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Žiar nad Hronom, Czechoslovakia

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Curriculum vitae

Academy:

- 1994 – 1999 Faculty of Mathematics and Physics,
Comenius University in Bratislava, Slovakia
Student of Theoretical and Mathematical Physics
Master (Diploma) Thesis: Model-independent determination of the course of the
electromagnetic form factor of pion.
Supervisor: Professor A.Z.Dubničková
- 1999 – 2003 Faculty of Pharmacy and Faculty of Mathematics and Physics,
(14.5.2003) Comenius University in Bratislava, Slovakia
PhD. student of Biophysics
PhD. project: SANS and SAXS studies of the effects of additive molecules on the
phospholipid membranes.
Supervisor: Associate Professor P. Balgavý
- 10.3.2017 Pavol Jozef Šafárik University in Košice, Slovakia
Doctor of Physical Sciences
Doctoral dissertation: Biophysical Perspectives of Model Biological Membranes Studied
by Neutron and X-ray Scattering

Professional Career:

- 1999 – 2003 Faculty of Pharmacy Comenius University in Bratislava
PhD graduate student at the Department of chemical theory of drugs
- 2003 – 2006 Department of Physics, Carnegie Mellon University, Pittsburgh, Pennsylvania
Postdoctoral Research Associate
- 2006 – 2008 National Research Council of Canada – Canadian Neutron Beam Centre v Chalk River,
Ontario
Postdoctoral Research Associate
- 2007 – pres. Faculty of Pharmacy Comenius University in Bratislava**
Faculty member at Department of Physical Chemistry of Drugs
- 2008 – 2014 NRC, Canadian Neutron Beam Centre, Chalk River, Ontario
Assistant Research Officer and Associate Research Officer
- 2014 – pres. JINR, Frank Laboratory of Neutron Physics, Dubna, Russia**
Deputy Director for Science

Teaching Experience

- 2001 – 2003 Teaching Assistant Faculty of Pharmacy, Comenius University Bratislava, Slovakia
2015 – 2021 Lecturer at Moscow Institute of Physics and Technology in Dolgoprudny, Russia
2018 – 2022 Lecturer at Faculty of Pharmacy, Comenius University in Bratislava, Slovakia
2008 – 2014 Co-supervisor of 3 master students, 3 graduate students and 3 doctoral students at the N5 spectrometer, Canadian Neutron Beam Centre v Chalk River, Ontario
2016 – pres. Supervisor of 2 master students, 3 graduate students and 1 postdoctoral fellow

Research Experience

- Small Angle Neutron Spectrometers – YUMO (JINR Dubna), PAXE (LLB CEA/Saclay), NG& (NIST Gaithersburg), BioSANS (ORNL Oak Ridge)
Neutron Diffractometers/Reflectometers – ANDR (NIST Gaithersburg), N5 (CNBC Chalk River), D3 (CNBC Chalk River)
X-ray spectrometers – C1, D1 a G1 (CHESS Ithaca)

Management Experience

- 2011 – 2014 National Research Council of Canada – Canadian Neutron Beam Centre in Chalk River, ON
Research program manager
**2014 – pres. Frank Laboratory of Neutron Physics, Dubna, Russia
Deputy Director for Science**
**2015 – pres. Central European Neutron Initiative – Institut Laue-Langevin, Grenoble, France
Representative of Slovak Republic**
2018 – 2021 Joint Institute for Nuclear Research, Dubna, Russia
Deputy Head of the national group of the Slovak Republic
**2021 – pres. Joint Institute for Nuclear Research, Dubna, Russia
Head of the national group of the Slovak Republic**
Organization of – III International Conference on SANS (JINR Dubna), 4th EJTEMM (CU Bratislava), School of XFEL and Synchrotron Radiation Users 2017, 2018, 2019, 2022 (CENI Slovakia)

Fellowships, Grants and Awards

- 2001 HERCULES Fellowship, Universite Joseph Fourier in Grenoble, France
2005, 2010 Scientific work of young physicists awards, Slovak Physical Society, Slovakia
2008 – 2022 Co-proponent of VEGA grants 1/0295/08, 1/0159/11, 1/1224/12, 1/0916/16, 1/0223/20
2009, 2015 Awards for three-year scientific impact, Literary fond, Slovakia
2009 – 2021 Co- and principal investigator of collaborative project JINR – FPharmUK, Bratislava
2014 – 2015 Co-investigator of Ontario Research Fund grant
2017 Prize for scientific impact awarded by Slovak Physical Society, Slovakia
2019 – 2022 Principal investigator of Russian Science Foundation grant 19-72-20186
2021 Honorary diploma of JINR for many years of fruitful activity, JINR, Dubna
2022 1st and 3rd prize in the FLNP competition of experimental, methodical and applied works in condensed matter physics, Frank Laboratory of Neutron Physics, JINR, Dubna

RÉSUMÉ

Since the beginning of my research career, I always accepted responsibilities and challenges. I was constantly extending my scientific interests starting from the physics of elementary particles and nuclear physics towards the application of learned methods to the life sciences. I have enjoyed opportunity to collaborate with researchers from different scientific areas covering the wide spectrum of fields such as pure theoretical physics, physical chemistry, biophysics and biology, and gained priceless experiences in neutron and X-ray scattering experiments. I have participated in many experimental runs as a stand-alone and/or collaborative user, and **co-authored about 120 publications (h index = 41)**.

