Volodymyr **Kulinskyi**

Professor · Dr. Sci&Math, PhD

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Summary

- Motivated and experienced lecturer with over 20 year experience lecturing and mentoring post graduate, undergraduate and college students. Teaching strategy is the learning through problem solving building student's personal studying trajectory.
- Researcher with international project experience in phase transitions and critical phenomena, nonequilibrium dynamical transitions in the systems of self-propelling particles, point-like and low-dimensional quantum defects in condensed matter with possible applications to quantum computing hardware.

Education

I.I. Mechnikov Odessa State University — *Odessa, UA*

PhD Theoretical Physics — *1992 - 1995*

- Thesis: Canonical formalism for the description of critical phenomena in simple liquids
  Advisor: Prof. M.P. Malomuzh

I.I. Mechnikov Odessa State University — *Odessa, UA*

B.S. and M.S. in Theoretical Physics — *1985 - 1992*

Experience

Department of Theoretical Physics and Astronomy, I.I. Mechnikov Odessa National University — *Odessa, UA*

Professor — *2011 – present*

- Theoretical research in phase transitions and critical phenomena: simple and complex liquids; nonequilibrium dynamical transitions in the systems of self-propelling particles, point-like and low-dimensional quantum defects in condensed matter.
- Supervising research projects for PhD and M.S. students.

North Carolina Central University — *Durham, USA*

Fulbright Research Scholar — *Oct 2017 - Apr 2018*

- Research project "Global Isomorphism between molecular fluids and the Ising-like models".
- Studied physical structure of singular interactions for 1dim Schrodinger operator including those with the spin-flip mechanism and their applications for spintronics.

Department of Molecular Physics, Taras Shevchenko National University of Kyiv — *Kyiv, UA*

Doctor of Sci in Phys& Math program fellow — *2008 – 2011*

- Developed novel approach to explain the Zeno-line and the rectilinear diameter linearities and asymmetry of liquid-gas equilibrium.

Leiden University — *Leiden, NL*

Visiting scientist — *2003 - 2007*

- Developed hydrodynamical models for the system of self-propelling particles with kineamatic constraints
- Computer simulations of dynamics of self-propelling particle systems

Department of Theoretical Physics, I.I. Mechnikov Odessa National University — *Odessa, UA*

Associate Professor — *Sep 2001 – 2008*

- Theoretical research in phase transitions and critical phenomena: simple and complex liquids. Dynamical transitions in the systems of self-propelling particles subjected to kinematic constraints.
- Leading research projects for PhD and M.S. students.

Department of Theoretical Physics, I.I. Mechnikov Odessa National University — *Odessa, UA*

Senior Lecturer — *Sep 1998 – 2001*

- Theoretical research in phase transitions and critical phenomena: simple and complex liquids.
- Practical classes for problem solving on Classical Mechanics
- Leading research projects for M.S. students.

Teaching experience

Department of Theoretical Physics and Astronomy, Odessa National University *Odessa, UA*

Professor/Lecturer *2011 - present*

- Taught Quantum Mechanics modules (PHYC20020 and PHYC30030) for over 20 B.S. students
- Taught programming lab classes on Modeling of physical processes in Mathematica environment to 6 M.S. students
- Taught Foundations Physics (PHYC10070) course for about 40 B.S. students of pure and applied mathematics departments (since 2020)
- Taught advanced courses: Selected problems in Statistical Physics and Quantum Field Theory, Introduction to Superconductivity for 10 M.S. students

Department of Theoretical Physics, Odessa National University *Odessa, UA*

Associate Professor/Lecturer *2001 - 2008*

- Taught courses Thermodynamics and Statistical Physics (PHYC20100), Quantum Mechanics (PHYC20020), Introduction to Superconductivity for over 20 B.S. students
- Taught advanced courses: Selected problems in Statistical Physics and Quantum Field Theory, Nonequilibrium Thermodynamics and Stochastic Processes for M.S. and postgraduate students

Richelieu Lyceum *Odessa, UA*

Part time teacher *1996 - 2005, 2020*

- Taught basic course "Wolfram Mathematica: an introduction" adopted for college students
- Taught advanced classes with extracurricular problems in Physics and Math (1996-2005). This implied that the students' qualification is above the standard high school curriculum and is on the level of the 1^{st} - 2^{nd} year of the undergraduate program
- Jury member of Olympiad in Physics for talented high school students across Ukraine. and International Tournaments of Young Physicists (IYPT) 2008-2019

Mentoring

5 of my diploma students won 1st prizes on All Ukrainian competitions of student scientific projects in Physics.

