Curriculum Vita

Evguenii Rakhmanov

Born: July 7, 1952, in Moscow, USSR

Address:

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Department of Mathematics, University of South Florida,
Tampa, Florida 33620-5700, USA (office)

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Education:

Doctor of Science in Physics and Mathematics, Steklov Mathematical Institute, 1983. The degree of Doctor of Science in Russia is equivalent to European degree Doctor of Science (Second Doctor)

Candidate of Science in Physics and Mathematics (Ph.D.). Steklov Math. Institute, 1977.

Postgraduate Course, Steklov Math. Institute, 1974–1977

Diploma in Mathematics (M.D.) Moscow University, 1974

Moscow University, Mechanics-Mathematics Faculty, 1969–1974

Positions:

Professor, University of South Florida, 1999–present

Adviser, Steklov Mathematical Institute 2000–present.

Associate Professor, University of South Florida, 1995–1999

Leading Researcher, Steklov Mathematical Institute 1989-2000.

Associate Professor, Moscow University, Mech.–Math. Faculty, 1990–1994

Assistant Professor, Moscow University, Mech.–Math. Faculty, 1988–1990

Senior Researcher, Steklov Math. Inst. 1983–1989

Junior Researcher, Steklov Math. Inst. 1977–1983

Held several short term visiting positions in universities of USA, Spain, Germany

In 1990 -1993 was appointed as a state expert in mathematics in VAC (High Attestate Commission)

Grants:

NSF Grant DMS – 9501130, "Minimal Discrete Energy Problem and Approximation Theory," co-principal investigator (with E. Saff), 1995–1997, $171,000.

NSF Grant DMS – 9801677, " " co-principal investigator (with E. Saff), 1998–200,

Awards:

Award for the Best Result of the Year from the Academy of Sciences of USSR for the solution of so called "1/9" problem in the Theory of Rational Approximation of Analytic Functions, (with A. A. Gonchar), 1987.

Award for the Best Result of the Year from the Steklov Mathematical Institute for theorems on Asymptotics for Orthogonal Polynomials on the Real Axis, 1982

Award for the Best Result of the Year from the Steklov Mathematical Institute for the Solution of Steklov Problem in the Theory of Orthogonal Polynomials, 1980

Some of Invited Lectures on International Conferences

1. *Laguerre-type equations for Hermite-Pade Polynomials and application to asymptotics*, International Conference "Orthoquad", Tenerife, Spain, January 2014.
2. *Existence theorems for scalar and vector S-curves*, American Institute of Mathematics, Workshop on Vector Equilibrium, San Francisco, April 2012.
3. *Orthogonal Polynomials and S-curves*, International Conference devoted to 60th birthday of Francisco Marcellan, Madrid, Spain, 2011.

4. *Stieltjes Polynomials and Critical measures*, International Conference devoted to 60th birthday of Guillermo Lopez Lagomasino, Madrid, Spain, 2008.

5. *Problem of equilibrium in a conducting domain and its applications*, International Conference "Kolmogorov and Contemporary Mathematics" devoted to 100th birthday of A.N.Kolmogorov, Moscow University, 2004.

6. *Critical measures and Compacts with S-property*, International Conference on Minimal energy problems, City University of Honk Kong 1999 .

7. *Asymptotics for Orthogonal Polynomials of a Discrete Variable*, Eighth Symposium on Orthogonal Polynomials and Their Applications, Sevilla, Spain, 1997.

8. *On the Bounds of Polynomials Normalized in a Discrete Norm*, International Conference on Functional Spaces, Approximation Theory and Nonlinear Analysis, Moscow, 1995.

9. *Equilibrium Distributions in Approximation Theory and Asymptotics of Orthogonal Polynomials*, Seminar on the Theory of Functions, Odessa, Ukraine, 1992.

10. *Equilibrium Measures and their Applications*, Conference in Approximation Theory, Oberwolfach, Germany, 1990.

11. *Equilibirium Measures and Asymptotics for Orthogonal Polynomials*, US-USSR Joint Conference in Approximation Theory, Tampa, Florida, USA, 1989.

