

Alexander Nersesyan

Curriculum Vitae

Personal Data

Gender: Male
Born: November 27, 1943, Tbilisi, Georgia.
Address: 26 A.Kazbegi ave., build.1, Tbilisi 0177
Work address: Javakhishvili State University, Andronikashvili Institute of Physics,
Tamarashvili str. 6, 0177, Tbilisi, Georgia
Email: alex.a.nersesyan@gmail.com
Home telephone: (+99532) 239 52 44
Mobile: Tbilisi 557 06 06 79

Languages

Language	Writing	Reading	Speaking
English	C2	C2	C2
Russian	C2	C2	C2
Georgian	C1	C1	C1

Education and Academic Degrees

1966: Master degree in Theoretical Physics, Tbilisi State University, Tbilisi, Georgia (USSR)

1971: Ph.D. (Candidate of Science Degree) in theoretical physics, Tbilisi State University.
Thesis: "On the theory of metals with magnetic impurities".
Advisors: Dr. G.E. Gurgenshvili, Dr. G.A. Kharadze.
External examiner: Prof. A.I. Larkin, Landau Institute of Theoretical Physics, Moscow.

1985: Habilitation degree (Doctor of Science) in theoretical physics. Tbilisi State University.
Thesis: "Magnetic properties of one-dimensional Fermi systems: Exact results".
External examiners: Prof. I.E. Dzyaloshinskii, Landau Institute of Theoretical Physics, Moscow,
Prof. L. Bulaevsky, Lebedev Physical Institute, Moscow,
Prof. A.D. Pataraya, Abastumani Astrophysical Observatory.

Since 2018: Full member of the National Academy of Sciences of Georgia.

Scholarships and awards

Certificate of Honor (Unesco World Science Day) issued by Georgian National Academy of Sciences, 2017.

Positions held

Since 2018 - invited professor at Ilia State University, School of Natural Sciences and Medicine, Tbilisi, Georgia.

2014 - 2017 - full professor at Ilia State University, Faculty of Natural Sciences and Engineering, Tbilisi, Georgia.

October 1998 -- December 2022:
Research Staff Associate, Condensed Matter and Statistical Physics Section, Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy.

Since January 2008: Chief Researcher at Andronikashvili Institute of Physics, Tbilisi, Georgia.

November 1997 - October 1998 : Visiting Professor at Physikalisches Institut der Universität Bonn, Bonn, Germany.

July 1996 - July 1997: Visiting scientist at Condensed Matter Section, ICTP, Trieste, Italy.

March 1995 - March 1996: Senior Visiting Fellow at the Department of Theoretical Physics, University of Oxford, Oxford, UK.

July 1992 - July 1994: Visiting Professor at the Institute of Theoretical Physics, Chalmers University of Technology, Goteborg, Sweden.

1984 - 1992: Leading Scientific Researcher, Condensed Matter Dept., Institute of Physics, Tbilisi, Georgia.

1976 - 1984: Senior Scientific Researcher, Condensed Matter Dept., Institute of Physics, Tbilisi, Georgia.

1973 - 1976: Scientific Researcher, Condensed Matter Dept., Institute of Physics, Tbilisi, Georgia.

1969 - 1973: Junior Scientific Researcher, Condensed Matter Dept., Institute of Physics, Tbilisi, Georgia.

Workshops and Conferences

15th USSR Conference on Low-Temperature Physics, Tbilisi, 1969.

1st USSR conference on Solid State Theory, Moscow, 1969.

International Conference on Magnetism", Moscow, 1973.

18th USSR Conference on Low-Temperature Physics, Kiev, 1974.

Soviet-Hungarian Seminar on Solid State Theory, Moscow, 1978.

Soviet-Hungarian Seminar on Solid State Theory, Budapest, 1979.

USSR-USA Workshop on Condensed Matter Theory, Sevan, Armenia, USSR, 1979.

Soviet-Hungarian Seminar on Solid State Theory, Moscow, 1983.

USSR-USA Conference on Solid State Theory, Tbilisi, 1988.

