

# Curriculum vitæ

Jean-Yves WELSCHINGER

June 12, 2016

## 1 Marital status

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

## 2 Current address

Institut Camille Jordan  
Université Lyon 1  
43, bd du 11 novembre 1918  
69622 Villeurbanne cedex  
(FRANCE)  
**Tel:** 33 4 26 23 45 58  
**Fax:** 33 4 72 43 16 87  
**E-mail:** welschinger@math.univ-lyon1.fr

## 3 Current research interests

I did work on the subjects of real algebraic geometry, symplectic geometry, enumerative geometry and more recently random topology.

## 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** (Hyderabad, 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 2015/2019.

## 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.

## 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, 777794.
- [2] Welschinger, Jean-Yves, Courbes algébriques réelles et courbes flexibles sur les surfaces réglées de base  $\mathbf{CP}^1$ , *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, to appear in *Comm. Math. Phys.*, arXiv:1503.01582 (2015).
- [25] Gayet, Damien ; Welschinger, Jean-Yves, Betti numbers of random nodal sets of elliptic pseudo-differential operators, to appear in *Asian J. Math.*, arXiv:1406.0934 (2014).

## 10 Preprints

- [1] Welschinger, Jean-Yves, Enumerative invariants of strongly 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).

## 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.

## 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 started in Septembre 2015.

### 13 Mini-courses since 2011

- "*Real and open Gromov-Witten invariants*", during the "Master Class : Pseudo-holomorphic curves and applications" at Strasbourg (October 29th - November 2nd 2012).
- "*Introduction à la géométrie complexe*", Master 2 course at the Université Lyon 1 (September 2012- January 2013).
- "*Surfaces de Riemann*", Master 1 course at the ÉNS Lyon (January-May 2014).
- "*Topology of random real hypersurfaces*", during the CIMPA summer school on real algebraic geometry at Villa de Leyva, Colombia (July 2014).
- "*Surfaces de Riemann*", Master 1 course at the ÉNS Lyon (January-May 2015).
- "*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).

### 14 Invited conferences since 2011

- Kaleidoscopic view of modern mathematics, IHÉS / IHP Paris (January 2011).
- Conference **Real algebraic geometry**, Rennes (June 2011).
- Conference **Moduli spaces and Gromov-witten theory**, Grenoble (July 2011).
- **Israeli-Polish Mathematical Meeting** at Lodz, Poland (September 2011)
- Workshop **Interactions between algebra and dynamics in symplectic topology** Haifa, Israël (June 2012)
- États de la recherche of the SMF **Géométrie symplectique et de contact** at Paris, France (January 2013)
- Workshop  **$J$ -holomorphic curves in symplectic geometry, topology and dynamics** at Montréal, Canada (April 2013)
- Borel seminar **on tropical and real algebraic geometry** at Les Dia-

- blerets, Switzerland (June 2013)
- Conference **Moduli spaces of real and complex varieties** at Angers, France (June 2014)
  - CIMPA summer school on **Real algebraic geometry** at Villa de Leyva, Colombia (July 2014)
  - **Journée transfrontalière de géométrie**, Chambéry, France (septembre 2014)
  - **SuissMAP Geometry& Topology** conference at Engelberg, Suisse (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),

## 15 Editorial activities

I am an editor of the **Journal de l'École Polytechnique** and of **Mathematische Annalen**.