Alessandro Tomasiello

Curriculum vitæ

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Research interests: String theory, quantum field theory, supersymmetry, general relativity.

1 Research career.

2021– Full Professor at Università di Milano-Bicocca.

2014–2021 Associate Professor at Università di Milano-Bicocca.

2009–2014 Assistant Professor at Università di Milano-Bicocca.

2007–2009 Postdoc: Harvard University, USA.

2004–2007 Postdoc: Stanford University, USA.

2001–2004 Postdoc: Ecole Polytechnique, Palaiseau and IHES, Bures-sur-Yvette, France.

2 Awards and Grants.

- **ERC Starting Grant (Consolidator)**[1] "The Structure of the Extra Dimensions of String Theory" (XD-STRING), September 1, 2012 – August 31, 2017.
- **FIRB Grant** RBFR10QS5J, "String Theory and Fundamental Interactions" (from the Italian Ministry for Research (MIUR)), Unit Leader of Milano-Bicocca node (one of two nodes), March 8, 2012 – March 7, 2016.
- **SIGRAV Prize** 2010 (Prize of the Italian Society for Gravitation and General Relativity).
- Invited as a plenary speaker to about 70 conferences and workshops. In particular, at the annual conference of my field: "Strings 2005", Toronto; "Strings 2008", CERN; "Strings 2014", Princeton; "Strings 2019", Brussels.

[1] At the time of my application, there was a single "Starting Grant" call, subdivided in the subclasses "Starter" and "Consolidator". These two subclasses were later transformed in the current "Starting Grant" and "Consolidator Grant".

3 Education.

1997–2001 PhD in Mathematical Physics, SISSA/ISAS, Trieste. Advisor: Loriano Bonora (Co-advisor: Cesare Reina.) Defense: October 18, 2001.

1992–1997 Physics Degree (Laurea), Pisa University. Grade 110/110 cum laude. Advisor: Michele Maggiore. Defense: March 20, 1997.

Diploma from Scuola Normale Superiore, Pisa, grade 70/70 cum laude. Defense: September 1997.

4 Academic duties.

- Member of the Editorial College for SciPost Physics (since 2020).
- Referee for various academic journals, including the Journal of High Energy Physics (JHEP); Physical Review Letters; Physical Review D; Nuclear Physics B; SIGMA; Journal of Physics A; International Journal of Modern Physics A; Journal of Geometry and Physics; Journal of Mathematical Physics; Classical and Quantum Gravity; European Physics Journal C; Advances in High Energy Physics; Symmetry; Universe; Particles.
- Member of PhD award committees in the Belgium, France, Italy, the Netherlands, Sweden, UK, USA.
- Referee for the U. S. National Science Foundation (NSF), the German Research Foundation (DFG), the Flanders Science Foundation (FWO), the Basque Science Foundation (Ikerbasque).
- Member of University-wide "Committee for Research" (2014–2016; 15 members), whose tasks included enhancing the success rate for external grants, and awarding University grants.

5 Research interests and achievements.

My reseach activity is mainly focused on topics in string theory, supergravity, quantum field theory.

String compactifications.

String theory is a promising candidate for quantum unification of forces. In its best understood phase, this theory predicts six additional space dimensions, curled up on a space S_6 smaller than the scales we can resolve with present-day experiments. The physics observed in the four dimensions (three plus time) of our everyday experience would then depend on the shape and size of S_6. If one wants to make predictions from string theory, one needs to understand what choices for S_6 are allowed by the theory's equations of motion. On these topics I have written a book for Cambridge University Press [3].

A class that has attracted intense interest is the one where S_6 preserves supersymmetry, a symmetry that exchanges fermions (matter particles) with bosons (force quanta) and which plays an important role in string dynamics. A famous subclass of spaces with this property consists of so-called Calabi–Yau manifolds. It is not, however, the most general possibility. My work has provided a geometric characterization of the spaces S_6 which preserve supersymmetry. In particular:

- In a series of papers, I have shown [63, 59, 67] that S_6 must admit a so-called **generalized complex structure**, a property originally defined by Hitchin for purely mathematical reasons.

More precisely, my results yield a purely geometrical system (using the language of exterior algebra and differential forms) equivalent to supersymmetry. In practice, this gives a procedure to classify solutions and to generate new explicit examples.

I also have given contributions to the study of semiclassical corrections:

- I have shown [65, 62] under which conditions instanton corrections are present in string compactifications.

In the simpler Calabi–Yau case, one can enrich the physics of the model by adding D-branes. In this context:

- I have shown that D-branes on a Calabi–Yau are described mathematically by so-called helices or exceptional collections [77, 74].

Holography.

I have also applied the above-mentioned generalized complex geometry techniques to the gauge/gravity correspondence. It is a duality that relates a field theory, often strongly coupled, to a quantum gravity theory, often obtained from a string theory compactification. In this area:

- I have shown that the so-called supergravity **Romans mass** has a natural interpretation in quantum field theory as a Chern–Simons level.