Workshop on Strongly Correlated Electron Systems, Trieste, 1990.

Soviet-German Seminar on Solid State Theory, Bad-Honeff, 1990.

Workshop on Strongly Correlated Electron Systems, Trieste, 1995.

Condensed Matter / Field Theory Joint Forum, University of Oxford, Department of Theoretical Physics, 1995.

Conference on Strongly Correlated Electron Systems, Trieste, 1999.

NATO Summer School: New Theoretical Approaches to Strongly Correlated Systems, Isaac Newton Institute for Mathematical Sciences, Cambridge, UK, 2000.

Summer School on Low-Dimensional Quantum Systems (Theory and Experiment). Trieste, Italy, 2001 (co-director and lecturer)

International Workshop on Field Theory Methods in Correlated Nanoscale Systems, Brookhaven, USA, August 2002.

Summer College on Nonequilibrium Physics from Classical to Quantum Low Dimensional Systems, Trieste, Italy, July 2009.

International Workshop "Low Dimensional Physics and Gauge Principles" dedicated to 80th birthdate of Professor Sergei Matinyan, Yerevan-Tbilisi, October 2011.

Regional meeting: Advances and Perspectives of Basic Sciences in Caucasus and Central Asian Region, Tbilisi, Georgia, November 2011.

Sasha Gogolin Memorial Meeting on Many-Body Theory, ICTP, Trieste, Italy, November 2011 (co-director).

Conference on Field Theory Methods in Low-Dimensional Strongly Correlated Quantum Systems, ICTP, Trieste, Italy, August 2014.

School and Workshop: Low Dimensional Emergent Phenomena in Correlated Systems and Topological Quantum Matter, Tbilisi, Georgia, 01 - 10.06.2019, co-organizer.

Short-Term Visits to Other Institutes

1987 - 1989; 1991 - 1995: NORDITA, Copenhagen, Denmark.

1991 - Rutgers University, NJ, USA.

1992 - Stockholm University, Sweden.

1992 - Oulu University, Finland.

1997, 2000 - University of Rome "La Sapienza", Rome, Italy.

1999 - University of Bologna, Bologna, Italy.

2000 - Goettingen University and Institute of Theoretical Physics, University of Hannover, Germany.

2001 - University of Lisbon, Portugal.

2001 - Visiting Fellow in the Department of Physics, University of Warwick, UK (under EPSRC grant GR/N19359).

2002 , 2003 - Brookhaven National Laboratory, Upton, NY, USA.

2003 - Imperial College, London, UK.

2004, 2011 - Fribourg University, Switzerland.

Completed projects supported by grants

* Dynamical effects in low-dimensional electron and spin systems, director, covered period 05/05/2012 - 05/05/2014, Georgian National Science Foundation.

* Symmetry-breaking effects in strongly correlated electron and spin systems, co-director, covered period 01/05/2010 - 01/05/2012, Swiss National Science Foundation SCOPES.

* Dynamical effects in strongly correlated electron and spin systems, project head, covered period 01/05/1998-01/05/2000, INTAS-Georgia.

Pedagogical Activity

* International Centre for Theoretical Physics, Trieste, Italy. Postgraduate Diploma Programme, Condensed Matter Physics. Years: 1997, 1999-2006 (annually), 2008, 2010-2018. Courses given:

Elementary excitations in condensed matter systems, Quasi-one-dimensional conductors, Many-Body Theory. Mathematical Techniques in Condensed Matter Theory. The lectures are video-recorded and have free access at

<http://www.ictp.tv/diploma/search13-14.php?activityid=CMP&course=Many-Body_Fundamentals>;

<http://www.ictp.tv/diploma/search.php?activityid=CMP&course=Mathematical_Techniques>

* 2010-2011 and 2015-2019: Lecture courses given at Ilia State University, Tbilisi, Georgia . Courses given: Field theory in Condensed Matter Physics (Master programme), Topological aspects of Quantum Field Theory and Condensed Matter Physics (Master programme), Phase Transitions and Critical Phenomena (Master programme), Mathematical methods in physics (Bachelor programme), Advanced Quantum Mechanics (Master programme), Advanced Statistical Physics (Master programme)

* April – June 2012: Lecture course “Phase transitions and critical phenomena”, Master students at Javakishvili State University, Tbilisi, Georgia.

