

# Dr. Marco Baldi

## Curriculum Vitae et Studiorum

July 27, 2021

### — CONTACT INFORMATION —

MARCO BALDI

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### — EDUCATION AND RESEARCH APPOINTMENTS —

SEPTEMBER 2018 - PRESENT

**Senior Assistant Professor** (RTD-B) at the Department of Physics and Astronomy “Augusto Righi” of the Alma Mater University of Bologna.

MARCH 2017

**Habilitation to the role of Associate Professor** for italian universities (Abilitazione Scientifica Nazionale).

SEPTEMBER 2015 - SEPTEMBER 2018

**Fixed-Term Researcher** (RTD-A) without teaching duties at the Department of Physics and Astronomy of the Alma Mater University of Bologna.

NOVEMBER 2014 - SEPTEMBER 2015

**Post-Doctoral Researcher** at the Department of Physics and Astronomy of the Alma Mater University of Bologna.

NOVEMBER 2012 - OCTOBER 2014

**Marie-Curie Fellowship** recipient (under the 7th Framework Program of the European Commission) at the Department of Physics and Astronomy of the Alma Mater University of Bologna.

DECEMBER 2009 - OCTOBER 2012

**Post-Doctoral Researcher** at the Excellence Cluster Universe in Garching (Germany)

APRIL 2009 - OCTOBER 2009

**Post-Doctoral Researcher** at the Institute for Theoretical Physics, University of Heidelberg (Germany)

20 MARCH 2009

**Ph.D. in Astronomy (Dr.Rer.Nat.)** with the grade **MAGNA CUM LAUDE** at the Ludwig-Maximilians University in Munich (Germany), with the research thesis “**Interactions between Dark Energy and Dark Matter**”, held under the supervision of Prof. Dr. Simon D. M. White.

SEPTEMBER 2005 - MARCH 2009

**PhD Student** at the Max-Planck-Institut für Astrophysik in Garching (Germany) within the framework of the International Max Planck Research School on Astrophysics (IMPRS).

17 DECEMBER 2004

**Laurea in Physics** with the maximum mark of **110/110 CUM LAUDE** at the Bologna University, with the thesis “**Evolution of perturbations in cosmological models with dynamic dark energy**”, held under the supervision of Prof. Sabino Matarrese, Prof. Lauro Moscardini and Dr. Fabio Finelli.

## — FELLOWSHIPS AND RESEARCH GRANTS —

**2019 – Present - Research Unity Coordinator** of the PRIN-MIUR project “*Combining Cosmic Microwave Background and Large Scale Structure data: an Integrated Approach for Addressing Fundamental Questions in Cosmology*” (National Coordinator: Prof. Michele Liguori, University of Padova) funded under the PRIN-2017 funding initiative. The project entails the **coordination of an independent research group** composed by two post-doctoral researchers.

**2015 – 2018** - Recipient of a **SIR individual research grant** (EUR 530,552.00 for a period of 36 months, success rate  $\sim 2.7\%$ ) from the Italian Ministry of Research and Education (MIUR) as Principal Investigator of the SIMCODE ( “*Simulating the Impact of Cosmic Degeneracies on Precision Cosmology*”) research project, entailing the **coordination of an independent research group** composed by one PhD student and two post-doctoral researchers.

**2012 – 2014** - Recipient of a **Marie Curie Intra European Fellowship** (EUR 185,763.60 for a period of 24 months, success rate  $\sim 10\%$ ) under the 7-th framework program of the European Commission for the SIDUN ( “*Simulating the Dark Universe*”) research project.

**2006** - Awarded the **IMPRS PhD Fellowship** (3 years of PhD fellowship) from the International Max Planck Research School on Astrophysics in Garching (Germany).

## — COMPUTING TIME GRANTS —

**2020 – 2021** - Principal Investigator of the **ISCRA Class B project DZSH** (*Dynamic Zoom Simulations at High Resolution*): 1.5 million CPU hours on the Tier-0 machine Marconi100 (Cineca Supercomputing Center).

