

Martina Gerbino

Researcher

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Current position

Oct 2019 Researcher (ricercatrice III livello), Istituto Nazionale di Fisica Nucleare (INFN), sezione di Ferrara

Past positions

Nov 2018 – Postdoctoral Appointee, High Energy Physics division, Argonne National Laboratory;
Oct 2019 Associated Fellow at the Kavli Institute for Cosmological Physics, the University of Chicago
Nov 2015 – Postdoctoral Researcher at the Oskar Klein Centre for Cosmoparticle Physics (OKC),
Nov 2018 Stockholm University

Research Interests

Brief description I am a theoretical cosmologist working at the interface between theory and observations. I test fundamental physics theories against cosmological data. My research activities span a broad range of interests, including phenomenological investigation of theoretical models with a main focus on neutrino physics, and analysis and interpretation of Cosmic Microwave Background (CMB) data.

Key-words Neutrino physics, Fundamental Physics, CMB, Early Universe, Large Scale Structures, Data analysis, Systematics, Bayesian Inference, Model comparison.

Publications Full list of preprint and publications: [INSPIRE/Gerbino](https://inspirehep.net/literature/author/index/gerbino). ORCID ID: <https://orcid.org/0000-0002-3538-1283>

Education

2013 – PhD in Physics, University of Rome “Sapienza”,
2015 *Thesis*: Current and future constraints on fundamental physics in light of the results from the Planck satellite, *final mark: cum laude*
Received: 22 Jan 2016
Thesis Supervisor: Prof. Alessandro Melchiorri, *Co-supervisor*: Dr. Luca Pagano
2010 – Master’s Degree in Astronomy and Astrophysics, University of Rome “Sapienza”,
2012 *final mark*: 110/110 *cum laude*
2007 – Bachelor’s Degree in Physics, University of Rome “Sapienza”
2010 *final mark*: 110/110 *cum laude*

— Collaboration memberships

- 2020 – Member of the LiteBIRD collaboration. Involved in data management activities and Present analysis pipeline development.
- 2020 – Member of the Euclid consortium. Member of the CMBXC working group, for the Present development of the likelihood code for CMB-galaxy cross-correlation.
- 2017 – Member of the CMB Stage-IV collaboration. Member of the “Governing Board” and Present of the “Publication Committee” (since 2020). Active participation to the preparation of Decadal Survey Report on neutrino masses from cosmology.
- 2016 – Member of the Simons Observatory collaboration. Co-leader of the “Likelihood and Present Theory” working group, devoted to development of the official likelihood code for the extraction of cosmological parameters. Coordinator of the study for the propagation of instrumental systematics to cosmological parameters. Participation to the study of propagation of systematics in polarization, that informed the preliminary experimental setup. The study led to several proceedings of the SPIE conference (major conference for presentation of original results in experimental astrophysics). Participation to the preparation of the Science Overview Paper that summarizes forecast performances in terms of cosmological constraints.
- 2015 – Member of the CORE collaboration, one of the leading authors of the paper forecasting Present sensitivity on key cosmological parameters.
- 2013 – Member of the Planck-LFI Core Team (since 2016), major role in the large-scale Present polarisation likelihood team, relevant contribution to the Likelihood and Cosmological Parameter papers.

— Invited talks

- 1 Latest Advances in the Physics of BBN and Neutrino Decoupling, online, 12-13 Apr 2021, *Cosmological measurements of Neff: current status and future prospects*, plenary talk
- 2 Statistical Mechanics and Field Theory (SM&FT) 2019, Bari, 11-13 Dec 2019, *The standard cosmological model: current status and future prospects*, plenary talk
- 3 Workshop on Connecting Insights in Fundamental Physics: Standard Model and Beyond, Corfu, 31 Aug-11Sep 2019, *Cosmological constraints on neutrino physics*
- 4 Vera Rubin Symposium, Washington DC, 24-26 Jun 2019, *Neutrino mass from cosmology*, plenary talk
- 5 COSMOS meeting on Λ CDM, Rome, 28-29 May 2019, *Neutrino cosmology*, keynote
- 6 Neutrino Telescopes, Venice 18-22 Mar 2019, *Cosmology: Hubble Constant and Neutrinos*, plenary talk
- 7 Cosmology 2018, Dubrovnik, 22-27 Oct 2018, *Neutrino properties from Cosmology*, plenary talk
- 8 TeV Particle Astrophysics (TeVPA), Berlin, 27-31 Aug 2018, *Neutrino mass constraints from cosmology*, plenary talk