* March 2009: Lectures on Scaling and Renormalization in the Theory of Critical Phenomena for students at Javakishvili State University, Tbilisi, Georgia.

* Lectures and tutorials for Master students at Javakishvili TSU, 2008, 2nd term. Course: “Collective phenomena in condensed matter systems”.

* 1999: Lecture course: “Quantum spin chains and ladders: Bosonization approach”, University of Bologna, Italy.

* 1995: University of Oxford, Balliol College. Lectures and tutorials in Condensed Matter Physics, Michlmas Term, III-year students.

* 1993-1994: Institute for Theoretical Physics, Chalmers University. Extensive course on Renormalization Group and Bosonization Method in Quantum Theory of One-Dimensional Fermi Systems. (Application to quantum spin chains and planar statistical models).

* 1991: NORDITA, Copenhagen. Series of lectures on "Off-Diagonal Perturbations in One-Dimensional Luttinger Liquid" given to scientific staff, visitors, postdocs and post-graduate students.

* 1978-1982: 2-semester course "Methods of Quantum Field Theory in Condensed Matter Physics" for V year students at the Tbilisi State University.

* 1977-1979: Lecture courses on Phase Transitions and Critical Phenomena given for graduate students and junior researchers at the Institute of Physics, Tbilisi.

* 1968-1969: 2-semester course on Quantum Statistics for IV - V year students at the Tbilisi State University. Lectures and seminars.

Supervision of students and postdocs:

* Supervisor of PhD student George Japaridze, Institute of Physics, Tbilisi, Georgia. Defended by G.Japaridze in 1983 (Candidate of Physics degree).

* Co-advisor of PhD student Fabian Wenger, Institute of Theoretical Physics, Chalmers University of Technology, Göteborg, Sweden. Project: "Disorder effects in two-dimensional d-wave superconductors". Defended by F.Wenger in 1995.

* Supervisor of PhD student Mehdi Zarea, SISSA, Trieste, Italy.

Project: ``Nature of incommensurate spin correlations in frustrated spin ladders". Defended by M. Zarea in October 2003.

* Supervisor of ICTP postdoctoral fellow Yong-Jun Wang (China), Trieste, Italy.
Project: "Quantum criticalities in spin chains and ladders". (1998-2001)

* Consultant of ICTP postdoctoral fellow Sam Carr (UK), Trieste, Italy. Project: ``Fermionic ladders in the presence of magnetic flux: orbital effects and phase diagram" . (2003-2006)

* Supervisor of Javakishvili State University student Mariam Rusishvili. BSc dissertation project: "Friedel oscillations in one-dimensional conductors", 2013. In 2014 Mariam Rusishvili received a MSc diploma from ICTP, Trieste, Italy, and joined the 3-year PhD program at the International School for Advanced Studies (SISSA), Trieste, Italy. She received a PhD degree from SISSA in 2018 and presently holds a Postdoctoral position at University of Chicago.

* MSc thesis advisor of Postgraduate ICTP student (Condensed Matter Physics) Merab Malishava, Trieste, Italy. Thesis project: Topological properties of junctions of electron and spin chains with a classical impurity. Defended by M. Malishava in 2017.

* MSc thesis advisor of Ilia State University MSc student Mikheil Tsitsishvili. Diploma project "Correlation effects and Quantum Criticalities in a Two-Chain Su-Schrieffer-Heeger ladder". Defended in 2019. Presently M. Tsitsishvili is a Postgraduate Diploma student at International Centre for Theoretical Physics (ICTP), Trieste, Italy.

Major Research Interests:

* Non-perturbative theoretical approaches to quantum physics in one dimension, based on Conformal Field Theory, Bosonization and Integrability.

* Strongly correlated low-dimensional systems. Quantum magnetism. Quantum spin chains and ladders.