**2017 – 2019** - Principal Investigator of the **European Tier-0 PRACE project SIMCODE1**: 18 million CPU hours on the Tier-0 machines Marconi (Cineca Supercomputing Center) and MareNostrum4 (Barcelona Supercomputing Center).

**2015** - Principal Investigator of the **European EUDAT pilot project SIMCODE-DS**: 300 TB of long-term storage on the Pico Data Repository machine at Cineca Supercomputing Center.

**2012** - Principal Investigator of the **European Tier-0 PRACE project SIBEL1**: 8.4 million CPU hours on the Tier-0 machine MareNostrum3 at the Barcelona Supercomputing Center.

**2011** - Awarded the **HPC-Europa2 Visiting Grant nr. 985**: 6 weeks of visiting time at European institutes and 80 thousand CPU hours on high-performance computing systems.

**2011** - Awarded the **HPC-Europa2 Visiting Grant nr. 589**: 8 weeks of visiting time in European institutes and 150 thousand CPU hours on high-performance computing systems.

— INVITED TALKS AND INSTITUTE SEMINARS —

- 12 February 2020 - Solicited Talk at the Euclid Italy annual meeting, Bologna (Italy)
- 11 November 2019 - Invited Institute Seminar at the Physics Department, University of Torino (Italy)
- 13 February 2019 - International Conference “*Euclid and Beyond: the many faces of modern cosmology*”, Rome (Italy)
- 28-29 June 2018 - International Conference “*79 and counting: a Large-Scale Tribute to Silvio Bonometto*”, Trieste (Italy)
- 22 May 2018 - Invited Astrophysics Seminar at SISSA, Trieste (Italy)
- 29 November 2017 - Invited Cosmology Seminar at Institute for Theoretical Physics, University of Heidelberg (Germany)
- 27 April 2017 - International Conference “*PONT – Progresses on Old and New Themes in Cosmology*”, Avignon (France)
- 1 September 2015 - International Workshop “*From Inflation to Galaxies: a workshop in honor of Sabino Matarrese*”, Castiglioncello (Italy)
- 3 July 2015 - International Conference “*Cosmological Simulations: from galaxies to large scales*”, Sexten Center for Astrophysics, Sesto Pusteria (Italy)
- 23 April 2015 - Invited Seminar, Institute for Theoretical Physics, Heidelberg University (Germany)
- 19 February 2015 - Invited Institute Seminar, Physics Department, Ferrara University (Italy)
- 15 December 2014 - International Conference “*The Quest for Dark Energy II*”, Ringberg (Germany)
- 3 July 2014 - International Workshop “*Non-Linear Structure in the Modified Universe*”, Lorentz Center, Leiden (The Netherlands) - **Invited Discussion Leader**
- 29 November 2013 - International GRAVASCO Conference “*Origin of cosmic structures*”, Paris (France)
- 9 May 2013 - *57th Congress of the Italian Astronomical Society*, Bologna (Italy)
- 14 March 2013 - International conference “*Cosmological tests of gravity*”, Oxford (UK)
- 25 June 2012 - International conference “*The quest for Dark Energy*”, Ringberg (Germany) - **Invited Review Talk**
- 4 October 2011 - International conference “*The Dark Universe*”, Heidelberg (Germany)
- 16 May 2011 - Invited Institute Seminar, Astronomical Observatory, Trieste University (Italy)
- 28 April 2011 - Invited Institute Seminar, Astronomy Department, Bologna University (Italy)
- 12 October 2010 - Invited Institute Seminar, Institute for Theoretical Astrophysics, Oslo University (Norway)
- 16 June 2010 - Invited Institute Seminar, S.I.S.S.A., Trieste (Italy)
- 21 October 2009 - Invited Institute Seminar, ICG, Portsmouth University (UK)
- 13 October 2009 - Excellence Cluster Science Week, Munich (Germany)
- 8 July 2009 - Invited Institute Seminar, CAUP, Porto University (Portugal);
- 18 June 2009 - Invited Institute Seminar, Astronomy Department, Bologna University (Italy);
- 27 November 2008 - Invited Institute Seminar, ICE, Barcelona University (Spain).

