

Marco Gibertini

Curriculum vitæ

Researcher IDs

Google Scholar DRzat84AAAAJ
ResearcherID A-1866-2017
ORCID 0000-0003-3980-5319
Scopus 33067774400

Education

- 9-10/2011 **Visiting PhD**, *Lorentz Institute*, Leiden, The Netherlands
From September 19th to October 28th. Supervisor: Prof. Carlo Beenakker.
- 1/2010-12/2012 **PhD course**, *Scuola Normale Superiore*, Pisa, Italy
22/02/2013 Ph.D. defence, 70/70 *cum laude*.
Title: *Quantum transport and many-body effects in graphene and topological superconductors*.
Supervisors: Prof. Rosario Fazio, Dr. Marco Polini, and Dr. Fabio Taddei
- 10/2007-9/2009 **Excellence School**, *Scuola Normale Superiore*, Pisa, Italy
27/5/2010 Diploma di Licenza, 70/70 *cum laude*.
Title: *Electron density distribution and screening in rippled graphene sheets*.
Supervisor: Dr. Marco Polini.
- 9/2007-7/2009 **Master of Science**, *University of Pisa*, Italy
22/07/2009 Master Degree in Physical Sciences, 110/110 *cum laude*.
Title: *Ground-state properties of inhomogeneous graphene sheets*.
Supervisor: Dr. Marco Polini.
- 9/2004-7/2007 **Bachelor of Science**, *University of Modena and Reggio Emilia*, Italy
27/07/2007 Bachelor Degree in Physics, 110/110 *cum laude*.
Title: *Geometrical and topological aspects of modern classical and quantum physics*.
Supervisor: Prof. Carlo Maria Bertoni.

Professional employment

Eligible to apply in Italy for full professorships in theoretical condensed-matter physics (Abilitazione Scientifica Nazionale 02/B2)

- 12/2022-present **Associate professor**, *University of Modena and Reggio Emilia*, Modena, Italy
- 12/2019-11/2022 **Assistant professor**, *University of Modena and Reggio Emilia*, Modena, Italy
- 11/2017-11/2019 **SNSF Ambizione fellow**, *University of Geneva*, Geneva, Switzerland
Supervisor: Prof. Alberto Morpurgo.
- 1/2013-10/2017 **Post-doctoral research scientist**, *EPFL*, Lausanne, Switzerland
Supervisor: Prof. Nicola Marzari.

Projects and funding

Research projects

- 2024-2025 PI of a BAC project on "EMergent toPological states in sEmiconductor-ferROmagnet van der Waals heteRostructures" (EMPEROR), budget: 233.624,14 €.
- 2023-2025 PI of a PRIN 2022 project on "Simultaneous electrical control of spin and valley polarization in van der Waals magnetic materials" (SECSY), budget: 189.963 €.

- 2019-2022 Rita Levi-Montalcini fellowship, budget: 193.173 €.
- 2017-2021 Ambizione fellowship of the Swiss National Science Foundation, budget: 655.233 CHF.

Simulation grants

- 2020-2021 Co-PI of a ISCRA-B project on Marconi 100, Cineca. Allocation: 40.000 core hours
- 2019-2020 PI of a production proposal on Piz Daint, CSCS. Allocation: 3.600.000 core hours.
- 2018-2019 PI of a production proposal on Piz Daint, CSCS. Allocation: 3.600.000 core hours.
- 2017-2020 Co-PI of a PRACE allocation of 30.000.000 core hours on Marconi, Cineca.
- 2014-2017 Co-PI of a production proposal on Piz Daint, CSCS. Allocation: 12.000.000 core hours.

Articles

For direct internet links to publications, please hover over the journal reference or the arXiv identifier.

Pre-prints

- 70 H. Boban, T. Prongué, A. Choudhury, D. Marchiani, A. Bareño, F. Eder, E. Giannini, F.O. von Rohr, A.F. Morpurgo, **M. Gibertini**, A. Tamai, and F. Baumberger, arXiv:2608.20978
Quasi-one-dimensional topological band structure and van Hove singularities in monolayer TaIrTe₄ from laser μ -ARPES.
- 69 A. Bose, N. Manko, **M. Gibertini**, and A. Marrazzo, arXiv:2608.02925
Symmetry-Guided Computational Screening of Two-Dimensional Altermagnets with ab initio Hubbard Corrections.
- 68 L. Sun, **M. Gibertini**, A. Scarfato, M. Liao, F. Wu, A. F. Morpurgo, and C. Renner, arxiv:2505.09946.
Coupling between magnetism and band structure in a 2D semiconductor.

2026

67. V. A. Bastos, F. Paleari, E. Luppi, **M. Gibertini**, and A. Ruini, Phys. Rev. B **113**, 195440 (2026) and arXiv:2603.04294
Ab initio study of saddle-point excitons in monolayer SnS₂
66. F. Haddadi, D. Campi, F. dos Santos, N. Mounet, L. Ponet, N. Marzari, and **M. Gibertini**, ACS Nano (2026) and arxiv:2509.09531
Exploring the magnetic landscape of easily-exfoliable two-dimensional materials.
65. F. Orlando, A. Droghetti, L. Varrassi, G. Cuono, C. Franchini, P. Barone, A. Marrazzo, **M. Gibertini**, S. Stavrić, and S. Picozzi, npj Computational Materials **12**, 146 (2026) and arxiv:2509.20226
AMaRaNTA: Automated First-Principles Exchange Parameters In 2D Magnets.
64. X. Wang, S. Wang, Y. Zhang, Y. Ding, X. Dong, L. Zou, S. Liu, M. He, T. Taniguchi, K. Watanabe, X. Pan, L. Zhang, **Marco Gibertini**, J. Pan, Z. Qu, K. Wang, Z. Wang, Science Bulletin **71**, 236 (2026).
Spin valve effect in hybrid spin filters with Cr₂Ge₂Te₆.