In the last couple of years, I have become focused on the models of biological membrane and its inner structure, and very recently also on their interactions with various peptides, amyloid-beta peptides in particular. I believe the structural studies on the level of membrane-peptide interactions are necessary for revealing the sought-out relation between the structure and (dis)function of membranes. Based on the knowledge collected, I have designed a platform for studies of Alzheimer's disease on the membrane level. We have observed dramatic changes of the membrane morphology when transitioning between gel and fluid phase, that have suggested the temporal breakage of membrane in the presence of amyloid-beta peptide. By discovering these morphology changes, we have established the research approach for tackling the mechanism of the amyloid-beta peptide triggered reorganization of lipid membranes as a plausible cause of conformational diseases. Our investigations bring up enhancements also to pharmacology and medicine, and eventually will help to increase the quality of human life. I am more than interested to be a part of this big picture, and to continue steering the direction of research and development in the field.

- 2022-*invited* Small Triangle Meeting , Medzilaborce, Slovakia, October 25-28, 2022
- 2022-*plenary* 14th International Conference on Physics of Advanced Materials & 5th Autumn School on Physics of Advanced Materials, Dubrovnik, Croatia, September 8-15, 2022
- 2022-*invited* International Conference on Neutron Scattering, Buenos Aires, Argentina, August 21-25, 2022
- 2021-*plenary* International Seminar „NEUTRONS AND SYNCHROTRON RADIATION IN INVESTIGATIONS OF CONDENSED MATTER”, online, October 12-13, 2021
- 2021-*plenary* 13th International Conference on Physics of Advanced Materials & 4th Autumn School on Physics of Advanced Materials, Sant Feliu de Guixols, Spain, September 24-30, 2021
- 2020-*plenary* Condensed Matter Research at the IBR-2 2020, online, October 12-16, 2020
- 2020-*invited* Bionanosmart 2020, Stara Lesna, Slovakia, March 10-13, 2020
- 2019-*invited* Bilayers at the ILL (BILL2019), Grenoble, France, December 11 - 13, 2019
- 2019-*invited* International Conference in Molecular Medicine with special reference to structural biology and nanotechnology (MOLMED-2019), Changa, India, September 26 - 27, 2019
- 2018-*invited* NANOSMAT Africa, Cape Town, South Africa, November 19-23, 2018
- 2017-*invited* 5th European Joint Theoretical/Experimental Meeting on Membranes, Krakow, Poland, December 6-8, 2017
- 2017-*plenary* XXI International Scientific Conference of Young Scientists and Specialists, Dubna, Russia, October 2-6, 2017
- 2017-*plenary* 19th conference of czech and slovak physicists, Presov, Slovakia, September 4-7, 2017
- 2017-*invited* The 8th International Student Summer School “Nuclear Physics – Science and applications”, Brasov, Romania, July 26 - August 4, 2017
- 2017-*invited* Neutron Diffraction and the Mesoscale, Daejeon, Republic of Korea, July 6-7, 2017
- 2017-*invited* School of XFEL and Synchrotron Radiation Users, Liptovsky Jan, Slovakia, May 9-12, 2017
- 2016-*invited* Student Training Course, FLNP JINR, Dubna on August 29 - Spetember 2, 2016
- 2015- *invited* 3rd European Joint Theoretical/Experimental Meeting on Membranes, Stockholm, Sweden, September 30 - October 2, 2015
- 2015- *invited* VIII International Spring School on Nuclear Physics - JINR Days in Bulgaria, Borovets, Bulgaria, May 19-22, 2015
- 2015- *invited* Institute of Molecular Biosciences seminar, Univeristy of Graz, Austria, April 14, 2015
- 2015- *invited* XIX International Conference of Young Scientists and Specialists, Dubna, Russia, February 16-20, 2015
- 2014- *invited* Complex and Magnetic Soft Matter Systems: Physico-Mechanical Properties and Structure, Dubna, Russia, 29 September - 3 October 2014
- 2014- *invited* 39th meeting of the Program Advisory Committee for Condensed Matter Physics, Joint Institute of Nuclear Research in Dubna, Russia, January 20-21, 2014
- 2011- *invited* ORNL Neutron Scattering User Meeting, Oak Ridge, Tennessee, November 14-15, 2011
- 2011- *invited* 11th Canadian Neutron Scattering Summer School, Chalk River, Ontario, May 8-13, 2011
- 2006-*invited* American Conference on Neutron Scattering, St. Charles, Illinois, June 18-22, 2006
- 2005-*invited* Chalk River Laboratories seminar, Chalk River, Ontario, December, 2005

