

# The Ladyzhenskaya Lecturer 2024

Professor Susanna Terracini (University of Torino, Italy)



Susanna Terracini was born in 1963. She has got PhD in S.I.S.S.A. Trieste in 1990. She is Full Professor at the Department of Mathematics “G. Peano”, University of Torino (since 2012).

She is an associate member of the Académie Royale de Belgique, a corresponding member of the Istituto Lombardo Accademia di Scienze e Lettere. She was awarded the Calogero Vinti prize for Mathematics (2002), the Bruno Finzi prize for Rational Mechanics (2007), and the Juliusz Schauder International Medal (2020). From 2013 till 2016, she was the Convenor of the European Women in Mathematics association.

**Title of the Lecture: Boundary Harnack principles and Schauder estimates for degenerate equations on singular sets.**

*Abstract:* The ratio  $v/u$  of two solutions to a second order elliptic equation in divergence form solves a degenerate elliptic equation if  $u$  and  $v$  share the zero set; that is,  $Z(u) \subseteq Z(v)$ . The coefficients of the degenerate equation vanish on the nodal set as  $u^2$ . Developing a Schauder theory for such equations, we prove  $C^{k,\alpha}$ -regularity of the ratio from one side of the regular part of the nodal set in the spirit of the higher order boundary Harnack principle established by De Silva and Savin in [4]. Then, by a gluing lemma, the estimates extend across the regular part of the nodal set. Eventually, using conformal mapping in dimension  $n = 2$ , we provide local gradient estimates for the ratio which hold also across the singular part of the nodal set and depends on the highest value attained by the Almgren frequency function.

The talk is based on results obtained jointly with Giorgio Tortone (University of Pisa) and Stefano Vita (University of Torino).

## References

[1] S. Terracini, G. Tortone and S. Vita, Higher order boundary Harnack principle on nodal domains via degenerate equations, preprint, 2022.

[2] Y. Sire, S. Terracini, S. Vita. Liouville type theorems and regularity of solutions to degenerate or singular problems part I: even solutions. *Comm. Partial Differential Equations*, 46-2 (2021), 310-361.

[3] Y. Sire, S. Terracini, S. Vita. Liouville type theorems and regularity of solutions to degenerate or singular problems part II: odd solutions. *Mathematics in Engineering*, 3-1 (2021), 1-50.

[4] D. De Silva, O. Savin. A note on higher regularity boundary Harnack inequality. *DCDS-A*, 35(12), (2015) 6155-6163.

The Lecture will be held at the meeting of the V.I. Smirnov Seminar on Mathematical Physics on March 11, at 16-30 (St. Petersburg time) in Zoom.