2025

63. A. Vezzosi, A. Bertoni, **M. Gibertini**, and G. Goldoni, Phys. Rev. B **112**, 085425 (2025) and arxiv:2409.00274.
Spin-orbit control of Dirac points and end states in inverted gap nanowires.
62. A. Grubišić-Čabo et al. (Lorentz center's Quantum Magnetic Materials collaboration), 2D Materials **12**, 031501 (2025) and arXiv:2412.18020.
Roadmap on Quantum Magnetic Materials.

61. M. Quinzi, T. Chiarotti, **M. Gibertini**, A. Ferretti. Phys. Rev. B **111**, 125148 (2025) and arXiv:2412.15020
Broken symmetry solutions in one-dimensional lattice models via many-body perturbation theory.
 60. T. Sohler, **M. Gibertini**, I. Martin and A.F. Morpurgo, Phys. Rev. Research **7**, 013290 (2025) and arxiv:2409.11834.
Unconventional gate-induced superconductivity in transition-metal dichalcogenides.
 59. F. Yao, M. Liao, **M. Gibertini**, C.-Y. Cheon, X. Lin, F. Wu, K. Watanabe, T. Taniguchi, I. Gutiérrez-Lezama, and A. F. Morpurgo. Nature Nanotechnology **20**, 609 (2025) and arXiv:2503.13000.
Switchable spin-split conduction band in antiferromagnetic bilayer transistors.
 58. M. Brzezińska, S. Grytsiuk, M. Rösner, **M. Gibertini**, L. Rademaker, 2D Materials **12**, 015003 (2025) and arXiv:2404.07165.
Pressure-tuned many-body phases through Γ -K valleytronics in moiré bilayer WSe₂.
-
- 2024**
57. F. Yao, D. Rossi, I. A. Gabrovski, V. Multian, N. Hua, K. Watanabe, T. Taniguchi, **M. Gibertini**, I. Gutiérrez-Lezama, L. Rademaker, and A. F. Morpurgo, Nature Communications **15**, 10377 (2024) and arXiv:2412.01658.
Moiré magnetism in CrBr₃ multilayers emerging from differential strain.
 56. X. Lin, F. Wu, S. Lopez, F. O. von Rohr, **M. Gibertini**, I. Gutiérrez-Lezama, and A. F. Morpurgo, Phys. Rev. Research **6**, 013185 (2024) and arXiv:2401.16931.
Influence of magnetism on vertical hopping transport in CrSBr.
 55. F. Haddadi, E. Linscott, I. Timrov, N. Marzari, **M. Gibertini**, Phys. Rev. Materials **8**, 014007 (2024) and arXiv:2306.06286.
On-site and inter-site Hubbard corrections in magnetic monolayers: The case of FePS₃ and CrI₃.
-
- 2023**
54. F. Wu, **M. Gibertini**, K. Watanabe, T. Taniguchi, I. Gutiérrez-Lezama, N. Ubrig, and A. F. Morpurgo, Nano Letters **23**, 8140 (2023) and arXiv:2304.12712.
Magnetism-induced band-edge shift as mechanism for magnetoconductance in CrPS₄ transistors.
 53. F. Yao, V. Multian, Z. Wang, N. Ubrig, J. Teyssier, F. Wu, E. Giannini, **M. Gibertini**, I. Gutiérrez-Lezama, and Alberto F. Morpurgo, Nat. Commun. **14**, 4969 (2023) and arXiv:2308.08355.
Multiple antiferromagnetic phases and magnetic anisotropy in exfoliated CrBr₃ multilayers.
 52. F. Margot, S. Lisi, I. Cucchi, E. Cappelli, A. Hunter, I. Gutiérrez-Lezama, K.Y. Ma, F. von Rohr, C. Berthod, F. Petocchi, S. Poncé, N. Marzari, **M. Gibertini**, A. Tamai, A. Morpurgo, F. Baumberger, Nano Letters **23**, 6433 (2023) and arXiv:2306.00749.
Electronic structure of few-layer black phosphorus from μ -ARPES.
 51. D. Campi, N. Mounet, **M. Gibertini**, G. Pizzi, and N. Marzari, ACS Nano **17**, 11268 (2023) and arXiv:2210.11301.
Expansion of the Materials Cloud 2D database.
 50. F. Wu, **M. Gibertini**, K. Watanabe, T. Taniguchi, N. Ubrig, I. Gutiérrez-Lezama, and A. F. Morpurgo, Advanced Materials **35**, 2211653 (2023) and arXiv:2301.10535.
Gate-controlled magnetotransport and electrostatic modulation of magnetism in 2D magnetic semiconductor CrPS₄.
 49. S. Poncé, M. Royo, **M. Gibertini**, N. Marzari, and M. Stengel, Phys. Rev. Lett. **130**, 166301 (2023) and arXiv:2207.10187.

Accurate prediction of Hall mobilities in two-dimensional materials through gauge-covariant quadrupolar contributions.

