

18.996 SPRING 2007: SOME BIBLIOGRAPHY

On some algebro-geometric aspects of $\mathcal{M}_{g,n}$ and $\overline{\mathcal{M}}_{g,n}$

- E. Arbarello. Weierstrass points and moduli of curves. *Compositio Math.*, 29:325–342, 1974.
- E. Arbarello and M. Cornalba. The Picard groups of the moduli spaces of curves. *Topology*, 26(2):153–171, 1987.
- E. Arbarello, M. Cornalba, P.A. Griffiths and J. Harris. *Geometry of algebraic curves. Vol. I*, volume 267 of *Grundlehren der Mathematischen Wissenschaften [Fundamental Principles of Mathematical Sciences]*. Springer-Verlag, New York, New York, 1985.
- M. D. T. Cornalba. On the projectivity of the moduli spaces of curves. *J. Reine Angew. Math.*, 443:11–20, 1993.
- P. Deligne and D. Mumford. The irreducibility of the space of curves of given genus. *Inst. Hautes Études Sci. Publ. Math.*, no. 36, 75–109, (1969).
- S. Diaz. A bound on the dimensions of complete subvarieties of \mathcal{M}_g . *Duke Math. J.*, 51(2):405–408, 1984.
- J. Harris and D. Mumford. On the Kodaira dimension of the moduli space of curves. *Invent. Math.*, 67(1):23–88, 1982. With an appendix by William Fulton.
- F.F. Knudsen and D. Mumford. The projectivity of the moduli space of stable curves. I. Preliminaries on “det” and “Div”. *Math. Scand.*, 39(1):19–55, 1976.
- F.F. Knudsen. The projectivity of the moduli space of stable curves. II. The stacks $\mathcal{M}_{g,n}$. *Math. Scand.*, 52(2):161–199, 1983.
- F.F. Knudsen. The projectivity of the moduli space of stable curves. III. The line bundles on $\mathcal{M}_{g,n}$, and a proof of the projectivity of $\overline{\mathcal{M}}_{g,n}$ in characteristic 0. *Math. Scand.*, 52(2):200–212, 1983.
- M. Roth and R. Vakil. The affine stratification number and the moduli space of curves. In *Algebraic structures and moduli spaces*, volume 38 of *CRM Proc. Lecture Notes*, pages 213–227. Amer. Math. Soc., Providence, RI, 2004.

On the tautological ring

- E. Arbarello and M. Cornalba. Calculating cohomology groups of moduli spaces of curves via algebraic geometry. *Inst. Hautes Études Sci. Publ. Math.*, (88):97–127 (1999), 1998.
- C. Faber. A conjectural description of the tautological ring of the moduli space of curves. In *Moduli of curves and abelian varieties*, Aspects Math., E33, pages 109–129. Vieweg, Braunschweig, 1999.
- T. Graber and R. Vakil. Relative virtual localization and vanishing of tautological classes on moduli spaces of curves. *Duke Math. J.*, 130(1):1–37, 2005.

- E.-N. Ionel. Topological recursive relations in $H^{2g}(\mathcal{M}_{g,n})$. *Invent. Math.*, 148(3):627–658, 2002.
- E.-N. Ionel. Relations in the tautological ring of \mathcal{M}_g . *Duke Math. J.*, 129(1):157–186, 2005.
- E. Looijenga. On the tautological ring of \mathcal{M}_g . *Invent. Math.*, 121(2):411–419, 1995.
- S. Morita. Characteristic classes of surface bundles. *Bull. Amer. Math. Soc. (N.S.)*, 11(2):386–388, 1984.
- S. Morita. Characteristic classes of surface bundles. *Invent. Math.*, 90(3):551–577, 1987.
- S. Morita. Generators for the tautological algebra of the moduli space of curves. *Topology*, 42(4):787–819, 2003.
- D. Mumford. Towards an enumerative geometry of the moduli space of curves. In *Arithmetic and geometry, Vol. II*, pages 271–328. Birkhäuser Boston, Boston, MA, 1983.