* Carbon nanotubes. Quantum transport in wires and ladders.

* Quantum criticalities and fractionalized excitations in quantum frustrated antiferromagnets and fermionic ladders. Majorana boundary states in spin ladders and one-dimensional superconductors.

* Disorder effects in two-dimensional electron systems with Dirac-like spectrum (applications to high-temperature superconductors). Unconventional ordered phases in two-dimensional electron systems (orbital antiferromagnet and spin nematic states).

* Topological phases and boundary states in quantum chains.

Journal Referee

Physical Review B
Physical Review Letters
Journal of Statistical Mechanics

Principal results obtained in the following selected publications:

[1] G. I. Japaridze and A. A. Nersisyan, "Ground-state phases and quantum criticality of a one-dimensional Peierls model with spin-dependent sign-alternating potentials", Physical Review B, vol. 99, pp. 036134 (1-16) (2019).

[2] M. Müller and A. A. Nersisyan, "Classical impurities and boundary Majorana zero modes in quantum chains, Annals of Physics, vol. 372, pp. 482-522 (2016).

- [3] S.T.Carr, B.N.Narozhny and A.A.Nersesyan, "Spinful fermionic ladders at incommensurate filling: Phase diagram, local perturbations and ionic potentials", *Annals of Physics*, vol. 339, pp. 22-80 (2013).
- [4] A.A. Nersesyan and A.M. Tsvelik, "Zero energy Majorana modes in spin ladders and a possible realization of the Kitaev model", *European Physics Letters*, vol.96, pp. 17002 (1-5) (2011).
- [5] S.T.Carr, B.N.Narozhny and A.A.Nersesyan, "The effect of a local perturbation in a fermionic ladder", *Physical Review Letters*, vol. 106, pp. 126805 (1-4) (2011).
- [6] S.T. Carr, A.O. Gogolin and A.A. Nersesyan, "Interaction induced dimerization in zigzag single-wall carbon nanotubes", *Physical Review*, vol. 76, pp. 245121 (1-9) (2007).
- [7] A.A.Nersesyan and A.M. Tsvelik, "Spinons in more than one dimension: Resonance Valence Bond stabilized by frustration", *Physical Review*, vol. 67, pp. 024422 (1-19) (2003).
- [8] Y.J.Wang, F.H.L. Essler, M. Fabrizio and A.A. Nersesyan, "Quantum Criticality in a two-leg antiferromagnetic $S=1/2$ ladder induced by a staggered magnetic field", *Physical Review*, vol. 66, pp. 024412 (1-28) (2002).
- [9] P. Lecheminant, A.O. Gogolin and A.A. Nersesyan, "Criticality in self-dual sine-Gordon models", *Nuclear Physics B [FS]* vol. 639, pp. 502-523 (2002).
- [10] A.A. Nersesyan, "Ising-model description of quantum critical points in 1D electronic and spin systems", *NOTO ASI/EC Summer School: New Theoretical Approaches to Strongly Correlated Systems*, pp. 92-120, Kluwer Academic Publishers, 2001.
- [11] M. Fabrizio, A.O. Gogolin and A.A. Nersesyan, "Critical properties of the double-frequency sine-Gordon model with applications", *Nuclear Physics B [FS]*, vol. 580, pp. 647-687 (2000).
- [12] M. Fabrizio, A.O. Gogolin and A.A. Nersesyan, "From band insulator to Mott insulator in one dimension", *Physical Review Letters*, vol. 83, pp. 2014-2018 (1999).
- [13] P. Azaria, A.O. Gogolin, P. Lecheminant and A.A. Nersesyan, "One-dimensional $SU(4)$ model: a low-energy effective theory", *Physical Review Letters*, vol. 83, pp. 624-628 (1999).
- [14] A.A. Nersesyan, A.O. Gogolin and F.H.L. Essler, "Incommensurate spin correlations in spin-1/2 frustrated two-leg Heisenberg ladders", *Physical Review Letters*, vol. 81, pp. 910-914 (1998).
- [15] A.A.Nersesyan and A.M. Tsvelik, "One-dimensional spin liquid without magnon excitations," *Physical Review Letters*, vol. 79, pp. 3939-3943 (1997).
- [16] D. Shelton, A.A.Nersesyan and A.M. Tsvelik, "Antiferromagnetic spin ladders: crossover between spin $S=1/2$ and $S=1$ chains", *Physical Review B*, vol. 53, pp. 8521-8532 (1996).
- [17] A.A.Nersesyan, A.M. Tsvelik and F. Wenger, "Disorder effects in two-dimensional Fermi systems with conical spectrum: exact results for the density of states", *Nucl.Phys. B [FS]* vol. 438, pp. 561-588 (1995).
- [18] A.A. Nersesyan and A. Luther, "Gapless phases in an $S=1/2$ quantum spin chain with bond alternation", *Physical Review B*, vol. 50, pp. 309-318 (1994).

