

Curriculum Vitae
Craig A. Tracy

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Born United Kingdom, U.S. Citizen.

Education

University of Missouri, Columbia, Physics, B. S., 1967.
State University of New York, Stony Brook, Physics, Ph. D., 1973.

Thesis Advisor Barry M. McCoy

Positions Held

2003-: Distinguished Professor, Dept. of Mathematics, UC Davis.
2001-02: Acting Director, Institute of Theoretical Dynamics, UC Davis.
1994-98: Chair, Department of Mathematics, UC Davis.
1992: Spring, Acting Director, Institute of Theoretical Dynamics, UC Davis.
1991: June-Dec., Research Professor, RIMS, Kyoto University.
1989: Fall, Acting Director, Institute of Theoretical Dynamics, UC Davis.
1986: Fall, Research Fellow, Research School of Physical Sciences,
The Australian National University.
1986: May, Research Fellow, Institute for Scientific Interchange, Torino, Italy.
1985: August, Visiting Research Scientist, Brookhaven National Laboratory.
1984- Professor, Dept. of Mathematics, UC Davis.
1983-84: Associate Professor, Dept. of Mathematics, Dartmouth College.
1982: Fall, Visitor at the Institute for Mathematics and Its Applications,
University of Minnesota.
1978-83: Assistant Professor, Dept. of Mathematics, Dartmouth College.
1976: Summer, Visitor at Los Alamos Scientific Laboratory.
1975-78: Research Associate, Institute for Theoretical Physics,
SUNY at Stony Brook.
1973-75: Research Associate, Institute for Fundamental Studies,
University of Rochester.

Professional Activities

1. Member of the American Mathematical Society.
2. Member of the Society of Industrial and Applied Mathematics.
3. Member of the MSRI Board of Trustees, 1998-2002.
4. Member of the Editorial Board for *Mathematical Physics, Analysis and Geometry*, ended 2013.
5. Member of the Editorial Board of *Progress in Mathematical Physics*
6. Associate Editor, *The Annals of Probability*, 2006-2011.
7. Associate Editor, *The Annals of Statistics*, 2007-2015.
8. Associate Editor, *Journal of Statistical Physics*, 2011-.
9. Member of the Editorial Board of *Random Matrices: Theory and Applications*. 2011-.

Awards, Prizes and Honors

1. Woodrow Wilson Fellowship, 1967-68.
2. JSPS (Japan Society for the Promotion of Science) Fellowship, 1991.

3. 2002 George Pólya Prize of the Society of Industrial and Applied Mathematics (shared with H. Widom).
4. Distinguished Professor, UC Davis, 2003.
5. Fellow, American Academy of Arts and Sciences, 2006.
6. Norbert Wiener Prize in Applied Mathematics, 2007 (shared with H. Widom).
7. Aisenstadt Chair, Centre de Recherches Mathématiques, Université de Montréal, 2008–09.
8. Batsheva Fellowship in Natural Sciences and Mathematics, Israel Academy of Sciences, 2008–09.
9. Fellow of SIAM, Class of 2011.
10. Fellow of the American Mathematical Society, Class of 2013.
11. KITP Simons Distinguished Visiting Scientist, Winter quarter 2016, UCSB.

Field of Research Statistical physics, integrable systems, probability theory.

Grant History

1. *Lattice model calculations of scaling functions*, NSF MSC–8002148.
2. *Lattice model calculations of scaling functions*, NSF MSC–8102536.
3. *Integrable models in statistical mechanics*, NSF MCS–8301261.
4. *Integrable models in statistical mechanics*, NSF DMS–8415678.
5. *Integrable models in statistical mechanics*, NSF DMS–8421141.
6. *Solvable models in lattice statistical mechanics*, NSF DMS–8700867.
7. *Integrable models in mathematics and physics*, NSF DMS–9001794.
8. *Tau functions for Dirac operators*, NSF INT–9106953.
9. *Integrable models in mathematics and physics*, NSF DMS–9303413.
10. *Research in random matrices and integrable systems*, NSF DMS–9802122.
11. *Research in random matrices and integrable systems*, NSF DMS–0304414.
12. *Random matrices, integrable systems and related stochastic processes*, NSF DMS–0553379.
13. *Integrable systems, operator determinants and probabilistic models*, NSF DMS–0906387.
14. *Integrable structure of interacting particle systems and quantum spin chains*, NSF DMS–1207995.