- Katts Andriy, Odesa University, PhD thesis: Global isomorphism between Yukawa fluids and the Ising model. Scientific adviser, 2019-2023
- Panchenko Dmytro, Odesa University, PhD thesis: The structure of point perturbations of the Schrödinger operator in one-dimensional and two-dimensional quantum systems. Scientific adviser, 2014-2019
- Chepizhko Oleksander, Odesa University, PhD thesis: Kinetics of the order-disorder transition for the systems of self-propelled particles. Scientific adviser 2012-2015
- Kupriyanova Yulia, Odesa University, PhD thesis: Diffusion motion in colloidal systems in external fields. Scientific adviser 2011-2014
- Ratushnaya Valeria, Leiden University, PhD thesis: Collective Behaviour of Self-Propelling Particles with Conservative Kinematic Constraints. Co-promotor 2003-2007

Extracurricular Activity

Executive Director *Odesa, UA*

Charity Fund "KTF-ONU" *2016-present*

- Fundraising management for the Department initiatives
- Sponsorship of local STEM education jointly with the Odesa Richelieu Lyceum

Jury member

International Young Physisicts Tournament *2015, 2017, 2019*

Development

- **Certified instructor for the course "Mathematica - an intorduction"**, issued by Wolfram Research Inc, 2019
- **Academic Teaching Excellence: English as the Medium of Instruction** 35hr course delivered by the British Council of Ukraine, certificate of completion, Lviv 1-6 Dec 2015
- **Aptis C1 certificate**, the British Council of Ukraine, May 2015
- **Stanford OpenEdX on-line course "Writing in the Sciences"**, certificate of completion with distinction, Nov 2013

Skills

Programming Mathematica, LaTeX, Python, C
Languages Ukrainian, Russian, English

Honors & Awards

2017-2018 **Fulbright Scholar Award**, Fulbright Program in Ukraine *USA*
2002 **Sign of Excellence in National Education**, Ministry of Education of Ukraine *UA*
1992-1995 **Scholarship for young scientists**, Council of Ministers of Ukraine *UA*
1994-1995 **G.Soros Scholarship in Physics for Postgraduates**, Soros Foundation *UA*

Selected Publications (Citations: 400+, WoS&Scopus h-index=13)

Quantum Physics

Singular spin-flip interactions for the 1D Schrödinger operator

Kulinskii V and Panchenko D — *2020*

- Physica Scripta (2020) **95**, p. 015205

Point-Like Rashba Interactions as Singular Self-Adjoint Extensions of the Schrödinger Operator in One Dimension

Kulinskii V and Panchenko D — *2019*

- Frontiers in Physics, (2019) **7**, 44

Mass-jump and mass-bump boundary conditions for singular self-adjoint extensions of the Schrödinger operator in one dimension

Kulinskii V and Panchenko D — *2019*

- Annals of Physics, (2019) **404**, pp. 47 - 56

Physical structure of point-like interactions for one-dimensional Schrödinger operator and the gauge symmetry

Kulinskii V and Panchenko D — *2015*

- Physica B: Condensed Matter, (2015) **472**, pp. 78-83

Localized states near the Abrikosov vortex core in type-II superconductors wihin zero-range potential model

Kulinskii V and Panchenko D — *2015*

- Nanosystems: Physics, Chemistry, Mathematics, (2015) **6**, pp. 353-360

Statistical Physics and Phase Transitions

The parameters of the Liquid-Gas state triangle for hard core attractive Yukawa fluids

