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ON THE FALL SESSION OF THE ROMANIAN ITINERANT SEMINAR ON MATHEMATICS AND ITS APPLICATIONS (RISMA), 10 September 2026, Târgovişte, Romania

Gheorghe Moroşanu, founder and coordinator of RISMA*

Dedicated to Professor Constantin Fetecau on his 80th anniversary

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1 Introduction

It is well known within the Romanian mathematical community that I launched in 2017 the Romanian Itinerant Seminar on Mathematical Analysis and Its Applications: www.cs.ubbcluj.ro/rismaa/. Since then, six successful annual sessions have taken place in various cities: Cluj-Napoca (2018), Constanţa (2019), Alba Iulia (2021), Braşov (2022), Craiova (2023), and Cluj-Napoca again in 2024.

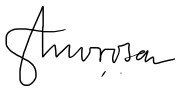
In 2024, I proposed renaming the seminar as *Romanian Itinerant Seminar on Mathematics and Its Applications* (RISMA): http://www.aosr.ro/en/romanian-itinerant-seminar-on-mathematics-and-applications-sirma/, expan ding its scope to include all areas of mathematics and its applications. Under this new format, the seminar sessions are held twice a year, as parts of the Spring and Fall Scientific Conferences organized by the Academy of Romanian Scientists (ARS), and hosted in the same cities where the ARS Spring and Fall Conferences of all ARS sections take place. More precisely, the Spring and Fall Conferences of the ARS Mathematics Section are replaced by extensions called *RISMA Spring and Fall Sessions*. The idea is to

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expand the ARS mathematics conferences to a wider audience. The papers resulting from this seminar are usually published in our journal, *Annals of the Academy of Romanian Scientists, Series on Mathematics and Its Applications*.

The participants to this RISMA Fall Session who presented their scientific results on this occasion are glad and honored to dedicate their corresponding abstracts below to Professor Emeritus Constantin Fetecau who turned 80 this year.

September 10, 2026 Gheorghe Moroșanu



2 Abstracts of the Presentations

The abstracts of the presentations are attached below, listed in alphabetical order by the presenters' names. Full papers may be obtained by contacting the authors directly at the email addresses provided.

• **Luminița BARBU**, *Ovidius* University of Constanța, Romania, Associate Member of the Academy of Romanian Scientists; email: lbarbu@univ-ovidius.ro, and **Gheorghe MOROŞANU**, *Babeş-Bolyai* University, Cluj-Napoca, Romania, Full Member of the Academy of Romanian Scientists, email: gheorghe.morosanu@ubbcluj.ro

Title: **On a Delay Second Order Integro-Differential Equation in a General Banach Space**

Abstract: Consider in a real Banach space X the following second order integro-differential equation

$$u''(t) = Au(t) + \int_{-r}^{0} g(s, u_t(s))\, ds + f(t),\ t \in [0, T], \quad (E)$$

$$u(0) = \phi(0),\ u'(0) = b,\ u_0 = \phi, \quad (IC)$$

where $A : D(A) \subset X \to X$ is a densely defined, closed linear operator generating a strongly continuous cosine family, g is a possibly unbounded

nonlinear function which is dominated in some sense by A, and for each $t \in [0,T]$, u_t denotes the function defined by $u_t(s) = u(t+s)$, $-r \leq s \leq 0$.

Existence and uniquennes of solutions for problem $(E)-(IC)$ are derived by using a fixed point approach combined with properties of the cosine family generated by A.

• **Vasile BERINDE**, Technical University of Cluj-Napoca, North University Center at Baia Mare, Romania, Full Member of the Academy of Romanian Scientists; email: vasile.berinde@gmail.com

Title: **Existence and Approximation of Solutions of Boundary Value Problems for Second Order Iterative Differential Equations**

Abstract: We study the existence and approximation of solutions to the second order iterative boundary-value problem

$$\ddot{x}(t) = f(t, x(t), x[2](t)), \quad 0 \leq t \leq 1,$$

where $x[2](t) := x(x(t))$, with solutions satisfying one of the two sets of boundary conditions:

$$(i) \quad x(0) = 0,\ x(1) = 1;$$

$$(ii) \quad x(0) = 1,\ x(1) = 0.$$

• **Aurelian CERNEA**, Faculty of Mathematics and Computer Science, University of Bucharest, Academiei 14, 010014 Bucharest, Corresponding Member of the Academy of Romanian Scientists; email: acernea@fmi.unibuc.ro