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- Ivankov, O., Murugova, T.N., Ermakova, E.V., Kondela, T., Badreeva, D.R., Hrubovčák, P., Soloviov, D., Tsarenko, A., Rogachev, A., Kuklin, A.I., Kučerka, N.; Amyloid-beta peptide (25–35) triggers a reorganization of lipid membranes driven by temperature changes. *Scientific Reports* 11/1 (2021) 21990.
- Tomáš Kondela, Ermuhammad Dushanov, Maria Vorobyeva, Kahramon Mamatkulov, Elizabeth Drolle, Dmytro Soloviov, Pavol Hrubovčák, Kholmırzo Kholmurodov, Grigory Arzumanyan, Zoya Leonenko, and Norbert Kučerka; Investigating the competitive effects of cholesterol and melatonin in model lipid membranes. *BBA-Biomembranes* 1863/9 (2021) 183651 (1-11).
- Norbert Kučerka, Elena Ermakova, Ermuhammad Dushanov, Kholmırzo T. Kholmurodov, Sergei Kurakin, Katarína Želinská and Daniela Uhríková; Cation-zwitterionic lipid interactions are affected by the lateral area per lipid. *Langmuir* 37 (2021) 278-288.
- Milka Doktorova, Norbert Kučerka, Jacob J. Kinnun, Jianjun Pan, Drew Marquardt, Haden L. Scott, Richard M. Venable, Richard W. Pastor, Stephen R. Wassall, John Katsaras, and Frederick A. Heberle; The Molecular Structure Of Sphingomyelin In Fluid Phase Bilayers Determined By The Joint Analysis Of Small-Angle X-Ray And Neutron Scattering Data. *Journal of Physical Chemistry B* 124 (2020) 5186-5200.
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- Norbert Kučerka, Daniela Uhríková, Biophysical perspectives of lipid membranes through the optics of neutron and X-ray scattering. in *Characterization of Biological Membranes* edited by Mu-Ping Nieh, Fred A. Heberle and John Katsaras. DeGruyter (2019) 3-41.
- Petra Pullmannová, Elena Ermakova, Andrej Kováčik, Lukáš Opálka, Jaroslav Maixner, Jarmila Zbytovská, Norbert Kučerka, Kateřina Vávrová; Long and Very Long Periodicity Lamellar Phases in Model Stratum Corneum Lipid Membranes. *Journal of Lipid Research* 60/5 (2019) 963-971.
- Kučerka N., Hrubovčák P., Kondela T., Dushanov E., Kholmurodov Kh.T., Gallová J., Balgavý P.; Location of the general anesthetic n-decane in model membranes. *Journal of Molecular Liquids* 276 (2019) 624-629.
- Tomáš Kondela, Jana Gallová, Thomas Hauß, Jonathan Barnoud, Siewert-J. Marrink, Norbert Kučerka; Alcohol interactions with lipid bilayers. *Molecules* 22 (2017) 2078.
- Norbert Kučerka, Ermuhammad Dushanov, Kholmırzo T. Kholmurodov, John Katsaras, and Daniela Uhríková; Calcium and zinc differentially affect the structure of lipid membranes. *Langmuir* 33 (2017) 3134-3141.
- Norbert Kučerka, Frederick Heberle, Jianjun Pan, John Katsaras; Structural Significance of Lipid Diversity as Studied by Small Angle Neutron and X-ray Scattering. *Membranes* 5/3 (2015) 454-472.
- Norbert Kučerka, Brad Van Oosten, Jianjun Pan, Frederick A. Heberle, Thad A. Harroun, and John Katsaras, Molecular Structures of Fluid Phosphatidylethanolamine Bilayers Obtained from Simulation-to-Experiment Comparisons and Experimental Scattering Density Profiles. *Journal of Physical Chemistry B* 119 (2015) 1947-1956.
- E. Drolle, N. Kučerka, Y. Choi, J. Katsaras, Z. Leonenko, Effect of melatonin and cholesterol on the structure of DOPC and DPPC lipid membrane. *Biochimica et Biophysica Acta - Biomembranes* 1828 (2013) 2247-2254.
- Jianjun Pan, Frederick A. Heberle, Stephanie Tristram-Nagle, Michelle Szymanski, Mary Koepfinger, John Katsaras, and Norbert Kučerka, Molecular structures of fluid phase phosphatidylglycerol bilayers as determined by small angle neutron and X-ray scattering. *Biochimica et Biophysica Acta - Biomembranes* 1818 (2012) 2135-2148.

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- Kučerka,N., J.F.Nagle, S.E.Feller and P.Balgavý, Models to analyze small-angle neutron scattering from unilamellar lipid vesicles. *Physical Review E* vol. 69 (2004) 051903.
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