12. *Strong and Logarithmic Asymptotics for Orthogonal Polynomials on* $\mathbb{R}$, Seminar on Rational Approximation and Orthogonal Polynomials, Saragoza, Spain, 1988.

13. *Equilibrium for Vector Potentials with Applications in Approximation Theory*, Seminar on Approximation and Optimization, Habana, Cuba, 1987

14. *Rational Approximation for* e^{-x} *on* R_+, Conference in Complex Analyis, Varna, Bulgaria, 1987.

15. *Rational Approximations, Orthogonal Polynomials and Equilibrium Distribution*, Conference in Orthogonal Polynomials and their Applications, Segovia, Spain, 1986.

16. *Rational Approximaton of Analytic Functions*, Semester for Complex Analysis and Approximation Theory, Banach Center, Warsaw, Poland, 1986.

17. *Asymptotics of Orthogonal Polynomials on* $\mathbb{R}$ *and Weighted polynomial Approximation on* $\mathbb{R}$, Conference on the Theory of Functions, Kiev, 1982.

List of Main Publications

1. *On the Asymptotic of the Ratio of Orthogonal Polynomials*, Mat. Sb. 103 (145), 1977, 237–252; English Translation in Math. USSR Sb. 32 (1977), 199–213.

2. *On the Convergence Of Diagonal Padé Approximants*, Mat. Sb. 104 (146) (1977), 271–291; English Translation in Math. USSR Sb. 33 (1977).

3. *On the Convergence Of Diagonal Padé Approximants of Markov Type Functions*, Candidate Dissertation, 1978, Steklov Math. Inst., Moscow.

4. *On the Convergence Of Diagonal Padé Approximants of Markov Type Functions*, Thesis of Candidate Dissertation, 1978, Steklov Math. Inst., Moscow.

5. *On the Steklov Conjecture in the Theory of Orthogonal Polynomials*, Mat. Sb., (1979); English Translation in Math. USSR Sb.

6. *On the Convergence of Padé Approximants in Classes of Holomorphic Functions*, Mat. Sb. 112 (154) (1980), N2; English Translation in Math. USSR Sb. 40 (81), 149–155.

7. *On the Convergence of Simultaneous Padé Approximants for Systems of Functions of Markov Type*, (with A. A. Gonchar), Trudy Mat. Inst. Steklov 157 (1981), 31–48; English Translation in Proc. Steklov Inst. Math. 1983, No. 3 (157).

8. *Estimates of the Growth of Orthogonal Polynomials Whose Weight is Bounded Away From Zero*, Doklady of Acad. of Sci. of USSR, (1981); English Translation in Math. USSR Sb.

9. *Estimates of the Growth of Orthogonal Polynomials Whose Weight is Bounded Away from Zero*, Mat. Sb. (1981); English Translation in Math. USSR Sb.

10. *On Asymptotic Properties of Polynomials Orthogonal on the Real Axis*, Doklady of Acad. of Sci. of USSR, (1982); English Translation in Math. USSR Sb. 47 (1984).

11. *On Asymptotic Properties of Polynomials Orthogonal on the Real Axis*, Mat. Sb. 119 (161) (1982), 163–203; English Translation in Math. USSR Sb. 47 (1984).

12. *On the Asymptotic of the Ratio of Orthogonal Polynomials: II*, Mat. Sb. 118 (160), 1982, 104–117; English Translation in Math. USSR Sb. 46 (1983), 105–117.

13. *Asymptotic Properties of Orthogonal Polynomials*, Doctoral Dissertation, Steklov Math. Inst., Moscow, 1983 (in Russian).

14. *Asymptotic Properties of Orthogonal Polynomials*, Thesis of Doctoral Dissertation, Steklov Math. Inst., Moscow, 1983 (in Russian).

15. *Equilibrium Measure and the Distribution of Zeros of Extremal Polynomials*, (with A. A. Gonchar), Mat. Sb. 125 (167) (1984, No. 1); English Translation in Math. USSR Sb. 53(1986), 119–130.

