

## EDWARD FRENKEL

### BIBLIOGRAPHY

#### Books

1. *Vertex Algebras and Algebraic Curves* (with D. Ben-Zvi), Mathematical Surveys and Monographs **88**, AMS, First Edition, 2001; Second Edition, 2004 (400 pp.).
2. *Langlands Correspondence for Loop Groups*, Cambridge Studies in Advanced Mathematics **103**, Cambridge University Press, 2007 (395 pp.).
3. *Love and Math*, Basic Books, 2013 (Paperback, 2014), 300 pp., translated into 18 languages.

#### Papers

1. *Cohomology of the commutator subgroup of the braid group*, *Funct. Anal. Appl.* **22**, 248–250 (1988).
2. *A family of representations of affine Lie algebras* (with B. Feigin), *Russ. Math. Surv.* **43**, N 5, 221–222 (1988).
3. *Representations of affine Kac-Moody algebras and bosonization* (with B. Feigin), in *Physics and Mathematics of Strings. V.G. Knizhnik Memorial Volume*, eds. L. Brink, D. Friedan, A.M. Polyakov, 271–316. Singapore: World Scientific, 1990.
4. *Representations of affine Kac-Moody algebras, bosonization and resolutions* (with B. Feigin), *Lett. Math. Phys.* **19**, 307–317 (1990).
5. *Affine Kac-Moody Algebras and semi-infinite flag manifolds* (with B. Feigin), *Comm. Math. Phys.* **128**, 161–189 (1990).
6. *Bosonic ghost system and the Virasoro algebra* (with B. Feigin), *Phys. Lett.* **B 246**, 71–74 (1990).
7. *Quantization of the Drinfeld-Sokolov reduction* (with B. Feigin), *Phys. Lett.* **B 246**, 75–81 (1990).
8. *Semi-infinite Weil complex and the Virasoro algebra* (with B. Feigin), *Comm. Math. Phys.* **137**, 617–639 (1991).
9. *Affine Kac-Moody algebras at the critical level and Gelfand-Dikii algebras* (with B. Feigin), in *Infinite Analysis*, eds. A. Tsuchiya, T. Eguchi, M. Jimbo, *Adv. Ser. in Math. Phys.* **16**, 197–215, Singapore: World Scientific, 1992.
10. *Duality in  $W$ -algebras* (with B. Feigin), *Duke Math. Journal* **64**, *IMRN* **6**, 75–82 (1991).
11. *Characters and fusion rules of  $W$ -algebras via quantized Drinfeld-Sokolov reduction* (with V. Kac and M. Wakimoto), *Comm. Math. Phys.* **147**, 295–328 (1992). [Reprinted in  *$\mathcal{W}$ -symmetry*, eds. P. Bouwknegt, K. Schoutens, pp. 400–433, Singapore: World Scientific, 1995.]

