Curriculum vitæ

Jean-Yves WELSCHINGER

November 27, 2025

1 Marital status

Born on the 11th of October 1974
Married, two children
French nationality

2 Current address

Institut Camille Jordan
Université Lyon 1
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3 Current research interests

I did work on real algebraic geometry, symplectic geometry, enumerative geometry, random topology and discrete geometry.

4 Thesis

1) Ph.D. thesis
Title: *Courbes algébriques réelles et courbes flexibles sur les surfaces réglées* (Real algebraic curves and flexible curves on ruled surfaces).

Defense: 24th of November 2000 at the University Louis Pasteur of Strasbourg (France).
Advisor: Viatcheslav Kharlamov.

2) Habilitation à diriger des recherches
Title: *Invariants entiers en géométrie énumérative réelle* (Integer valued invariants in real enumerative geometry).
Defense: 17th of March 2008 at the École normale supérieure of Lyon.

5   Academic positions

- **Ph. D. student** at the University Louis Pasteur of Strasbourg, September 1997 - August 2001.

- **Post-doc** ("agrégé préparateur") at the École normale supérieure of Lyon, September 2001 - September 2003.

- **Post-doc** at the Mathematical Sciences Research Institute (MSRI) of Berkeley, January - May 2004.

- **Permanent research position** at the Centre National de la Recherche Scientifique (CNRS) in France since October 2003.
As a **"chargé de recherches"** from October 2003 until September 2009, working at the École normale supérieure of Lyon.
As a **"directeur de recherches"** since October 2009, working at the Institut Camille Jordan of the University Lyon 1.

- **Visiting associate professor** at Stanford University, January - February 2007.

6   Prizes and awards

- **Ernest Déchelle** prize 2008 from the French Academy of science.
- **Bronze medal** 2009 from the CNRS.
- Invited speaker at the International Congress of Mathematicians **ICM 2010** (Hyderhabad, India) in sections 4: Algebraic geometry and 6: Topology.
- Laureate of an **ERC** starting grant from the European research council in $2010 - 2015$

7 Funding

- Responsible of Lyon's team in the project *Interactions et aspects énumératifs des géométries réelles, tropicale et symplectiques*, funded by the French Agence nationale de la recherche (**ANR**) in 2005/2008.

- Responsible of Lyon's team in the project *Floer Power*, granted by the French Agence nationale de la recherche (**ANR**) in 2009/2011.

- Responsible of the project *Real uniruled manifolds* granted by the European Research Council (**ERC**) in 2010/2015.

- Member of the project *MICROLOCAL*, granted by the French Agence nationale de la recherche (**ANR**) in 2015/2020.

8 Co-organization of conferences

- Meeting "*Real structures on complex manifolds: achievements and perspectives*", in honor of V. Kharlamov's 60th birthday, CIRM, Luminy, France in June 2010, 14th - 18th.

- Workshop "*Real enumerative questions in complex and tropical geometry*", Oberwolfach in April 2011, 17th - 23th.

- Workshop "*Symplectic geometry, contact geometry, and interactions*", École normale supérieure of Lyon in January 2015, 29th - 31st.

- Meeting "*Real Algebraic Geometry in Lyon*", University Lyon 1, France in November 2020, 16th - 27th. (cancelled)

- Conference "*Facets of real algebraic geometry*", Nantes, France in June 2021, 21st - 25th.

- Meeting "*Real Aspects of Geometry*", CIRM, Luminy, France in October 2022, 31st - November 4th.

- Meeting "*Perspectives in Real Algebraic Geometry*", University Lyon 1, France in September 2026, 14th - 25th.

9 Publications

[1] Welschinger, Jean-Yves, J-courbes réelles à nids profonds sur les surfaces réglées. *Zap. Nauchn. Sem. S.-Peterburg. Otdel. Mat. Inst. Steklov. (POMI)* **267** (2000), Geom. i Topol. 5, 88–118, 327; translation in *J. Math. Sci.* (N. Y.) **113** (2003), no. 6, 777-794.

[2] Welschinger, Jean-Yves, Courbes algébriques réelles et courbes flexibles sur les surfaces réglées de base $\mathbf{C}P^1$, *Proc. London Math. Soc.* **85** (2002), no. 2, 367–392.

