

CURRICULUM VITAE

1. PERSONAL RECORD.

Full name: **Dr. Hovhannes Khudaverdyan**

(in most of scientific articles after 2000 ‘H. M.Khudaverdian’, before 2000: ‘O.M.Khudaverdian’)

Nationality: British, Armenian

Date and place of birth: 28 May 1955, Yerevan (Armenia)

Marital status: Married with two adult sons.

Place of residence: 33 Highfield Road, Prestwich, Manchester M25 3AQ.

Languages: Armenian and Russian mother tongues, English fluent, French competent

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2. EDUCATION AND QUALIFICATIONS.

Ph.D. in Theoretical and Mathematical Physics. 1982

Thesis: *Multiplicative and Additive Functionals; their Role in Quantum Field Theory*

Advisor: Professor A.S. Schwarz.

Referees: Professor V.I. Ogievetsky, Professor Yu.I. Manin

1978–1981 *Postgraduate student*

Department of Theoretical Nuclear Physics

Moscow Physical Engineering Institute (MPEI).

M.S. in Physics (with Honors). 1978.

Thesis: On Anomalies in Quantum Field Theory.

Advisor: Professor A.S. Schwarz.

1975–1978 Department of Theoretical Nuclear Physics

Moscow Physical Engineering Institute.

1972–1975 Department of Physics

Yerevan State University.

3. PROFESSIONAL EXPERIENCE.

Current position:

Since August 2005 Senior Lecturer in Pure Mathematics, University of Manchester

Previous positions:

- 2001—2005 Lecturer in Pure Mathematics, UMIST
(University of Manchester from 2004)
- 1996—2001 Senior Researcher,
Laboratory of Computing Technique and Automation
Joint Institute for Nuclear Research (Dubna, Russia)
- 1985—1996 Senior Researcher, Department of Theoretical Physics
Yerevan State University (Yerevan, Armenia)
- 1981—1985 Junior Researcher, Laboratory of Theoretical Physics
Yerevan Physics Institute (Yerevan, Armenia)

Invited guest positions:

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| December 2019 | Guest Professor in I.H.E.S. (Paris) |
| October 2019–November 2019 | Guest Professor Camille Jordan Institut of Mathematics (L) |
| December 2015–January 2016 | Guest Professor Max-Planck-Institut für Mathematik (Bo) |
| October–November 2015 | Guest Professor in I.H.E.S. (Paris) |
| January 2012 | Guest Professor in I.H.E.S. (Paris) |
| October–November 2011 | Guest Professor Max-Planck-Institut für Mathematik (Bo) |
| 2000 | Academic Visitor, UMIST |
| October–November 1999 | Guest Professor Max-Planck-Institut für Mathematik (Bo) |
| Autumn 1994 | Advanced Institute of Basic Sciences, (Zanjan, Iran) |
| 1989 | Visiting Researcher, Department of Theoretical Physics
Geneva University (Geneva, Switzerland) |

Research grants:

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| 10-2010 and 02-2012; LMS (scheme 2) grant | supporting a visitor to UK |
| 10-2007 and 07-2008 | Royal Society grants for conferences |
| 2000-2001 | EPSRC |
| 1996–1998, | INTAS-RFFI: European Union and
Russian Foundation for Basic Research |
| 1993–1995 | International Science Foundation |

Main field of scientific interest: Mathematical Physics and Differential Geometry. In particular my interests include Quantum Field Theory (mathematical aspects), supermanifold geometry and its application in physics and in other areas of mathematics, Poisson brackets, Lie algebroids, geometry of differential operators.

Talks on seminars (after 2001):