48. S. Poncé, M. Royo, M. Stengel, N. Marzari, and **M. Gibertini**, Phys. Rev. B **107**, 155424 (2023) and arXiv:2207.10190.

Long-range electrostatic contribution to electron-phonon couplings and mobilities of two-dimensional and bulk materials.

2022

47. D. Domaretskiy, M. Philippi, **M. Gibertini**, N. Ubrig, I. Gutiérrez-Lezama, and A. F. Morpurgo, Nat. Nanotechnol. **17**, 1078 (2022) and arXiv:2108.06117.

Quenching the bandgap of 2D semiconductors with a perpendicular electric field.

46. A. Marrazzo and **M. Gibertini**, npj 2D Materials and Applications **6**, 30 (2022) and arXiv:2112.07695.

Twist-resilient and robust ferroelectric quantum spin Hall insulators driven by van der Waals interactions.

45. F. Wu, I. Gutiérrez-Lezama, S. Lopez, **M. Gibertini**, K. Watanabe, T. Taniguchi, F. O. von Rohr, N. Ubrig, and A. F. Morpurgo, Advanced Materials **34**, 2109759 (2022) and arXiv:2202.11427.

Quasi 1D electronic transport in a 2D magnetic semiconductor.

2021

44. Z. Wang, I. Gutiérrez-Lezama, D. Dumcenco, N. Ubrig, T. Taniguchi, K. Watanabe, E. Giannini, **M. Gibertini**, and A. F. Morpurgo, Nature Communications **12**, 6659 (2021) and arXiv:2106.13930.

Magnetization dependent tunneling conductance of ferromagnetic barriers.

43. G. Pizzi, S. Milana, A.C. Ferrari, N. Marzari, and **M. Gibertini**, ACS Nano **15**, 12509 (2021) and arXiv:2011.14681.

Shear and breathing modes of layered materials.

42. L. Rademaker and **M. Gibertini**, Phys. Rev. Materials **5**, 044201 (2021) and arXiv:2007.09926.

Gate-tunable imbalanced Kane-Mele model in encapsulated bilayer jacutingaite.

41. T. Sohler, **M. Gibertini**, and M. Verstraete, Phys. Rev. Materials **5**, 024004 (2021) and arXiv:2011.04961.

Remote free-carrier screening to boost the mobility of Fröhlich-limited 2D semiconductors.

40. T. Sohler **M. Gibertini**, and N. Marzari, 2D Materials **8**, 015025 (2021) and arXiv:2007.16110.

Profiling novel high-conductivity 2D semiconductors.

39. **M. Gibertini**, Journal of Physics D: Applied Physics **54**, 064002 (2021) and arXiv:2008.11246.

Magnetism and stability of all primitive stacking patterns in bilayer chromium trihalides.

2020

38. P. D'Amico, **M. Gibertini**, D. Prezzi, D. Varsano, A. Ferretti, N. Marzari, and E. Molinari, Phys. Rev. B **101**, 161410 (2020) and arXiv:1909.01613.

Intrinsic edge excitons in two-dimensional MoS₂.

37. D. Mauro, H. Henck, **M. Gibertini**, M. Filippone, E. Giannini, I. Gutiérrez-Lezama, and A.F. Morpurgo, 2D Materials **7**, 025042 (2020) and arXiv:1910.13228.

Multi-frequency Shubnikov-de Haas oscillations in topological semimetal Pt₂HgSe₃.

