# LUCIO BEDULLI

Curriculum Vitae

## Personal Information


- Born in Viadana (MN) (Italy), on January 8, 1973.
- e-mail: lucio.bedulli@univaq.it


## Education

- April 28, 2000: degree in Mathematics cum laude from the University of Parma; dissertation entitled "*Euler structures with boundary and Reidemeister Torsion*", supervised by Carlo Petronio (University of Pisa).
- September 28, 2004. PhD degree from the University of Firenze. Dissertation entitled "*Generalized Calabi-Yau 3-folds*" supervised by Paolo de Bartolomeis.

## Past Positions

- April 28, 2000: First degree in Mathematics cum laude from the University of Parma; dissertation entitled "*Euler structures with boundary and Reidemeister Torsion*", supervised by Carlo Petronio (University of Pisa).
- September 28, 2004. PhD degree from the University of Firenze. Dissertation entitled "*Generalized Calabi-Yau 3-folds*" supervised by Paolo de Bartolomeis.
- From July 2005 to october 2006 post-doc fellow at the Department of Mathematics of the University of Bologna. Supervisor: prof. Luca Migliorini.
- from november 2006 to october 2007 research fellowship entitled "*Global Analysis on manifolds and applications*" at the University of Firenze. Supervisor: prof. Fabio Podestà.
- from November 2007 to October 2008 research fellowship at the Department of Mathematics for Decisions of the University of Firenze.
- from March 2009 to November 2010 research fellowship at the Department of Mathematics "G. Castelnuovo" of Sapienza - Università di Roma.
- from December 2010 1-year research fellowship at the Department of Mathematics "U. Dini" of the University of Firenze. (INdAM grant)
- from March 2012 to January 1$^{st}$ 2013 research fellowship at the Department of Pure an Applied Mathematics at University of L'Aquila.
- From may 18$^{th}$ 2015 to April 2$^{nd}$ 2023: Associate professor of Geometry (MAT/03) at University of L'Aquila.

## Present Position

- From April 3rd 2023: Full professor of Geometry (MAT/03) at University of L'Aquila.

## Schools and conferences attended

- August 2001: "Differential Geometry", summer school of "Scuola Matematica Interuniversitaria" at Cortona (prof. F. Podestà and C. Le Brun).
- May 2002: "Algebraic Varieties", Conference in memory of Fabio Bardelli, Firenze.
- September 2002: Conference "Proprietà Geometriche delle varietà reali e complesse nuovi contributi italiani III", Palermo.
- June 2003: "Superfici Algebriche", doctoral school of the University of Trento (prof. M. Andreatta and F. Catanese).
- September 2003: C.I.M.E. course "Symplectic 4-Manifolds and Algebraic Surfaces" (prof. D. Auroux, G. Tian, B. Siebert, F. Catanese, M. Manetti, I. Smith, P. Seidel), Cetraro.
- August 2004: "Differential Geometry", summer school of "Scuola Matematica Interuniversitaria" at Cortona (prof. D. Alekseevsky and K. Galicki).
- September 2004: "Progressi Recenti in Geometria Reale e Complessa", conference organized by CIRM (Scientific committee: V.Ancona, P.de Bartolomeis, A.Silva), Levico.
- September - Novembre 2004: "Differential Geometry and Topology", a quarter organized by "Centro di Ricerca Matematica Ennio de Giorgi - Scuola Normale Superiore, Pisa.
- September 2005: "Symmetry in Geometry and Physics", conference in honour of Dmitri Alekseevsky, University "La Sapienza", Roma.
- March 2006: conference "Recenti sviluppi della geometria complessa, differenziale, simplettica"at the Centro di Ricerca Matematica "Ennio de Giorgi" (Pisa).
- October 2006: "Progressi Recenti in Geometria Reale e Complessa", conference organized by CIRM (Scientific committee: V.Ancona, P.de Bartolomeis, A.Silva), Levico.
- January 2007: workshop "Giornate di lavoro di Geometria Complessa e Simplettica"at the Centro di Ricerca Matematica "Ennio de Giorgi" (Pisa).
- June 2007: "Recent advances in Differential Geometry", international conference in honour of Prof. O. Kowalski, Lecce.
- September 2008: "Global Analysis on Manifolds", conference in honour of Sylvestre Gallot, University "La Sapienza", Roma.
- June 2009: "Kähler and Sasaki geometry in Rome", conference in honour of K. Galicki, Università "La Sapienza" di Roma.
- November 2009 "'Kähler and related geometries", conference, Université de Nantes;

- May 2010: "Geometria in Bicocca", conference, Università di Milano Bicocca;
- September 2011: "New trends in differential geometry", conference, Università dell' Aquila.
- October 2013: Meeting FIRB 2012 *Geometria Differenziale e Teoria Geometrica delle Funzioni*, conference, Università di Firenze.
- March 2015: Workshop *Varietà reali e complesse: geometria, topologia e analisi armonica*, Scuola Normale Superiore, Pisa.
- July 2016: *Differential Geometry in the Large*, conference, Università di Firenze.
- January 2017: *Perspectives in Geometry. A conference in memory of Paolo de Bartolomeis*, conference, Università di Firenze.
- January 2018: '*Informal Geometry Workshop in "Paradiso"*, Cogne.