December 2019 Séminaire de physique mathématique. IHES (Bures sur Yvette, Paris)
 December 2019 Department of Mathematics Mathematics, Nancy
 November 2019 Camille Jordan Institute of Mathematics, Lyon
 May 2018 Korteweg-de Vries Instituut, Amsterdam
 December 2017 I.V. Tamm Department of Theoretical Physics, Moscow
 October 2017 Colloquim. Department of Mathematiques, Sheffield University
 January 2017 Seminar in Geometry. Haifa University, Izrael
 November 2016 Seminar in Mathem. Physics. Institute of Appl. Math. and Mech, Lviv, U
 March 2016 Colloquim. Department of Mathematiques, Durham University
 January 2016 Seminar in Mathematical Physics, Max Planck Institute, Bonn
 November 2015 Colloquim & Séminaire. Laboratoire de Mathématiques de Reims Universit
 November 2015 Séminaire “Groupes de Lie et espaces des modules”. Université de Genève
 October 2015 Séminaire de physique mathématique. IHES (Bures sur Yvette, Paris)
 October 2015 Séminaire de géométrie et physique mathématique. Université Paris Didero
 October 2015 Colloquim. Département de Mathematiques, Université d’Angers (France)
 September 2014 Mathematical Physics Seminar in Department of Mathematics MGU (Russ
 May 2014 Mathematical Physics Seminar in UCL Davis University (USA)
 November 2011 Geometry Seminar in Liege University (Belgium)
 November 2011 Seminar in Mathematical Physics, Max Planck Institute, Bonn
 Novembre 2010 Seminar Geometrique, Physique et Symetries Luminy (Marseille, France)
 Novembre 2010 Geometry Seminar in Lyon (France)
 January 2010 Analysis and Geometry Seminar in Newcastle University
 December 2009 Mathematics Seminar in Valenciennes University (France)
 December 2009 Mathematical Physics Seminar in Lille University (France)
 October 2009 Geometry and Topology Seminar in Aberdeen University
 May 2008 Mathematical Physics Seminar in Bordeaux University (France)
 April 2008 W.Brauder Special topology seminar in Princeton University (USA)
 January 2008 S.P. Novikov Geometry and Topology Seminar,
 V.A. Steklov Mathematical Institute (Moscow)
 November 2007 Applied Mathematics Seminar in Brunel University
 January 2007 All-Moscow seminar ”Globus”
 December 2006 Geometry seminar in Independent University
 January 2006 Geometry Seminar in Edinbuirg University
 September 2004 I.R.Shafarevitch Algebra Seminar, Steklov Institute (Moscow)
 February 2004 Seminar on Mathematical Physics, University of Loughborough
 December 2003 Analysis/Geometry Seminar, King’s College
 October 2003, Bristol Pure Mathematics Seminar
 October 2003, Liverpool Pure Mathematics Colloquium
 September 2003 I.V. Tamm Department of Theoretical Physics, Moscow
 April 2003, Geometry of differential equations Seminar, Moscow, IU
 July 2002 International Workshop Quantum Gravity and Superstrings, Dubna
 November 2001, Geometry with Brackets and Quantization, Warwick

Invited talks on meetings (after 2001)

Workshop on Supergeometry and applications 16–19 December, 2019,

Luxembourg University

Russian-Armenian conference,

15 September—19 September 2019, Yerevan, Armenia

International conference SQS XIX,

26 August—31 August, 2019, Yerevan, Armenia

International conference "Algebraic topology, Combinatorics, and Mathematical Physics" in honor of Professor Buchstaber,

May 24-31, 2018, Moscow

Workshop on Supergeometry and applications 14–15 December, 2017, Luxembourg University

Invited Lecturer on FAR/ANSEF-ICTP Summer School in Theoretical Physics in Armenia. *Lecture course "Geometry of Differential operators"* Yerevan 21 August 2017—25 August 2017.

GAP XIV séminaire itinérant "Géométrie et Physique"

8—12 August, 2016, Sheffield University

Workshop on Higher Geometry and Field Theory 9–11 December, 2015, Luxembourg University

Conference "Integrability in Algebra Geometry and Physics. New Trends" dedicated to Sasha Veselov's 60th birthday

13-17 July 2015 @ Congressi Stefano Franscini, Suisse, 14 July

Conference "Integrability and All That"

dedicated to Sasha Veselov's 60th birthday

8–10 May 2015, Loughborough , 10 May

Workshop "Geometry, Topology and Integrability"

October 20–26, 2014, Moscow, Skolkovo

International workshops "Supersymmetry in Integrable Systems - SIS"

SIS 14, September 11-13, 2014, Dubna, Russia

SIS 11, August 1-4, 2011, Hannover, Germany, (*Closing talk*)

SIS 10, August 24-28, 2010, Yerevan, Armenia,

Workshop "Homological Methods in Algebra, Geometry and Physics"