On the (co)homology of the moduli space of curves

- R. Hain and E. Looijenga. Mapping class groups and moduli spaces of curves. *Algebraic geometry—Santa Cruz 1995, Proc. Sympos. Pure Math.*, vol. 62. Amer. Math. Soc., Providence, RI, 1997, pp. 97–142.
- J. Harer. The second homology group of the mapping class group of an orientable surface. *Invent. Math.*, 72(2):221–239, 1983.
- J. Harer and D. Zagier. The Euler characteristic of the moduli space of curves. *Invent. Math.*, 85(3):457–485, 1986.
- J. L. Harer. Stability of the homology of the mapping class groups of orientable surfaces. *Ann. of Math. (2)*, 121(2):215–249, 1985.
- J. L. Harer. The virtual cohomological dimension of the mapping class group of an orientable surface. *Invent. Math.*, 84(1):157–176, 1986.
- J. L. Harer. The cohomology of the moduli space of curves. In *Theory of moduli (Montecatini Terme, 1985)*, pages 138–221. Springer, Berlin, 1988.
- N. V. Ivanov. On the homology stability for Teichmüller modular groups: closed surfaces and twisted coefficients. In *Mapping class groups and moduli spaces of Riemann surfaces (Göttingen, 1991/Seattle, WA, 1991)*, volume 150 of *Contemp. Math.*, pages 149–194. Amer. Math. Soc., Providence, RI, 1993.
- E. Y. Miller. The homology of the mapping class group. *J. Differential Geom.*, 24(1):1–14, 1986.
- S. Morita. Structure of the mapping class group and symplectic representation theory. In *Essays on geometry and related topics, Vol. 1, 2*, volume 38 of *Monogr. Enseign. Math.*, pages 577–596. Enseignement Math., Geneva, 2001.
- R. C. Penner. Perturbative series and the moduli space of Riemann surfaces. *J. Differential Geom.*, 27(1):35–53, 1988.
- S. Wolpert. On the homology of the moduli space of stable curves. *Ann. of Math. (2)*, 118(3):491–523, 1983.

On the stable mapping class group

- C.-F. Bödigheimer and U. Tillmann. Stripping and splitting decorated mapping class groups. In *Cohomological methods in homotopy theory (Bellaterra, 1998)*, volume 196 of *Progr. Math.*, pages 47–57. Birkhäuser, Basel, 2001.
- S. Galatius. Mod p homology of the stable mapping class group. *Topology*, 43(5):1105–1132, 2004.
- S. Galatius, I. Madsen, and U. Tillmann. Divisibility of the stable Miller-Morita-Mumford classes. *J. Amer. Math. Soc.*, 19(4):759–779 (electronic), 2006.
- I. Madsen and U. Tillmann. The stable mapping class group and $Q(\mathbb{C}P_+^\infty)$. *Invent. Math.*, 145(3):509–544, 2001.
- I. Madsen and M. Weiss. The stable moduli space of Riemann surfaces: Mumford’s conjecture, 2002. e-print: [math.AT/0212321](https://arxiv.org/abs/math/0212321).
- U. Tillmann. On the homotopy of the stable mapping class group. *Invent. Math.*, 130(2):257–275, 1997.

Miscellanea on Teichmüller theory

- A. Fathi, F. Laudenbach, and V. Poénaru. *Travaux de Thurston sur les surfaces*, volume 66 of *Astérisque*. Société Mathématique de France, Paris, 1979. Séminaire Orsay, With an English summary.
- W. M. Goldman. The symplectic nature of fundamental groups of surfaces. *Adv. in Math.*, 54(2):200–225, 1984.
- J. Hubbard and H. Masur. Quadratic differentials and foliations. *Acta Math.*, 142(3-4):221–274, 1979.
- G. McShane. Simple geodesics and a series constant over Teichmüller space. *Invent. Math.*, 132(3):607–632, 1998.
- J. G. Ratcliffe. *Foundations of hyperbolic manifolds*, volume 149 of *Graduate Texts in Mathematics*. Springer-Verlag, New York, 1994.
- K. Strebel. *Quadratic differentials*, volume 5 of *Ergebnisse der Mathematik und ihrer Grenzgebiete (3) [Results in Mathematics and Related Areas (3)]*. Springer-Verlag, Berlin, 1984.
- S. Wolpert. An elementary formula for the Fenchel-Nielsen twist. *Comment. Math. Helv.*, 56(1):132–135, 1981.
- S. Wolpert. The Fenchel-Nielsen deformation. *Ann. of Math. (2)*, 115(3):501–528, 1982.

