They have various degrees of singularity, and the simplest ones are called Calderon – Zygmund operators. Their theory was completed in the 50´s by Zygmund and Calderon. Or it seemed like that. The last 20 years saw the need to consider CZ operators in very bad environment, so kernels are still very good, but the ambient set has no regularity whatsoever. Initially such situations appeared from the wish to solve some outstanding problems in complex analysis: such as Painleve's, Ahlfors', Denjoy's and Vitushkin's problems. But recently it turned out that the non-homogeneous harmonic analysis (=the analysis of CZ operators on very bad sets and measures) is also very fruitful in the part of Geometric Measure Theory that deals with rectifiability, and also helps a lot to understand the geometry of harmonic measure. Lennart Carleson, Nikolai Makarov, Jean Bourgain, Peter Jones and Tom Wolff obtained important results on metric properties of harmonic measure in the 80's and 90's. But most of the results concerned the structure of harmonic measure of planar domains. As an example of the use of non-homogeneous harmonic analysis, we will show how it allows us to understand very fine property of harmonic measure of any domain in any dimension.

Date:     24 January 2018 (Wednesday)
Time:     2:00pm – 3:00pm
Venue:   Room 222, Lady Shaw Building,
            The Chinese University of Hong Kong, Shatin

*All are Welcome*