36. I. Cucchi, A. Marrazzo, E. Cappelli, S. Ricco, F. Y. Bruno, S. Lisi, M. Hoesch, T. K. Kim, C. Cacho, C. Besnard, E. Giannini, N. Marzari, **M. Gibertini**, F. Baumberger, and A. Tamai, Phys. Rev. Lett. **124**, 106402 (2020) and arXiv:1909.05051.
Bulk and surface electronic structure of the dual-topology semimetal Pt_2HgSe_3 .
 35. A. Marrazzo, N. Marzari, and **M. Gibertini**, Phys. Rev. Research **2**, 012063(R) (2020) and arXiv:1909.05050. Selected as Editors' suggestion.
Emergent dual topology in the three-dimensional Kane-Mele Pt_2HgSe_3 .
 34. G. Long, H. Henck, **M. Gibertini**, D. Dumcenco, T. Taniguchi, K. Watanabe, E. Giannini, and A.F. Morpurgo, Nano Letters **20**, 2452 (2020) and arXiv:1910.13287.
Persistence of magnetism in atomically thin $MnPS_3$ crystals.
 33. C. Backes *et al.* (Graphene Flagship WP 3 –Materials– collaboration), 2D Materials **7**, 022001 (2020).
Production and processing of graphene and related materials.
 32. G. Pizzi, V. Vitale, R. Arita, S. Blügel, F. Freimuth, G. Géranton, **M. Gibertini**, D. Gresch, C. Johnson, T. Koretsune, J. Ibañez-Azpiroz, H. Lee, J.-M. Lihm, D. Marchand, A. Marrazzo, Y. Mokrousov, J.I. Mustafa, Y. Nohara, Y. Nomura, L. Paulatto, S. Poncé, T. Ponweiser, J. Qiao, F. Thöle, S.S. Tsirkin, M. Wierzbowska, N. Marzari, D. Vanderbilt, I. Souza, A.A. Mostofi, and J.R. Yates, J. Phys.: Condens. Matter **32**, 165902 (2020) and arXiv:1907.09788.
Wannier90 as a community code: new features and applications.
 31. N. Ubrig, Z. Wang, J. Teyssier, T. Taniguchi, K. Watanabe, E. Giannini, A.F. Morpurgo, and **M. Gibertini**, 2D Materials **7**, 015007 (2020) and arXiv:1908.09607.
Low-temperature monoclinic layer stacking in atomically thin CrI_3 crystals.
-
- 2019**
30. A. Marrazzo, **M. Gibertini**, D. Campi, N. Mounet, and N. Marzari, Nano Letters **19**, 8431 (2019) and arXiv:1908.08334.
Relative abundance of $\mathbb{Z}_2$ topological order in exfoliable two-dimensional insulators.
 29. Z. Wang, **M. Gibertini**, D. Dumcenco, T. Taniguchi, K. Watanabe, E. Giannini, and A.F. Morpurgo, Nature Nanotechnology **14**, 1116 (2019) and arXiv:1911.04376.
Determining the phase diagram of atomically thin antiferromagnet $CrCl_3$.
 28. T. Sohler, E. Ponomarev, **M. Gibertini**, H. Berger, N. Marzari, N. Ubrig, and A. F. Morpurgo, Physical Review X **9**, 031019 (2019) and arXiv:1901.08012.
Enhanced electron-phonon interaction in multi-valley materials.
 27. T. Sohler, **M. Gibertini**, D. Campi, G. Pizzi, and N. Marzari, Nano Letters **19**, 3723 (2019) and arXiv:1902.11209.
Valley-engineering mobilities in two-dimensional materials.
 26. **M. Gibertini**, M. Koperski, A. F. Morpurgo, and K. S. Novoselov, Nature Nanotechnology **14**, 408 (2019) and arXiv:1910.03425.
Magnetic 2D materials and heterostructures.
 25. L. Thiel, Z. Wang, M. A. Tschudin, D. Rohner, I. Gutiérrez-Lezama, N. Ubrig, **M. Gibertini**, E. Giannini, A. F. Morpurgo, and P. Maletinsky, Science **364**, 973 (2019) and arXiv:1902.01406.
Probing magnetism in 2D materials at the nanoscale with single spin microscopy.
 24. I. Cucchi, I. Gutiérrez-Lezama, E. Cappelli, S. McKeown Walker, F. Y. Bruno, G. Tenasini, L. Wang, N. Ubrig, C. Barreteau, E. Giannini, **M. Gibertini**, A. Tamai, A. F. Morpurgo, and F. Baumberger, Nano Lett. **19**, 554 (2019) and arXiv:1811.04629.
Microfocus laser-ARPES on encapsulated mono-, bi-, and few-layer $1T'$ - WTe_2 .

2018

23. T. Sohier, D. Campi, N. Marzari, and **M. Gibertini**, Phys. Rev. Materials **2**, 114010 (2018) and arXiv:1808.10808. Selected as Editors' suggestion.
Mobility of 2D materials from first principles in an accurate and automated framework.
22. Z. Wang, I. Gutiérrez-Lezama, N. Ubrig, M. Kroner, **M. Gibertini**, T. Taniguchi, K. Watanabe, A. Imamoglu, E. Giannini, and A. F. Morpurgo, Nature Commun. **9**, 2516 (2018) and arXiv:1801.08188.
Very Large Tunneling Magnetoresistance in Layered Magnetic Semiconductor CrI_3 .
21. A. Marrazzo, **M. Gibertini**, D. Campi, N. Mounet, and N. Marzari, Phys. Rev. Lett. **120**, 117701 (2018) and arXiv:1712.03873.
Prediction of a large-gap and switchable Kane-Mele quantum spin Hall insulator.
20. N. Mounet, **M. Gibertini**, P. Schwaller, D. Campi, A. Merkys, A. Marrazzo, T. Sohier, I.E. Castelli, A. Cepellotti, G. Pizzi, and N. Marzari, Nature Nanotech. **13**, 246 (2018) and arXiv:1611.05234. Featured as cover image of the March issue.
Two-dimensional materials from high-throughput computational exfoliation of experimentally known compounds.

2017

19. A. Bussy, G. Pizzi, and **M. Gibertini**, Phys. Rev. B **96**, 165438 (2017) and arXiv:1705.01303.
Strain-induced polar discontinuities in 2D materials from combined first-principles and Schrödinger-Poisson simulations.
18. T. Sohier, **M. Gibertini**, M. Calandra, F. Mauri, and N. Marzari, Nano Lett. **17**, 3758 (2017) and arXiv:1612.07191.
Breakdown of optical phonons' splitting in two-dimensional materials.

2016

17. G. Pizzi*, **M. Gibertini***, E. Dib*, N. Marzari, G. Iannaccone, and G. Fiori, Nat. Commun. **7**, 12585 (2016) and arXiv:1612.04129.
Performance of arsenene and antimonene double-gate MOSFETs from first principles.

2015

16. **M. Gibertini** and N. Marzari, Nano Lett. **15**, 6229 (2015) and arXiv:1509.07598.
Emergence of one-dimensional wires of free carriers in transition-metal-dichalcogenide nanostructures.
15. D. Dumcenco, D. Ovchinnikov, K. Marinov, P. Lazić, **M. Gibertini**, N. Marzari, O. Lopez Sanchez, Y.-C. Kung, D. Krasnozhan, M.-W. Chen, S. Bertolazzi, P. Gillet, A. Fontcuberta i Morral, A. Radenovic, and A. Kis, ACS Nano **9**, 4611 (2015).
Large-area epitaxial monolayer MoS_2 .
14. Y. Krupskaya, **M. Gibertini**, N. Marzari, and A. Morpurgo, Adv. Mat. **27**, 2453 (2015) and arXiv:1507.03424.
Band-like electron transport with record-high mobility in the TCNQ family.