16. *On the Equilibrium Problem for the Vector Potentials*, Uspekhi Mat. Nauk **40** (1985), No. 4, (244), 155–156 (with A. Gonchar); English Translation in Russian Math. Surveys **40** 1985.

17. *On Asymptotic Properties of Orthogonal Polynomials on the Circle With Weights Not Satisfying the Szegö Condition*, Math. Sb. 130 (172) (1986), 157–169; English Translation in Math. USSR Sb. 58 (87).

18. *Equilibrium Distributions and Degree of Rational Approximation of Analytic Functions*, (with A. A. Gonchar), Mat. Sb. 134 (176) (1987); English Translation in Math. USSR Sb. 62 (1989), 305–348.

19. *Rational Approximations, Orthogonal Polynomials and Equilibrium Distributions*, (with G. Lopez), Lecture Notes In Mathematics 1329 (1988); Proceedings of Segovia (1986).

20. *On the Rate of Convergence of Padé Approximants for Orthogonal Expansions*, (with A. A. Gonchar and S. P. Suetin), Proc. of Tampa (1989) In: Progress in Approximation Theory, An International Perspective, Springer-Verlag, New York 1992.

21. *Strong Asymptotics for Orthogonal Polynomials Associated with Exponential Weight on* $\mathbb{R}$, in "Methods of Approximation Theory in Complex Analysis and Mathematical Phyiscs", A. A. Gonchar and E. B. Saff eds., 71–97, Moscow, "NAUKA", 1992.

22. *Variations of the equilibrium energy and the S-property of a compacts of minimal capacity* 1994, manuscript (with K. Perevoznikova).

23. *Electrons on the sphere*, (with Y. M. Zhou and E. B. Saff), Computational Methods and Function Theory (CMFT '94), R. M. Ali, S. Ruschewayh and E. B. Saff eds., 293–309.

24. *Minimal Discrete Energy on the Sphere*, (with Y. M. Zhou and E. B. Saff), Mathematical Research Letters, I (1994), 647–662.

25. *Rational Approximationa with Varying Weights I*, (with P. Borwein and E.B. Saff), Constructive Approximation 12, 223–240, 1996.

26. *Equilibrium Measure and the Distribution of Zeros of the Extremal Polynomials of a Discrete Variable*, Math. Sb. 187; 8 1213–1228 (1996).

27. *Zero distributions of discrete orthogonal polynomials*, Proceedings of the VIII SPOA, Sevilla 1997, J. Comp. Appl. Math 1997 (with A.B.J. Kuijilaars).

28. *On families of measures that are balanced in the external field on the real axis*, Math. Sb., 1999, 187; 8 1213–1228 (with V. S. Buyrov) .

29. *Existence and regularity for an energy maximization problem in two dimensions*, (with S. Kamvissis), J. Math. Phys., 46, no 8 (2005).

30. *Bound for polynomials with a unit discrete norm*, Annals of Math.,165, pp. 55 –88, 2007.

31. *On asymptotic behavior of Heine-Stieltjes and Van Vleck polynomials*, Recent trends in orthogonal polynomials and approximation theory, Contemporary Mathematics, vol 507, Amer.Math. Soc.,Providence, RI, 2010, pp.209-232 (with A. Martínez-Finkelshtein),

32. *On the convergence of Chebyshev-Pade approximations to real-valued algebraic functions*, Arxiv: 1009.4813,2010 (with A.A. Gonchar and S.P. Suetin).

33. *Variation of the equilibrium measure and the S-property of a stationary compact set*, Uspekhi Mat. Nauk, 2011, vol 66, issue 1(397), pp. 183–184 (with A. Martínez-Finkelshtein and S. P. Suetin)

34. *Variation of the equilibrium measure and the S-property of a stationary compact set*, Mat. Sb. 2011, vol 202, issue 12, pp. 113–136 (with A. Martínez-Finkelshtein and S. P. Suetin)

35. *Padé–Chebyshev approximants of multivalued analytic functions, variation of equilibrium energy, and the S-property of stationary compact sets* Uspekhi Mat Nauk, 2011, vol 66, issue 6(402), pp. 3 - 36 (with A.A. Gonchar and S.P. Suetin).