This implies in particular that this parameter has a nonperturbative interpretation, even if it is not yet clear how to include it in the eleven-dimensional phase of the theory (often called M-theory).

More recently, I have used similar techniques to study quantum field theories in six dimensions. For example

- I have found explicitly [41, 40] the most general holographic dual to **six-dimensional conformal field theory**. These results have also led to progress in the more general classification of such theories [38].

Quantum field theory.

Some of the results I mentioned above also have field theory applications. But I have also given more direct contributions to quantum field theory. The study of supersymmetric theories on curved spaces often provides explicit computations for various quantities, which can be used to test conjectural dualities or renormalization-group flows. In this context:

- I have shown that four-dimensional field theories preserve at least one supercharge on complex manifolds (in Euclidean signature) and on spaces with at least one lightlike Killing vector (in Minkowski signature) [46, 45].

I have also given contributions to the study of noncommutative field theories (see for example [79]).

6 Organization.

- Co-organizer of the Workshop “Holography, Generalized Geometry and Duality”, Mainz (Germany), May 6 – 17, 2019.

- Co-organizer of the Aspen Summer Program “Superconformal Field Theories and Geometry”, Aug. 19 – Sep. 16, 2018.

- Convener at the ICHEP2010 (International Conference of High Energy Physics), for Track 12, "Beyond Quantum Field Theory Approaches (including String Theories)", Paris (France), July 22–28, 2019.
- Co-organizer of workshop "Current Problems in Theoretical Physics", Vietri, Italy, editions 2010–12, 2016.
- Co-organizer of the workshop "Supersymmetry in complex geometry ", IPMU, Tokyo (Japan), January 4–9, 2009.
- Organizer of the Visitor Program at the String Theory Group in Harvard University (2007–2008), of the weekly seminar at the Stanford Institute for Theoretical Physics (2006–2007), of the weekly seminar of the theory group at Milano–Bicocca (2009–present, co-organizer since 2016; about 30 a year).

7 Outreach.

- Public lecture in Aspen, CO (March 2017).
- Public lecture at the Milan local edition of the European Researchers' Night, 2017.
- Various public lectures in highschools (2015–2017) about General Relativity.
- Lecture to highschool and undergraduate students in Milano-Bicocca, in the context of University celebration for 100 years of General Relativity, Nov. 2015.
- Lecture for RAI Scuola (educational national TV channel), Feb. 2015.
- Lecture to journalists (overview of modern physics), Milano-Bicocca, Nov. 2014.
- "Alpha-class" lecture to first-year undergraduates of Torino Polytechnic University, Nov. 2014.

8 Teaching.

Lecture notes for most of my courses can be found at `moby.mib.infn.it/~atom/teaching.html`. Unless otherwise noted, courses were held at Milano-Bicocca University.

PhD students

- "Geometrical methods for string compactifications" (LACES 2009 and 2020, GGI, Florence).
- "Compactifications and Dualities in String Theory" (Spring 2011, Milano-Bicocca; Summer 2013, Scuola Normale Superiore, Pisa);
- "Geometrical Aspects of AdS/CFT" (Spring 2012 and 2015);

Master's students

- "General Relativity" (2015–present)
- "Mathematical Methods for Physics" (Group Theory; from finite groups to the classification of semisimple Lie algebras; 2010–2018).
- "Quantum Gravity" (Black hole thermodynamics, Hawking radiation; 2016–2017).

B.S. students

- "General Physics II" (Electromagnetism; for math students; 2014–present).
- "Mathematics for Physics" (Holomorphic functions, Hilbert spaces, operators; Fall 2009).

9 Supervision.

I have followed directly the research activities of several postdocs funded by my grants: K. Hristov, A. Passias, S. Katmadas, N. Macpherson, G. Solard.

I have supervised six PhD students so far:

- Fabio Saracco, "Patching up IIA singularities", 2013.
- Dario Rosa, "From spinors to forms: results on G-structures in supergravity and on topological field theories", 2014.
- Andrea Rota, "Holography for six dimensional theories - a universal framework", 2016.
- G. Bruno De Luca, "Non-Supersymmetric Space-Times and Renormalization Group Flows in String Theory", 2020.
- Andrea Legramandi, "Supergravity solution classifications through bispinors", 2020.
- Gabriele Lo Monaco, "Duality walls and three-dimensional superconformal field theories", 2020.

I have moreover supervised

- 14 Master's theses;
- 26 B.S. final projects.

The complete list is available at virgilio.mib.infn.it/~atom/teaching.html.

10 Publications.

My papers have so far attracted a total of roughly **5100** citations, with an h index of **43**. I have written 3 papers with more than 250 citations, 12 papers with between 100 and 250 citations, and 23 with between 50 and 100 citations.[2]

1. G. B. De Luca, N. De Ponti, A. Mondino, and A. Tomasiello, "Gravity from thermodynamics: optimal transport and negative effective dimensions," 2212.02511.
2. B. Assel, Y. Tachikawa, and A. Tomasiello, "On $\mathcal{N} = 4$ supersymmetry enhancements in three dimensions," 2209.13984.
3. A. Tomasiello, *Geometry of String Theory Compactifications*. Cambridge University Press, 2022.