Title: **Existence of Solutions for Some Fractional Differential Inclusions**

Abstract: The talk was concerned with two classes of differential inclusions. The first problem is

$$D_C^q x(t) \in F(t, x(t), V(x)(t)) \quad a.e.\ ([0,1]) \qquad (a)$$

$$D_C^\sigma x(\xi) = \sum_{i=1}^{n} \alpha_i D_C^\nu x(\eta_i), \quad x(1) = \sum_{i=1}^{n} \beta_i \int_0^{\eta_i} x(s)ds + \sum_{i=1}^{n} \gamma_i x(\eta_i), \qquad (b)$$

where D_C^q is the Caputo fractional derivative of order $q \in (1,2]$, $0 < \sigma, \nu \leq 1$, $0 < \xi < \eta_1 < \eta_2 < ... < \eta_n < 1$, $\alpha_i, \beta_i, \gamma_i \in \mathbf{R}$, $i = \overline{1,n}$, $F : [0,1] \times \mathbf{R} \times \mathbf{R} \to \mathcal{P}(\mathbf{R})$ is a set-valued map and $V : C([0,1],\mathbf{R}) \to C([0,1],\mathbf{R})$ is a nonlinear Volterra integral operator defined by $V(x)(t) = \int_0^t k(t,s,x(s))ds$ with $k(.,.,.) : [0,1] \times \mathbf{R} \times \mathbf{R} \to \mathbf{R}$ a given function. The second problem is

$$\begin{cases} D_C^{q_1} x_1(t) \in F_1(t, x_1(t), x_2(t)), & a.e.\ t \in I, \\ D_C^{q_2} x_2(t) \in F_2(t, x_1(t), x_2(t)), & a.e.\ t \in I, \end{cases} \tag{c}$$

$$\begin{cases} x_1(0) = 0, \quad x_1'(T) = 0, \quad x_1(T) = p_1 \int_0^\xi x_2(s)ds + Tp_2 x_2(\xi), \\ x_2(0) = 0, \quad x_2'(T) = 0, \quad x_2(T) = r_1 \int_0^\xi x_1(s)ds + Tr_2 x_1(\xi), \end{cases} \tag{d}$$

where $I = [0,T]$, $T > 0$, $q_1, q_2 \in (2,3)$, $\xi \in (0;T)$, $p_1, p_2, r_1, r_2 \in \mathbf{R}$, $F_i(.,.,.) : I \times \mathbf{R}^2 \to \mathcal{P}(\mathbf{R})$, $i = 1,2$ are given set-valued maps.

Existence results for problem $(a) - (b)$ and $(c) - (d)$ are provided when the values of the set-valued maps are not convex; instead these set-valued maps are assumed to be Lipschitz in state variables.

• **Eduard-Marius CRĂCIUN**, *Ovidius* University of Constanţa, Romania, Associate Member of the Academy of Romanian Scientists; email: emcraciun@yahoo.com

Title: **Cracks Interaction in Pre-Stressed Composites**

Abstract: We consider a pre-stressed, orthotropic, linear, elastic material representing a fiber reinforced composite. We suppose that the material is unbounded and contains two collinear and unequal cracks situated in the same plane, parallel to the reinforcing fibers and to the initial applied stresses. We assume that the upper and lower faces of the cracks are acted by symmetrically distributed incremental stresses. Our first aim is to determine the incremental elastic state produced in the body. To do this we use Guz's representation theorem. Using the theory of the Riemann-Hilbert problem we give the solution of our mathematical problem, assuming that the applied incremental stresses have a given constant value. Our second aim is to determine the critical values of the given incremental stress for which the tips of the cracks start to propagate. Our third aim is to study the interaction of two unequal cracks. According to the obtained results this interaction is strong only if the distance between the cracks is much more smaller as their length. In such a situation, the inner tips start to propagate first and the cracks tend to unify. If the distance is much grater as the length of

the cracks, the interaction is weak and the tips of the longest crack start to propagate first.