[3] Welschinger, Jean-Yves, Forme d'intersection tordue et extension de la congruence d'Arnold. *Math. Z.* **242** (2002), no. 3, 589–614.

[4] Welschinger, Jean-Yves, Real structures on minimal ruled surfaces, *Comment. Math. Helv.* **78** (2003), no. 2, 418–446.

[5] Welschinger, Jean-Yves, Deformation classes of real ruled manifolds, *J. Reine Angew. Math.* **574** (2004), 103–120.

[6] Welschinger, Jean-Yves Invariants of real rational symplectic 4-manifolds and lower bounds in real enumerative geometry. *C. R. Math. Acad. Sci. Paris* **336** (2003), no. 4, 341–344.

[7] Welschinger, Jean-Yves, Spinor states of real rational curves in real algebraic convex 3-manifolds and enumerative invariants. *Duke Math. J.* **127** (2005), no. 1, 89–121.

[8] Welschinger, Jean-Yves, Invariants of real symplectic 4-manifolds and lower bounds in real enumerative geometry, *Invent. Math.* **162** (2005), no. 1, 195–234.

[9] Welschinger, Jean-Yves, Invariants of real symplectic four-manifolds out of reducible and cuspidal curves, *Bull. Soc. Math. France* **134** (2006), no. 2, 287–325.

[10] Welschinger, Jean-Yves, Towards relative invariants of real symplectic 4-manifolds, *Geom. Funct. Anal.*, **16** (2006), no. 5, 1157–1182.

[11] Welschinger, Jean-Yves, Invariant count of holomorphic disks in the contangent bundles of the two-sphere and real projective plane. *C. R. Math. Acad. Sci. Paris*, **344** (2007), no. 5, 313–316.

[12] Welschinger, Jean-Yves, Effective classes and Lagrangian tori in symplectic four-manifolds, *J. Sympl. Geom.*, special volume dedicated to Dusa McDuff, **5**, (2007), no. 1, 9–18.

[13] Welschinger, Jean-Yves, Invariants entiers en géométrie énumérative réelle, *Proceedings of the International Congress of Mathematicians, Vol. II (Hyderabad 2010)*, 652–678.

[14] Gayet, Damien ; Welschinger, Jean-Yves, Exponential rarefaction of real curves with many components, *Publ. Math. Inst. Hautes Études Sci.*, **113** (2011), no. 1, 69–96.

[15] Mangolte, Frédéric ; Welschinger, Jean-Yves, Do uniruled six-manifolds contain Sol Lagrangian submanifolds?, *Int. Math. Res. Notices* (2012) **Vol. 2012**, 1569–1602.

[16] Welschinger, Jean-Yves, Open Gromov-Witten invariants in dimension six, *Math. Ann.* **356** (2013), no. 3, 1163–1182.

[17] Gayet, Damien ; Welschinger, Jean-Yves, What is the total Betti number of a random real hypersurface?, *J. Reine Angew. Math.* **689** (2014), 137–168.

[18] Gayet, Damien ; Welschinger, Jean-Yves, Lower estimates for the expected Betti numbers of random real hypersurfaces, *J. London Math. Soc.* **90** (2014), no. 1, 105–120.

[19] Welschinger, Jean-Yves, Topology of random real hypersurfaces, *Rev. Colombiana Mat.*, **49** (2015), no. 1, 139–160.

[20] Gayet, Damien ; Welschinger, Jean-Yves, Expected topology of random real algebraic submanifolds, *J. Inst. Math. Jussieu*, **14** (2015), no. 4, 673–702.

[21] Welschinger, Jean-Yves, Open Gromov-Witten invariants in dimension four, *J. Sympl. Geom.*, **13** (2015), no. 4, 1075–1100.

[22] Gayet, Damien ; Welschinger, Jean-Yves, Betti numbers of random real hypersurfaces and determinants of random symmetric matrices, *J. Eur. Math. Soc.*, **18** (2016), no. 4, 733–772.