July 23—25, 2014, London

International conference "The Modern Physics of Compact Stars and Relativistic Gravity"

September 18—21, 2013, Yerevan, Armenia *Plenary talk*

International conference "Algebraic topology and abelian functions" in honor of Professor Buchstaber,

June 18—22, 2013, Moscow

Mini-workshop on pseudogroups and differential equations
 13—16 March, 2013, Tromsø, Norway

Workshops on Geometry in Physics. Białowieża, Poland,
 June 2016 (*Invited talk*)
 July 2011 (*Opening plenary talk*)
 July 2008 (plenary talk)
 July 2006 (plenary talk)
 July 2003 (plenary talk)

Lectures for students at School attached to the conference—July 2012,2013

Workshop on Equivariant Quantisation
 September 11 - 13, 2011, Luxembourg

Third International Conference on Geometry and Quantization GEOQUANT
 September 7 - 11, 2009, Luxembourg, (*Closing talk*)

International workshops "Supersymmetry and Quantum Symmetries."
 August 2015, July 2009, July 2007, and July 2005, Dubna, Russia

XVIII International Colloquium "Integrable Systems and Quantum Symmetries"
 June 18—20,2009, Prague, Czech Republic

One-day Geometry workshop Lyon—Manchester—Loughborough
 March 13, 2009, Loughborough

Conference "Conformal Field Theory and Integrability",
 October 2007, Nor-Amberd, Armenia *Plenary talk*

"Integrable Day" in Loughborough
 November 2006, Loughborough

10-th International Conference Symmetry Methods in Physics.
 13–20 August, 2003, Yerevan

International workshop "Quantum Gravity and Superstrings".
 11—18 July, 2002, Dubna, Russia, *Plenary Talk*.

LMS Northern Meeting and international workshop "Quantization, deformations, and new homological and categorical methods in mathematical physics".
 7-13 July 2001, Manchester

General audience lectures

October 28, 2014, Moscow— Lecture "Krammer rule; from Determinants to Berezinians" for students and staff of Moscow Highest School of Economy
 2018 (August)—Lecture "Mercator projection and navigation" for schoolchildren, Ratmino, Dubna

I had also lectures for general audience in the School of Mathematics

February 2008 “Tubes formula”
November 2012 “Mean algebraico-arithmetic”
November 2013 “Chebyshev approximation and Helly’s Theorem”
March 2016 “Galois theory for pedestrians; explicit formulae for cubic and quartic equations”
November 2017 “Locally Euclidean geometries and hyperbolic geometry”

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March 2019 “On one theorem of linear algebra and free particles”

I keep also the page “Rtudes” on my website “khudian.net” for all who likes mathematics.

Reviewing: Mathematical Reviews (1994–1996), Zentralblatt (2000—2003)

Refereeing: Lett.Math.Phys and Journal of Math. Physics.

Editorial work: member of editorial board of the Armenian Journal of Mathematics 2008—2013.

4. TEACHING.

During my life from 1978 till now I taught different courses in Moscow, Yerevan and Manchester in Mathematical and Theoretical Physics and in Mathematics: Electrodynamics, Quantum Mechanics, Differential Geometry, Applications of Differential Geometry in Theoretical Physics, Group Theory, Homological methods in Physics, Galois Theory, Elements of Functional analysis e.t.c. Now I teach the new courses: the course “Introduction in Geometry” for second years students and the course “Riemannian Geometry” for third and fourth year students.

Shortlisted in 2013 for Manchester Teaching Awards.

Supervision of research students

Last 20 years I share my PHD students with Ted Voronov. I supervised these years 8 PhD students. Six of them already finished their thesis.

One of my former PhD students (Armen Nersessian) nowadays is the leading researcher in mathematical physics in Yerevan, Armenia.

I regularly supervised projects of undergraduate and master students in Galois Theory and Differential Geometry and I supervised dissertations and projects of MSC students.

I was four times internal examiner, three times the external examiner (Aberdeen 2010, Loughborough 2012, 2013) and once the member of jury (international rapporteur in Paris-Diderot, 2016) on PHD oral examinations.

I make regularly projects with foundation year students.

