

CURRICULUM VITAE

Mariia SHCHERBYNA

Born: 11.12.1958, Kharkiv, USSR
Family status: married, 2 children.

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Education

1976-1981 - Kharkiv State University, diploma with honours in mathematics
1981-1983 Graduate Studies, Inst. Low Temp. Physics, Kharkiv
Candidate of sciences (PHD): 1986, Inst. Low Temp. Physics, Kharkiv. Dissertation : "Some asymptotical problems of the statistical physics".
Doctor of sciences (habilitation): 1997, Inst. Low Temp. Physics, Kharkiv, Dissertation: "Mean field problems of statistical mechanics and random matrix theory".

Employment

1983 – present – Institute for Low Temperature Physics of Ukrainian Ac.Sci, Kharkiv,
(from Junior research fellow to Head of Department of Mathematical Physics)
2010-2021 - Professor of Mathematics in Karazin National University of Kharkiv
2014-2020 - Panel Member of the European Reserch Cauncil Starting Grants
evaluation panel
08.2021-12.2021 –Chern Professor in the program Universality and Integrability in Random
Matrix Theory and Interacting Particle Systems (MSRI, Berkelay)
2023-2024 - Member of School of Mathematics of Institute for Advanced Study (Princeton)
2024-2025 - Invited professor of Institute of Science and Technology of Austria (ISTA) (Klosterneuburg,
Austria)

Awards:

2003 Invited speaker of European Congress of Mathematics in Stockholm
2009 Prize named by M.Ostrogradskiy of National Academy of Sciences of Ukraine
2012 Elected as a corresponding member of National Academy of Sciences of Ukraine
2018 Invited speaker of International Congress of Mathematics in Rio de Janeiro
2018 State Prize of Ukraine in the Field of Science and Technique
2020 Medal of National Academy of Sciences of Ukraine "For Professional Achievements"
2021 Prize named by M.Lavrentiev of National Academy of Sciences of Ukraine

Research interests

Spectral theory of random matrices, in particular, local eigenvalue distribution of big random matrices, methods of super symmetric integration, non hermitian random matrices, mathematical problems of statistical physics, neural networks and spin glass theories.

Invitations

- Laboratoire de Physique Mathematique et Geometrie, Universite Paris-7, chercheur invite (1 month 1992, 3 months 1993, one month 1994, 3 months 1995, 3 months 1996)
- Facultat und Institut fur Mathematic, Ruhr Universitat, Bochum (1 month 1993, 1995, 1996, 1997)
- Mathematical Department of University "La Sapienza" of Rome (1 month 1991, 1993, 1994, 1995, 1996, 1997, 1998, 3 months 1999, 2001, 2002, 2003, 2004, 2005, 2006, 1 month 2008, 2011)
- Institute Henri Poincare (Paris) (3 months 2007)
- Mathematical Science Research Institute (Berkley, California) (1 month 2010)
- University of Toronto (1 month 2010)
- University of Marseilles (1 month 2013)
- Stony Brook University (1 month 2015)
- Program on QUANTITATIVE LINEAR ALGEBRA (IPAM, Los Angeles, 1 month 2018)
- Program "Universality and Integrability in Random Matrix Theory and Interacting Particle Systems" (MSRI, Berkeley, 4 month 2021)
- Invited researcher in University of Bielefeld (6 months 2023)
- Member of School of Mathematics of Institute for Advanced Study (Princeton, year 2023-2024)
- Invited professor in Institute of Science and Technology of Austria (ISTA) (Klosterneuburg, academic year 2024-2025)