Riemann surfaces and ribbon graphs

- E. Arbarello, M. Cornalba, P. Griffiths, and J. Harris. *Geometry of Algebraic Curves II*. book in preparation.

- D. Bessis, C. Itzykson, and J. B. Zuber. Quantum field theory techniques in graphical enumeration. *Adv. in Appl. Math.*, 1(2):109–157, 1980.
- B. H. Bowditch and D. B. A. Epstein. Natural triangulations associated to a surface. *Topology*, 27(1):91–117, 1988.
- J. Conant and K. Vogtmann. On a theorem of Kontsevich. *Algebr. Geom. Topol.*, 3:1167–1224 (electronic), 2003.
- K. Costello. The A-infinity operad and the moduli space of curves, 2004. e-print: math.AG/0402015.
- D. B. A. Epstein and R. C. Penner. Euclidean decompositions of noncompact hyperbolic manifolds. *J. Differential Geom.*, 27(1):67–80, 1988.
- K. Igusa. Combinatorial Miller-Morita-Mumford classes and Witten cycles. *Algebr. Geom. Topol.*, 4:473–520, 2004.
- K. Igusa. Graph cohomology and Kontsevich cycles. *Topology*, 43(6):1469–1510, 2004.
- J. A. Jenkins. On the existence of certain general extremal metrics. *Ann. of Math. (2)*, 66:440–453, 1957.
- R. M. Kashaev. Coordinates for the moduli space of flat $\mathrm{PSL}(2, \mathbb{R})$ -connections. *Math. Res. Lett.*, 12(1):23–36, 2005.
- S. Kojima. Polyhedral decomposition of hyperbolic manifolds with boundary. In D. P. Chi, editor, *On the Geometric Structure of Manifolds. Proceedings of Workshops in Pure Mathematics, Vol.10, Part III*, pages 37–57, 1990.
- M. Kontsevich. Feynman diagrams and low-dimensional topology. In *First European Congress of Mathematics, Vol. II (Paris, 1992)*, volume 120 of *Progr. Math.*, pages 97–121. Birkhäuser, Basel, 1994.
- E. Looijenga. Cellular decompositions of compactified moduli spaces of pointed curves. In *The moduli space of curves (Texel Island, 1994)*, pages 369–400. Birkhäuser Boston, Boston, MA, 1995.
- F. Luo. On Teichmüller Space of a Surface with Boundary, 2006. preprint: math.GT/0601364.
- G. Mondello. Combinatorial classes on $\overline{\mathcal{M}}_{g,n}$ are tautological. *Int. Math. Res. Not.*, (44):2329–2390, 2004.
- R. C. Penner. The decorated Teichmüller space of punctured surfaces. *Comm. Math. Phys.*, 113(2):299–339, 1987.
- K. Strebel. On quadratic differentials with closed trajectories and second order poles. *J. Analyse Math.*, 19:373–382, 1967.
- G. 't Hooft. A planar diagram theory for strong interactions. *Nucl. Phys.*, B72:461, 1974.
- A. Ushijima. A canonical cellular decomposition of the Teichmüller space of compact surfaces with boundary. *Comm. Math. Phys.*, 201(2):305–326, 1999.

Weil-Petersson geometry

- R. Kaufmann, Y. Manin, and D. Zagier. Higher Weil-Petersson volumes of moduli spaces of stable n -pointed curves. *Comm. Math. Phys.*, 181(3):763–787, 1996.
- H. Masur. Extension of the Weil-Petersson metric to the boundary of Teichmüller space. *Duke Math. J.*, 43(3):623–635, 1976.