# Research themes

## Differential Geometry

### Geometry of complex and hyper-complex manifolds

- Flows of Hermitian metrics on complex manifolds;
- Flows of hyper-Hermitian metrics on hyper-complex manifolds;
- Flows of special (closed/coclosed) metrics on $G_2$ manifolds;
- Existence of Kähler-Ricci solitons with large isometry group;
- Homogeneous special structures.

### Differential geometry of string theory

- Geometry of SU(3) manifolds;
- Non Kähler mirror symmetry and Lagrangian torus fibrations (Strominger-Yau-Zaslow conjecture)

### Lie group actions and submanifolds

- Homogeneous Lagrangian submanifolds: existence, uniqueness and classification in Hermitian symmetric spaces;
- Hamiltonian stability of minimal Lagrangian submanifolds in Kähler-Einstein manifolds;
- Totally complex submanifolds in quaternion-Kähler manifolds.

## Publications

- L.Bedulli, A.Gori: *A splitting result for compact symplectic manifolds*, "**Results in Mathematics**" n. 47 (3/4) (2005) 194–198;
- L.Bedulli, A.Gori: *On deformations of Hamiltonian actions* "**Archiv der Mathematik**" n.88 (5) (2007) 468–480;
- L.Bedulli, A.Gori: *A Hamiltonian stable minimal Lagrangian submanifold of projective space with non-parallel second fundamental form*, "**Transformation Groups**" n. 12 (4) (2007) 611–617;
- L.Bedulli, L.Vezzoni: *The Ricci tensor of* SU(3)*-manifolds*, "**Journal of Geometry and Physics**" n. 57 (4) (2007) 1125–1146;
- L.Bedulli, A.Gori: *Homogeneous Lagrangian submanifolds*, "**Communications in Analysis and Geometry**" n. 16 (3) (2008) 591–615;
- L.Bedulli, L.Vezzoni: *Torsion of* SU(2)*-structures and Ricci curvature in dimension 5*, "**Differential Geometry and its Applications**" n. 27 (1) (2009) 85–99;
- L.Bedulli, A.Gori: *Actions of vanishing homogeneity rank on quaternionic-Kähler projective spaces*, "**Journal of Lie Theory**" n. 18 (4) (2008) 817–837;
- L.Bedulli, A.Gori, F. Podestà: *Maximal totally complex submanifolds of* $\mathbb{HP}^n$*: homogeneity and normal holonomy*, "**Bulletin of the London Mathematical Society**" n. 41 (2009) 1029–1040;
- L.Bedulli, A.Gori, F. Podestà: *Homogeneous hypercomplex structures and Joyce's construction*, "**Differential Geometry and its Applications**" n. 29 (2011) 547–554.
- L. Bedulli, A. Gori, *Isometric embeddings of Kähler-Ricci solitons in the complex projective space*, "**Proceedings of the American Mathematical Society**", n. 142 (2014), 1777–1781;
- L. Bedulli, A. Gori, *Remarks on Kähler-Ricci solitons*, "**Advances in Geometry**" n. 15 (2) (2015) 167–172;
- L. Bedulli, L. Vezzoni, *A parabolic flow of balanced metrics*, "**Journal für die reine und angewandte Mathematik**" **(Crelle's Journal)**, n. 723 (2017), 79–99;
- L. Bedulli, W. He, L. Vezzoni, *Second order geometric flows on foliated manifolds*, "**The Journal of Geometric Analysis**", n. 28 (2018), 697–725.
- L. Bedulli, L. Vezzoni, *A scalar Calabi-type flow in Hermitian Geometry: Short-time existence and stability*, "**Annali della Scuola Normale Superiore di Pisa, Classe di Scienze**", n. 20 (2020), 657–676.
- L. Bedulli, L. Vezzoni, *Stability of geometric flows of closed forms*, **Advances in Mathematics** n. 364 (2020), 107030.

- L. Bedulli, L. Vezzoni, *A remark on the Laplacian flow and the modified Laplacian co-flow in $G_2$-Geometry*, "**Annals of Global Analysis and Geometry**", n. 58 (2020), no. 3, 287–290.
- L. Bedulli, L. Vezzoni, *On the stability of the anomaly flow*, "**Mathematical Research Letters**", n. 29 (2) (2022), 323–338;
- L. Bedulli, G. Gentili, L. Vezzoni, *A parabolic approach to the quaternionic Monge-Ampère equation*, "**Mathematische Zeitschrift**" n. 302 (2) (2022), 917–933.