36. *On asymptocis of Hermite-Pade polynomials for a couple of Markov-type functions*, Math. Sb, 202:1 (2011).

37. *Critical measures, quadratic differentials and weak limits of of zeros of Stieltjes polynomials*, Arxiv:0902.0193, 2009 , Communications in Mathematical Physics, (302)2011, no 1, 53 -111 (with A. MartínezFinkelshtein) .

38. *Heine, Hilbert, Padé, Riemann, and Stieltjes: a John Nuttall's work 25 years later*, Contemporary Mathematics, 2012, Amer. Math. Soc., Providence, RI, vol. 578, pp. 165 - 193 (with A. Martínez-Finkelshtein and S .Suetin),

39. *Orthogonal polynomials and S-curves*, Contemporary Mathematics, 2012, Amer. Math. Soc., Providence, RI, vol. 578, pp. 195 - 239.

40. *Phase transitions in the Hermittian matrix model and Equilibrium measure*, (with A. MartínezFinkelshtein and R. Orive) posted in Arxive 2013, submitted to Communications in Mathematical Physics .

41. *Asymptotic behaviour of Hermite–Padé polynomials of the 1st kind for a pair of functions making up a Nikishin system* Uspekhi Mat. Nauk, 2012, vol 67, issue 5(407) pp. 177–178 (with S. P. Suetin)

42. *Laguerre type equarion for of Hermite–Padé polynomials and application to asymptotics*, In progress (with S. P. Suetin)

43. *Zero disribution of the Hermite–Padé polynomials and geometry of Stoks lines*, In progress (with A. MartínezFinkelshteinS and P. Suetin)

Career Summary

Research Areas and main results

Complex analysis, constructive methods of approximations of analytic functions, orthogonal polynomials, potential theory. I solved, in particular, a number of longstanding problems in these areas (Ratio asymptotics problem, Steklov's problem, Freud's problem, problem of the rate of convergence of Padé approximants for Stieltjes series, problem of the rate of convergence of rational approximants for exponential function and others). Those results (some of them are obtained in collaboration with A.A.Gonchar) have had an important influence on the further development of these areas. Equilibrium problems of various kind has been introduced and studied as parts of the methods of solution. Those equilibrium problems (equilibrium in the external field, vector equilibrium, constrained equilibrium, equilibrium in aconducting domain) has become a common tool in analysis, approximation theory and mathematical physics. Recently a classical problem of asymptotics for Heine-Stieltjes and Van Vleck polynomials has been solved (in collaboration with A.Martinez) which was based on systematic study of relation between discrete and contimuous equilibrium problems.

Teaching

I has been teaching for four years at Moscow State University on the graduate and undergraduate levels. In particular undergraduate Complex Analysis (1988 - 1991) and graduate courses Padé Approximants (1989), Special Topics in Complex Analysis (1990), Rational Approximations of Analytic Functions (1991). Served as organizer and head of the research seminar "Selected Problems in the Theory of Functions" Directed Ph.D. dissertation for V. Buyarov and MS-thesis for K. Perevoznikova.

Since 1992 I teach in USF at the undergraduate and graduate levels. I have developed several graduate courses, in particular, special topics in complex analysis, special functions, approximation theory. I also teach regular courses such as real analysis, complex analysis, numerical analysis, differential equations, calculus, linear and computational algebra, finite mathematics, college algebra. Served as a member of Doctorial Dissertation Committees for a number of students

Service

State Expert for Mathematics and Mechanics of USSR (Russia) in 1989–1994. Member of editorial board of Journals"Analysis Mathematika" in 1988–1992, Constuctive Mathematics and Functional Analysis since 2005. Since 1977 I regularly serve as a referee for several leading mathematical journals.

November 2012