PUBLICATIONS

1. S. Krinsky, C. Tracy, and M. Blume, *Variational approximation to the Ising model in a magnetic field*, Phys. Rev. Letts. **30** (1973), 750–753.
2. C. A. Tracy and B. M. McCoy, *Neutron scattering and the correlation functions of the Ising model near T_c* , Phys. Rev. Letts. **31** (1973), 1500–1504.
3. C. A. Tracy and B. M. McCoy, *On the maximum of the k -dependent susceptibility for fixed k and $T > T_c$* , Phys. Letts. **46A** (1974), 371–372.
4. C. A. Tracy, *On the decay rate of order-parameter fluctuations*, Phys. Letts. **48A** (1974), 9–10.
5. S. Krinsky, C. Tracy, and M. Blume, *Variational approximation to a ferromagnet in a magnetic field*, Phys. Rev. **B9** (1974), 4808–4815.
6. C. A. Tracy and B. M. McCoy, *Examination of the phenomenological scaling functions for critical scattering*, Phys. Rev. **B12** (1975), 368–387.
7. C. A. Tracy, *Critical scattering scaling functions and the measurement of η* , in *Magnetism and Magnetic Materials–1975*, eds. J. J. Becker, G. H. Lander, and J. J. Rhyne, American Institute of Physics Conference Proceedings 29, 1975, pp. 483–487.
8. T. T. Wu, B. M. McCoy, C. A. Tracy, E. Barouch, *Spin-spin correlation functions for the two-dimensional Ising model: Exact theory in the scaling region*, Phys. Rev. **B13** (1976), 316–374.
9. B. M. McCoy, C. A. Tracy, and T. T. Wu, *Painlevé functions of the third kind*, J. Math. Phys. **18** (1977), 1058–1092.

10. B. M. McCoy, C. A. Tracy, and T. T. Wu, *Spin-spin correlation functions for the two-dimensional Ising model*, in *Statistical Mechanics and Statistical Methods in Theory and Application*, ed. U. Landman, Plenum Publ. Corp., 1977, pp. 83–97.
11. B. M. McCoy, C. A. Tracy, and T. T. Wu, *Two-dimensional Ising model as an exactly solvable relativistic quantum field theory: Explicit formulas for n-point functions*, Phys. Rev. Letts. **38** (1977), 793–796.
12. B. M. McCoy, C. A. Tracy, and T. T. Wu, *Connection between the KdV equation and the two-dimensional Ising model*, Phys. Letts. **61A** (1977), 283–284.
13. H. G. Vaidya and C. A. Tracy, *Transverse time-dependent spin correlation functions for the one-dimensional XY model at zero temperature*, Physica **92A** (1978), 1–41.
14. C. A. Tracy, *Painlevé transcendents and scaling functions of the two-dimensional Ising model*, in *Nonlinear Equations in Physics and Mathematics*, ed. A. O. Barut, D. Reidel Publ. Co., Dordrecht, Holland, 1978, 221–237.
15. H. G. Vaidya and C. A. Tracy, *Crossover scaling function for the one-dimensional XY model at zero temperature*, Phys. Letts. **68A** (1978), 378–380.
16. H. G. Vaidya and C. A. Tracy, *One-particle reduced density matrix of impenetrable bosons in one dimension at zero temperature*, Phys. Rev. Letts. **42** (1979), 3–6.
17. H. G. Vaidya and C. A. Tracy, *One-particle reduced density matrix of impenetrable bosons in one dimension at zero temperature*, J. Math. Phys. **20** (1979), 2291–2313.
18. J. Palmer and C. Tracy, *Two-dimensional Ising correlation functions: Convergence of the scaling limit*, Adv. in Applied Math. **2** (1981), 329–388.
19. J. Palmer and C. Tracy, *Two-dimensional Ising correlation functions: The SMJ analysis*, Adv. in Applied Math. **4** (1983), 46–102.
20. C. A. Tracy, *Complete integrability in statistical mechanics and the Yang-Baxter equations*, Physica **14D** (1984), 253–264.
21. C. A. Tracy, *Embedded elliptic curves and the Yang-Baxter equations*, Physica **16D** (1985), 203–220.
22. M. P. Richey and C. A. Tracy, *The Z_n Baxter model: Symmetries and the Belavin parametrization*, J. Statistical Phys. **42** (1986), 311–348.
23. C. A. Tracy, *Z_n Baxter model: Critical behavior*, J. Statistical Phys. **44** (1986), 183–191.
24. C. A. Tracy, *The emerging role of number theory in exactly solvable models in lattice statistical mechanics*, Physica **25D** (1987), 1–19.
25. M. P. Richey and C. A. Tracy, *Symmetry group for a completely symmetric vertex model*, J. Phys. A.: Math. Gen. **20** (1987), 2667–2677.
26. C. A. Tracy, L. Grove, and M. F. Newman, *Modular properties of the hard hexagon model*, J. Statistical Phys. **48** (1987), 477–502.
27. M. P. Richey and C. A. Tracy, *Equation of state and isothermal compressibility for the hard hexagon model in the disordered regime*, J. Phys. A.: Math. Gen. **20** (1987), L1121–L1126.
28. C. A. Tracy, *Universality class of a Fibonacci Ising model*, J. Statistical Phys. **51** (1988), 481–490.
29. C. A. Tracy, *Universality classes of some aperiodic Ising models*, J. Phys. A.: Math. Gen. **21** (1988), L603–L605.
30. C. A. Tracy, *Monodromy preserving deformation of the Klein-Gordon equation in the hyperbolic plane*, Physica **34D** (1989), 347–365.
31. C. A. Tracy, *Introduction to exactly solvable models in statistical mechanics*, Proc. Symposia in Pure Math. **49** (1989), Part I, 355–375.
32. M. P. Richey and C. A. Tracy, *Algorithms for the computation of polynomial relationships for the hard hexagon model*, Nuclear Physics **B330** (1990), 681–704.

