SEMINARI D'ANÀLISI UAB-UB **Curs 2013–2014**

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Aula A1 (CRM).

The higher order regularity Dirichlet problem for elliptic systems in nonsmooth domains

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ABSTRACT:

Given a bounded domain Ω, we formulate the ℓ-th order Dirichlet boundary value problem for the Laplacian Δ in Ω as follows

$$\begin{cases} \Delta u = 0 \ \text{ in } \ \Omega \\ u\big|_{\partial\Omega}^{n.t.} = f \in L^p_\ell(\partial\Omega), \\ \mathcal{N}(\nabla^k u) \in L^p(\partial\Omega) \ \text{ for } \ 0 \leq k \leq \ell, \end{cases}$$

where $\mathcal{N}$ denotes the nontangential maximal operator, while $u\big|_{\partial\Omega}^{n.t.}$ stands for the non-tangential trace of u onto $\partial\Omega$. We show that the nature of the outward unit normal, exhibited through its multiplier properties and oscillatory behavior, is the determinant geometrical factor in establishing whether the previous problem is well-posed when formulated at a certain regularity level ℓ. This produces a scale of results which contains, as endpoints, the well-posedness theorems in regular SKT domains from Hofmann-Mitrea-Taylor (corresponding to $\ell = 0,\ 1$) and the classical well-posedness theorems in C^∞ domains (corresponding to $\ell = \infty$). Furthermore, we show that this theory extends to a large class of constant (complex) coefficient, second order elliptic systems including all scalar operators, as well as the Lamé system of elasticity, among others.

Joint work with D. Mitrea and M. Mitrea.