



## Prof. Luis Ángel Caffarelli

### Professor



#### **Most important awards, prizes and academies**

*Professional societies:* American Mathematical Society; American Academy of Arts and Sciences (1986); National Academy of Sciences (1991); Pontifical Academy of Sciences; Unión Matemática Argentina; Foreign Member, Academia Nacional de Ciencias, Buenos Aires and Córdoba; Foreign Member, Accademia Nazionale delle Scienze; Foreign Member, Accademia Nazionale dei Lincei. *Honours and awards:* Plenary Lecturer at ICM Beijing (2002); Fermi Lectures, Scuola Normale di Pisa (1998); Colloquium Lecturer – A.M.S. (1993); Pius XI Gold Medal (1988); Invited Lecturer, Math into the XXI Century Series, A.M.S. Centennial Celebration Guggenheim Fellowship (1985); Bocher Prize (1984); Co-awarded Stampacchi Prize (1982); Premio Konex Platino-Brillante (2003); Rolf Schock Prize, Swedish Academy of Science (2005); Doctor Honoris Causa Universidad Autónoma de Madrid, École Normale Supérieure, and Universidad de la Plata; Honorary Professor Universidad de Buenos Aires and Universidad de Mar del Plata.

#### **Summary of scientific research**

Luis Caffarelli works in non linear analysis, mainly on non linear partial differential equations arising from geometry and mechanics. He has conducted extensive research into free boundary and singular perturbation problems. He has worked on free boundary problems that arise naturally when a constitutive relation or a conserved quantity (a temperature, a pressure, a density)

changes discontinuously its behavior across some value of the variables under consideration. Typical examples are solid-liquid interphases, burnt-unburnt mixtures in flame propagation, and flow in porous media. Understanding of the geometry and stability of the solution and its interphase is important in selecting and evaluating simulation methods, as well as understanding the models themselves. Another area of research is fully non linear equations and optimal transportation. Fully non linear equations arise in optimization and optimal control. They have also been recently studied in relation to optimal transportation and optimal antenna design. Other areas of interest are incompressible flows, harmonic maps, and minimal surface theory and more recently, on non linear random homogenization.

### Main publications

Caffarelli, L.A., Non linear elliptic theory and the Monge-Ampere equation, *Proceedings of the International Congress of Mathematicians*, Vol. I, pp. 179-87, Higher Ed. Press (Beijing, 2002); Caffarelli, L.A., Jerison, D., Kenig, C.E., Some new monotonicity theorems with applications to free boundary problems, *Ann. of Math.*, (2) 155(2002), no. 2, pp. 369-404 (Reviewer: Ján Lovivsek); Caffarelli, L.A., Roquejoffre, J.-M., A nonlinear oblique derivative boundary value problem for the heat equation: analogy with the porous medium equation, *Ann. Inst. H. Poincaré Anal. Non Linéaire*, 19(2002), no. 1, pp. 41-80 (Reviewer: Jesús Hernández); Caffarelli, L.A., Feldman, M., McCann, R.J., Constructing optimal maps for Monge's transport problem as a limit of strictly convex costs, *J. Amer. Math. Soc.*, 15(2002), no. 1, pp. 1-26 (electronic), (Reviewer: J.E. Brothers); Caffarelli, L.A., Viaclovsky, J.A., On the regularity of solutions to Monge-Ampère equations on Hessian manifolds, *Comm. Partial Differential Equations*, 26(2001), no. 11-12, pp. 2339-51 (Reviewer: John Urbas); Athanasopoulos, I., Caffarelli, L.A., Salsa, S., The free boundary in an inverse conductivity problem, *J. Reine Angew. Math.*, 534(2001), pp. 1-31 (Reviewer: Hong Ming Yin); Caffarelli, L.A., The obstacle problem. *Lezioni Fermiane*, [Fermi Lectures], Accademia Nazionale dei Lincei, Rome, Scuola Normale Superiore, Pisa, 1998, pp. ii+54, pp. 49-52; Athanasopoulos, I., Caffarelli, L.A., Salsa, S., Caloric functions in Lipschitz domains and the regularity of solutions to phase transition problems, *Ann. of Math.*, (2), 143(1996), no. 3, pp. 413-34 (Reviewer: Elena Comparini); Caffarelli, Luis A., A priori estimates and the geometry of the Monge Ampère equation, *Nonlinear partial differential equations in differential geometry* (Park City, UT, 1992), 5-63, IAS/Park City Math. Ser., 2, *Amer. Math. Soc.*, Providence, RI (1996), (Reviewer: John Urbas); Caffarelli, L.A., Cabré, X., Fully nonlinear elliptic equations, *American Mathematical Society Colloquium Publications*, 43, American Mathematical Society, Providence, RI (1995), pp. vi+104 (Reviewer: P. Lindqvist); Caffarelli, L.A., Gidas, B., Spruck, J., Asymptotic symmetry and local behavior of semilinear elliptic equations with critical Sobolev growth, *Comm. Pure Appl. Math.*, 42(1989), no. 3, pp. 271-97 (Reviewer: Robert McOwen).