33. C. A. Tracy, *Monodromy preserving deformation of linear ordinary and partial differential equations*, in *Solitons in Physics, Mathematics, and Nonlinear Optics*, eds. P. J. Olver and D. H. Sattinger, Springer-Verlag, New York, 1990, pp. 165–174.
34. J. Palmer and C. A. Tracy, *Monodromy preserving deformation of the Dirac operator acting on the hyperbolic plane*, in *Mathematics of Nonlinear Science* ed. M. S. Berger, American Mathematical Society, Providence, 1990, pp. 119–131.
35. R. Narayanan and C. A. Tracy, *Holonomic quantum field theory of bosons in the Poincaré disk and the zero curvature limit*, Nuclear Physics **B340** (1990), 568–594.
36. E. L. Basor and C. A. Tracy, *The Fisher-Hartwig conjecture and its generalizations*, Physica **177A** (1991), 167–173.
37. C. A. Tracy, *Asymptotics of a τ -function arising in the two-dimensional Ising model*, Commun. Math. Phys. **142** (1991), 297–311.
38. E. L. Basor and C. A. Tracy, *Some problems associated with the asymptotics of τ -functions*, Surikagaku (Mathematical Sciences) **30**, no. 3 (1992), 71–76 [English translation appears in RIMS–845 preprint].
39. B. Temple and C. A. Tracy, *From Newton to Einstein*, American Math. Monthly **99** (1992), 507–521.
40. E. L. Basor and C. A. Tracy, *Asymptotics of a tau-function and Toeplitz determinants with singular generating functions*, Int. J. Modern Physics A **7**, Suppl. 1A (1992), 83–107.
41. E. L. Basor, C. A. Tracy and H. Widom, *Asymptotics of level spacing distributions for random matrices*, Phys. Rev. Letts. **69** (1992), 5–8.
42. R. Narayanan, J. Palmer and C. A. Tracy, *Some isomonodromy problems in hyperbolic space*, in *Proceedings of the NATO Advanced Workshop on Painlevé Transcendents, Their Asymptotics, and Physical Applications*, eds. D. Levi and P. Winternitz, Plenum, New York, 1992, pp. 407–424.
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45. E. L. Basor and C. A. Tracy, *Variance calculations and the Bessel kernel*, J. Statistical Phys. **73** (1993), 415–421.
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48. C. A. Tracy and H. Widom, *Level-spacing distributions and the Bessel kernel*, Commun. Math. Phys. **161** (1994), 289–309.
49. C. A. Tracy and H. Widom, *Fredholm determinants, differential equations and matrix models*, Commun. Math. Phys. **163** (1994), 33–72.
50. J. Palmer, M. Beatty, and C. A. Tracy, *Tau-functions for the Dirac operator on the Poincaré disk*, Commun. Math. Phys. **165** (1994), 97–173.
51. Y. Chen, K. J. Eriksen and C. A. Tracy, *Largest eigenvalue distributions in the double scaling limit of matrix models: a Coulomb fluid approach*, J. Phys. A.: Math. Gen. **28** (1995), L207–L211.
52. C. A. Tracy and H. Widom, *Systems of partial differential equations for a class of operator determinants*, in *Partial Differential Operators and Mathematical Physics*, eds. M. Demuth and B.-W. Schulz, Operator Theory: Advances and Applications, Vol. 78, Birkhäuser Verlag, Berlin, 1995, pp. 381–388.