• **Vasile DRĂGAN**, *Simion Stoilow* Institute of Mathematics, Romania, Full Member of the Academy of Romanian Scientists; email: vasile.dragan@imar.ro, and **Samir ABERKANE**, Universite de Lorraine, CRAN, UMR Vandoeuvre-les-Nancy Cedex, France, and CNRS, CRAN, UMR 7039, France; email: samir.aberkane@univ-lorraine.fr

Title: **Coupled Matrix Riccati Differential Equations with Applications to the Solution of some Control Problems for Systems Modelled by Mean-field Stochastic Linear Differential Equations**

Abstract: We consider a class of coupled matrix Riccati differential equations involved in the solution of some linear quadratic optimal control problems for systems described by McKean-Vlasov linear stochastic differential equations also known as mean-field stochastic linear differential equations. For this kind of Riccati differential equations several special solutions defined on the whole real axis are studied. We refer to maximal and bounded solution and stabilizing and bounded solution. We shall provide necessary and sufficient conditions which guarantee the existence of that solutions. We emphasize the role of these solutions in the proof of the existence of an optimal control for an optimal control problem consisting of the minimization of a quadratic functional defined on the set of the trajectories of a system of McKean-Vlasov linear stochastic differential equations.

• **Teodor HAVÂRNEANU**, *Octav Mayer* Institute of Mathematics, Romanian Academy, Iaşi, Romania; email: havi@uaic.ro, and **Cătălin POPA**, *Octav Mayer* Institute of Mathematics, Romanian Academy, Iaşi, Romania

Title: **A Splitting Approximation Scheme for the Two-Dimensional Magnetohydrodynamic Equations**

Abstract: We consider the following two-dimensional magnetohydrodynamic equations:

$$\frac{\partial y}{\partial t} - \Delta y + (y \cdot \nabla) y + \nabla p + \nabla\left(\frac{1}{2}B^2\right) - (B \cdot \nabla)B = 0 \quad \text{in } Q = \Omega \times (0,T), \tag{1}$$

$$\frac{\partial B}{\partial t} + \widetilde{\operatorname{curl}}(\operatorname{curl} B) + (y \cdot \nabla)B - (B \cdot \nabla)y = 0 \quad \text{in } Q, \tag{2}$$

$$\operatorname{div} y = 0, \quad \operatorname{div} B = 0 \quad \text{in } Q, \tag{3}$$

$$y = 0, \qquad B \cdot N = 0, \quad \operatorname{curl} B = 0 \quad \text{on } \partial\Omega \times (0,T), \tag{4}$$

$$y(\cdot,0) = y_0, \quad B(\cdot,0) = B_0 \quad \text{in } \Omega, \tag{5}$$

where $y = (y_1, y_2) : \Omega \times [0,T] \to \mathbb{R}^2$ is the fluid velocity, $p : \Omega \times [0,T] \to \mathbb{R}$ is the scalar pressure, $B = (B_1, B_2) : \Omega \times [0,T] \to \mathbb{R}^2$ is the magnetic field, and $\Omega \subset \mathbb{R}^2$ is a bounded domain with a smooth boundary. We proposed a splitting approximation scheme of $(1) - (5)$ which consists of decoupling the Navier–Stokes equations and Maxwell equations which form the system $(1) - (5)$, on small time intervals. To compute the approximate solutions we start with a pair of initial velocity and magnetic fields and alternatively solve Navier–Stokes equations and dynamo equations. The main result states that for sufficiently smooth initial data the scheme converges in L^p with $p > 2$.

• **Liviu IGNAT**, *Simion Stoilow* Institute of Mathematics, Romania, Associate Member of the Academy of Romanian Scientists; email: liviu.ignat@gmail.com, and **Nicola de NITTI**, Polytechnic University of Bari, and **Fernando QUIROS**, Universidad Autonoma de Madrid

Title: **Convection Diffusion Problems with Non-Integrable Initial Data**

Abstract: We describe the long time behaviour of the solutions to

$$u_t - u_{xx} + \left(a|u|^{q-1}u\right)_x = 0 \ \text{ in } (0,\infty) \times \mathbb{R}, \qquad u(0) = u_0 \ \text{ on } \mathbb{R},$$

where $a \in \{\pm 1\}$, $q > 1$ and $u_0 \in L^\infty(\mathbb{R})$ need not be integrable, the model case being $u_0(x) \simeq k_\pm |x|^{-\gamma}$ as $x \to \pm\infty$, $0 < \gamma \le 1$. For integrable data the diffusive and the convective regimes are separated by $q = 2$; here the mass is infinite and the critical exponent becomes $q_c = 1 + 1/\gamma$.