2014

13. **M. Gibertini**, G. Pizzi, and N. Marzari, Nature Communications **5**, 5157 (2014) and arXiv:1412.2471.
Engineering polar discontinuities in honeycomb lattices.
12. **M. Gibertini**, F.M.D. Pellegrino, N. Marzari, and M. Polini, Phys. Rev. B **90**, 245411 (2014) and arXiv:1410.7325.

2013

11. N. Didier, **M. Gibertini**, A. Moghaddam, J. König, and R. Fazio, Phys. Rev. B **88**, 024512 (2013) and arXiv:1202.6357.
Josephson-Majorana cycle in topological single-electron hybrid transistors.
10. **M. Gibertini**, R. Fazio, M. Polini, and F. Taddei, Phys. Rev. B **88**, 140508(R) (2013) and arXiv:1302.2736.
Topological pumping in class-D superconducting wires.
9. D. Rossini, **M. Gibertini**, V. Giovannetti and R. Fazio, Phys. Rev. B **87**, 085131 (2013) and arXiv:1301.3735.
Topological pumping in the one-dimensional Bose-Hubbard model.

2012

8. J.P. Dahlhaus, **M. Gibertini**, and C.W.J. Beenakker, Phys. Rev. B. **86**, 174520 (2012) and arXiv:1208.5491.
Scattering theory of topological invariants in nodal superconductors.
7. **M. Gibertini**, A. Tomadin, F. Guinea, M.I. Katsnelson, and M. Polini, Phys. Rev. B **85**, 201405(R) (2012) and arXiv:1111.6280.
Electron-hole puddles in the absence of charged impurities.
6. **M. Gibertini**, F. Taddei, M. Polini, and R. Fazio, Phys. Rev. B **85**, 144525 (2012) and arXiv:1111.4656.
Local density of states in metal – topological superconductor hybrid systems.

2011

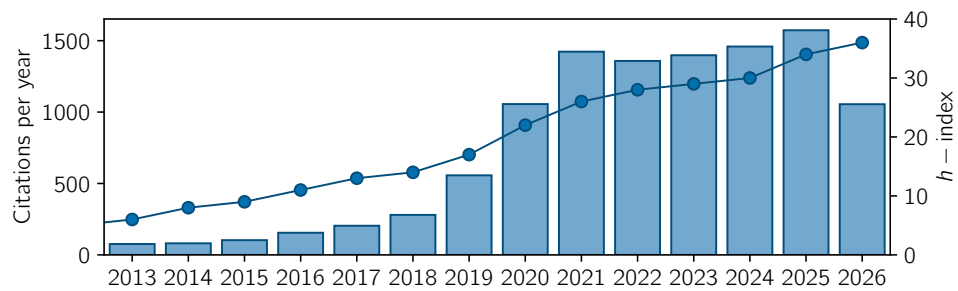
5. S. Peotta, **M. Gibertini**, F. Dolcini, F. Taddei, M. Polini, L.B. Ioffe, R. Fazio, and A.H. MacDonald, Phys. Rev. B **84**, 184528 (2011) and arXiv:1108.1533. Selected as PRB Editors' suggestion.
Josephson current in a four-terminal superconductor/exciton-condensate/superconductor system.
4. A. Singha, **M. Gibertini**, B. Karmakar, S. Yuan, M. Polini, G. Vignale, M.I. Katsnelson, A. Pinczuk, L.N. Pfeiffer, K.W. West, and V. Pellegrini, Science **332**, 1176 (2011) and arXiv:1106.3215.
Two-dimensional Mott-Hubbard electrons in an artificial honeycomb lattice.

2010

3. G. De Simoni, A. Singha, **M. Gibertini**, B. Karmakar, M. Polini, V. Piazza, L.N. Pfeiffer, K.W. West, F. Beltram, and V. Pellegrini, Appl. Phys. Lett. **97**, 132113 (2010) and arXiv:1007.3168.
Delocalized-localized transition in a semiconductor two-dimensional honeycomb lattice.
2. **M. Gibertini**, A. Tomadin, M. Polini, A. Fasolino, and M.I. Katsnelson, Phys. Rev. B **81**, 125437 (2010) and arXiv:1002.1268.
Electron density distribution and screening in rippled graphene sheets.

2009

1. **M. Gibertini**, A. Singha, V. Pellegrini, M. Polini, G. Vignale, A. Pinczuk, L.N. Pfeiffer, and K.W. West, Phys. Rev. B **79**, 241406(R) (2009) and arXiv:0904.4191. Selected as PRB Editors' suggestion and Physics viewpoint.
Engineering artificial graphene in a two-dimensional electron gas.



Source: Web of Science™, 11/09/2026.

Patents

- 24/3/2016 US patent application 20160087129 on “Methods for engineering polar discontinuities in non-centrosymmetric honeycomb lattices and devices including a two-dimensional insulating material and a polar discontinuity of electric polarization”. Inventors: **M. Gibertini**, G. Pizzi, N. Marzari.