International Conferences where I was an invited speaker

- International Conferens in Stochastic Processes, Bonn, October 1994
- 5th European Symposium in Stochastic Analysis Bonn, Germany 1994.
- International Conference on Stochastic Methods in Statistical Mechanics, Finances and Biology , Bielefeld, Germany, 1996,
- International Conference on the Disordered Spin Systems, Berlin, Germany 1996
- International Workshop in Statistical Physics Bielefeld, Germany, 1996
- Sattelite Colloquium of STATPHYS 20 "Mathematical Results in Statistical Mechanics". Marseille, 1998 .
- International conference "Mathematical aspects of Statistical Mechanics". Marseille, 2002.
- International conference "Physics and Mathematics of Large N limit in Gauge Theory" Mountreal, January, 5-9 2004
- 4 Europian Congress in Mathematics. Stockholm, June, 27- July 03, 2004 invited ECM speaker.
- International conference "Mathematical Physics of Spin Glasses", Cortona, June 27-July 2 2005.
- Workshop "Limit Theorems and Characterization problems in Statistics and Probability" Bielefeld: December 5-7 2005
- International Conference on Costractive Complex Approximation Theory. Ambleteuse, France May,25-30, 2006.
- Luminy conference on random matrices. Marseille, France: October,30- November,03, 2006,
- Workshop "Random matrices: probabilistic aspects and applications", Bonn, Germany, January 14-18, 2008
- Workshop: Disordered Systems: Random Schrodinger Operators and Random Matrices March 23rd - March 29th, 2008
- Workshop on High-Dimensional Phenomena in Mathematical Physics, Paris-Marne-la-Valle, June 2-6, 2008
- Workshop "Disordered systems: spin glasses", Mountreal, June 8-13 2009
- International conference "The State of Geometry and Functional Analysis" Tel-Aviv, June 24-30, 2009
- International conference Asymptotic Geometric Analysis, Euler International Mathematical Institute, St. Petersburg, Russia, June 30 - July 4, 2010

- Workshop Random Matrix Theory and its Applications, MSRI, Berkeley, USA, September 13-17 2010
- Workshop Connections for Women: An Introduction to Random Matrices, MSRI, Berkeley, USA, September 20-21 2010
- Workshop on Geometric Probability and Optimal Transportation, Toronto, October 25-29, 2010
- Workshop "Vector equilibrium problems and their applications to random matrix models" AIM, Palo Alto, USA April 2012 .
- Workshop "Mathematics and Physics of Disordered Systems" Cambridge, UK, September 2012
- Random Matrix Workshop / Paris-Telecom, October 2012
- Mathematical Physics of Disordered Systems. Hagen, Germany, May 2013
- Advanced School and Workshop on Random Matrices and Growth Models, Treste, Italy September 2013
- Memorial conference dedicated to the memory of academician Andrei Aleksandrovich Gonchar November 25-26, 2013, Steklov Mathematical Institute of RAS, Moscow
- Workshop on Random Matrices and Random Systems. IAS, Princeton, April 1- 4, 2014
- Conference "Mathematical Physics: Theory and Applications" 18-20 Sept Rome, Italy
- Workshop "Random Matrices and Their Applications ", 5-9 January, 2015, Hong Kong
- Workshop "Random and Other Ergodic Problems" 22-26 June, 2015, Cambridge
- CIMPA Summer School in Buenos Aires (July 6-17, 2015) (invited lecturer)
- Conference on Geometric Functional Analysis Edmonton, 15-20.05.2016
- Workshop "Probability and asymptotic analysis in strongly coupled systems" 11-16 January, 2016, Bonn
- Summer School "Spectral Theory, Differential Equations and Probability" Mainz, 05-15.09.16
- Conference "Classical and Quantum Motion in the Disordered Environment December 18-22, 2017, Queen Mary University of London
- Workshop Random Matrices and Free Probability Theory (IPAM, UCLA, Los Angeles) May 14 - 18, 2018
- International Congress in Mathematics August, 1-9, 2018 Rio de Janeiro
- Workshop "From Many Body Problems to Random Matrices" BIRS, 4-9 August 2019
- School and Workshop on Random Matrix Theory and Point Processes, Trieste, 23-28.09.2019
- Conference "Random Schrödinger operators, and related topics" Florence, 17-21.02.2020
- Workshop: Universality and Integrability in Random Matrix Theory and Interacting Particle Systems, Berkeley, 20-24.09.2021
- Conference "Renyi 100" Budapest, Hungary, 20-24.06.2022 (plenary speaker)
- Meeting "Disordered Systems Days- II", Kings College of London 10-12.06.2024,
- Conference "Representation Theory and Probability" Leipzig University, 23-27.10.2024
- Trilateral International Scientific Meeting (UK - Poland - Ukraine) Warsaw, 14-16.10.2024 (organizer)