[23] Anselmo, Christophe ; Welschinger, Jean-Yves ; Cariou, Jean-Pierre ; Miffre, Alain ; Rairoux, Patrick, Gas concentration measurement by optical similitude absorption spectroscopy: methodology and experimental demonstration, *Opt. Express*, **24** (2016), no. 12, 12588–12599.

[24] Gayet, Damien ; Welschinger, Jean-Yves, Universal components of random nodal sets, *Commun. Math. Phys.*, **347** (2016), 777–797.

[25] Gayet, Damien ; Welschinger, Jean-Yves, Betti numbers of random nodal sets of elliptic pseudo-differential operators, *Asian J. Math.*, **21** (2017), no. 5, 811–840.

[26] Galtier, Sandrine ; Anselmo, Christophe ; Welschinger, Jean-Yves ; Sivignon Jean-François ; Cariou, Jean-Pierre ; Miffre, Alain ; Rairoux, Patrick, Remote sensing of methane with OSAS-lidar on the $2\nu_3$ band Q-branch: Experimental proof, *J. Mol. Spectrosc.*, **348** (2018) 130-136.

[27] Salepci, Nermin ; Welschinger, Jean-Yves, Asymptotic topology of random subcomplexes in a finite simplicial complex, *Int. Math. Res. Notices*, (2019), no. 17, pp 5219-5255.

[28] Salepci, Nermin ; Welschinger, Jean-Yves, Asymptotic measures and links in simplicial complexes, *Discrete Comput. Geom.*, **62** (2019), no. 1, pp 164–179.

[29] Welschinger, Jean-Yves, Spectral sequences of a Morse shelling, *Homology Homotopy Appl.*, **24**, no. 2, (2022), 241–254.

[30] Welschinger, Jean-Yves, Shellable tilings on relative simplicial complexes and their h-vectors, *Adv. Geom.*, **23**, no. 2, (2023), 191–206.

[31] N. Salepci; J.-Y. Welschinger, Upper estimates for the expected Betti numbers of random subcomplexes, *Topology Appl.* **355** (2024), Paper No. 109010, 23 pp.

[32] Welschinger, Jean-Yves, Morse shellings out of discrete Morse functions, *Discrete Comput. Geom.*, **73** (2025), 896–918.

[33] N. Salepci; J.-Y. Welschinger, Asymptotic Betti numbers of random subcomplexes, *Topology Appl.* **373** (2025), Paper No. 109476, 10 pp.

[34] Kişisel, Ali Ulaş Özgür, Welschinger, Jean-Yves, Amoeba Measures of Random Plane Curves, *Trans. AMS*, To appear (2025).

10   Preprints

[1] Welschinger, Jean-Yves, Enumerative invariants of stongly semipositive real symplectic six-manifolds, arXiv.math/0509121, (2005).

[2] Welschinger, Jean-Yves, Optimalité, congruences et calculs d'invariants des variétés symplectiques réelles de dimension quatre, arXiv:0707.4317 (2007).

[3] Welschinger, Jean-Yves, Open strings, Lagrangian conductors and Floer functor. arXiv:0812.0276 (2008).

[4] Welschinger, Jean-Yves, Associahedral categories, particles and Morse functor, arXiv:0906.4712 (2009).

[5] Salepci, Nermin ; Welschinger, Jean-Yves, Morse shellability and triangulations, arXiv:1910.13241 (2019).

[6] Welschinger, Jean-Yves, Morse shellings on products, arXiv:2010.12206 (2020).

11 Short visits

- MSRI of Berkeley in January-May 2004.
- Northwestern University in April 2004.
- Fields Institute of Toronto and CRM of Montréal in October 2004.
- Peking University in July 2006.
- Stanford University in January-February 2007.
- ETH Zürich in October 2007.
- Cambridge University, Imperial College of London and Oxford University in November 2007.
- École Polytechnique Fédérale de Lausanne (EPFL) in February 2008.
- Sissa Trieste in November 2008.
- Tel Aviv University in January 2009.
- Max-Planck Institute of Leipzig in April 2009.
- ETH Zürich in October 2010.
- ETH Zürich in March 2014.
- Nantes university in July and September 2022.
- Nantes university in January and July 2023.
- Côte d'Azur university in October 2023.
- Nantes university in July 2024.
- Middle East Technical University, Ankara in October 2024.