6. PUBLICATIONS.

1. A.V. Gayduk, O.M. Khudaverdian, A.S. Schwarz. *Multiplicative Functionals on Curves, Additive Functionals on Surfaces; their significance in*

QFT. In Proceedings: “Group Theor. Methods in Physics”, vol. 2, p. 201-205, Zvenigorod 1979.

2. O.M. Khudaverdian, A.S. Schwarz. *A Few Comments on the String Representation of Gauge Fields*. Phys. Lett. v. 91B (1980), p. 107-110.

3. O.M. Khudaverdian, A.S. Schwarz. *Additive and Multiplicative Functionals*. Preprint ITEP-3-1980.

4. O.M. Khudaverdian, A.S. Schwarz. *Multiplicative Functionals and Gauge fields*. Theor. Math. Phys. (in Russian), v. 46 (1981) p. 187-198 (transl. into English: p. 124-132).

5. O.M. Khudaverdian, A.S. Schwarz, Yu.S. Tyupkin. *Integral invariants for Supercanonical Transformations*. Lett. Math. Phys., v. 5 (1981), p. 517-522.

6. A.V. Gayduk, O.M. Khudaverdian, A.S. Schwarz. *Integration over Surfaces in Superspace*. Theor. Math. Phys. (in Russian), v. 52 (1982), p. 375-383 (transl. into English: p. 862-868).

7. O.M. Khudaverdian, A.S. Schwarz. *Normal Gauge in Supergravity*. Theor. Math. Phys., v. 57 (1983), p. 354-362 (transl. into English: p. 1189-1195).

8. O.M. Khudaverdian, A.V. Rosly, A.S. Schwarz. *Supergravity and Complex Geometry*. In book: News of Science and Technics. Modern Problems of Mathematics. v. 9, 1986, p. 247-284 (in Russian) (transl. into English: “Encyclopedia of Modern Mathematics”, Springer-Verlag).

9. O.M. Khudaverdian, R.L. Mkrtchian, L.A. Zurabian. *On the Axial Anomalies in External Tensor Fields*. Theor. Math. Phys. v. 71 (1987) p. 393-401.

10. O.M. Khudaverdian, A.P. Nersessian. *Formulation of Hamiltonian Mechanics with Even and Odd Poisson Bracket*. Preprint EFT 1031-81(87), Yerevan (1987).

11. O.M. Khudaverdian, R.L. Mkrtchian. *Integral Invariants of Buttin Bracket*. Lett. Math. Phys. v. 18 (1989), p. 229-231 (Preprint EFI-918-69-86- Yerevan (1986)).

12. O.M. Khudaverdian, A.P. Nersessian. *Superspaces with Odd and Even Canonical Two-Forms and the Strange Superalgebra*. Izv. Acad. Nauk Arm. SSR, v. 24, No. 6, (1989) p. 288-294 (transl. into English: Soviet Journal of Contemp. Phys., v. 24 No.6, p. 22-27).

13. O.M. Khudaverdian, A.P. Nersessian. *The Supergeneralization of $CP(N)$ as Reduced Phase Space of Super-Hamiltonian Systems*. Izv. Acad. Nauk Arm. SSR, v. 25, No. 6, (1990) p. 330-337 (transl. into English: Soviet Journal of Contemp. Phys., v. 25 No.6.)