PUBLICATIONS OF M. SHCHERBYNA

1. Pastur L.A. Shcherbina M.V. Long-range limit for the correlation function of the lattice systems. *Teor. Mat. Fiz.* **61**, N1, p. 1984.
2. Shcherbina M.V. Long-range limit for the correlation functions of the classical continuous systems for small activities. *Dokl. Ac. Sci.Ukr SSR, A* , p.5, 1985.
3. M.Shcherbina. Classical Heisenberg model at zero temperature. *Teor.Mat.Fiz.* **81**, N1, p.134-144, 1989.
4. B.Khoruzhenko, L.Pastur, and M.Shcherbina. Generalized spherical model in an inhomogeneous field Preprint, *Inst. for Low Temp. Phys. Engin.* 1987, N41-87, pp 1-43.
5. B.Khoruzhenko, L.Pastur, and M.Shcherbina. On the critical temperature of the Heisenberg model's spherical limit on a decorated lattice Preprint, *Inst. for Low Temp. Phys. Engin.* 1988, N22-88, pp 1-10.
6. M.Shcherbina. Spherical limit of n -vector correlations. *Teor.Mat.Fiz.* **77**, N3, p.460-471, 1988.
7. B.Khoruzhenko, L.Pastur, and M.Shcherbina. Large- n limit of the Heisenberg model: the decorated lattice and the disordered chain. *J.Stat.Phys.* **57**, 41-52, 1989.
8. H.Englisch, A.Engel, A.Schutte, and M.Shcherbina. Strongly diluted networks with retrieval-dependent thresholds. In: *Computer Analysis of Images and Patterns* (Eds.: K.Voss, D.Chetvericov, Sommer) Akademievelag Berlin, p.95-103, 1989.
9. B.Khoruzhenko, M.Shcherbina, and V.Slusarev. On a magnetic model for doped CuO systems. Preprint Karl-Marx-Universitat, Leipzig, 1990.
10. H.Englisch, A.Engel, A.Schutte, and M.Shcherbina. Improved retrieval in nets of formal neurons with thresholds and non linear synapses. *Studia Biophysica.* p.136, 1990.
11. L.Pastur, and M.Shcherbina. The absence of the selfaverageness of the order parameter in the Sherrington-Kirkpatrick model. *J.Stat.Phys.*, **62**, N1/2, p.1-19, 1991.
12. M.Shcherbina. The infinite component limit for Hopfield model. *Teor.oper.*, Kiev:Naukova dumka, p.164-172, 1991 (in russian).
13. M.Shcherbina. More about the absence of selfaverageness of order parameter in SK-model. Preprint Rome University-I, 1991.
14. A.Khorunzy, B.Khoruzhenko, L.Pastur and M.Shcherbina. The Large- n limit in statistical mechanics and spectral theory of disordered systems. *Phase transition and critical phenomena.v.15*, p.73, Academic Press , 1992.
15. Khoruzhenko B., Pastur L., Shcherbina M. The Infinite Component Limit of the random Anisotropy n -Vector Model, *Adv. in Sov. Math.*, **19**, p.269-286, 1994.
16. A.Boutet de Monvel, and M.Shcherbina. On the norm of random matrices *Mat.Zametki*, **57**, N5, p.688-698, 1995, (Preprint University Paris-VII, 1992).
17. M.Shcherbina and B.Tirozzi. The free energy of the class of Hopfield model *JSP* .**72**, p.113-125, 1993.