[2] All the citation data (updated in February 2023) are taken from http://inspirebeta.net, the database run by SLAC, which is the one commonly used in High-Energy Theory community.

4. S. Giri, L. Martucci, and A. Tomasiello, "On the stability of string theory vacua," *JHEP* **04** (2022) 054, 2112.10795.

5. N. T. Macpherson and A. Tomasiello, "$\mathcal{N}$ = (1, 1) supersymmetric AdS_3 in 10 dimensions," *JHEP* **03** (2022) 112, 2110.01627.

6. G. B. De Luca, N. De Ponti, A. Mondino, and A. Tomasiello, "Cheeger bounds on spin-two fields," *JHEP* **12** (2021) 217, 2109.11560.

7. G. B. De Luca and A. Tomasiello, "Leaps and bounds towards scale separation," *JHEP* **12** (2021) 086, 2104.12773.

8. F. Marchesano, E. Palti, J. Quirant, and A. Tomasiello, "On supersymmetric AdS_4 orientifold vacua," *JHEP* **08** (2020) 087, 2003.13578.

9. O. Bergman, M. Fazzi, D. Rodríguez-Gómez, and A. Tomasiello, "Charges and holography in 6d $(1,0)$ theories," *JHEP* **05** (2020) 138, 2002.04036.

10. A. Legramandi and A. Tomasiello, "Breaking supersymmetry with pure spinors," *JHEP* **11** (2020) 098, 1912.00001.

11. F. Apruzzi, G. Bruno De Luca, A. Gnecchi, G. Lo Monaco, and A. Tomasiello, "On AdS_7 stability," *JHEP* **07** (2020) 033, 1912.13491.

12. C. Córdova, G. B. De Luca, and A. Tomasiello, "New de Sitter Solutions in Ten Dimensions and Orientifold Singularities," *JHEP* **08** (2020) 093, 1911.04498.

13. M. Fazzi and A. Tomasiello, "Holography, Matrix Factorizations and K-stability," *JHEP* **05** (2020) 119, 1906.08272.

14. C. Córdova, G. B. De Luca, and A. Tomasiello, "Classical de Sitter Solutions of Ten-Dimensional Supergravity," *Phys. Rev. Lett.* **122** (2019), no. 9, 091601, 1812.04147.

15. C. Córdova, G. De Luca, and A. Tomasiello, "AdS_8 Solutions in Type II Supergravity," *JHEP* **07** (2019) 127, 1811.06987.

16. G. B. De Luca, A. Gnecchi, G. Lo Monaco, and A. Tomasiello, "Holographic duals of 6d RG flows," *JHEP* **03** (2019) 035, 1810.10013.

17. A. Legramandi, L. Martucci, and A. Tomasiello, "Timelike structures of ten-dimensional supersymmetry," *JHEP* **04** (2019) 109, 1810.08625.

18. J. J. Heckman, T. Rudelius, and A. Tomasiello, "Fission, Fusion, and 6D RG Flows," *JHEP* **02** (2019) 167, 1807.10274.

19. G. Dibitetto, G. Lo Monaco, A. Passias, N. Petri, and A. Tomasiello, "AdS_3 solutions with exceptional supersymmetry," *Fortsch. Phys.* **66** (2018), no. 10, 1800060, 1807.06602.

20. L. Bhardwaj, D. R. Morrison, Y. Tachikawa, and A. Tomasiello, "The frozen phase of F-theory," *JHEP* **08** (2018) 138, 1805.09070.

21. G. B. De Luca, G. Lo Monaco, N. T. Macpherson, A. Tomasiello, and O. Varela, "The geometry of $\mathcal{N} = 3$ AdS_4 in massive IIA," *JHEP* **08** (2018) 133, 1805.04823.

22. A. Passias, D. Prins, and A. Tomasiello, "A massive class of $\mathcal{N} = 2$ AdS$_4$ IIA solutions," *JHEP* **10** (2018) 071, 1805.03661.

23. B. Assel and A. Tomasiello, "Holographic duals of 3d S-fold CFTs," *JHEP* **06** (2018) 019, 1804.06419.

24. S. Katmadas and A. Tomasiello, "Gauged supergravities from M-theory reductions," *JHEP* **04** (2018) 048, 1712.06608.

25. A. Passias, G. Solard, and A. Tomasiello, "$\mathcal{N} = 2$ supersymmetric AdS$_4$ solutions of type IIB supergravity," *JHEP* **04** (2018) 005, 1709.09669.

26. N. Mekareeya, K. Ohmori, H. Shimizu, and A. Tomasiello, "Small instanton transitions for M5 fractions," *JHEP* **10** (2017) 055, 1707.05785.