12. *W-algebras and Langlands-Drinfeld correspondence*, in *New Symmetries in Quantum Field Theory*, eds. J. Fröhlich, e.a., 433–447, New York: Plenum Press, 1992. [Reprinted in *W-symmetry*, eds. P. Bouwknegt, K. Schoutens, pp. 385–399, Singapore: World Scientific, 1995.]
13. *Free field resolutions in affine Toda field theories* (with B. Feigin), *Phys. Lett.* **B 276**, 79–86 (1992).
14. *Determinant formulas for the free field representations of the Virasoro and Kac-Moody algebras*, *Phys. Lett.* **B 286**, 71–77 (1992).
15. *Dilogarithm identities, q-difference equations and the Virasoro algebra* (with A. Szenes), *Duke Math. Journal* **69**, *IMRN* **2**, 53–60 (1993).
16. *Coinvariants of nilpotent subalgebras of the Virasoro algebra and partition identities* (with B. Feigin), in *I.M.Gelfand Seminar*, eds. S. Gelfand, S. Gindikin, *Adv. in Soviet Math.* **16**, Part 1, 139–148, Providence: AMS, 1993.
17. *Crystal bases, dilogarithm identities and torsion in algebraic K-theory* (with A. Szenes), *Journal of AMS* **8**, 629–664 (1995).
18. *Integrals of motion and quantum groups* (with B. Feigin), in *Proceedings of the C.I.M.E. School Integrable Systems and Quantum Groups*, Italy, June 1993, *Lect. Notes in Math.* **1620**, Springer, Berlin, 1995.
19. *Kac-Moody groups and integrability of soliton equations* (with B. Feigin), *Invent. Math.* **120**, 379–408 (1995)
20. *Gaudin model, Bethe ansatz and critical level* (with B. Feigin and N. Reshetikhin), *Comm. Math. Phys.* **166**, 27–62 (1994)
21.  $W_{1+\infty}$  and  $W(gl_N)$  with central charge  $N$  (with V. Kac, e.a.), *Comm. Math. Phys.* **170**, 337–357 (1995)
22. *Free field realizations in representation theory and conformal field theory*, in *Proceedings of the International Congress of Mathematicians, Zürich, 1994*, pp. 1256–1269, Birkhäuser Verlag, 1995.
23. *Affine algebras, Langlands duality and Bethe ansatz*, in *Proceedings of the International Congress of Mathematical Physics, Paris, 1994*, ed. D. Iagolnitzer, pp. 606–642, International Press, 1995.
24. *Quantum affine algebras and deformations of the Virasoro and W-algebras* (with N. Reshetikhin), *Comm. Math. Phys.* **178**, 237–264 (1996).
25. *Thermodynamic Bethe Ansatz and dilogarithm identities* (with A. Szenes), *Math. Res. Lett.* **2**, 677–693 (1995)
26. *Quantum W-algebras and elliptic algebras* (with B. Feigin), *Comm. Math. Phys.* **178**, 653–678 (1996)
27. *Deformations of the KdV hierarchies and related soliton equations*, *Int. Math. Res. Notices.* **2**, 55–76 (1996)
28. *Equivalence of two approaches to integrable hierarchies of KdV type* (with B. Enriquez), *Comm. Math. Phys.* **185**, 211–230 (1997).
29. *Geometric interpretation of the Poisson structure in affine Toda field theory* (with B. Enriquez), *Duke Math. J.* **92**, 459–495 (1998).

30. *Geometric realization of Whittaker functions and the Langlands conjecture* (with D. Gaitsgory, e.a.), Journal of AMS **11**, 451–484 (1998).
31. *Drinfeld-Sokolov reduction for difference operators and deformations of  $\mathcal{W}$ -algebras I.* (with N. Reshetikhin and M. Semenov-Tian-Shansky), Comm. Math. Phys. **192**, 605–629 (1998).
32. *Towards deformed chiral algebras* (with N. Reshetikhin), in Quantum Group Symposium at the XXI International Colloquium on Group Theoretical Methods in Physics (Goslar, 1996), eds. H.-D. Doebner and V.K. Dobrev, (Heron Press, Sofia, 1997), pp. 27-42.
33. *Deformations of  $\mathcal{W}$ -algebras associated to simple Lie algebras* (with N. Reshetikhin), Comm. Math. Phys. **197**, 1–32 (1998).
34. *Five lectures on soliton equations*, in Surveys in Differential Geometry, vol. 4, ed. S.-T. Yau, pp. 131–180, International Press 1999.
35. *The  $q$ -characters of representations of quantum affine algebras and deformations of  $\mathcal{W}$ -algebras* (with N. Reshetikhin), in Recent Developments in Quantum Affine Algebras and Related Topics, N. Jing and K. Misra (eds.), Contemporary Mathematics **248**, pp. 163–205, AMS 1999.
36. *Spectral curves, opers and integrable systems* (with D. Ben-Zvi), Publ. IHES **94** (2001) 87–159.
37. *Integrable hierarchies and Wakimoto modules* (with B. Feigin), in Differential Topology, Infinite-Dimensional Lie Algebras, and Applications: D. B. Fuchs' 60th Anniversary Collection, A. Astashkevich and S. Tabachnikov (eds.), pp. 27–60, AMS 1999.
38. *Whittaker patterns in the geometry of moduli spaces of bundles on curves* (with D. Gaitsgory and K. Vilonen), Annals of Math. **153**, 699–748 (2001).
39. *Combinatorics of  $q$ -characters of finite-dimensional representations of quantum affine algebras* (with E. Mukhin), Comm. Math. Phys. **216**, 23–57 (2001).
40. *Jet scheme of the nilpotent cone*, Appendix to *Jet schemes of locally complete intersection canonical singularities* by M. Mustata (with D. Eisenbud), Inv. Math. **145** (2001) 397–424.
41. *Vertex algebras and algebraic curves*, Seminaire Bourbaki, Exp. 875, Asterisque **276** (2002) 299–339.
42. *On the geometric Langlands conjecture* (with D. Gaitsgory and K. Vilonen), Journal of AMS **15** (2001) 367–417.
43. *The  $q$ -characters at roots of unity* (with E. Mukhin), Advances in Math. **17** (2002) 139–167.
44. *The Hopf algebra  $\text{Rep}U_q\widehat{\mathfrak{gl}}_\infty$*  (with E. Mukhin), Selecta Mathematica **8** (2002) 537–635.
45. *Twisted modules over vertex algebras on algebraic curves* (with M. Szczesny), Advances in Math. **187** (2004) 195–227.
46. *Wakimoto modules, opers and the center at the critical level*, Advances in Math. **195** (2005) 297–404.
47. *Geometric Realization of the Segal–Sugawara Construction* (with D. Ben-Zvi), in Topology, geometry and quantum field theory, pp. 46–97, London Math. Soc. Lecture Note Ser. **308**, Cambridge Univ. Press, Cambridge, 2004.

