



Mercoledì 13 Gennaio 2016, dalle ore 9:30 precise, in Sala Riunioni di questo Dipartimento, si svolgerà *Una Giornata sulle Equazioni Ellittiche Nonlineari* secondo il seguente programma:

– dalle 9:30 alle 10:20 il chiarissimo **Professor Xavier Cabré**, dell'*ICREA* e della *Universitat Politècnica de Catalunya* di Barcelona, Spagna, terrà un seminario su

**Curves and surfaces with constant nonlocal mean curvature**

Sunto. We are concerned with hypersurfaces of  $\mathbb{R}^N$  with constant nonlocal (or fractional) mean curvature. This is the equation associated to critical points of the fractional perimeter under a volume constraint. Our results are twofold. First we prove the nonlocal analogue of the Alexandrov result characterizing spheres as the only closed embedded hypersurfaces in  $\mathbb{R}^N$  with constant mean curvature. Here we use the moving planes method. Our second result establishes the existence of periodic bands or "cylinders" in  $\mathbb{R}^2$  with constant nonlocal mean curvature and bifurcating from a straight band. These are Delaunay type bands in the nonlocal setting. Here we use a Lyapunov–Schmidt procedure for a quasilinear type fractional elliptic equation.

(This is joint work with Mouhamed M. Fall, Joan Solà–Morales and Tobias Weth).

– dalle 10:30 alle 11:20 la chiarissima **Professoressa Raffaella Servadei**, del *Dipartimento di Scienze Pure e Applicate* dell'*Università degli Studi di Urbino "Carlo Bo"*, terrà un seminario su

**Critical fractional equations with concave–convex nonlinearities**

Sunto. In this talk we deal with the following fractional critical problem

$$(P_\lambda) = \begin{cases} (-\Delta)^s u = \lambda u^q + u^{2_s^*-1}, & u > 0 \text{ in } \Omega \\ u = 0 & \text{in } \mathbb{R}^n \setminus \Omega, \end{cases}$$

where  $\Omega \subset \mathbb{R}^n$  is a regular bounded domain,  $\lambda > 0$ ,  $0 < s < 1$  and  $n > 2s$ . Here  $(-\Delta)^s$  denotes the fractional Laplace operator defined, up to a normalization factor, by

$$-(-\Delta)^s u(x) = \int_{\mathbb{R}^n} \frac{u(x+y) + u(x-y) - 2u(x)}{|y|^{n+2s}} dy, \quad x \in \mathbb{R}^n.$$

Our main results show the existence and multiplicity of solutions to problem  $(P_\lambda)$  for different values of  $\lambda$ . The dependency on this parameter changes according to whether we consider the concave power case ( $0 < q < 1$ ) or the convex power case ( $1 < q < 2_s^* - 1$ ). These two cases will be treated separately.

(This is joint work with B. Barrios, E. Colorado and F. Soria.)

– dalle 15:30 alle 16:20 il chiarissimo **Professor Giovanni Molica Bisci**, del *Dipartimento di Patrimonio, Architettura e Urbanistica* dell'*Università degli Studi "Mediterranea"* di Reggio Calabria, terrà un seminario su

**A Brezis–Nirenberg type result for a nonlocal fractional operator**

Sunto. Aim of this talk is to deal with the nonlocal fractional counterpart of the Laplace equation involving critical nonlinearities studied in the famous paper of Brezis and Nirenberg. Namely, our model is the following equation

$$\begin{cases} (-\Delta)_p^s u = |u|^{p_s^*-2}u + \lambda g(x, u) & \text{in } \Omega \\ u = 0 & \text{in } \mathbb{R}^n \setminus \Omega, \end{cases}$$

where  $(-\Delta)_p^s$  is the fractional  $p$ -Laplace operator,  $s \in (0, 1)$ ,  $\Omega$  is an open bounded set of  $\mathbb{R}^n$ ,  $2s \leq ps < n$ , with smooth boundary,  $\lambda > 0$  is a real parameter,  $p_s^* := pn/(n - ps)$  is a fractional critical Sobolev exponent, and  $g$  is a subcritical nonlinearity. In this setting, through variational techniques, we prove the existence of one weak solution for the above problem provided that  $\lambda$  is sufficiently small. In addition, if the perturbation term  $g$  vanish at the origin, a multiplicity result is established.

(This is joint work with J. Mawhin.)

– dalle 16:30 alle 17:20 il chiarissimo **Professor Alessio Fiscella**, del **Departamento de Matemática** dell'*Universidade Estadual de Campinas, IMECC*, Brasile, terrà un seminario su

### **Nonlocal fractional problems involving the Hardy potential**

Sunto. In this talk we introduce existence, multiplicity and asymptotic behavior of nontrivial weak solutions of nonlinear problems driven by the fractional Laplace operator and involving a critical Hardy potential. In particular, we will face problems involving both subcritical and critical Sobolev terms. The results for the subcritical case are based on the fact that the main underlying elliptic functional is weakly lower semicontinuous and coercive. This property is a direct consequence of the delicate study of the exact behavior of weakly convergent sequences in the space of measures. While for problems involving critical Sobolev terms this strategy does not work and, as usual, we must pay attention to the lack of compactness at critical level. For this we exploit a tricky qualitative analysis, mainly based on an asymptotic property of the mountain pass level.

(This is joint work with P. Pucci.)

Sarà gradita la presenza della S. V.

Prof. P. Pucci

*Il Direttore*  
Prof. P. Brandi