27. I. Bah, A. Passias, and A. Tomasiello, "AdS$_5$ compactifications with punctures in massive IIA supergravity," *JHEP* **11** (2017) 050, 1704.07389.

28. N. T. Macpherson and A. Tomasiello, "Minimal flux Minkowski classification," *JHEP* **09** (2017) 126, 1612.06885.

29. N. Mekareeya, T. Rudelius, and A. Tomasiello, "T-branes, Anomalies and Moduli Spaces in 6D SCFTs," *JHEP* **10** (2017) 158, 1612.06399.

30. A. Passias and A. Tomasiello, "Spin-2 spectrum of six-dimensional field theories," *JHEP* **12** (2016) 050, 1604.04286.

31. J. J. Heckman, T. Rudelius, and A. Tomasiello, "6D RG Flows and Nilpotent Hierarchies," *JHEP* **07** (2016) 082, 1601.04078.

32. S. Cremonesi and A. Tomasiello, "6d holographic anomaly match as a continuum limit," *JHEP* **05** (2016) 031, 1512.02225.

33. S. Katmadas and A. Tomasiello, "AdS$_4$ black holes from M-theory," *JHEP* **12** (2015) 111, 1509.00474.

34. A. Passias, A. Rota, and A. Tomasiello, "Universal consistent truncation for 6d/7d gauge/gravity duals," *JHEP* **10** (2015) 187, 1506.05462.

35. F. Apruzzi, M. Fazzi, A. Passias, A. Rota, and A. Tomasiello, "Six-Dimensional Superconformal Theories and their Compactifications from Type IIA Supergravity," *Phys. Rev. Lett.* **115** (2015), no. 6, 061601, 1502.06616.

36. F. Apruzzi, M. Fazzi, A. Passias, and A. Tomasiello, "Supersymmetric AdS$_5$ solutions of massive IIA supergravity," *JHEP* **06** (2015) 195, 1502.06620.

37. A. Rota and A. Tomasiello, "AdS$_4$ compactifications of AdS$_7$ solutions in type II supergravity," *JHEP* **07** (2015) 076, 1502.06622.

38. M. Del Zotto, J. J. Heckman, A. Tomasiello, and C. Vafa, "6d Conformal Matter," *JHEP* **1502** (2015) 054, 1407.6359.

39. F. Apruzzi, M. Fazzi, A. Passias, D. Rosa, and A. Tomasiello, "AdS$_6$ solutions of type II supergravity," *JHEP* **1411** (2014) 099, 1406.0852.

40. D. Gaiotto and A. Tomasiello, "Holography for $(1,0)$ theories in six dimensions," *JHEP* **1412** (2014) 003, 1404.0711.

41. F. Apruzzi, M. Fazzi, D. Rosa, and A. Tomasiello, "All AdS_7 solutions of type II supergravity," *JHEP* **1404** (2014) 064, 1309.2949.

42. D. Rosa and A. Tomasiello, "Pure spinor equations to lift gauged supergravity," *JHEP* **1401** (2014) 176, 1305.5255.

43. F. Saracco, A. Tomasiello, and G. Torroba, "Topological resolution of gauge theory singularities," *Phys.Rev.* **D88** (2013) 045018, 1305.2929.

44. K. Hristov, A. Tomasiello, and A. Zaffaroni, "Supersymmetry on Three-dimensional Lorentzian Curved Spaces and Black Hole Holography," *JHEP* **1305** (2013) 057, 1302.5228.

45. D. Cassani, C. Klare, D. Martelli, A. Tomasiello, and A. Zaffaroni, "Supersymmetry in Lorentzian Curved Spaces and Holography," *Commun.Math.Phys.* **327** (2014) 577–602, 1207.2181.

46. C. Klare, A. Tomasiello, and A. Zaffaroni, "Supersymmetry on Curved Spaces and Holography," *JHEP* **1208** (2012) 061, 1205.1062.

47. F. Saracco and A. Tomasiello, "Localized O6-plane solutions with Romans mass," *JHEP* **1207** (2012) 077, 1201.5378.

48. A. Tomasiello, "Generalized structures of ten-dimensional supersymmetric solutions," *JHEP* **1203** (2012) 073, 1109.2603.

49. A. Tomasiello and A. Zaffaroni, "Parameter spaces of massive IIA solutions," *JHEP* **1104** (2011) 067, 1010.4648.

50. O. Aharony, D. Jafferis, A. Tomasiello, and A. Zaffaroni, "Massive type IIA string theory cannot be strongly coupled," *JHEP* **1011** (2010) 047, 1007.2451.

51. M. Haack, D. Lüst, L. Martucci, and A. Tomasiello, "Domain walls from ten dimensions," *JHEP* **0910** (2009) 089, 0905.1582.

52. D. Gaiotto and A. Tomasiello, "Perturbing gauge/gravity duals by a Romans mass," *J. Phys.* **A42** (2009) 465205, 0904.3959.

