



International  
Scientific Conference



# Algebraic and Geometric Methods of Analysis



Devoted to 160 anniversary of  
**Dvytro Grave**  
(25.08.1863 - 19.12.1939)  
Academician of the Ukrainian  
Academy of Sciences, the  
first director of the Institute of  
Mathematics of NAS of Ukraine

May 29 – June 1, 2023  
Odesa, Ukraine

## LIST OF TOPICS

- Algebraic methods in geometry
- Differential geometry in the large
- Geometry and topology of differentiable manifolds
- General and algebraic topology
- Dynamical systems and their applications
- Geometric and topological methods in natural sciences
- Geometric problems in mathematical analysis

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- Odesa National University of Technology
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- Taras Shevchenko National University of Kyiv
- Kyiv Mathematical Society

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- [5] V.D. Gordevskyy, E.S. Sazonova Continual approximate solution of the Boltzmann equation with arbitrary density. *Mat. Stud.*, 45(2) : 194–204, 2016.

## On a flower-shape geometry

**Raffaella Servadei**

(Dipartimento di Scienze Pure e Applicate  
Università degli Studi di Urbino Carlo Bo)

*E-mail:* raffaella.servadei@uniurb.it

Several important problems arising in many research fields, such as physics and differential geometry, lead to consider elliptic equations when a lack of compactness occurs. From the mathematical point of view, the main interest relies on the fact that often the tools of nonlinear functional analysis, based on compactness arguments, cannot be used, at least in a straightforward way, and some new techniques have to be developed.

Aim of the talk is to present some of these techniques, which strongly use symmetry, together with their applications to elliptic problems with a variational structure. In particular we deal with a group theoretical scheme, raised in the study of problems which are invariant with respect to the action of orthogonal subgroups, and we present a construction, called flower-shape geometry, and its applications to the study of nonlinear problems set in strip-like domains. These results appeared in a joint paper with Giuseppe Devillanova (Politecnico di Bari) and Giovanni Molica Bisci (Urbino).

## On equicontinuity of families of mappings with one normalization condition by the prime ends

**Sevost'yanov Evgeny**

(Zhytomyr Ivan Franko State University; Institute of Applied Mathematics and Mechanics,  
Slavyansk)

*E-mail:* esevostyanov2009@gmail.com

**Ilkevych Nataliya**

(Zhytomyr Ivan Franko State University)

*E-mail:* ilkevych1980@gmail.com

Borel function  $\rho : \mathbb{R}^n \rightarrow [0, \infty]$  is called *admissible* for  $\Gamma$ , abbr.  $\rho \in \text{adm } \Gamma$ , if  $\int_{\gamma} \rho(x) |dx| \geq 1$  for each (locally rectifiable)  $\gamma \in \Gamma$ . We define the quantity

$$M(\Gamma) = \inf_{\rho \in \text{adm } \Gamma} \int_{\mathbb{R}^n} \rho^n(x) dm(x) \quad (1)$$

and call  $M(\Gamma)$  a *modulus* of  $\Gamma$ ; here  $m$  stands for the  $n$ -dimensional Lebesgue measure, see [1, 6.1].

Given sets  $E$  and  $F$  and a domain  $D$  in  $\overline{\mathbb{R}^n} = \mathbb{R}^n \cup \{\infty\}$ , we denote  $\Gamma(E, F, D)$  the family of all paths  $\gamma : [0, 1] \rightarrow \overline{\mathbb{R}^n}$  joining  $E$  and  $F$  in  $D$ , that is,  $\gamma(0) \in E$ ,  $\gamma(1) \in F$  and  $\gamma(t) \in D$  for all  $t \in [0, 1]$ .

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