- M. Mirzakhani. Weil-Petersson volumes and intersection theory on the moduli space of curves. *J. Amer. Math. Soc.*, 20(1):1–23, 2007.
- G. Schumacher and S. Trapani. Estimates of Weil-Petersson volumes via effective divisors. *Comm. Math. Phys.*, 222(1):1–7, 2001.
- S. Wolpert. The finite Weil-Petersson diameter of Riemann space. *Pacific J. Math.*, 70(1):281–288, 1977.
- S. Wolpert. On the symplectic geometry of deformations of a hyperbolic surface. *Ann. of Math. (2)*, 117(2):207–234, 1983.
- S. Wolpert. On the Weil-Petersson geometry of the moduli space of curves. *Amer. J. Math.*, 107(4):969–997, 1985.
- S. Yamada. On the geometry of Weil-Petersson completion of Teichmüller spaces. *Math. Res. Lett.*, 11(2-3):327–344, 2004.

Ribbon graphs and Weil-Petersson geometry

- E. Arbarello. Sketches of KdV. In *Symposium in Honor of C. H. Clemens (Salt Lake City, UT, 2000)*. Contemp. Math. 312, pages 9–69, Providence, RI, 2002.
- E. Arbarello and M. Cornalba. Combinatorial and algebro-geometric cohomology classes on the moduli spaces of curves. *J. Algebraic Geom.*, 5(4):705–749, 1996.
- P. Di Francesco, C. Itzykson, and J.-B. Zuber. Polynomial averages in the Kontsevich model. *Comm. Math. Phys.*, 151(1):193–219, 1993.
- R. Dijkgraaf, H. Verlinde, and E. Verlinde. Loop equations and Virasoro constraints in nonperturbative two-dimensional quantum gravity. *Nuclear Phys. B*, 348(3):435–456, 1991.
- S. Grushevsky. An explicit upper bound for Weil-Petersson volumes of the moduli spaces of punctured Riemann surfaces. *Math. Ann.*, 321(1):1–13, 2001.
- M. Kontsevich. Intersection theory on the moduli space of curves and the matrix Airy function. *Comm. Math. Phys.*, 147(1):1–23, 1992.
- E. Looijenga. Intersection theory on Deligne-Mumford compactifications (after Witten and Kontsevich). *Astérisque*, (216):Exp. No. 768, 4, 187–212, 1993. Séminaire Bourbaki, Vol. 1992/93.
- G. Mondello. Triangulated Riemann surfaces with boundary and the Weil-Petersson Poisson structure. Preprint: [math.DG/0610698](https://arxiv.org/abs/math/0610698), 2006.
- A. Papadopoulos and R. C. Penner. The Weil-Petersson symplectic structure at Thurston’s boundary. *Trans. Amer. Math. Soc.*, 335(2):891–904, 1993.
- R. C. Penner. The Poincaré dual of the Weil-Petersson Kähler two-form. *Comm. Anal. Geom.*, 1(1):43–69, 1993.
- R. C. Penner. Weil-Petersson volumes. *J. Differential Geom.*, 35(3):559–608, 1992.
- E. Witten. Two-dimensional gravity and intersection theory on moduli space. In *Surveys in differential geometry (Cambridge, MA, 1990)*, pages 243–310. Lehigh Univ., Bethlehem, PA, 1991.
- E. Witten. On the Kontsevich model and other models of two-dimensional gravity. In *Proceedings of the XXth International Conference on Differential Geometric Methods in Theoretical Physics, Vol. 1, 2 (New York, 1991)*, pages 176–216. World Sci. Publ., River Edge, NJ, 1992.

- E. Witten. The N matrix model and gauged WZW models. *Nuclear Phys. B*, 371(1-2):191–245, 1992.
- E. Witten. Algebraic geometry associated with matrix models of two-dimensional gravity. In *Topological methods in modern mathematics (Stony Brook, NY, 1991)*, pages 235–269. Publish or Perish, Houston, TX, 1993.
- E. Witten. Chern-Simons gauge theory as a string theory. In *The Floer memorial volume*, volume 133 of *Progr. Math.*, pages 637–678. Birkhäuser, Basel, 1995.