53. D. Gaiotto and A. Tomasiello, "The gauge dual of Romans mass," *JHEP* **01** (2010) 015, 0901.0969.

54. D. L. Jafferis and A. Tomasiello, "A simple class of $\mathcal{N} = 3$ gauge/gravity duals," *JHEP* **10** (2008) 101, 0808.0864.

55. A. Tomasiello, "New string vacua from twistor spaces," *Phys. Rev.* **D78** (2008) 046007, 0712.1396.

56. N. Halmagyi and A. Tomasiello, "Generalized Kaehler Potentials from Supergravity," *Commun.Math.Phys.* **291** (2009) 1–30, 0708.1032.

57. A. Tomasiello, "Reformulating Supersymmetry with a Generalized Dolbeault Operator," *JHEP* **02** (2008) 010, arXiv:0704.2613 [hep-th].

58. A. Kapustin and A. Tomasiello, "The general $(2,2)$ gauged sigma model with three-form flux," *JHEP* **11** (2007) 053, hep-th/0610210.

59. M. Graña, R. Minasian, M. Petrini, and A. Tomasiello, "A scan for new $\mathcal{N} = 1$ vacua on twisted tori," *JHEP* **05** (2007) 031, hep-th/0609124.

60. J. P. Hsu, A. Maloney, and A. Tomasiello, "Black hole attractors and pure spinors," *JHEP* **09** (2006) 048, hep-th/0602142.

61. W.-y. Chuang, S. Kachru, and A. Tomasiello, "Complex / symplectic mirrors," *Commun. Math. Phys.* **274** (2007) 775–794, hep-th/0510042.

62. E. Bergshoeff, R. Kallosh, A.-K. Kashani-Poor, D. Sorokin, and A. Tomasiello, "An index for the Dirac operator on D3 branes with background fluxes," *JHEP* **10** (2005) 102, hep-th/0507069.

63. M. Graña, R. Minasian, M. Petrini, and A. Tomasiello, "Generalized structures of $\mathcal{N} = 1$ vacua," *JHEP* **11** (2005) 020, hep-th/0505212.

64. A.-K. Kashani-Poor and A. Tomasiello, "A stringy test of flux-induced isometry gauging," *Nucl. Phys.* **B728** (2005) 135–147, hep-th/0505208.

65. R. Kallosh, A.-K. Kashani-Poor, and A. Tomasiello, "Counting fermionic zero modes on M5 with fluxes," *JHEP* **06** (2005) 069, hep-th/0503138.

66. A. Tomasiello, "Topological mirror symmetry with fluxes," *JHEP* **06** (2005) 067, hep-th/0502148.

67. M. Graña, R. Minasian, M. Petrini, and A. Tomasiello, "Supersymmetric backgrounds from generalized Calabi–Yau manifolds," *JHEP* **08** (2004) 046, hep-th/0406137.

68. U. Lindström, R. Minasian, A. Tomasiello, and M. Zabzine, "Generalized complex manifolds and supersymmetry," *Commun. Math. Phys.* **257** (2005) 235–256, hep-th/0405085.

69. S. Fidanza, R. Minasian, and A. Tomasiello, "Mirror symmetric SU(3)-structure manifolds with NS fluxes," *Commun. Math. Phys.* **254** (2005) 401–423, hep-th/0311122.

70. M. Petrini, A. Tomasiello, and A. Zaffaroni, "On the geometry of matrix models for $\mathcal{N} = 1$," *JHEP* **08** (2003) 004, hep-th/0304251.

71. P. Kaste, R. Minasian, and A. Tomasiello, "Supersymmetric M-theory compactifications with fluxes on seven-manifolds and G-structures," *JHEP* **07** (2003) 004, hep-th/0303127.

72. P. Kaste, R. Minasian, M. Petrini, and A. Tomasiello, "Nontrivial RR two-form field strength and SU(3)-structure," *Fortsch. Phys.* **51** (2003) 764–768, hep-th/0301063.

73. P. Kaste, R. Minasian, M. Petrini, and A. Tomasiello, "Kaluza–Klein bundles and manifolds of exceptional holonomy," *JHEP* **09** (2002) 033, hep-th/0206213.

74. M. R. Douglas, S. Govindarajan, T. Jayaraman, and A. Tomasiello, "D-branes on Calabi–Yau manifolds and superpotentials," *Commun. Math. Phys.* **248** (2004) 85–118, hep-th/0203173.

75. A. Tomasiello, "A-infinity structure and superpotentials," *JHEP* **09** (2001) 030, hep-th/0107195.

76. R. Minasian and A. Tomasiello, "Variations on stability," *Nucl. Phys.* **B631** (2002) 43–65, hep-th/0104041.

77. A. Tomasiello, "D-branes on Calabi–Yau manifolds and helices," *JHEP* **02** (2001) 008, hep-th/0010217.

78. L. Bonora, M. Schnabl, M. M. Sheikh-Jabbari, and A. Tomasiello, "Noncommutative SO(n) and Sp(n) gauge theories," *Nucl. Phys.* **B589** (2000) 461–474, hep-th/0006091.