Katts A and **Kulinskii V** — *2023*

Journal of Physical Chemistry B, (2023) **127**, pp. 8468-8475a

Global isomorphism approach: attractive Yukawa fluid, 2D case

Katts A and **Kulinskii V** — *2023*

Journal of Molecular Liquids, (2023) **388**, pp. 122736

Hard-core attractive Yukawa fluid global isomorphism with the lattice gas model

Katts A and **Kulinskii V** — *2022*

Journal of Chemical Physics, (2022) **156**, pp. 244104

Surface tension of molecular liquids: Lattice gas approach

Maslechko A and Glavatskiy K, and **Kulinskii V** — *2017*

- Journal of Molecular Liquids, (2017) **235**, pp. 119 - 125

Surface Tension of the Liquid – Vapor Interface of the Lennard-Jones Fluids from the Ising Model

Kulinskii V and Maslechko A — *2016*

- J. Phys. Chem. C, (2016) **120**, pp. 8790-8803

The critical compressibility factor value: Associative fluids and liquid alkali metals

Kulinskii V — *2014*

- J. Chem. Phys. **141** (2014), p. 054503

The Critical Compressibility Factor of Fluids from the Global Isomorphism Approach

Kulinskii V — *2013*

- J. Chem. Phys., **139** (2013), p. 184119

The Vliegenthart-Lekkerkerker relation. The case of the Mie-fluids

Kulinskii V — *2011*

- J. Chem. Phys., (2011) **134**, p. 144111

The Unified picture for the Classical Laws of Batschinski and the Rectilinear diameter for Molecular Fluids

Bulavin L and **Kulinskii V** — *2011*

- J. Phys. Chem. B, (2011) **115**, pp. 6061-6068

Communication: The Application of the Global Isomorphism to the Study of Liquid-Vapor Equilibrium in Two and Three-Dimensional Lennard-Jones Fluids

Kulinskii V — *2010*

- J. Chem. Phys., (2010) **133**, p. 131102

Global Isomorphism between the Lennard-Jones Fluids and the Ising model

Kulinskii V — *2010*

- J. Chem. Phys., (2010) **133**, p. 034121

Generalized principle of corresponding states and the scale invariant mean-field approach

Bulavin L and **Kulinskii V** *2010*

- J. Chem. Phys., (2010) **133**, p. 134101

Simple Geometrical Interpretation of the Linear Character for the Zeno-Line and the Rectilinear Diameter

Kulinskii V *2010*

- J. Phys. Chem. B, (2010) **114**, pp. 2852-2855

New version of the fluctuation Hamiltonian for liquids near the critical point

Kulinskii V and Malomuzh N *2010*

- Journal of Molecular Liquids **158**, (2011) pp. 166-169

Dynamics of self-propelling particle systems

The hydrodynamic description for the system of self-propelled particles: Ideal Vicsek fluid

Chepizhko O and **Kulinskii V** *2014*

- Physica A: Statistical Mechanics and its Applications, (2014) **415**, pp. 493 - 502

On the relation between Vicsek and Kuramoto models of spontaneous synchronization

Chepizhko O and **Kulinskii V** *2010*

- Physica A: Statistical Mechanics and its Applications, (2010) **389**, pp. 5347 - 5352

Collective behavior of self-propelling particles with kinematic constraints: The relation between the discrete and the continuous description

Ratushnaya V, Bedeaux D, **Kulinskii V** and Zvelindovsky A *2007*

- Physica A: Statistical Mechanics and its Applications, (2007) **381**, pp. 39-46

Hydrodynamic model for the system of self propelling particles with conservative kinematic constraints; two dimensional stationary solutions

Ratushnaya V, **Kulinskii V**, Bedeaux D, and Zvelindovsky A *2006*

- Physica A: Statistical Mechanics and its Applications, (2006) textbf366, pp. 107-114

Hydrodynamic model for a system of self-propelling particles with conservative kinematic constraints

Kulinskii V, Ratushnaya V, Bedeaux D, and Zvelindovsky A *2005*

- Europhys. Lett., (2005) **71**, pp. 207-213