Since $|x|^{-\gamma}$ lies in the weak (Marcinkiewicz) space $L^{1/\gamma,\infty}(\mathbb{R})$ but in no Lebesgue space, we work in $L^{p_0,\infty}(\mathbb{R}) \cap L^\infty(\mathbb{R})$, where we prove well-posedness and the sharp decay estimates

$$\|u(t)\|_{L^\infty(\mathbb{R})} \lesssim \begin{cases} \|u_0\|_{L^{p_0,\infty}(\mathbb{R})}\, t^{-\frac{1}{2p_0}}, & q \ge p_0 + 1, \\ \|u_0\|^{\frac{p_0}{p_0+q-1}}_{L^{p_0,\infty}(\mathbb{R})}\, t^{-\frac{1}{p_0+q-1}}, & 1 < q \le p_0 + 1, \end{cases}$$

parabolic in the first case and hyperbolic in the second, the latter following from Oleinik-type gradient bounds and multi-point estimates.

We then obtain the first term of the asymptotic expansion: for $\gamma \in (0,1)$, $k_\pm \neq 0$, $R > 0$,

$$\lim_{t\to\infty} \int_{|\xi|\le R} \left| t^\alpha u(t, t^\beta \xi) - U_\gamma(\xi) \right| d\xi = 0, \qquad (\alpha, \beta) = \left(\tfrac{\gamma}{1+(q-1)\gamma_*}, \tfrac{1}{1+(q-1)\gamma_*} \right),$$

with $\gamma_* = \gamma$ for $q < q_c$ and $\gamma_* = 0$ otherwise; here U_γ is the profile of the unique self-similar solution with datum $k\,\mathrm{sgn}x|x|^{-\gamma}$ of the heat equation, of the complete equation or of the pure conservation law, according to the regime, its uniqueness in the convective range being the delicate point.

• **Aurelian ISAR**, Faculty of Physics, University of Bucharest; *Horia Hulubei* National Institute of Physics and Nuclear Engineering, Măgurele; Full Member of the Academy of Romanian Scientists; email: isar@theory.nipne.ro, and **Alina STOICA**, Faculty of Physics, University of Bucharest; *Horia Hulubei* National Institute of Physics and Nuclear Engineering, Măgurele; email: dobre.alina@theory.nipne.ro

Title: **Generation of Quantum Correlations in Gaussian Quantum Systems**

Abstract: Hellinger geometric quantum discord and interferometric power are investigated for an open system consisting of two bosonic modes interacting with four different environments: vacuum, squeezed vacuum, thermal and squeezed thermal, taking the initial state of the system either a single-mode squeezed state, which presents no correlations, or a squeezed vacuum state. The time evolution of the correlations is investigated in the framework of the theory of open systems, based on completely positive quantum dynamical semigroups, using the Gorini-Kossakowski-Lindblad-Sudarshan master equation. We show that both quantum correlations can be generated from an initial factorized state and even amplified. For the squeezed vacuum environment, the competition between the influences exerted by the squeezing of the initial state and the squeezing of the environment leads to the decreasing, and even destruction of the correlations, or to their enhancement. In the case of an initial squeezed vacuum state in interaction with the squeezed vacuum environment, for specific conditions one can achieve decoherence-free states.

• **Liviu IXARU**, *Horia Hulubei* National Institute of Physics and Nuclear Engineering, Department of Theoretical Physics, Bucharest, Romania, Full

Member of the Academy of Romanian Scientists; email: ixaru@theory.nipne.ro

Title: **On the Visualization of an Atomic Nucleus**

Abstract: The image of an atom, based on the well-known planetary model of Bohr, is so familiar to the general public that we find it even just on the logo of various institutions in the country or abroad. The situation is different for the atomic nucleus since this is typically based on a simple but naive model such that a modification is needed for a more realistic base. We opt for the nuclear shell model, a standard tool in the current nuclear physics. We examine this approach to present its results by a series of graphs and animations. A series of novelties and surprises will arise. Our presentation is intended to be of use for both specialists and nonspecialists.