48. *Recent Advances in the Langlands Program*, Bull. Amer. Math. Soc. **41** (2004) 151–184.
49. *D-modules on the affine Grassmannian and representations of affine Kac-Moody algebras* (with D. Gaitsgory), Duke Math. J. **125** (2004) 279–327.
50. *Affine Kac-Moody algebras, integrable systems and their deformations*, Preprint math.QA/0305216, in Proceedings of the XXIV Colloquium on Group Theoretical Methods in Physics, eds. J.-P. Gazeau, e.a., pp. 21–32, Institute of Physics Publishing, 2004.
51. *Chiral de Rham Complex and Orbifolds* (with M. Szczesny), J. Alg. Geom. **16** (2007) 599–624.
52. *Opers on the projective line, flag manifolds and Bethe Ansatz*, Mosc. Math. J. **4** (2004) 655–705.
53. *Self-extensions of Verma modules and differential forms on opers* (with C. Teleman), Compos. Math. **142** (2006) 477–500.
54. *Gaudin model and opers*, in Infinite Dimensional Algebras and Quantum Integrable Systems, eds. P. Kulish, e.a., Progress in Math. **237**, pp. 1–60, Birkhäuser, 2005.
55. *Mirror symmetry in two steps: A–I–B* (with A. Losev), Comm. Math. Phys. **269** (2007) 39–86 (hep-th/0505131).
56. *Affine Kac-Moody algebras and local geometric Langlands correspondence* (with D. Gaitsgory), in Algebraic Geometry and Number Theory, Progress in Math. **253**, pp. 69–260, Birkhäuser Boston, 2006 (math.RT/0508382).
57. *Fusion and convolution: applications to affine Kac-Moody algebras at the critical level* (with D. Gaitsgory), Pure and Applied Math. Quart. **2**, (2006) 1255–1312 (math.RT/0511284).
58. *Lectures on the Langlands Program and Conformal Field Theory*, in *Frontiers in number Theory, Physics and Geometry II*, eds. P. Cartier, e.a., pp. 387–536, Springer, 2007 (hep-th/0512172).
59. *Localization of  $\widehat{\mathfrak{g}}$ -modules on the affine Grassmannian* (with D. Gaitsgory), Annals of Math. **170** (2009) 1339–1381 (math.RT/0512562).
60. *Geometric realizations of Wakimoto modules at the critical level* (with D. Gaitsgory), Duke Math. J. **143** (2008) 117–203 (math.RT/0603524).
61. *Instantons beyond topological theory I* (with A. Losev and N. Nekrasov), J. of Inst. Math. Jussieu **10** (2011) 463–565 (hep-th/0610149).
62. *Ramifications of the geometric Langlands Program*, in *Representation Theory and Complex Analysis*, Lecture Notes in Mathematics **1931**, pp. 51–136, Springer Verlag 2008 (math.QA/0611294).
63. *Gaudin models with irregular singularities* (with B. Feigin and V. Toledano Laredo), Advances in Math. **223** (2010) 873–948 (math.QA/0612798).
64. *Notes on instantons in topological field theory and beyond* (with A. Losev and N. Nekrasov), Nuclear Phys. B Proc. Suppl. **171** (2007) 215–230. (hep-th/0702137).
65. *Quantization of soliton systems and Langlands duality* (with B. Feigin), in *Exploration of New Structures and Natural Constructions in Mathematical Physics*, pp. 185–274, Adv. Stud. Pure Math. 61, Math. Soc. Japan, Tokyo, 2011 (arXiv:0705.2486).