## Papers in preparation

- *Non Kähler SYZ mirror symmetry of solvmanifolds*, joint work with Alessandro Vannini.

## Invited talks

- September 2004: "Generalized Calabi-Yau 3-folds", in the conference Progressi Recenti in Geometria Reale e Complessa, Levico.
- November 2005: "Moment map and Homogeneous Lagrangian submanifolds", at the Department of Mathematics of the University of Bologna.
- March 2006: "Homogeneous Lagrangian submanifolds", at the Centro di Ricerca Matematica "Ennio de Giorgi" (Pisa), in the conference "Recenti sviluppi della geometria complessa, differenziale, simplettica".
- October 2006: "Torsion of SU(3)-structures and the Ricci tensor", in the conference "Progressi recenti in Geometria Reale e Complessa", Levico;
- January 2008: "3-coisotropic actions on quaternion-Kähler manifolds", at the Department of Mathematics of the University of Firenze;
- May 2009: "Totally complex submanifolds of quaternion-Kähler manifolds and geometry of twistor spaces", at the Department of Mathematics of the University of Rome "La Sapienza";
- June 2011 "Totally complex submanifolds and the geometry of twistor spaces", at the Department of Mathematics of the University of Trento;
- March 2012 :"Parabolic flows of closed forms: the case of balanced metrics", at the Department of Mathematics of Politecnico di Torino.
- March 2015: "Isometric embedding of Kähler Ricci solitons in $\mathbb{CP}^n$", Scuola Normale Superiore, Pisa.
- Gennaio 2018 :"Balanced metrics on complex manifolds and geometric flows of closed forms", Informal Geometry Workshop in "Paradiso", Cogne.

## Teaching

- 2000/2001: Teaching assistantship "Geometry II" (General Topology), degree in Mathematics, 'Università del Piemonte Orientale. (20 hours) Course held by G.Gigante.
- 2004/2005: Teaching assistantship "Geometry and Linear Algebra", degree in Telecommunication Engineering, Università di Firenze. (20 hours) Course held by M. Landucci.
- 2004/2005: Teaching assistantship "Foundations of Higher Geometry", degree in Mathematics, Università di Firenze. (20 hours) Course held by G. Gentili.
- 2005/2006: Preliminary course in mathematics, degree in Economics Università di Firenze. (8 hours)
- 2005/2006: Teaching assistantship "Foundations of Higher Geometry", degree in Mathematics, Università di Firenze. (20 hours) Course held by G. Gentili.
- 2006/2007: Teaching assistantship "Mathematics II" (N-Z) degree in Architecture, Università di Firenze. (20 hours) Course held by A. Selvaggi.
- 2006/2007: Teaching assistantship "Mathematics II" (A-M) degree in Architecture, Università di Firenze. (20 hours) Course held by F. Podestà.
- 2007/2008: Teaching assistantship "Mathematics I", degree in Architecture, Università di Firenze. (20 hours) Course held by L. Serena.
- 2007/2008: Teaching assistantship "Foundations of Higher Geometry", degree in Mathematics, Università di Firenze. (20 hours) Course held by G. Gentili.
- 2009/2010: Teaching assistantship "Calculus II", degree in Mathematics, Sapienza Università di Roma. (20 hours) Courses held by E. Sinestrari and G.M. Troianiello.
- 2010/2011: Teaching assistantship "Foundations of Higher Geometry", degree in Mathematics, Università di Firenze. (20 hours) Course held by G. Gentili.
- 2013/2014: "Mathematics" degree in Biology, Università dell'Aquila. (48 hours).
- 2013/2014: "Foundations of Higher Geometry", degree in Mathematics, Università dell'Aquila. (30 hours).
- 2014/2015: "Geometry II", degree in Mathematics, Università dell'Aquila. (30 hours)
- 2014/2015: "Foundations of Higher Geometry", degree in Mathematics, Università dell'Aquila. (30 hours).
- 2015/2016: "Geometry B", degree in Mathematics, Università dell'Aquila. (120 hours)
- 2015/2016: "Advanced Geometry 2", degree in Mathematics, Università dell'Aquila. (60 hours)
- 2016/2017: "Geometry B", degree in Mathematics, Università dell'Aquila. (60 hours)

