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## Nonlinear Analysis

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## Editorial

## Special issue “Singular and degenerate phenomena in nonlinear analysis”



Degenerate and singular partial differential equations are at the heart of many scientific advances. The behaviour of various material objects and phenomena in nature can be modelled by differential equations of this type or by equations with similar features. For this reason, the qualitative or numerical analysis of degenerate and singular partial differential equations has been an extremely active research topic during the past few years.

Nonlinear elliptic, parabolic or hyperbolic equations often may have vanishing coefficients or small parameters in higher order partial derivatives, causing a change in types of partial differential equations, singular concentration behaviours or blowup of solutions. In addition, singularities in the geometry of the domain and/or terms in the partial differential equations lead to significant complexities of analysis, yielding still more unusual phenomena or patterns of solutions.

Degenerate or singular partial differential equations arise naturally at the interplay between various disciplines like nonlinear analysis, geometry, life sciences, elasticity, mathematical physics, climate modelling/prediction, materials science, engineering, finance, etc. We can see an immense breadth of mathematics and its beauty in the works of this research. Degenerate and singular partial differential equations have consequently become one of the largest and most diverse research fields of present-day mathematics.

To highlight the importance of this area, to present the state-of-the art of the theory and techniques, and with a further aim to attract more attention from the nonlinear analysis contributors and readerships alike, we put together this special issue by leading researchers. Overall, there are 31 research papers. The topics covered include the following:

- traces of weighted Sobolev spaces;
- critical phenomena for various differential operators;
- Brezis–Nirenberg phenomena for nonlocal operators;
- necessary and sufficient conditions for lower semicontinuity;
- bifurcation at isolated singular points for degenerate elliptic operators;
- supercritical problems on manifolds;
- fractional Sobolev–Hardy inequalities;
- gradient estimates for singular fully nonlinear elliptic equations;
- bubble solutions for elliptic problems with critical growth;
- homogenization for anisotropic fractional operators;
- singular elliptic systems;
- porous medium equations of fractional type.

I am much indebted to the authors for their invaluable contributions to this volume. I also thank the reviewers for their helpful reports and comments. Finally, I warmly thank the Nonlinear Analysis Editors-in-Chief, Professors Enzo L. Mitidieri and Siegfried Carl, for their kind assistance and enthusiastic support of this project.

*Guest Editor*

Vicențiu D. Rădulescu

*Institute of Mathematics “Simion Stoilow” of the Romanian Academy,  
Bucharest, Romania*

*E-mail address:* [vicentiu.radulescu@imar.ro](mailto:vicentiu.radulescu@imar.ro)