18. L.Pastur M.Shcherbina and B.Tirozzi. The Hopfield model without replica trick. JSP,**74**,p.1161-1183, 1994.
19. L.Pastur, M.Shcherbina. Eigenvalue distribution for a certain class of random matrices in the limit of their infinite order . Math. Phys., Anal., Geom., 1, 131-138 1994.
20. M. Shcherbina, B. Tirozzi, Saddle Point Equations of a Neural Network with Correlated Attractors. J. de Physique I **4**, p. 629-633, 1994.
21. A.Boutet de Monvel, L.Pastur and M.Shcherbina, On the Statistical Mechanics Approach in the Random Matrix Theory. Integrated Density of States. J.Stat.Phys., **79**, p.585-611, 1995.
22. L.Pastur, M.Shcherbina. Universality of the Local Eigenvalue Statistics for a Class of Unitary Invariant Matrix Ensembles. J.Stat.Phys., **86**, p.109-147, 1997 (Preprint IMA N1315, Minneapolis, 1995).
23. M. Shcherbina. Tirozzi B. A Perturbative Expansion for the Hopfield Model, HPA, **69**, N5, p.470, 1995.
24. S.Albeverio, L.Pastur and M.Shcherbina. On Asymptotic Properties of Certain Ortogonal Polynomials. Matem. Fiz., Analiz, Geom., **4**, N3, p.263-277, 1997.
25. M. Shcherbina. On the Replica Symmetric Solution for the Sherrington-Kirkpatrick Model . HPA, **70**, p.838-853, 1997.
26. Boutet de Monvel A., Shcherbina M. On the Free Energy of the Two Dimensional $U(n)$ Gauge Field Theory on the Sphere. Teor.Mat.Fiz. **115**, N3, p.389-401, 1998.
27. A.Boutet de Monvel, M.Shcherbina, D.Shepelsky. On the integrated density of states for a certain ensemble of random matrices. Random Oper. Stoch. Eqs. **6**, N4, p.331-338, 1998.
28. M.Shcherbina,. Some estimates for the critical temperature of The Sherrington-Kirkpatrick model with magnetic field. In: Mathematical Results in Statistical Mechanics. World Scientific, Singapore, p.455-474, 1999.
29. L.Pastur, M.Shcherbina, B.Tirozzi. On the replica symmetric equations for the Hopfield model. J.Math.Phys. V.40 (1999)
30. J.Feng, M.Shcherbina, B.Tirozzi . On the critical capacity of the Hopfield model. Commun.Math.Phys. V.216, p.139-177, (2001).
31. S.Albeverio, L.Pastur and M.Shcherbina. On the $1/n$ expansion for some unitary invariant ensembles of random matrices. Commun.Math.Phys. V.224, p.271-305, (2001).
32. M.Shcherbina, B.Tirozzi. Generalization and learning error for non linear perceptron. Mathematical and Computing Modelling V.35, p.259-271 (2002)
33. M.Shcherbina, B.Tirozzi.Rigorous Solution of the Gardner Problem Preprint ArXiv math-ph/0112003 (2001), Rigorous Solution of the Gardner Problem. Commun.Math.Phys, V.234, p.383-422 (2003).
34. M.Shcherbina, B.Tirozzi.On the Volume of the Intersection of a Sphere with Random Half Spaces. CRAS Ser.I V.334 p.803-806, (2002).
35. M.Shcherbina, B.Tirozzi. Convexity and Intersection of Random Spaces. Proceedings of China Japanese Seminar Re-finements of number -theoretic methods (2002)
36. M.Shcherbina, B.Tirozzi. Central Limit Theorems for Order Parameters of the Gardner Problem, Markov processes and related fields, N4, p.583-602 (2003) (Preprint ArXiv cond-mat/ (2002))