79. L. Bonora, M. Schnabl, and A. Tomasiello, "A note on consistent anomalies in noncommutative YM theories," *Phys. Lett.* **B485** (2000) 311–313, hep-th/0002210.

80. A. Tomasiello, "Projective resolutions of coherent sheaves and descent relations between branes," *Adv. Theor. Math. Phys.* **4** (2002) 617–626, hep-th/9908009.

81. D. Fabbri, P. Fre', L. Gualtieri, C. Reina, A. Tomasiello, A. Zampa, and A. Zaffaroni, "3-D superconformal theories from Sasakian seven-manifolds: New nontrivial evidences for AdS$_4$/CFT$_3$," *Nucl.Phys.* **B577** (2000) 547–608, hep-th/9907219.

82. G. Bonelli, L. Bonora, F. Nesti, and A. Tomasiello, "Heterotic matrix string theory and Riemann surfaces," *Nucl. Phys.* **B564** (2000) 86–102, hep-th/9905092.

83. G. Bonelli, L. Bonora, F. Nesti, and A. Tomasiello, "Matrix string theory and its moduli space," *Nucl. Phys.* **B554** (1999) 103–135, hep-th/9901093.

11 Invited seminars.

Over my career, I have been invited to give about 75 seminars in various departments around the world. Univ. Torino, math dept (March 2023); Stanford Univ. (Jan. 2023); LMU Munich (virtual, July 2022); Rencontres Théoriciennes, Paris (June 2022); Durham Univ. (Feb. 2020); Univ. Roma Tor Vergata (Oct. 2019); Yau Center, Tsinghua Oxford (Sep. 2019); Univ.; King's College; Theory Colloquium, Dublin (Feb. 2019); TU Wien (Jan. 2019); Rencontres Théoriciennes, Paris (Jan. 2019); Berkeley Univ. (Sep. 2018); Uppsala Univ. (May 2018); CERN, Geneva (Dec. 2017); DESY, Hamburg (June 2017); AEI, Potsdam; Humboldt Univ., Berlin (May 2017); Munich (Dec. 2016); Imperial College (March 2016); Uppsala (Dec. 2015); DESY (June 2015); 3-Lecture Series at Harvard, Math Dept. (May 2015); INRNE, Sofia (May 2015); Joint ICTP/SISSA seminar, Trieste (Feb. 2015); Rencontres Théoriciennes, Institut Henri Poincaré, Paris (Dec. 2014); Belgium Joint Seminar (Nov. 2014); Lisbon Univ., Torino Univ. (May 2014); Harvard University; Firenze Univ. (Apr. 2014); Amsterdam Univ. (Feb. 2014); Perimeter Institute (Oct. 2013); University of Oviedo (Apr. 2013); Brandeis University (Oct. 2012); SNS, Pisa (June 2012); UC Irvine (May 2012); King's College, London; CEA Saclay, Paris (March 2012); Durham (February 2012); ENS Lyon (January 2012); Tor Vergata University, Rome (November 2011); Stanford University (March 2011); Torino University, Fifth Joint Seminar of the ERC Grant "Superfields" (November 2010); Padova University (November 2010); Leuven University (October 2010); Rencontres Théoriciennes, Paris; University of Torino (March 2010); University of Amsterdam; SISSA/ISAS, Trieste; Scuola Normale Superiore, Pisa (February 2010); Joint Seminar in Theoretical High Energy Physics, Newe Shalom, Israel (January 2010); "Triangular Seminar", Imperial College, London (December 2009); Rutgers University (May 2009); **Colloquium**, Hamburg University (May 2009); MIT, Boston; McGill University, Montreal (April 2009); Cincinnati University (February 2009); FZU, Prague (December 2008); Brandeis University; University of New Hampshire (November 2008); University of Michigan at Ann Arbor;

Padova University (October 2008); Stony Brook University, New York (April 2008); Brown University; Rutgers University (March 2008); Texas A&M University; VirginiaTech (February 2008); Tor Vergata University, Rome; SISSA/ISAS, Trieste, Italy (January 2008); ENS, Paris (November 2007); Berkeley University, Uppsala University (May 2007); Toronto Univ. (March 2007); LMU, Munich; IHP, Paris (February 2007); SLAC (January 2007); CalTech (September 2006); IAS, Princeton (April 2006); University of Madison, Wisconsin; University of Chicago (March 2006); Harvard University (February 2006); DESY, Hamburg (April 2004); ULB, Bruxelles (March 2004); Imperial College, London (February 2004); IAS, Princeton; Toronto University; Rutgers University; UPenn, Philadelphia (November 2003); SISSA, Trieste (June 2003); CERN (May 2002); AEI, Potsdam (May 2001); Spinoza Instituut, Utrecht (April 2001); Paris, Ecole Polytechnique (March 2001) and IHP (September 2001).