14. O.M. Khudaverdian. *Geometry of Superspace with Even and Odd Brackets*. J. Math. Phys. v. 32 (1991) p. 1934-1937 (Preprint of the Geneva University, UGVA–DPT 1989/05–613).
15. O.M. Khudaverdian, A.P. Nersessian. *Canonical Poisson Brackets of Different Grading and Strange Superalgebras*. J. Math. Phys. v. 32 (1991) p. 1938-1941 (Preprint of the Geneva University, UGVA–DPT 1989/05–614).
16. O.M. Khudaverdian, A.P. Nersessian. *Even and Odd Symplectic and Kählerian Structures on Projective Superspaces*. J. Math. Phys. v. 34 (1993), p. 5533-5548.
17. O.M. Khudaverdian, A.P. Nersessian. *On Geometry of Batalin-Vilkovisky Formalism*. Mod. Phys. Lett. A, v. 8 (1993), No. 25, p. 2377-2385.
18. O.M. Khudaverdian. *Algebras with Operator and Campbell-Hausdorff Formula*. Lett. Math. Phys., v. 35 (1995), pp.27-38.
19. O.M. Khudaverdian. *Batalin-Vilkovisky Formalism and Odd Symplectic Geometry*. In: Proceedings of International Workshop “Geometry and Integrable Systems”, P.N.Pyatov and S.N.Solodukhin, eds. World Scientific Publishing Co., 1996, p. 144-181.
20. O.M. Khudaverdian, A.P. Nersessian. *Batalin-Vilkovisky Formalism and Integration Theory on Manifolds*. J. Math. Phys., v. 37 (1996), p. 3713-3724.
21. O.M. Khudaverdian, D.A. Sahakyan. *Cohomological Aspects of Noether Theorem for Lagrangians of Classical Mechanics*. Proceedings of the conference “Secondary calculus and Cohomological Physics”, Moscow, 1997, in Electronic Proceedings of EMIS, <http://www.emis.proceedings/SCCP97>
22. O.M. Khudaverdian. *Algebraic and Geometric Aspects of Constrained Systems*. In survey: “Collaboration JINR–YSU (1992–1997)”, JINR E-98-12, Dubna (1998).
23. O.M. Khudaverdian. *Odd Invariant Semidensity and Divergence-like Operators on Odd Symplectic Superspace*. Comm. Math. Phys., v. 198 (1998), p. 591-606.
24. O.M. Khudaverdian, D.A. Sahakyan. *Double Complexes and Cohomological Hierarchy in the Space of Weakly Invariant Lagrangians of Mechanics*. Acta Applicandae Mathematicae., v. 56 (2/3), (1999), p. 181-215.
25. O.M. Khudaverdian. *Delta-Operator on Semidensities and Integral Invariants in the Batalin-Vilkovisky Geometry*. Preprint of Max-Planck-Institut für Mathematik, MPI-135 (1999), Bonn.
26. O.M. Khudaverdian. *Evolution of oscillator wave function and Fourier transformation*. In: “Symmetries and Integrable Systems”, collected papers. A.N. Sissakian, ed., Dubna, 2000, p. 269–272.

27. H.M. Khudaverdian, T.Voronov *On complexes related with calculus of variations.*, J. Geom. Phys. 44 (2-3) (2002), 221-250
28. H.M. Khudaverdian *Laplacians in odd symplectic geometry.*— In *Quantization, Poisson Brackets and Beyond*, Theodore Voronov, ed., Contemp. Math., Vol. 315, Amer. Math. Soc., Providence, RI, 2002, pp. 199-212.
29. H.M. Khudaverdian, T.Voronov *On Odd Laplace operators.* Lett. Math. Phys. 62 (2002), 127-142
30. H.M. Khudaverdian, T.Voronov *Geometry of differential operators, and odd Laplace operators.* Russian Math. Surveys 58 (2003)
31. H.M. Khudaverdian. *Semidensities on odd symplectic supermanifold.*, Comm. Math. Phys., v. 247 (2004), pp. 353-390
32. H.M. Khudaverdian, T.Voronov *On odd Laplace operators. II.* In book: *Geometry, Topology and Mathematical Physics. S. P. Novikov's seminar: 2002 - 2003*, V. M. Buchstaber, I. M. Krichever, eds., Amer. Math. Soc. Transl. (2), Vol. 212, 2004, pp.179–205
33. H.M. Khudaverdian, T.Voronov *Geometry of differential operators, odd Laplacians, and homotopy algebras* Journal of Nonlinear Math. Phys. **11**, Supplement (2004), pp. 217–227. arXiv:math.DG/0402292
34. H.M. Khudaverdian, T.Voronov. *New facts about Berezinians.* In book: *Supersymmetries and Quantum Symmetries 2005.* Proceedings of International Workshop, Joint Institute of Nuclear Research, Dubna, 27-31 July 2005, E. Ivanov and B. Zupnik, eds., Dubna, 2006, 393-398, arXiv:math-ph/0512031.
35. H.M. Khudaverdian, T.Voronov. *Berezinians, Exterior Powers and Recurrent Sequences.*— Lett. Math. Phys. (Berezin memorial volume), 74 (2005), 201-228 (arXiv:math.DG/0309188)
36. H.M. Khudaverdian, T.Voronov. *On generalized symmetric powers and a generalization of Kolmogorov-Gelfand-Buchstaber-Rees theory.* Russian Mathematical Survey, **62** (3), 623—625, 2007, arXiv:math.RA/0612072.
37. H.M. Khudaverdian. *Tube formula, Berezinians and Dwork formula.* Journal of Geometry and Symmetry in Physics, v10, 2007, pp.29–40, arXiv:math.-phys.0707.1893
38. H.M. Khudaverdian, T.Voronov. *Operators on superspaces and generalizations of the Gelfand-Kolmogorov theorem.* In: XXVI Workshop on Geometric Methods in Physics. Bialowieza, Poland, 1 - 7 July 2007. AIP Conference Proceedings 956, Melville, New York, 2007, p. 149-155. arXiv:0709.4402 [math-ph].
39. H.M. Khudaverdian, T.Voronov. *Differential forms and odd symplectic geometry.* Amer. Math. Soc. Transl (2) Vol 224, 2008 pp.159—171