53. C. A. Tracy and H. Widom, *On orthogonal and symplectic matrix ensembles*, Commun. Math. Phys. **177** (1996), 727–754.
54. C. A. Tracy and H. Widom, *Fredholm determinants and the mKdV/sinh-Gordon hierarchies*, Commun. Math. Phys. **179** (1996), 1–10.
55. C. A. Tracy and H. Widom, *Proofs of two conjectures related to the thermodynamic Bethe Ansatz*, Commun. Math. Phys. **179** (1996), 667–680.
56. C. A. Tracy and H. Widom, *The thermodynamic Bethe Ansatz and a connection with Painlevé equations*, Int. J. Mod. Physics **B 11** (1997), 69–74.
57. C. A. Tracy and H. Widom, *On exact solutions to the cylindrical Poisson-Boltzmann equation with application to polyelectrolytes*, Physica **244A** (1997), 402–413.
58. C. A. Tracy and H. Widom, *Asymptotics of a class of solutions to the cylindrical Toda equations*, Commun. Math. Phys. **190** (1998), 697–721.
59. C. A. Tracy and H. Widom, *Correlation functions, cluster functions and spacing distributions for random matrices*, J. Statistical Phys. **92** (1998), 809–835.
60. C. A. Tracy and H. Widom, *Universality of the distribution functions of random matrix theory*, in *Statistical Physics on the Eve of the 21st Century: In Honour of J B McGuire on the Occasion of His 65th Birthday*, eds. M. T. Batchelor and L. T. Wille, World Scientific Publishing, 1999, pp. 230–239.
61. C. A. Tracy and H. Widom, *Asymptotics of a Class of Fredholm Determinants*, in *Spectral Problems in Geometry and Arithmetic*, ed. T. Branson, American Mathematical Society, Providence, 1999, pp. 167–174.
62. C. A. Tracy and H. Widom, *Random unitary matrices, permutations and Painlevé*, Commun. Math. Phys. **207** (1999), 665–685.
63. C. A. Tracy and H. Widom, *The distribution of the largest eigenvalue in the Gaussian ensembles: $\beta = 1, 2, 4$* , in *Calogero-Moser-Sutherland Models*, eds. J. F. van Diejen and L. Vinet, CRM Series in Mathematical Physics **4**, Springer-Verlag, New York, 2000, pp. 461–472.
64. C. A. Tracy and H. Widom, *Universality of the distribution functions of random matrix theory. II*, in *Integrable Systems: From Classical to Quantum*, CRM Proceedings & Lecture Notes, Vol. 26, eds. J. Harnad, G. Sabidussi, and P. Winternitz, American Mathematical Society, Providence, 2000, pp. 251–264.
65. C. A. Tracy and H. Widom, *On the distributions of the lengths of the longest monotone subsequences in random words*, Probab. Theo. Related Fields **119** (2001), 350–380.
66. J. Gravner, C. A. Tracy and H. Widom, *Limit theorems for height fluctuations in a class of discrete space and time growth models*, J. Statistical Physics **102** (2001), 1085–1132.
67. A. R. Its, C. A. Tracy and H. Widom, *Random words, Toeplitz determinants and integrable systems, I*, *Random Matrix Models and their Applications*, eds. P. Bleher and A. Its, Math. Sci. Res. Inst. Publications **40**, Cambridge University Press, New York, 2001, pp. 245–258.
68. A. R. Its, C. A. Tracy and H. Widom, *Random words, Toeplitz determinants and integrable systems, II*, Physica **152–153D** (2001), 199–224.
69. C. A. Tracy and H. Widom, *On the limit of some Toeplitz-like determinants*, SIAM J. Matrix Anal. Appl. **23** (2002), 1194–1196.
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72. J. Gravner, C. A. Tracy and H. Widom, *A growth model in a random environment*, Ann. Probab. **30** (2002), 1340–1368.