Oral contributions to conferences, workshops, and schools

2026

- 07-11/09 Wannier90 developers' meeting, Trieste, Italy.
pitch talk *Constrained Wannierization to separate spin and orbital degrees of freedom.*
- 26-28/08 Organizer of the Condensed-Matter Theory Conference, Brixen, Italy.
- 07-11/09 54th International Conference on the Physics of Semiconductors “Jaszowiec 2026”, Szczyrk, Poland.
- invited talk *First-principles exploration of novel 2D magnetic semiconductors.*

2025

- 25-28/08 Psi-k 2025 Conference, Lausanne, Switzerland.
talk *Constrained Wannierization to compute magnetic exchange interactions in plane-wave DFT.*
- 21-23/05 Workshop on recent progress, development, and applications of two-dimensional magnets in spintronics 'Let's give it a spin!', Belgrade, Serbia.
- invited talk *Electric field control of spin (and valley) polarization in two-dimensional antiferromagnets.*

2024

- 23-27/09 Workshop on Spin-Orbit Entangled Quantum Magnetism, Vienna, Austria.
invited talk *Expanding the portfolio of two-dimensional magnetic materials and their applications from first principles.*
- 1-5/07 International Conference on Magnetism 2024, Bologna, Italy.
invited talk *Expanding the portfolio of two-dimensional magnetic materials from first principles.*
talk *Switchable Chern number in van der Waals heterostructures.*
- 22-26/04 2024 MRS Spring Meeting & Exhibit, Seattle, USA.
invited talk *Expanding the portfolio of two-dimensional magnetic materials and their applications from first principles.*

2023

- 16-20/10 Workshop on Quantum Magnetic Materials, Lorentz Center, Leiden, Netherlands.
round table *Challenges and opportunities of 2D van der Waals magnetic materials.*

- 4-8/9 30th General Conference of the Condensed Matter Division of the European Physical Society, Milan, Italy.
- invited talk *Expanding the portfolio of two-dimensional magnetic materials and their applications from first principles.*
- talk *Volatile and non-volatile control of 2D topological insulators with vertical electric fields.*
- 5-7/6 Conference of the Condensed-Matter Theory community, Brixen, Italy.
- invited talk *Towards high-mobility 2D semiconductors through accurate and automated simulations.*
- 11-13/1 21st International Workshop on Computational Physics and Materials Science: Total Energy and Force Methods, ITCP, Trieste, Italy.
- poster *Emergent controllable topological phases in van der Waals heterostructures.*
-
- 2022**
- 22-25/8 Psi-k conference, Swiss Tech Convention Centre, Lausanne, Switzerland
- poster *Emergent controllable topological phases in van der Waals heterostructures.*
- 14-18/3 APS March Meeting, mixed event.
- talk *Twist-resilient and robust ferroelectric quantum spin Hall insulators driven by van der Waals interactions.*
-
- 2021**
- 27-29/10 CECAM Workshop on "Computational materials discovery of unconventional magnets", Lausanne, Switzerland.
- invited talk *Novel two-dimensional (magnetic) materials from high-throughput computational exfoliation.*
- 23-27/08 EPFL-ETH summer school on "Spintronics and Magnetism on 2D Materials", virtual event.
- invited lecture *Theory and simulation of magnetism in 2D materials.*
- 15-19/3 APS March Meeting, virtual event.
- talk *Remote free-carrier screening to boost the mobility of Fröhlich-limited 2D semiconductors.*
-
- 2020**
- 28/10 Israel-Italy workshop on "Nanomaterials For The Future", virtual event.
- invited talk *Novel two-dimensional materials from high-throughput computational exfoliation.*
- 2-6/3 APS March Meeting, Denver (CO), USA. Cancelled because of the Covid-19 pandemic.
- invited talk *Novel two-dimensional materials from high-throughput computational exfoliation.*
-
- 2019**
- 4-8/3 APS March Meeting, Boston (MC), USA.
- talk *Relative stability and magnetic ground state of all stacking patterns in bilayer chromium trihalides from first principles.*
- 9-11/1 19th International Workshop on Computational Physics and Materials Science: Total Energy and Force Methods, ITCP, Trieste, Italy.
- poster *Relative stability and magnetic ground state of all stacking patterns in bilayer chromium trihalides from first principles.*
-
- 2018**
- 10-12/9 International workshop on Computational Design and Discovery of Novel Materials (COMDI), Lausanne, Switzerland
- talk *Rigid vibrations and spectroscopic fingerprints of layered materials*
- 3-7/9 International conference "Flatlands beyond graphene", Leipzig, Germany.
- talk *Shear and Layer breathing modes of layered materials*

- 25/5 Graphene CDT Advanced Technology Lectures, Cambridge Graphene Centre, United Kingdom.
- invited lecture *Topology, magnetism and vibrations in layered materials*

2017

- 26/11-1/12 MRS Fall Meeting, Boston, USA.
- invited talk *Engineering One-Dimensional Wires of Free Carriers through Polar Discontinuities*
- 12/9 Annual meeting of the Swiss Society for Crystallography: "Crystallography meets Physics", Geneva, Switzerland.
- invited talk *Novel 2D materials from high-throughput computational exfoliation of experimentally known compounds*
- 8-9/5 Workshop on Quantum Matter: functional, topological and Dirac states, ETHZ, Zurich, Switzerland.
- invited talk *Novel 2D materials from materials informatics*
- 6-10/2 Workshop "Synthetic methods across the flagship", Puerto de la Cruz-Tenerife, Spain.
- talk *Novel two-dimensional materials from high-throughput computational exfoliation of experimentally known compounds*
- 12-14/1 18th International Workshop on Computational Physics and Materials Science: Total Energy and Force Methods, ITCP, Trieste, Italy.
- poster *One-dimensional metallic wires at phase-engineered boundaries in two-dimensional materials.*