— CONTRIBUTED TALKS AND CONFERENCES —

- 26 July 2019 - International MIAPP Workshop “*Dynamics of Large-Scale Structure Formation*”, Munich Institute for Astro-Particle Physics, Garching (Germany) (**Talk**)
- 2 May 2015 - International Conference “*Theoretical Cosmology in the Era of Large Surveys*”, Galileo Galilei Institute, Arcetri, Florence (Italy) (**Talk**)

- 1 October 2014 - International Workshop “*Dark Energy Interactions*”, NORDITA (Norway)
- 9-11 April 2014 - International Workshop “*Modified Gravity Simulations*”, Garching (Germany) **(Talk)**
- 8-13 September 2013 - International Conference “*Exascale Computing in Astrophysics*”, Ascona (Switzerland) **(Talk)**
- 17 January 2013 - *Physics and Astronomy Department*, University of Bologna (Italy), **(Talk)**
- 16-22 September 2012, International Conference “*Particles and the Universe*”, Corfu (Greece), **(Talk)**
- 13-17 June 2011 International Conference “*Advances in Computational Astrophysics*”, Cefalù (Italy), **(Talk)**
- 18 January 2011 - *Cahill Center for Astrophysics*, CALTECH, Pasadena (USA), **(Talk)**
- 10-14 January 2011- International Conference “*Essential Cosmology for the Next Generation*”, Puerto Vallarta (Mexico), **(Talk)**
- 4-8 October 2010 - International Conference “*Cosmology meets Particle Physics*”, Bad Honnef (Germany), **(Talk)**
- 28 June-1 July 2010 - International Conference “*Modified Gravity approaches to the Dark Sector*”, Strasbourg (France), **(Talk)**
- 29-31 March 2010 - “*5th IberiCos Cosmology Conference*”, CAUP, Porto (Portugal), **(Talk)**
- 7-11 September 2009 - International Conference “*Cosmo 09*”, CERN, Geneva (Switzerland), **(Talk)**
- 2-4 March 2009 - International Conference “*Dark Energy*”, Galileo Galilei Institute, Florence (Italy), **(Talk)**
- 7-11 October 2008 - *Third Biannual Leopoldina Conference on Dark Energy*, Munich (Germany), **(Talk)**
- 8-12 September 2008 - International Conference “*Cosmology Across Cultures*”, Granada (Spain)
- 23-25 June 2008 - International Conference “*Symmetries and Phases in the Universe*”, Kloster Irsee (Germany), **(Poster)**
- 30 September - 3 October 2007 - Second Transregio Meeting “*The Dark Universe*”, Bad Honnef (Germany), **(Poster)**
- 7-8 November 2006 - First Transregio Meeting “*The Dark Universe*”, Heidelberg (Germany), **(Poster)**
- 7-11 November 2005 - International Conference “*Einstein’s Legacy*”, Munich (Germany)
- 30 June - 2 July 2005 - 9th Paris Cosmology Colloquium “*Daniel Chalonge*”, Paris (France)

## — TEACHING —

- 2021 (December): **Invited Lecturer** for the XIV Tonale Winter School on Cosmology, Passo del Tonale (Italy) (see <https://indico.physi.uni-heidelberg.de/event/297/>);
- 2021: **Invited Lecturer** for the PhD course “*Dark Energy and Modified Gravity*”, Ferrara University;
- 2020-2021: **Teaching the undergraduate course *High-Performance Computing for Astrophysics and Cosmology*** at the Astrophysics and Cosmology Master Degree program, Bologna University (**64 hours/year**);
- 2019-2020: **Teaching the undergraduate course *High-Performance Computing for Astrophysics and Cosmology*** at the Astrophysics and Cosmology Master Degree program, Bologna University (**64 hours/year**);
- 2018-2019: **Teaching the undergraduate course General Physics B-I** (Classical Mechanics) at the Aerospace Engineerings and the Mechanical Engineerings Bachelor Degree programs, Bologna University (**60 hours/year**);
- 2017-2018: **Teaching the undergraduate course General Physics B-II** (Thermodynamics) at the Aerospace Engineerings and the Mechanical Engineerings Bachelor Degree programs, Bologna University (**20 hours/year**);
- 2017: **Invited Lecturer** for the PRACE school “*HPC Methods for Computational Fluid Dynamics and Astrophysics*” (see <https://events.prace-ri.eu/event/659/>) at the Cineca supercomputing center, Bologna (Italy)