- 9 XII International Conference on the Interconnection between Particle Physics and Cosmology (PPC 2018), Zurich, 20-24 Aug 2018, *Neutrinos in cosmology*, plenary talk
- 10 COSMOS meeting on Astroparticle and Fundamental Physics with the Cosmic Microwave Background, Ferrara, 26-27 Jun 2018, *A review of neutrino cosmology*, keynote talk
- 11 VI Meeting on Fundamental Cosmology, Granada, 28-30 May 2018, *Neutrino Properties from Cosmology*
- 12 NuPhys2017: Prospects in Neutrino Physics, London, UK, 20-22 Dec 2017, *Neutrino properties and cosmology*, plenary talk
- 13 Invisibles2017 Workshop, Zurich, CH, 12-16 Jul 2017, *Massive neutrinos in cosmology*, senior talk
- 14 COSMO-16, Ann Arbor, MI-USA, 8-12 Aug 2016, *Neutrinos in cosmology: an overview*, plenary talk
- 15 Neutrinos and light particles in cosmology, Berkeley CCP, USA, 22-24 Jun 2016, *Constraints on neutrino masses from cosmology and laboratory experiments*
- 16 9th LHC Days in Split, held in Split, Croatia, 29 Sep-4 Oct 2014, *Constraining Fundamental Physics with Planck*

International conferences, workshops and seminars

For a full list, see sections “Seminars” and “Contributed talks and posters”

Honours and awards

- 2021 National scientific habilitation to full professor for the Astronomy and Astrophysics sector of the Italian academic system
- 2020 National scientific habilitation to associate professor for the Astronomy and Astrophysics sector of the Italian academic system
- 2019 Official certificate in recognition of the “important contribution to the final results published by the Planck Collaboration” by Jan Tauber, Planck Project Scientist.
- 2018 Gruber Prize in Cosmology 2018 as a member of the Planck Team; Group Achievement Award (Royal Astronomical Society) as a member of the Planck Team
- 2016 Grant from Nordic Institute for Theoretical Physics - NORDITA for the organization of a month-long scientific program and a one-week conference (400k SEK)
- 2015 Best talk, Nordita Day, NORDITA, *A Tale of a Bright Guy: Listening to the CMB old story*
- 2014 P.I. of the project “Neutrino Physics in the Era of Precision Cosmology” - Grant for junior researchers (2k€) University of Rome “Sapienza”
- 2012 Corso di Eccellenza (course and grant for outstanding students), Master’s in Astronomy and Astrophysics, University of Rome “Sapienza”
- 2011 ISSNAF-INAF Fellowship (subsistence and 400\$/week for research) for a summer internship at NASA Goddard Space Flight Center, USA, supervisor: Dr. Neil Gehrels

- 2008 – Corso di Eccellenza (course for outstanding students), Bachelor's in Physics, University of Rome "Sapienza"
2010
2007 – University fellowship for outstanding students, "Collegio Universitario Lamaro-Pozzani",
2012 Rome

Organisation of conferences and workshops

- 1 Invited member of the TAUP 2021 International Advisory Committee
- 2 CMB-S4 Spring Collaboration Meeting, LOC member (fully online event)
- 3 "Next-generation Spectroscopy with LSST" workshop, Argonne National Laboratory, USA, SOC and LOC member
- 4 Convener of the "Cosmology" parallel session of the TeV Particle Astrophysics (TeVPA) conference, Sydney, Australia, 2-6 Dec 2019, <https://indico.cern.ch/event/828038/overview>
- 5 Main organiser of the Nordita program "Advances in Theoretical Cosmology in Light of Data", Stockholm, Sweden, 4-29 Jul 2017, <http://cosmo-nordita.fysik.su.se>
- 6 Convener of the "Cosmology" parallel session of the TeV Particle Astrophysics (TeVPA) conference, Columbus, OH-USA, 7-11 Aug 2017, <https://tevpa2017.osu.edu>

Institutional activities

- 2021 – Faculty member, PhD program in Physics, Ferrara University
Present
- 2020 Admission committee to the PhD program in Physics, Ferrara University
- 2019 – Organiser of cosmology seminars, weekly journal clubs and cosmology group meetings,
Present Ferrara University
- 2019 Coordinator of the "Cosmic Infrared Background" working group, HEP-ANL
- 2019 Member of the HEP-ANL committee for lunch seminars: organisation of weekly/biweekly seminars delivered by leading experts
- 2016 – Member of the OKC colloquium committee: organisation of weekly colloquia delivered
2018 by international experts in the research fields represented at the OKC.
- 2017 – Coordinator of the "Cosmology and Gravity" working group at the OKC: organisation
2018 of bi-weekly working group activities, including seminars, journal club, brainstorming sessions.