2016

- 10-12/10 Graphene Flagship EU-US Workshop on 2D Materials, Heterostructures and Devices, Manchester, UK.
- poster *One-dimensional metallic wires at phase-engineered boundaries in two-dimensional materials.*
- 14-18/3 APS March Meeting, Baltimore (MD), USA.
- talk *One-dimensional metallic wires at phase-engineered boundaries in two-dimensional materials.*
- 13-20/2 International Winterschool on Electronic Properties of Novel Materials, Kirchberg, Austria.
- invited talk *Engineering electron and hole wires in 2D materials through polar discontinuities.*
- 19-23/1 Workshop on "Advances in the synthesis of graphene" (Graphene Flagship WP1 meeting), Fuerteventura, Spain.
- talk *Engineering wires of free carriers in 2D materials.*

2015

- 6-10/9 Psi-k 2015 Conference, San Sebastian/Donostia, Spain.
- talk *Engineering polar discontinuities in 2D honeycomb lattices.*
- 28-30/6 Topical meeting on 2D transition metal dichalcogenides, Villa Garbald, Switzerland.
- invited talk *Engineering polar discontinuities in transition metal dichalcogenides and other 2D materials.*
- 13-17/4 CECAM School on "Excitations in realistic materials using Yambo on massively parallel architectures", Lausanne, Switzerland.
- poster *Engineering polar discontinuities in 2D honeycomb lattices.*
- 22-24/4 US-EU workshop on 2D layered materials and devices, Arlington (VA), USA.
- invited talk *Engineering electron and hole wires in 2D materials through polar discontinuities.*
- 8-10/4 CECAM Workshop on "Emergent structural and electronic phenomena at interfaces of nanoscale oxides", Lausanne, Switzerland.
- invited talk *Engineering polar discontinuities in 2D honeycomb lattices.*
- 15-20/3 Spring Meeting of the German Physical Society, Berlin, Germany.

- talk *Origin of metallic edge states in transition-metal-dichalcogenide nanostructures.*
- 15-17/1 17th International Workshop on Computational Physics and Materials Science: Total Energy and Force Methods, ITCP, Trieste, Italy.
- invited talk *Engineering polar discontinuities in honeycomb lattices.*

2014

- 20-21/10 Workshop on “Nanoscience for Clean Energy”, Ringberg Castle, Germany.
- invited talk *First-principles engineering of 2D materials for light harvesting.*
- 5/6 Topical meeting on 2D transition metal dichalcogenides, Geneva, Switzerland.
- invited talk *Engineering the electronic structure of two-dimensional lattices.*
- 2-3/6 Platform for Advanced Scientific Computing (PASC) Conference, Zurich, Switzerland.
- talk *Engineering polar discontinuities in two-dimensional honeycomb lattices.*
- 30/3-4/4 Spring Meeting of the German Physical Society, Dresden, Germany.
- talk *Polarization discontinuities in two-dimensional honeycomb lattices.*

2013

- 10-15/3 Spring Meeting of the German Physical Society, Regensburg, Germany
- talk *Electron-hole puddles in the absence of charged impurities.*
- 10-12/1 16th International Workshop on Computational Physics and Materials Science: Total Energy and Force Methods, ITCP, Trieste, Italy.
- poster *Electron-hole puddles in the absence of charged impurities.*

2012

- 3-7/9 CECAM Workshop on “Graphene: from band structure to many-body physics”, Bremen, Germany.
- poster *Electron-hole puddles in the absence of charged impurities.*
- 12-17/2 International Physics School “Fundamentals of Nanoelectronics”, Tenerife, Spain.
- poster *Two-dimensional Mott-Hubbard electrons in an artificial honeycomb lattice.*

2011

- 26/7-7/8 Summer School and Workshop “Quantum phenomena in graphene, other low-dimensional materials, and optical lattices”, Erice, Italy.
- poster *Two-dimensional Mott-Hubbard electrons in an artificial honeycomb lattice.*

2010

- 9-23/8 5th Windsor Summer School: “Quantum phenomena in low dimensional materials and nanostructures”, Great Park (Windsor), UK.
- poster *What does STM tell us about disorder in exfoliated graphene sheets?*

2009

- 2-9/11 “DMD-CNR National School: Physics of Spin in Materials”, Chiavari (GE), Italy.
- poster *Engineering artificial graphene in a two-dimensional electron gas.*

Outreach activities

- 22/03/2024 Dissemination seminar addressed to high-school teachers and university students on waves in crystals.
- 06/02/2024 Activity on crystal structure and electronic properties of materials for high-school students within the program “A tu per tu con la scienza”

- 29/09/2023 Interactive presentation on flexible and biocompatible electronics at the European Researchers' Night.
- 30/09/2022 Interactive presentation of the research activities on 2D materials at the European Researchers' Night.
- 08/06/2022 Activity on crystal structure and electronic properties of materials for high-school students within the program "Una settimana da scienziato".
- 24/09/2021 Interactive presentation of the research activities on 2D materials at the European Researchers' Night.
- 19/02/2021 Dissemination seminar addressed to high-school teachers and university students on topological phases of matter.
- 5-6/11/2016 Interactive presentation of the group scientific activities during EPFL "Portes Ouvertes".