- 2016: **Invited Lecturer** for the PRACE school “*HPC Methods for Computational Fluid Dynamics and Astrophysics*” (see <https://events.prace-ri.eu/event/516/>) at the Cineca supercomputing center, Bologna (Italy)
- 2015: **Invited Lecturer** for the PhD school “*Astrophysical Probes of fundamental Physics*” at the University of Ferrara, Department of Physics and Earth Science (see <http://fst.unife.it/eventi/phd-school-astrophysics-1/phd-school-astrophysics>);
- 2014: **Teaching Assistant** (“contratto di tutorato”) for the undergraduate courses of “Informatics” and “Scientific Computing for Astronomy”, University of Bologna;
- 2011: **Teaching Assistant** for the Summer Semester Astrophysics Students Seminars at the Ludwig-Maximilians-University, Munich (Germany);

## — MENTORING AND OTHER TEACHING ACTIVITIES —

### PhD Thesis Supervision:

- 2015-2018: **PhD Advisor** of the thesis by Dr. Matteo Nori entitled “*Simulating highly non-linear dark matter dynamics beyond  $\Lambda$ CDM*” at the Physics and Astronomy Department, Bologna University;

### Master Thesis Supervision:

- 2021 (ongoing): **Advisor of the Master Thesis in Astrophysics and Cosmology** by Fulvio Ferlito entitled “Structure formation simulations with scattering between Dark Energy and baryons” at the Physics and Astronomy Department, Bologna University;
- 2018: **Co-advisor of the Master Thesis in Astrophysics and Cosmology** by Beatrice D’Angelo entitled “*Density and velocity profiles in dark scattering models*” at the Physics and Astronomy Department, Bologna University;
- 2016: **Co-advisor of the Master Thesis in Astrophysics and Cosmology** by Tommaso Ronconi entitled “*Modelling the size distribution of Cosmic Voids*” at the Physics and Astronomy Department, Bologna University;
- 2014: **Co-advisor of the Master Thesis in Physics** by Enrico Garaldi entitled “*Zoomed simulations of halo segregation in cosmological models with two species of coupled dark matter*” at the Physics and Astronomy Department, Bologna University;
- 2014: **Co-advisor of the Master Thesis in Astrophysics and Cosmology** by Giorgia Pollina entitled “*Statistical and structural properties of voids in cosmological simulations of interacting Dark Energy*” at the Physics and Astronomy Department, Bologna University;
- 2013: **Co-advisor of the Master Thesis in Physics** by Santiago Casas entitled “*Large scale structure formation and the nonlinear power spectrum in cosmological simulations of coupled Dark Energy*” at the Physics Department, Heidelberg University (Germany);
- 2012: **Co-advisor of the Master Thesis in Physics** by Ludwig Schrobenhauser entitled “*Analysis of simulated data for interacting Dark Energy models*” at the Physics Department, Ludwig-Maximilians University Munich (Germany);

### Bachelor Thesis Supervision:

- 2021 (ongoing): **Advisor of the Bachelor Thesis in Physics** by Riccardo Cavana entitled “*Correlations of scalar field properties and large-scale structure properties in modified gravity cosmologies*” at the Physics and Astronomy Department, Bologna University;
- 2018: **Advisor of the Bachelor Thesis in Physics** by Pietro Paolo Gambelli entitled “*Studio numerico dell’evoluzione del background cosmologico e della crescita di perturbazioni lineari in modelli di energia oscura interagente*” at the Physics and Astronomy Department, Bologna University;