12 Students

- Nicolas Puignau, thesis defended on the 9th of July 2007 at Toulouse, France (co-supervised by S. Orevkov).
- Rémi Crétois, thesis defended on the 8th of December 2011 at Lyon, France.
- Michele Ancona, thesis defended on the 26th of November 2018 at Lyon, France.
- Jules Chenal, thesis defended on the 5th of December 2023 at Lyon, France.

13 Mini-courses since 2014

- "*Surfaces de Riemann*", Master 1 course at the ÉNS Lyon (January-May 2014, 2015, 2016 and 2017).
- "*Topology of random nodal sets*", during the doctoral school "Elliptic methods and moduli spaces" at the CIRM of Marseille, France (September 2015).
- "*Introduction aux méthodes homologiques*", Master 2 course at the ÉNS Lyon (September 2015 - January 2016).
- "*Topologie des hypersurfaces aléatoires*", Journées Louis Antoine, Rennes (February 2016).
- "*Topology of random hypersurfaces*", Komplex Analysis Winterschool KAWA7, Toulouse (March 2016).
- "*Topology of random real hypersurfaces*", workshop on random polynomials, Montevideo, Uruguay (February 2017).
- "*Topology of real algebraic varieties*", Master 2 course at University Claude Bernard Lyon 1 (January-March 2026).

14 Invited conferences since 2015

- **SuissMAP Geometry& Topology** conference at Engelberg, Switzerland (January 2015)
- **Journées de géométries complexes** at Lille, France (March 2015)
- **30° Colóquio Brasileiro de Matemática** at Rio de Janeiro, Brasil (July 2015)
- Conference **Topology, geometry and dynamics, in honour of François Lalonde** at Montréal, Canada (August 2015),
- Conference **Analysis in the Large. Calculus of Variations, Dynamics, Geometry... In honour of Helmut Hofer** at Zürich, Switzerland

(June 2016),
- Conference **Trends in Modern Geometry** at Tokyo, Japan (July 2017),
- Conference **Perspectives in Real Geometry**, in memory of Jean-Jacques Risler at the CIRM of Marseille, France (September 2017),
- Workshop **Random geometries/Random topologies** at the ETH Zürich, Switzerland (December 2017),
- Conference **Patchworking of geometry and topology (on the occasion of the 70th anniversary of Oleg Viro)** at Belalp, Switzerland (June 2018),
- Workshop on **Random Algebraic Geometry** at the SISSA of Trieste, Italy (October 2018).
- Workshop **Topology and Geometry in Low Degrees** at the IMBM of Istanbul, Turkey (December 2018).
- Conference **Geometric Analysis (In Honor of Bernie Shiffman)** at the Johns Hopkins University, USA (March 2019)
- **Gökova Geometry/Topology conference** at Gökova, Turkey (May 2019)
- Conference **On random nodal domains** at Rennes, France (September 2019)
- Workshop **Random real algebraic geometry** at Kalkanlı, Cyprus (October 2019)
- Meeting **Lyon-Grenoble around Symplectic Geometry** at Grenoble, France (December 2021)
- **Conference in enumerative, real and birational geometry** at Le Croisic, France (June 2022)
- Workshop **New Directions in Real Algebraic Geometry** at Oberwolfach, Germany (March 2023)
- Conference **Geometric and Topological Properties of Random Algebraic Varieties** at Köln, Germany (October 2023)
- Conference **Gabriel Cramer days** at Geneva, Switzerland (June 2024)
- Conference **Toric and tropical techniques in Symplectic Field Theory** at the Mittag Leffler Institute, Sweden (June 2024)
- Workshop **Géométries à l'ÉNS Lyon** at the École normale supérieure of Lyon and the Académie des Sciences, Belles Lettres et Arts de Lyon, France (January 2025)
- Conference **Real Algebraic Geormetry and Interactions** at Nice, France (October 2025)
- Meeting **Grenoble-Lyon symplectic meeting** at Lyon, France (November 2025)

15 Editorial activities

I was an editor of the **Journal de l'École Polytechnique** (2013-2018) and am an editor of **Mathematische Annalen** (since 2015).