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38. O.Khorunzhy, M.Shcherbina, V.Vengerovsky. Eigenvalue distribution of large weighted random graphs. *Journal of Mathematical Physics*, vol. 45, N. 4, 1648-1672 (2004).
39. M.Shcherbina, B.Tirozzi. Stability of asynchronous states of spiking neurons. *International Journal of Modern Physics B*, V. 18, N 4 - 5, 759-771 (2004).
40. M.Shcherbina, B.Tirozzi. Central limit theorems for the free energy of the modified Gardner problem. *Markov processes and related fields*, N 1, p.1-17 (2005).
41. M.Shcherbina. Some mathematical problems of neural networks theory. In: *Proceedings of the 4th European Congress in Mathematics*. EMS Publishing house, p.425-444, 2005.
42. J.Feng, M.Shcherbina, B.Tirozzi, G.O.You. Optimal movement control models of Langeven and Hamiltonian types. *Mathematical and computer modelling* 46, p.680-698, 2007.
43. L.Pastur, M.Shcherbina Bulk universality and related properties of the unitary invariant matrix models Preprint arXiv:math-ph/0705.1101, *J Stat Phys*, V. 130, no. 2, pp. 205-250, 2007
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46. M.Shcherbina. Central limit theorem for linear eigenvalue statistics of orthogonally invariant matrix models, *Journal of Mathematical Physics, Analysis, Geometry* V4 N1 pp.171-195, 2008, Preprint arXiv:math-ph/0711.1718
47. J.Feng, M.Shcherbina, B.Tirozzi. Stability of the dynamics of an asymmetric neural network Preprint arXiv:cond-mat/0612006 *Communications on Pure and Applied Analysis* V.8, p. 655-671, 2009.
48. M.Shcherbina. On Universality for Orthogonal Ensembles of Random Matrices *Commun.Math.Phys.* 285, pp 957-974, 2009,Preprint arXiv:math-ph/0701046.
49. M.Shcherbina. Edge Universality for Orthogonal Ensembles of Random Matrices. *J Stat Phys*: V136, N1, pp 35-50, 2009
50. T.Kriecherbauer, M.Shcherbina. Fluctuations of eigenvalues of matrix models and their applications arXiv:1003.6121[math-ph]
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Journal of Mathematical Physics, Analysis, Geometry V7, N2, pp 176-192, 2011.
55. M.Shcherbina, B.Tirozzi. Central limit theorem for fluctuations of linear eigenvalue statistics of large random graphs. Diluted regime. arXiv:1111.5492[math-ph].
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J. Math. Phys. Vol 55, N4, 043504 (2014) DOI: 10.1063/1.4870603
60. M.Shcherbina. Asymptotic expansions for β matrix models and their applications to the universality conjecture in: Random Matrix Theory, Interacting Particle Systems and Integrable Systems. (Percy Deift and Piter Forrester Eds) Cambridge University Press 2014 ISBN: 9781107079922
61. M.Shcherbina. On fluctuations of eigenvalues of random band matrices, arXiv:1504.05762
J Stat Phys, DOI 10.1007/s10955 J.Stat.Phys., Vol 161, Issue 1, pp 73-90 (2015)
62. M.Shcherbina. Fluctuations of the eigenvalue number in the fixed interval for β -models with $\beta = 1, 2, 4$ arXiv:1504.05758 Theory and Applications in Mathematical Physics, 2015, pp. 131-146 ISBN: 978-981-4713-27-6
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63. M. Shcherbina, T. Shcherbina Transfer matrix approach to 1d random band matrices: density of states arXiv:1603.08476
J Stat Phys 164(6), 1233-1260 (2016). doi:10.1007/s10955-016-1593-x
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J Stat Phys (2017) 166:1092-1127 DOI 10.1007/s10955-016-1656-z
65. M. Shcherbina, T. Shcherbina Characteristic polynomials for 1D random band matrices from the localization side. arXiv:1602.08737
Com.Math.Phys. V 351, Issue 3, pp 1009-1044 (2017) DOI 10.1007/s00220-017-2849-2
66. M. Shcherbina, T. Shcherbina Universality for 1d Random Band Matrices: Sigma-Model Approximation J Stat Phys, (2018) 172(2), 627-664, DOI 10.1007/s10955-018-1969-1
67. M. Shcherbina, T. Shcherbina Transfer matrix approach to 1d random band matrices Proc. Int. Cong. of Math. 2018 Rio de Janeiro, Vol. 2 (2673-2694)
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