73. J. Gravner, C. A. Tracy and H. Widom, *Fluctuations in the composite regime of a disordered growth model*, Commun. Math. Phys. **229** (2002), 433–458.
74. C. A. Tracy and H. Widom, *Distribution functions for largest eigenvalues and their applications*, in *Proceedings of the International Congress of Mathematicians, Beijing 2002*, Vol. I, ed. LI Tatsien, Higher Education Press, Beijing, 2002, pgs. 587–596.
75. C. A. Tracy and H. Widom, *A system of differential equations for the Airy process*, Elect. Comm. in Probab. **8** (2003), 93–98.
76. C. A. Tracy and H. Widom, *A limit theorem for shifted Schur measures*, Duke Math. J. **123** (2004), 171–208.
77. C. A. Tracy and H. Widom, *Differential equations for Dyson processes*, Commun. Math. Phys. **252** (2004), 7–41.
78. C. A. Tracy and H. Widom, *Matrix kernels for the Gaussian orthogonal and symplectic ensembles*, Ann. Inst. Fourier, Grenoble **55** (2005), 2197–2207.
79. C. A. Tracy and H. Widom, *The Pearcey process*, Commun. Math. Phys. **263** (2006), 381–400.
80. C. A. Tracy and H. Widom, *Nonintersecting Brownian excursions*, The Annals of Applied Probability **17** (2007), 953–979.
81. C. A. Tracy and H. Widom, *Integral formulas for the asymmetric simple exclusion process*, Commun. Math. Phys. **279** (2008), 815–844. Erratum: Commun. Math. Phys. **304** (2011), 875–878.
82. C. A. Tracy and H. Widom, *A Fredholm determinant representation in ASEP*, J. Statistical Physics **132** (2008), 291–300.
83. C. A. Tracy and H. Widom, *The dynamics of the one-dimensional delta-function Bose gas*, J. Phys. A: Math. Theor. **41** (2008), 485204.
84. C. A. Tracy and H. Widom, *Asymptotics in ASEP with step initial condition*, Commun. Math. Phys. **290** (2009), 129–154.
85. C. A. Tracy and H. Widom, *Total current fluctuations in the asymmetric simple exclusion process*, J. Math. Phys. **50** (2009), 095204.
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87. C. A. Tracy and H. Widom, *On ASEP with step Bernoulli initial condition*, J. Statistical Physics **137** (2009), 825–838.
88. C. A. Tracy and H. Widom, *The distributions of random matrix theory and their applications*, in *New Trends in Mathematical Physics: Selected Contributions of the XVth International Congress on Mathematical Physics*, ed. Vladas Sidoravicius, Springer, 2009, pgs. 753–765.
89. C. A. Tracy and H. Widom, *Formulas for joint probabilities for the asymmetric simple exclusion process*, J. Math. Phys. **51** (2010), 063302.
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95. C. A. Tracy and H. Widom, *Formulas and asymptotics for the asymmetric simple exclusion process*, Mathematical Physics, Analysis and Geometry **14** (2011), 211–235.

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97. C. A. Tracy and H. Widom, *On the asymmetric simple exclusion process with multiple species*, J. Statistical Physics **150** (2013), 457–470.
98. C. A. Tracy and H. Widom, *The asymmetric simple exclusion process with an open boundary*, J. Math. Phys. **54** (2013), 103301.
99. C. A. Tracy and H. Widom, *On the diagonal susceptibility of the two-dimensional Ising model*, J. Math. Phys. **54** (2013), 123302.
100. C. A. Tracy and H. Widom, *On the singularities in the susceptibility expansion for the two-dimensional Ising model*, J. Statistical Physics **156** (2014), 1125–1135.
101. C. A. Tracy and H. Widom, *On the ground state energy of the delta-function Bose gas*, J. Phys. A: Math. Theor. **49** (2016) 294001.
102. C. A. Tracy and H. Widom, *On the ground state energy of the delta-function Fermi gas*, J. Math. Phys. **57**, 103301 (2016).
103. C. A. Tracy and H. Widom, *Natural boundary for a sum involving Toeplitz determinants*, *Large Truncated Toeplitz Matrices, Toeplitz Operators, and Related Topics*, eds. D. A. Bini, T. Ehrhardt, A. Y. Karlovich, and I. Spitkovsky, Springer International Publishing (2017), pgs. 703–718.