- 2016/2017: “Advanced Geometry 2”, degree in Mathematics, Università dell’Aquila. (60 hours)
- 2017/2018: “Advanced Geometry”, degree in Mathematics, Università dell’Aquila. (120 hours)
- 2017/2018: “Foundations of Higher Geometry I”, degree in Mathematics, Università dell’Aquila. (30 hours).
- 2018/2019: “Advanced Geometry”, degree in Mathematics, Università dell’Aquila. (120 hours)
- 2018/2019: “Riemannian Geometry”, degree in Mathematics, Università dell’Aquila. (30 hours)
- 2019/2020: “Advanced Geometry”, degree in Mathematics, Università dell’Aquila. (120 hours)
- 2019/2020: “Foundations of Mathematics 2”, degree in Chemistry, Università dell’Aquila. (28 hours).
- 2020/2021: “Advanced Geometry”, degree in Mathematics, Università dell’Aquila. (120 hours)
- 2020/2021: “Foundations of Mathematics 2”, degree in Chemistry, Università dell’Aquila. (28 hours).
- 2021/2022: “Advanced Geometry”, degree in Mathematics, Università dell’Aquila. (90 hours)
- 2021/2022: “Riemannian Geometry”, degree in Mathematics, Università dell’Aquila. (30 hours)

## Visiting periods

- June - July 2010: visiting researcher at the Mathematical Institute of the University of Oxford (UK).

## PhD students supervised

1. 2019-2023: Alessandro Vannini: PhD in Mathematics and Modeling, Università dell’Aquila. (title of the thesis: ” Affine structures on three-dimensional solvmanifolds and SYZ non-Kähler Mirror Symmetry”)

## Thesis supervised

- first degree thesis:
    1. *Teoria di Morse e applicazioni*, Francesca Salvatore, Università dell’Aquila, 2015.

2. *Metodi omologici e teoremi di separazione*, Silvia Della Sciucca, Università dell'Aquila, 2016.
3. *Introduzione alle rappresentazioni di gruppi di matrici: il caso di* $\mathrm{SO}(3,\mathbb{R})$, Federico Fallucca, Università dell'Aquila, 2017.
4. *La formula genere-grado per curve piane proiettive*, Lisa Delle Monache, Università dell'Aquila, 2017.
5. *Campi di vettori e topologia delle varietà*, Stefano Bontempo, Università dell'Aquila, 2017.
6. *Omologia cellulare e rivestimenti ramificati*, Gabriele Di Clemente, Università dell'Aquila, 2019.
7. *Invarianti di nodi e una connessione con la meccanica statistica*, Andrea Del Prete, Università dell'Aquila, 2019.

- master degree thesis:

1. *Strominger system and the Anomaly flow on complex parellalizable 3-folds*, Francesca Salvatore, Università dell'Aquila, 2017.
2. *HKT metrics on hypercomplex 8-manifolds*, Paola De Santis, Università dell'Aquila, 2019.
3. *Ricci solitons and Weyl curvature tensor*, Silvia Della Sciucca, Università dell'Aquila, 2020.
4. *Mean curvature flow of area decreasing maps*, Valeria Pucci, Università dell'Aquila, 2020 (co-supervisor: Giuseppe Pipoli).
5. *Classification of three-dimensional geometries*, Lisa Delle Monache, Università dell'Aquila, 2020.
6. *Surfaces in homogeneous three-manifolds*, Andrea Del Prete, Università dell'Aquila, 2020 (other supervisor: Joaquín Pérez Muñoz, Universidad de Granada).
7. *Special balanced threefolds from* $\mathrm{G}_2$*-manifolds*, Maria Lucia Berardi, Università dell'Aquila, 2021.

## Partecipation in research projects

1. PRIN 2002 *Proprietà geometriche delle varietà reali e complesse*;
2. PRIN 2005 *Proprietà geometriche delle varietà reali e complesse*;
3. PRIN 2005 *Metriche Riemanniane e variet'a differenziabili*
4. PRIN 2007 *Proprietà geometriche delle varietà reali e complesse*
5. PRIN 2007 *Geometria differenziale e Analisi Globale*
6. PRIN 2011 *Varietà reali e complesse: Geometria, topologia e analisi armonica*;
7. FIRB 2012 *Geometria Differenziale e Teoria Geometrica delle Funzioni*
8. PRIN 2015 *Varietà reali e complesse: geometria, topologia e analisi armonica*;

## Refereeing and reviewing activities

- referee for several international journals including *Bulletin of the London Mathematical Society*, *Communications in Partial Differential Equations*, *Annali di Matematica Pura ed Applicata*, *Advances in Geometry*, *Journal of Geometry and Physics*, *Revista de la Unión Matemática Argentina* and *Taiwanese Journal of Mathematics.Bulletin of the London Mathematical Society*, *Annali di Matematica Pura ed Applicata*, *Advances in Geometry.*
- From 2007 *Reviewer* for *Mathematical reviews* of the *American Mathematical Society.*

## Linguistic skills

- Besides Italian, I speak English and French fluently.