

# Anisotropic $p$ -Laplacean equations: the pursuit of a comprehensive theory of regularity

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In this talk we will introduce an equation in divergence form whose principal part is the Euler-Lagrange equation of the energy integral

$$\mathcal{F}(u) = \sum_{i=1}^N \frac{1}{p_i} \int_{\Omega} |\partial_i u|^{p_i} dx, \quad \Omega \subset\subset \mathbb{R}^N,$$

known to be the prototype of orthotropic non-standard growth functionals  $\mathcal{F}$  in the Calculus of Variations. We will focus on the similarities and differences of the theory of regularity in comparison with the  $p$ -Laplacean one, and describe a problem which is still active and widely open after more than fifty years.

The lack of homogeneity calls for a new approach to a wider theory of regularity that encompasses the minimizers of  $\mathcal{F}$ : we will present some possible new methods, motivated by recent Harnack estimates and adapted from the theory of parabolic differential equations.