12 Conference talks.

I have been invited to give about 70 talks at conferences and workshops:

- Workshop "Gravity from algebra: modern field theory methods for holography", KITP, Santa Barbara, USA (Jan. 23–26, 2023).
- Workshop "Back to the Swamp", Madrid, Spain (Sep. 26–28, 2022).
- Conference "Mikefest" in honor of Michael Douglas' 60th birthday, IHÉS, Bures-sur-Yvette (May 9–13, 2022).
- Conference "Eurostrings 2022", ENS Lyon (Apr. 25–29, 2022).
- Workshop "Quivers, Calabi-Yau threefolds and Donaldson-Thomas invariants", Sorbonne U. Paris (Apr. 11–15, 2022).
- Online Workshop "Geometry and Swampland" based in Banff, Canada (Jan. 23–28, 2022).
- Workshop "Geometry and Duality", AEI Potsdam (Dec. 2–6, 2019).
- Workshop "Fano Varieties, Cone Singularities and their Links" (Edge Days 2019), Edinburgh, UK (Nov. 4–8, 2019).
- Workshop "Supergravity 2019", Padova, Italy (Sep. 12–13, 2019).
- Workshop "Geometry and Strings 2019", Oxford, UK (Sep. 3–6, 2019).
- Workshop "Supersymmetries and Quantum Symmetries 2019", Yerevan, Armenia (Aug. 26–31, 2019).
- **Strings 2019**, Brussels, Belgium (July 8–13, 2019).
- Workshop "Pre-strings 2019", Leuven, Belgium (July 2–9, 2019).
- Conference "String phenomenology 2019", CERN, Geneva (June 24–28, 2019).
- Workshop "Avant-garde methods for quantum field theory and gravity", Nazareth (Feb. 17–21, 2019).
- Workshop "Third USU Workshop on Strings and Black Holes", Utah State Univ. (Apr. 30 – May 2, 2018).

- Workshop “Recent Trends in String Theory and Related Topics”, Tehran, Iran (May 7–11, 2018).
- Workshop “Strings, Geometry and Black holes”, London, UK (Apr. 9–13, 2018).
- Workshop “Physics and Geometry of F-Theory”, Madrid, Spain (March 5–8, 2018).
- Workshop “Geometry and Physics of F-theory”, Banff, Canada (Jan. 21–26, 2018).
- Workshop “String Dualities and Geometry”, Bariloche, Argentina (Jan. 14–19, 2018).
- Workshop “Fields And Duality 2017”, Munich, Germany (Oct. 9–13, 2017).
- Workshop “Holography and Quantum Gravity”, Oviedo, Spain (Oct. 5–6, 2017).
- Workshop “Recent Trends in String Theory and Related Topics”, Tehran, Iran (May 8–11, 2017).
- Workshop “Geometry, Gravity and Supersymmetry”, Mainz, Germany (April 24–28, 2017).
- Workshop “Superconformal Field Theories in $d \geq 4$”, Aspen, CO, USA (March 5–11, 2017).
- Workshop “Physics and Geometry of F-theory 2017”, Trieste, Italy (February 27 – March 2, 2017).
- Workshop “Strings and Geometry”, KIAS, Seoul (October 24–26, 2016).
- Conference of the Italian Society of Physics, Padova (September 26–30, 2016).
- Conference “Supergravity, the next 10 years”, GGI, Florence (September 7–9, 2016).
- Workshop “STIL 2016”, King’s College, London (August 29–September 3, 2016).
- Program “MAST 2016”, IHP, Paris (April–July 2016).
- Workshop “Recent Trends in String Theory and Related Topics”, Tehran (May 24–27, 2016).
- Workshop “Generalized Geometry & T-dualities”, Simons Center for Geometry and Physics (May 9–13, 2016).
- Workshop “Superstring solutions, supersymmetry and geometry”, Benasque, Spain (May 1–7, 2016).
- CERN Theory Institute “Recent Developments in M-theory” (February 8–19, 2016).
- VII Round Table Italy–Russia, Dubna, Russia (November 24–28, 2015).
- Workshop “Theories of the Fundamental Interactions”, review talk, Napoli, Italy (November 18–20, 2015).
- Workshop “Supergravity 2015”, Padova, Italy (October 29–30, 2015).
- Workshop “Stringy Geometry”, Mainz, Germany (September 14–25, 2015).
- Conference “The String Theory Universe” — 21st European string workshop and 3rd COST MP1210 meeting (review talk), Leuven, Belgium (September 7–11, 2015).