40. H.M. Khudaverdian, T.Voronov. *Higher Poisson brackets and differential forms*. In: Geometric Methods in Physics. AIP Conference Proceedings 1079, American Institute of Physics, Melville, New York, 2009, 203–215. arXiv:0808.3406v2 [math-ph].
41. A. Borovik, O.M. Khudaverdian. *Merkator projection, logarithm and... (in Russian)* Matematikeskoe Prosveteniye no. 14 (2010), 58–82.
42. H.M. Khudaverdian, T.Voronov. *A short proof of Buchstaber—Rees Theorem*. Phil. Trans. R. Soc. A. **369** (1939) (2011), pp.1334–1345
43. H.M. Khudaverdian, T.Voronov. *Geometry of differential operators of second order, the algebra of densities, and groupoids* J. Geom. Phys. **64** (February 2013), 31–53, math-arXiv:1210.0784.
44. A. Biggs, H.M. Khudaverdian “Operator pencil passing through a given operator” J. Math. Phys. **54**, 123503 (2013), math-arXiv:1301.6625
45. H.M. Khudaverdian, T.Voronov “Geometric constructions on the algebra of densities” Amer. Math. Soc. Trans, volume **254**, 2014 math-arXiv:1310.0784.
46. H.M. Khudaverdian “Kaluza-Klein theory revisited: projective structures and differential operators on algebra of densities”, Journal of Physics: Conference Series **496**, 2014, 012032 math-arXiv 1312-5208
47. A. Biggs, H.M. Khudaverdian “Operator pencils on the algebra of densities” Proceedings of Steklov Institute, 2014, volume 286, pp. 33–54 (in Russian pp.40–64)
48. H.M. Khudaverdian, M. Peddie “Odd Symmetric Tensors, and an Analogue of the Levi-Civita Connection for Odd Symplectic Supermanifold”, Yerevan University Journal. Physics & Mathematics, **3**, p. 25–31, 2016, math-arXiv: 1607.03439
49. H.M. Khudaverdian, M. Peddie “Odd laplacians; geometrical meaning of potential, and modular class”, Lett. in Math. Phys., **107**, 7, pp. 1195–1214 (2017), math-arXiv 1509-05586
50. H.M. Khudaverdian, R. Mkrtchyan “Universal volume of groups and anomaly of Vogel’s symmetry”, Lett. in Math. Phys., (2017), **107**, 8, 1491–1514, math-arXiv 1602.00337
51. H.M. Khudaverdian, R.L. Mkrtchyan “Diophantine equations, Platonic solids, McKay correspondence, equivelar maps and Vogel’s universality”, Geometry and Physics, **114**, (2017), 8590, math-arXiv:1604.06062
52. H.M. Khudaverdian, T.T. Voronov “Thick morphisms, higher Koszul brackets and L_∞ algebroids” math.arxiv, math.arxiv 1808.10049
53. H.M. Khudaverdian, T.T. Voronov “Thick morphisms on supermanifolds, quantum mechanics and spinor representation”, J. Geom. and Phys., 2019, article Number: 103540, DOI:10.1016/j.geomphys.2019.103540, arXiv:1909.00290