Reviewing activities

- 2016 – Reviewer for Physical Review D (PRD), Physical Review Letters (PRL), Journal of
present Astroparticle Physics (JCAP), Annalen der Physik, International Journal of Modern Physics D
- 2017 Reviewer for NASA Experimental Program to Stimulate Competitive Research (EP-SCoR), 2017

Additional research experiences

- Mar-Sep 2020 Visiting scientist, by invitation of Prof. K. Heitmann, HEP Division, Argonne National Laboratory, canceled due to COVID-19 emergency
- Feb-Jun 2017 Long term visit at the University of Michigan, Ann Arbor, MI-USA
- May-Jun 2015 Long term visit at Kavli Institute for Cosmological Physics (KICP), Chicago, IL-USA, host Prof. E.W.Kolb.
- Jul-Sep 2011 Summer Internship at the NASA Goddard Space Flight Center, supervisor: Dr. Neil Gehrels. Main contributor of the following work: Sakamoto, Gerbino, Cummings, *Classifying the X-ray Afterglow Light Curves Based on the Pulse Structure of the GRB Prompt Emission*, presented at the "Time Domain Astrophysics with Swift" conference, Clemson, SC, October 24-26, 2011

Seminars

- 1 High Energy Physics Division Seminar, Argonne National Laboratory, Jul 2020, *Neutrinos Across Frontiers*
- 2 Physics Seminar, Physics Division, Argonne National Laboratory, Jul 2019, *Neutrinos in Cosmology*
- 3 Astroparticle Seminar, SISSA, May 2019, *Neutrino Cosmology: Planck and Post-Planck perspectives*
- 4 Theory seminar, HEP Division, Argonne National Laboratory, Mar 2019, *Neutrinos in Cosmology*
- 5 OKC Day, Stockholm, Sep 2018, *CMB, Neutrinos and the OKC*
- 6 High Energy Physics theory seminar, Institute for Theoretical Particle Physics and Cosmology, Aachen University, Jun 2018, *Parity-violating scenarios in the early Universe in light of Cosmic Microwave Background data*
- 7 Cosmology Seminar, Institute of Theoretical Astrophysics, University of Oslo, May 2018, *Neutrino Properties from Cosmology*
- 8 Severo Ochoa Seminar, Institut de Física Corpuscular (IFIC) Valencia, May 2018, *Present and future of fundamental physics with the Cosmic Microwave Background*
- 9 Nuclear Particle Astrophysics Seminar, Yale University, May 2017, *Neutrino Mass from Cosmology*
- 10 HEP-Astro Seminar, University of Michigan, Apr 2017, *Neutrino Mass from Cosmology*
- 11 INPA Seminar, LBNL Berkeley, Mar 2017, *Three Neutrinos in Cosmology (to Say Nothing of Laboratory)*
- 12 OKC Day, Stockholm, Nov 2015, *Constraining Fundamental Physics with (Planck) CMB Data*
- 13 Nordita Day, Stockholm, Nov 2015, *A Tale of a Bright Guy: Listening to the CMB old story*, **awarded best talk of the event**