66. *Weyl modules and opers without monodromy* (with D. Gaitsgory), in *Arithmetic and geometry around quantization*, eds. O. Ceyhan, e.a., Progress in Math. **279**, pp. 101–121, Birkhäuser, 2010 (arXiv:0706.3725).
67. *Geometric Endoscopy and Mirror Symmetry* (with E. Witten), Communications in Number Theory and Physics, **2** (2008) 113–283 (arXiv:0710.5939).
68. *Local Geometric Langlands Correspondence: the Spherical Case* (with D. Gaitsgory), in *Algebraic analysis and around*, pp. 167–186, Adv. Stud. Pure Math. **54**, Math. Soc. Japan, Tokyo, 2009 (arXiv:0711.1132).
69. *D-modules on the affine flag variety and representations of affine Kac-Moody algebras* (with D. Gaitsgory), Representation Theory **13** (2009) 470–608 (arXiv:0712.0788).
70. *Opers with irregular singularity and spectra of the shift of argument subalgebra* (with B. Feigin and L. Rybnikov), Duke Math. Journal **155** (2010) 337–363 (arXiv:0712.1183).
71. *On the endomorphisms of Weyl modules over affine Kac-Moody algebras at the critical level* (with B. Feigin and L. Rybnikov), Lett. Math. Phys. **88** (2009) 163–173 (arXiv:0802.3872).
72. *Instantons beyond topological theory II* (with A. Losev and N. Nekrasov), 125 pp., arXiv:0803.3302.
73. *Langlands duality for representations of quantum groups* (with D. Hernandez), Math. Annalen **349** (2011) 705–746 (arXiv:0809.4453).
74. *Gerbal Representations of Double Loop Groups* (with Xinwen Zhu), Int. Math. Res. Notices 2012 (17) 3929–4013 (arXiv:0810.1487).
75. *Any flat bundle on a punctured disc has an oper structure* (with Xinwen Zhu), Math. Res. Lett. **17** (2010) 27–37 (arXiv:0811.3186).
76. *A rigid irregular connection on the projective line* (with B. Gross), Annals of Math. **170** (2009) 1469–1512 (arXiv:0901.2163).
77. *Langlands duality for finite-dimensional representations of quantum affine algebras* (with D. Hernandez), Lett. Math. Phys. **96** (2011) 217–261 (arXiv:0902.0447).
78. *Gromov-Witten Gauge Theory I* (with C. Teleman and A.J. Tolland), Adv. in Math. **288** (2016) 201–239 (arXiv:0904.4834).
79. *Gauge theory and Langlands duality*, Séminaire Bourbaki, Astérisque **332** (2010) 369–403 (arXiv:0906.2747).
80. *Soliton equations, vertex operators, and simple singularities* (with A. Givental and T. Milanov), Funct. Anal. and Other Math. **3** (2010) 47–63 (arXiv:0909.4032).
81. *Formule des Traces et Fonctorialité: le Début d'un Programme* (with R. Langlands and B.C. Ngô), Annales des Sciences Mathématiques du Québec **34** (2010) 199–243 (arXiv:1003.4578).
82. *Geometrization of trace formulas* (with B.C. Ngô), Bull. Math. Sci. **1** (2011) 1–71 (arXiv:1004.5323).
83. *Langlands Program, Trace Formulas, and their Geometrization* (Notes for the 2012 AMS Colloquium Lectures), Bull. AMS **50** (2013) 1–55 (arXiv:1202.2110).
84. *Geometric Langlands Correspondence Near Opers* (with C. Teleman), J. Ramanujan Math. Soc. **28A** (2013) 123–147 (arXiv:1306.0876).