- Workshop “Liouville, Integrability and Branes (11)”, Pohang, Korea (September 3–13, 2015).
- Workshop “Supersymmetries and Quantum Symmetries”, JINR, Dubna, Russia (August 3–8, 2015).
- 13th Simons Summer Workshop, “Mathematics & Physics: Conformal Theories in Higher Dimensions” (July 20–August 14, 2015).
- 5th Workshop on Geometric Correspondences of Gauge Theories, SISSA, Trieste (July 6–10, 2015).
- Workshop “Challenges to QFT in higher dimensions”, Haifa, Israel (June 28–July 2, 2015).
- Program “Holographic Methods for Strongly Coupled Systems”, GGI, Florence (April 2015).
- “The 2nd Workshop on Developments in M-Theory”, High1 Resort, Gangwondo, Korea (January 12–16, 2015).
- 6th Bethe Center Workshop on “Topological Strings and Applications”, Bonn, Germany (September 29 – October 3rd, 2014).
- Workshop “Frontiers in field and string theory”, Yerevan, Armenia (September 22–26, 2014).
- Workshop “Exact Quantum Fields and the Structure of M-theory”, Heraklion, Greece (July 10–16, 2014).
- **Strings 2014**, Princeton, USA (June 23–27, 2014).
- Workshop “Supersymmetric Quantum Field Theories in Five and Six Dimensions”, Perimeter Institute, Waterloo, Canada (April 24–26, 2014).
- Workshop “Supersymmetry in Physics and Mathematics”, IPMU, Tokyo (March 10–20, 2014).
- Workshop “Modern Developments in M-theory”, Banff, Canada (January 12–17, 2014).
- Workshop “String Geometry & Beyond”, Soltis Center of Texas A&M University, Costa Rica (November 24 – December 1, 2013).
- Conference “Geometry of Strings and Fields”, GGI, Florence, September 8–13, 2013.
- Conference “SUSY2013” (Formal Theory Session), Trieste, August 26 – September 1, 2013.
- Workshop “Supersymmetries and Quantum Symmetries”, JINR, Dubna, Russia, July 29 – August 3, 2013.
- Workshop “Supersymmetry, Geometry and Holography”, IHP, Paris, June 6–7, 2013.
- Round Table “Frontiers of Mathematical Physics”, Dubna, Russia, December 16–18, 2012.
- Workshop on “String Theory and Generalized Geometries”, Banff, Canada, December 2–7, 2012.
- Program “Mathematics and Applications of Branes in String and M-theory”, Isaac Newton Institute, Cambridge (January 3 – June 29, 2012).
- INFN Meeting “Theory of Fundamental Interactions”, SISSA, Trieste (January 9 – 11, 2012).

- Workshop "Geometry of Strings and Fields", Nordita Institute, Stockholm (November 1 – December 3, 2011).
- Workshop "Generalized Geometries and String Theory", Mitchell Institute, Texas A&M University (March 14–18, 2011).
- Workshop "Differential Cohomology", Simons Center, Stony Brook, New York (January 10–14, 2011).
- Program on "Higher Structures in Mathematics and Physics", ESI, Vienna (September 1 – November 7, 2010).
- Convegno Nazionale di Fisica Teorica, Plenary Speaker, Cortona (May 26–29, 2010).
- International Workshop on Gauge Theories, Supersymmetry, and Mathematical Physics, Lyon (April 6–10, 2010).
- 33rd Johns Hopkins Workshop on Current Problems in Particle Theory: "Maximal Supersymmetry", Göteborg (August 20–22, 2009).
- Workshop on "Kähler Geometry and Extremal Metrics", Simons Center, Stony Brook, New York (January 19–23, 2009).
- Indian Strings Meeting, Pondicherry, India (December 6–13, 2008).
- Mini-course of three lectures on "Introduction to generalized geometry and supergravity", at the Program "Geometrical Aspects of String Theory", Nordita, Stockholm (October 15 – December 15, 2008).
- Workshop on "Mathematical Challenges in String Phenomenology ", Vienna (October 6–15, 2008).
- 39th International Symposium Ahrenshoop on the Theory of Elementary Particles, "Recent Developments in String/M-Theory and Field Theory", Berlin (October 6–10, 2008).
- **Strings 2008**, CERN, Geneva, Switzerland (August 2008).
- Aspen Center for Physics, Summer Program (July 2007).
- Sowers Theoretical Physics Workshop 2007, Virginia Tech (May 14–18, 2007).
- Workshop on Generalized Geometry and Flux Compactifications, DESY, Hamburg (February 19 – March 1, 2007).
- Workshop on "Emerging Directions in String Theory", Banff, Canada (June 22–29, 2008).
- Mini-Workshop: Heterotic Strings, Derived Categories, and Stacks; Oberwolfach, Germany (November 13–19, 2005).
- **Strings 2005**, Toronto, Canada (July 2005).
- Workshop on $\mathcal{N} = 1$ compactifications; Toronto, Canada (March 21–25, 2005).
- WAGP, "K-theory, derived categories and strings", Genoa, Italy (June 18–21, 2002).
- Workshop "String Theory and Complex Geometry", Bad Honnef (April 8–12, 2002).