• **Mircea LUPU**, *Transilvania* University of Braşov, Romania, Corresponding Member of the Academy of Romanian Scientists; email: emlupu 2006@yahoo.com

Title: **New Methods of Optimization Airfoils, Aerodynamics**

Abstract: The paper addresses direct and inverse boundary value problems, effectively deriving solutions for nonlinear functionals or integral equations. It examines the dynamics of symmetric aerodynamic profiles within an ideal fluid, subjected to the action of either an unbounded or a physically bounded jet. Constitutive equations are formulated in an auxiliary plane, and profile designs are determined based on criteria for resistance or extreme lift. Solutions are obtained using analytical methods, inequalities, or extremal analysis.

• **Constantin P. NICULESCU**, Department of Mathematics, University of Craiova, Romania, Full Member of the Academy of Romanian Scientists; email: constantin.p.niculescu@gmail.com

Title: **In Memoriam, Sorin G. Gal**

Abstract: This talk was dedicated to the memory of my dear friend and collaborator Sorin G. Gal (August 23, 1953 - October 18, 2024). This summarizes the dramatic story behind our latest publication—the book on the Choquet integral—which he initiated as a project in 2023.

• **Adrian PETRUŞEL**, *Babeş-Bolyai* University, Cluj-Napoca, Romania, Full Member of the Academy of Romanian Scientists; email: adrian.petrusel @ubbcluj.ro, and **Gabriela PETRUŞEL**, *Babeş-Bolyai* University, Cluj-Napoca, Romania; email: gabriela.petrusel@ubbcluj.ro

Title: **Some Fixed Point Theorems for Nonself Operators in Metric and b-Metric Spaces**

Abstract: In this paper, we will present a synthesis on some fixed point results for nonself operators. The outline of the paper is the following one:
- Local fixed point theorems;
- Graph contractions;
- Contractions outside a bounded set;
- Fixed point results in b-metric spaces Applications.

• **Savin TREANŢĂ**, National University of Science and Technology Politehnica Bucharest, Romania, Corresponding Member of the Academy of Romanian Scientists; email: savin.treanta@upb.ro

Title: **On Some Constrained Optimization Problems via Gradient Type Variations**

Abstract: The aim of this presentation is the optimization of constrained integral-type functionals by considering gradient-type variation functions. Concretely, the associated necessary conditions of optimality are stated by applying appropriate mathematical pipelines. The main results highlight the nonhomogeneous Euler-Lagrange-type partial differential equations. Compared to classical variations, in this context we are led to controlled right-hand member equations, creating a novel perspective in the field of variational calculus. More precisely, we want to determine the pair (φ^*, u^*) that extremizes the following functional given by a simple integral

$$M\left(\varphi(\cdot), u(\cdot)\right) = \int_{\omega_0}^{\omega_1} G\left(\varphi(\omega), \dot{\varphi}(\omega), \ddot{\varphi}(\omega), u(\omega), \omega\right) d\omega$$

between all functions φ of C^3-class that meet the conditions

$$\varphi(\omega_0) = \varphi_0, \quad \varphi(\omega_1) = \varphi_1, \quad \dot{\varphi}(\omega_0) = \tilde{\varphi}_0, \quad \dot{\varphi}(\omega_1) = \tilde{\varphi}_1,$$

subject to the following ordinary differential inequalities (ODIs) and ordinary differential equations (ODEs)

$$g^{\alpha}\left(\varphi(\omega), \dot{\varphi}(\omega), \ddot{\varphi}(\omega), u(\omega), \omega\right) \leq 0, \quad \alpha = \overline{1, o},\ o \leq n,$$

$$\chi^{\mu}\left(\varphi(\omega),\dot{\varphi}(\omega),\ddot{\varphi}(\omega),\dddot{\varphi}(\omega),u(\omega),\omega\right)$$
$$:=\frac{d^{3}\varphi^{\mu}}{d\omega^{3}}-Z^{\mu}\left(\varphi(\omega),\dot{\varphi}(\omega),\ddot{\varphi}(\omega),u(\omega),\omega\right)=0,\quad \mu=\overline{1,n}$$

(see α as the index set labelling the ODI constraints and μ the index corresponding to each ODE constraint), by employing gradient-type variation functions subject to the boundary conditions.