85. *Baxter's Relations and Spectra of Quantum Integrable Models* (with D. Hernandez), Duke Math. Journal **164** (2015) 2407–2460 (arXiv:1308.3444).
86. *Surface Operators and Separation of Variables* (with S. Gukov and J. Teschner), Journal of High Energy Physics, 2016, No. 1, 179 (arXiv:1506.07508).
87. *Spectra of quantum KdV Hamiltonians, Langlands duality, and affine opers* (with D. Hernandez), Comm. Math. Phys **362** (2018) 361–414 (arXiv:1606.05301).
88. *Quantum  $q$ -Langlands Correspondence* (with M. Aganagic and A. Okounkov), Trans. Moscow Math. Soc. **79** (2018) 1–83 (arXiv:1701.03146).
89. *Quantum Langlands dualities of boundary conditions,  $D$ -modules, and conformal blocks* (with D. Gaiotto), Communications Number Theory and Phys. **14** (2020) 199–313 (arXiv:1805.00203).
90. *Quantum Langlands Duality of Representations of  $W$ -algebras* (with T. Arakawa), Compositio Mathematica **155** (12) 2235–2262 (arXiv:1807.01536).
91. *AI Safety: A First-Person Perspective*, in Artificial Intelligence Safety and Security, ed. R. Yampolskiy, pp. 199–205, CRC Press, 2018.
92. *Is there an analytic theory of automorphic functions for complex algebraic curves?* SIGMA **16** (2020) 042 (arXiv:1812.08160).
93. *An analytic version of the Langlands correspondence for complex curves* (with P. Etingof and D. Kazhdan), in Integrability, Quantization, and Geometry, dedicated to Boris Dubrovin, Vol. II, eds. S. Novikov, e.a., pp. 137–202, Proc. Symp. Pure Math. **103.2**, AMS, 2021 (arXiv:1908.09677).
94.  *$q$ -Opers,  $QQ$ -Systems, and Bethe Ansatz* (with P. Koroteev, D.S. Sage, and A.M. Zeitlin), 44 pp., to appear in Journal of the European Math. Society (arXiv:2002.07344).
95. *Hecke operators and analytic Langlands correspondence for curves over local fields* (with P. Etingof and D. Kazhdan), Duke Mathematical Journal **172** (2023) 2015–2071 (arXiv:2103.01509).
96. *Analytic Langlands correspondence for  $PGL_2$  on  $\mathbb{P}^1$  with parabolic structures over local fields* (with P. Etingof and D. Kazhdan), Geometric and Functional Analysis **32** (2022) 725–831 (arXiv:2106.05243).
97. *Folded quantum integrable models and deformed  $\mathcal{W}$ -algebras* (with D. Hernandez and N. Reshetikhin), Letters in Math. Physics **112** (2022) 80 (arXiv:2110.14600).
98. *Weyl group symmetry of  $q$ -characters* (with D. Hernandez), 27 pp., arXiv:2211.09779.
99. *A general framework for the analytic Langlands correspondence* (with P. Etingof and D. Kazhdan), 69, pp., to appear in Pure and Applied Mathematics Quarterly, arXiv:2311.03743.