Seminars

- 08/05/2026 "A first-principles journey into altermagnetic flatlands", Université de Geneve, Geneva (CH).
- 21/01/2026 "Engineering emergent topological phases in van der Waals heterostructures", École Polytechnique Fédérale de Lausanne, Lausanne (CH)
- 05/05/2025 "Engineering emergent topological phases in van der Waals heterostructures", University of Basel (CH).
- 14/02/2025 "Engineering emergent topological phases in van der Waals heterostructures", University of Turin (IT), online.
- 02/05/2024 "Towards high-mobility 2D semiconductors through accurate and automated first-principles simulations", Technical University of Denmark, Lyngby (DK).
- 28/04/2022 "Screening and engineering topological properties in novel two-dimensional materials and their heterostructures", University of Bath (UK), online.
- 07/02/2018 "Monolayer Jacutingaite: a large-gap and switchable topological insulator from a portfolio of novel 2D materials", University of Modena and Reggio Emilia, Modena (IT).
- 26/10/2015 "Engineering electron and hole wires in 2D materials through polar discontinuities", Université de Geneve, Geneva (CH).
- 2/10/2015 "Engineering electron and hole wires in 2D materials through polar discontinuities", University of Modena and Reggio Emilia, Modena (IT).
- 11/06/2012 "Electron-hole puddles in the absence of charged impurities in single layer graphene", École Polytechnique Fédérale de Lausanne, Lausanne (CH).
- 11/05/2012 "Probing the existence of Majorana fermions: from local density of states to new transport mechanisms", Freie Universität, Berlin (D).
- 18/04/2012 "Probing the existence of Majorana fermions: from local density of states to new transport mechanisms", Université de Geneve, Geneva (CH).
- 5/10/2011 "Josephson drag through an exciton condensate", Lorentz Institute, Leiden (NL).
- 21/9/2011 "Local density of states of Majorana fermions in normal metal-superconductor junctions", Lorentz Institute, Leiden (NL).

Supervision of graduate students

- 11/2023-04/2024 Andrea Pintus, master thesis on second-order screened exchange approximation using the sum-over-poles representation and the algorithmic inversion method.
- 01-09/2023 Matteo Quinzi, master thesis on broken symmetry solutions in one-dimensional lattice models via many-body perturbation theory.
- 02-04/2023 Andrea Biondini, bachelor thesis on the topology and spectrum of the Hofstadter butterfly.
- 04-06/2022 Margherita Rebottini, bachelor thesis on the topological properties of the Haldane and Kane-Mele models.

04-06/2022	Francesco Cosimo Castellucci, bachelor thesis on the magnetic properties of 2D systems through Monte Carlo simulations.
09/2021-03-2022	Cesare Cozza, master thesis on magnetic field tunable topological states in van der Waals heterostructures.
04-06/2021	Matteo Quinzi, bachelor thesis on the topological classification of an extended 1D Shockley model.
09/2015-11/2019	Antimo Marrazzo, co-supervision of PhD project on high-throughput search for topological insulators in two-dimensional materials.
04-12/2017	Farzad Rezaeianaran, master semester project on automatic calculation of piezoelectric tensors from first principles
02-06/2016	Augustin Bussy, master thesis project on stabilization pathways for MoS ₂ T-phase from first principles and group theory.
09-12/2015	Augustin Bussy, master semester project on dielectric properties of 2D materials interfaces and their simulation using a Schrödinger-Poisson approach.
06-12/2015	Daniel Marchand, master exchange project on automated computation of projected and local density of states with AiiDA and their visualization; automated computation of Wannier functions.
05-07/2015	Vadlamani Sri Krishna, bachelor exchange project on automated calculation of effective masses from Wannier interpolation.
02-05/2015	Alvaro Charlet, master semester project on electronic and transport properties of two-dimensional materials using Wannier functions.
02-05/2014	Christopher Schmitt, master semester project on the calculation of the thermoelectric power of MoS ₂ with the help of Wannier functions.

Management, administrative, and other professional activities

2022-present	Committee secretary of the Master Degree Council in Physics.
2019-present	Council member for the PhD School in Physics and Nanoscience.
2016-present	Expert member in the commission for the PhD candidacy exams, bachelor and master degrees (EPFL, UNIMORE), PhD candidacy exams (EPFL), PhD defence (La Sapienza, DTU, Basel).
2011-present	I have been reviewer for several scientific journals: Nature, Science, Nature Materials, ACS Nano, Journal of the American Chemical Society, Nano Letters, Nature Communications, Science Advances, Chemistry of Materials, Physical Review X, Nanoscale Horizons, Nanoscale Advances, npj Computational Materials, Physical Review Letters, 2D Materials, Scientific Reports, New Journal of Physics, Applied Surface Science, npj 2D Materials and Applications, npj Quantum Materials, Physical Review Materials, Physical Review Research, Physical Review B, Applied Physics Letters, Computer Physics Communications, ChemPhysChem, Journal of Applied Physics, Europhysics Letters, Journal of Electron Spectroscopy and Related Phenomena, Philosophical Magazine, European Physical Journal B.

Fellowships and awards

2022	Co-recipient of the PRACE HPC Excellence Award (20'000 €), issued by the Partnership for Advanced Computing in Europe.
2007-2009	Prestigious undergraduate fellowship from Scuola Normale Superiore, Pisa.
2004-2006	Academic scholarship for best students from University of Modena and Reggio Emilia.

September 11, 2026