TITLES AND ABSTRACTS OF TALKS

- **Guy David,** *Université Paris-Sud*

  Some boundary regularity for 2-D soap films in 3-space

  Abstract: We shall consider minimal or almost minimal sets, mostly of dimension 2 in 3-space, subject to a boundary constraint of sliding type along a surface or a curve. This is supposed to model soap films. Roughly speaking, we define minimality as in Almgren and Taylor's work, but where competitors of E are required to be obtained as deformations of E through maps that send points of the boundary to the boundary. Even in low dimensions, I will not be able to present the expected full regularity result, just some pieces.

- **José María Martell,** *ICMAT CSIC-UAM-UC3M-UCM Consejo Superior de Investigaciones Científicas, Spain*

  Extensions of the F. & M. Riesz Theorem: Harmonic measure and Rectifiability

  Abstract: The classical theorem of F. and M. Riesz established absolute continuity of harmonic measure with respect to arc length measure, for a simply connected domain in the complex plane with a rectifiable boundary. C. Bishop and P. Jones presented a counterexample to show that such a result may fail in the absence of some topological hypothesis (e.g., simple connectedness). In this talk we will survey some higher dimensional versions of this result and its converse. Our goal is to characterize the rectifiability or the uniform rectifiability of a set (or of the boundary of a given domain) by the good properties of the associated harmonic measure in terms of its absolute continuity or higher integrability with respect to the surface measure. Taking into account the Bishop-Jones example we will address these problems in different scenarios with or without some topological hypothesis (e.g, scale-invariant or quantitative connectivity).

- **Pertti Mattila,** *University of Helsinki*

  Singular integrals in Heisenberg groups

  Abstract: I shall survey some results on singular integrals with Calderon-Zygmund type kernels in Heisenberg groups, their relations to the geometric structure of the underlying sets and to the removability questions for the Lipschitz solutions of the sub-Laplacian equation.

- **Xavier Tolsa,** *ICREA-Universitat Autònoma de Barcelona*

  Riesz transforms, rectifiability, and harmonic measure

  Abstract: In this talk I will survey recent results in connection with the so called David-Semmes problem, square functions, and rectifiability. I will also describe recent applications to the study of the relationship between harmonic measure and rectifiability.

- **Sergei Treil,** *Brown University*

  Two weight L^p estimates for paraproducts in non-homogeneous settings

  Abstract: In the talk I present a necessary and sufficient condition for the two weight L^p-estimates for paraproducts in non-homogeneous settings, $1 < p < \infty$. Of interest is the case $p \neq 2$, since the case $p = 2$ is a well-known and easy corollary of the Carleson embedding theorem. The necessary and sufficient condition is given in terms of testing conditions of Sawyer type: for $p \leq 2$ only one ("direct") testing condition is required, but for $p > 2$ both "direct" and "adjoint" testing conditions are needed. An interesting feature is that the "adjoint" testing condition is that it is a testing condition not for the adjoint of the paraproduct, but for some auxiliary operator.

- **Alexander Volberg,** *Michigan State University*

  If harmonic measure is absolutely continuous, then it is rectifiable

  Abstract: This is a joint work with S. Hofmann, J.-M. Martell, S. Mayboroda, and X. Tolsa. We are improving on the previous result of Azzam–Mourgoglou–Tolsa and we are proving the following final result: If a compact set E in $\mathbb{R}^{n+1}$ has positive and finite H^n Hausdorff measure, and if the harmonic measure is absolutely continuous to this surface measure $H^n|E$, then the harmonic measure is rectifiable. Along with this "co-dimension 1 case" we are going to discuss the cases when the co-dimension is smaller than 1 and even what is known when the co-dimension is slightly bigger than 1. The co-dimension 1 case is heavily based on the recent solution of the co-dimension 1 case of the David–Semmes problem.