Contributed talks and posters

- 1 Topics in Cosmic Neutrino Physics, Fermilab, 9-11 Oct 2019, *Complementarity between cosmology and lab searches of neutrino properties*
- 2 TeV Particle Astrophysics (TeVPA), Columbus, OH, 7-11 Aug 2017, *Sensitivity of cosmological data to the neutrino mass hierarchy*, talk
- 3 Neutrino Oscillation Workshop (NOW), Otranto, Italy, 4-11 Sep 2016, *The hunt for neutrino hierarchy*, talk
- 4 51st Rencontres de Moriond, La Thuile, Italy, 19-26 Mar 2016, *Neutrino properties in light of cosmological and laboratory probes: current results and forecasts*, talk
- 5 28th Texas Symposium on Relativistic Astrophysics, Geneva, Switzerland, 13-18 Dec 2015, *Joint Constraints on Neutrino Masses from Cosmology and Particle Physics*, talk
- 6 XIV Marcel Grossmann meeting, Rome, 12-18 Jul 2015, *Joint Constraints on Neutrino Masses from Cosmology and Particle Physics*, talk
- 7 Cosmology on Safari, held in KwaZulu Natal, South Africa, 26-30 Jan 2015, *Neutrino properties from cosmology and particle physics*, talk
- 8 Planck 2014 - The microwave sky in temperature and polarization, held in Ferrara, Italy, 1-5 Dec 2014, *Planck 2014 constraints on neutrino perturbations*, poster on behalf of the Planck collaboration
- 9 5th Young Research Meeting, held in Trieste, Italy, 14-15 Jul 2014, *Neutrino mass scale in the era of precision cosmology*, talk
- 10 International School of Space Science, Observing the Universe with the Cosmic Microwave Background, held in L'Aquila, Italy, 22-26 Apr 2014, *Non-standard physics in light of CMB experiments*, talk
- 11 Rencontres de Moriond, held in La Thuile, Italy, 22-29 Mar 2014, *Neutrino anisotropies after Planck*, poster
- 12 7th TRR33 Winter School, held in Passo del Tonale, Italy, 1-6 Dec 2013, *Neutrino anisotropies after Planck*, talk
- 13 International School of Physics "Enrico Fermi", New Horizons in Observational Cosmology, held in Varenna, Italy, 1-6 Jul 2013, *Neutrino anisotropies*, poster

Teaching and mentoring

- 2020 Lecturer, *Neutrino Cosmology*, PhD course in Physics, Ferrara University
- 2019 Mentor of a junior member (grad student) of the SO collaboration
- 2014 Tutor – Preliminary courses for Mathematics Bachelor's
- 2013 – Teaching assistant – 'Mechanics', Physics Bachelor's
- 2014
- 2013 – Teaching assistant – 'Mechanics and Thermodynamics', Mathematics Bachelor's
- 2014

Supervision of students

- 1 PhD, Luca Caloni, co-supervisor, 2019-date (astroparticle physics), Ferrara University
- 2 PhD, Serena Giardiello, supervisor, (science performance of the LiteBIRD satellite), Ferrara University
- 3 PhD, Sunny Vagnozzi, mentor, 2015-2018 (constraining fundamental physics with cosmological data), Stockholm University
- 4 Master, Nicolò Elia Raffuzzi, co-supervisor, 2020, *Impact of instrumental systematics on future Cosmic Microwave Background observations: half-wave plate non-idealities and the quest for V modes*, defended, Ferrara University, Italy
- 5 Master, Francesco Sorrenti, external supervisor, 2020-date (constraints on neutrino masses from the reconstruction of the large-scale matter power spectrum, in preparation), Perugia University, Italy

Education and Outreach experiences

- 2021 Seminar for “Percorsi di Eccellenza” (extra curricula activities for outstanding high-school students), Ferrara University, *Big Bang Nucleosynthesis: la nascita degli elementi leggeri nell’ Universo primordiale*
- 2020 Seminar for “Associazione Italiana Studenti di Fisica” (Italian Physics Student Association), Perugia University, *Fantastica CMB e dove trovarla*
- 2020 – Coordinator of cosmology laboratories for high-school students, Ferrara University
- Present
- 2019 Speaker for “Soapbox Science 2019”, *Tiny, elusive, with a strong personality: How neutrinos have been shaping the Universe we live in, and how cosmology can help unveil their secrets*, Chicago, 13 Jul 2019
- 2019 Astronomy on Tap, outreach seminar on history of neutrino experimental searches, Berkeley, 5 Jul 2019
- 2018 Co-organiser of the Cosmology workshop “Blackbody throughout the Universe” during the Stockholm events “Forskarsfredag” and “Fysikfest” for the European Reserachers’ Night, 28-29 Sep 2018
- 2018 – Co-leader of the “Education and Public Outreach” working group for the Simons Present Observatory collaboration. Duties: official website content manager, official social media account manager, development and organisation of flagship outreach events
- 2016 Organiser of the “Nordita Day”, Nordita in-house event, May 2016
- 2012 – Examiner for the admittance tests to the “Collegio Universitario Lamaro-Pozzani’, 2016 Rome, academic years 2012-2013, 2014-2015, 2015-2016
- 2012 Contributed author of Semplici S (a cura di), *Italia No, Italia Forse, Perché i talenti fuggono e qualche volta ritornano*, Editrice La Scuola, ISBN 9788835036234

Languages

Italian (Mother tongue), English (Advanced), Swedish (Beginner)