## — DEPARTMENT ACTIVITIES —

- 2019–Present: **Member of the Executive Board** of the *Open Physics Hub* project at the Physics and Astronomy Department “Augusto Righi”, Alma Mater University of Bologna (see <https://site.unibo.it/openphysicshub/en>)

## — INTERNATIONAL COLLABORATIONS —

- **Appointed as Pre-Launch Key Project Coordinator** of the Euclid collaboration since 2021.
- **Member** of the Vera Rubin Observatory (VRO, formerly known as LSST) collaboration in the DESC group.
- **Member** of the Cosmology Group of the Square Kilometre Array (SKA) collaboration.
- **Work Package Coordinator** of the Euclid Simulations WG for the implementation of non-standard cosmologies.
- **Work Package Coordinator** of the Euclid Theory Science Working Group for the for the definition and selection of non-standard cosmologies.
- **Work Package Coordinator** of the Euclid CMB Cross Correlations Science Working Group for the development of the simulations pipeline.
- Member of the *Theory*, *Simulations* and *CMB cross-correlation* Science Working Groups of the **Euclid collaboration**
- Member of the **Transregio Collaboration** (<http://darkuniverse.uni-hd.de/view/Main/WebHome>) on the “Dark Universe” from 2006 to 2012

## — ADVISORY BOARDS AND EDITORIAL COLLABORATIONS —

- **Invited Contributor for the 2019 “News & Views” section of Nature Astronomy**;
- **Expert Reviewer for the following international scientific journals**: Nature Astronomy (Nat.Ast.), Monthly Notices of the Royal Astronomical Society (MNRAS), Monthly Notices of the Royal Astronomical Society Letters (MNRAS-L), Physical Review D (PRD), The Astrophysical Journal (ApJ), Journal of Cosmology and Astroparticle Physics (JCAP), Physics Letters B (PLB), Physics of the Dark Universe (PDU).
- **Invited external member of two Ph.D. defence committees** of the *Physics and Astronomy Department, Aarhus University, Denmark (September 2014)*;
- **Invited external reviewer** of the Ph.D. thesis by Antonio Bibiano at Swinburne University (Australia);
- **Member of the reviewing panels** of: *French National Research Agency* (Call 2012); *Polish National Science Center* (Call 2013); PRACE Time Assignment Committee (8th Call and 15th Call); NASA Post-Doctoral Fellowships (Call 2014); IS CRA Time Assignment Committee (2017, 2018, 2020, 2021).

## — CONFERENCE ORGANIZATION —

- **Main Organiser** of the international summer school “*Physical Sensing and Processing*”, Bologna (Italy), 5-9 July 2021;
- **Member of the Scientific Organising Committee** of the international conference “*From Dark Energy to Bright Synergies*”, Sesto Pusteria (Italy), 23-27 July 2018;
- **Member of the Steering Committee** of the yearly national cosmology meeting “*UniVersum*” (see <http://universum.to.infn.it/>);
- **Member of the Local Organizing Committee** of all the five editions of the *Transregio Winter School on Cosmology*, from 2007 to 2011;

— PUBLIC OUTREACH —

- 28 September 2018 - Public Lecture “*L’universo è come un iceberg*”, at the European Researchers Night, Aula Carducci, Bologna University (Italy)
- 29 September 2017 - Public Lecture “*L’universo è come un iceberg*”, at the European Researchers Night, Opificio Golinelli, Bologna (Italy)
- 19 May 2014 - Lecture “*The Dark Side of the Universe: Materia Oscura, Energia Oscura e Gravità Modificata*”, at the public high school *Liceo Scientifico Augusto Righi*, Bologna (Italy)
- 10 October 2013 - Public Conference “*The scales of the Universe*”, Chieti (Italy)
- 27 September 2013 - Speaker of the international public event “*Origins 2013*” within the “Speed-Dating” initiative held in Bologna (Italy)
- 1 December 2010 - Speaker of the international public initiative “*Dark Matter Awareness Week*” at the Excellence Cluster Universe building in Garching (Germany)

Bologna, 29/04/2021  
Marco Baldi