- [19] A.A.Nersesyan, A.M. Tsvelik and F. Wenger, "Disorder effects in two-dimensional d-wave superconductors", *Physical Review Letters*, vol. 72, pp. 2628-2632 (1994).
- [20] A.A. Nersesyan, A. Luther and F.V. Kusmartsev, "Scaling properties of the two-chain model", *Physics Letters A*, vol. 176, pp. 363-370 (1993).
- [21] A.A. Nersesyan, "Orbital antiferromagnetic ordering in a two-chain model of interacting fermions", *Physics Letters A*, vol. 153, pp. 49 - 54 (1991).
- [22] A.A. Nersesyan, G.I. Japaridze and I.G. Kimeridze, "Low-temperature magnetic properties of the two-dimensional spin nematic", *Journal of Physics: Condensed Matter*, vol. 3, pp. 3353-3366 (1991).
- [23] A.A.Nersesyan and G.E. Vachnadze, "Low-temperature thermodynamics of the two-dimensional orbital antiferromagnet", *Journal of Low Temperature Physics*, vol. 77, pp. 293-303 (1989).
- [24] A.A.Nersesyan and A.Luther, "Umklapp processes and dynamical instabilities in a two-dimensional system of weakly interacting fermions on a square lattice", *NORDITA (Copenhagen) report*, 1988.
- [25] G.I.Japaridze, A.A.Nersesyan and P.B. Wiegmann, "Exact results in two-dimensional U(1)-symmetric Thirring model", *Nuclear Physics B [FS]*, vol. 230, pp. 511- 547 (1984).
- [26] G.I. Japaridze and A.A. Nersesyan, "Low-temperature thermodynamics of one-dimensional interacting fermions", *Journal of Low Temperature Physics*, vol.47, pp. 91- 103 (1982).
- [27] G.I. Japaridze and A.A. Nersesyan, "Magnetic properties of one-dimensional interacting Fermi system", *Physics Letters A*, vol. 85, pp.23-26 (1981).
- [28] G.I. Japaridze and A.A. Nersesyan, "One-dimensional electron system with attractive interaction in a magnetic field", *Journal of Low Temperature Physics*, vol. 37, pp. 95-110 (1979).
- [29] G.I. Japaridze and A.A. Nersesyan, "Magnetic-field phase transition in a one-dimensional system of electrons with attraction", *Pis'ma Zh. Exp. Teor. Fiz.*, vol.27, pp. 356-359 (1978).
- [30] G.E.Gurgenishvili, A.A.Nersesyan and L.A. Chobanyan, "Generalized susceptibilities of one-dimensional electron system in a magnetic field", *Zh. Eksp. Teor. Fiz.* vol. 73, 279-288 (1977).

Book: A.O. Gogolin, A.A. Nersesyan, A.M. Tsvelik, *Bosonization and Strongly Correlated Systems*, Cambridge University Press, 1998.

Citations (data given on 30 Dec 2019)

GOOGLE SCHOLAR

<<https://scholar.google.com/citations?user=cM7hgC8AAAAJ&hl=en>>

Total citations:	4.271
Citations since 2014	1.059
h-index:	26