DR. ANNALISA PILLEPICH

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http://www.mpia.de/gc-theory

Curriculum Vitae

RESEARCH INTERESTS & METHODS

The highlight of my recent scientific outputs is the IllustrisTNG simulation project (https:// www.tng-project.org/), a computationally-ambitious and physically-realistic incarnation of large-volume cosmological magneto-hydrodynamical simulations enabling new understandings of galaxies and the large scale structure of the Universe. I am the co-I together with Dr. Dylan Nelson of both TNG50, the highest resolution run of IllustrisTNG, and of the new spin off project called TNG-Cluster (https://www.tng-project.org/cluster/).
My research themes and keywords include:

Numerical Galaxy Formation and Numerical Cosmology
Halo gas, Feedback, Clusters of Galaxies and Large-Scale Structure
Galaxy Evolution, including Milky Way's Structure and Assembly
21 cm, Dark Matter and Dark Energy Cosmology
Primordial Fluctuations, Inflation, and Primordial non-Gaussianity

Gravity + Magneto-Hydrodynamics Cosmological Numerical Simulations of Galaxies
Statistical Analysis of synthetic Datasets; forward modeling of simulated data; X-ray observations
Cosmological-parameter inference and Analytical Cosmological Perturbation Theory
Machine learning for parameter inference, for map- or field-level galaxy evolution and cosmology

EDUCATION

2010 **Ph.D. in Physics: ETH Zürich, Switzerland**
Advisors: Prof. C.Porciani and Prof. S. Lilly;
Thesis Title: *"Constraining Primordial Non-Gaussianity from the Large Scale Structure of the Universe"*

2005 **Master in Physics, 110/110: Universita' degli Studi di Pisa, IT**
Advisor: Prof. S. Matarrese; Thesis Title: *"Cosmological Perturbation Theory in a Matter Dominated Universe: the Gradient Expansion"*

2003 **Bachelor in Physics, 110/110 cum Laude: Universita' degli Studi di Pisa, IT**
Supervisor: Prof. E. Vicari, Final Work Title: *"Cosmological Models"*

PROFESSIONAL APPOINTMENTS

Sept 2020 - now **Max Planck Institute for Astronomy, Heidelberg**
Permanent Staff Member and Research Group Leader

June 2016 - August 2020 **Max Planck Institute for Astronomy, Heidelberg**
W2 Independent Research Group Leader

Nov 2013 - May 2016 Center for Astrophysics, **Harvard University**
Post-doctoral researcher

Nov 2010 - Oct 2013 **University of California at Santa Cruz, USA**
Swiss National Science Foundation Post-doctoral Fellow
UCSC Post-doctoral Scholar

June 2010 - July 2010 **CEA Saclay, France**
Short term Post-doctoral Scholar at Inst. of Theoretical Physics

Nov 2005 - May 2010 **ETH Zürich, Switzerland**
Research and Teaching Assistant

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ACADEMIC DISTINCTIONS, RESEARCH GRANTS, AWARDS, AND HONORS (HIGHLIGHTS)

2023 **ERC Consolidator Grant 2022 COSMIC-KEY**
PI and principal author: about €1,994,000

2022 **TNG-Cluster**: extending IllustrisTNG to the most massive objects in the Universe"
Steinbuch Centre for Computing at KIT: Computing proposal
Co-PI and principal author
64 million core hours allocated on HoreKA at KIT (value: approx. €2,400,000)

2021-2024 **Highly Cited Researcher, Clarivate award:**
Ranked in the top 1% by citations for the "Space Science" field in a given year

2021 **"EXPLORATORY PROJECT EP 3.4, EXC 2181 STRUCTURES"**
"From the fine-structure features of stellar haloes to the histories of their galaxies"
PI and author: about €45,000 for a 1-year PhD salary

2019 **"HLRS Golden Spike Award"**
Awarded by the High-Performance Computing Center Stuttgart (HLRS)

2019-2022 **"SFB881 The Milky Way System"**
DFG Heidelberg-wide Collaborative Research Centre: Third funding period
Co-PI and author: about €501,000 for a PhD and postdoctoral position

2019-2025 **"EXC 2181 STRUCTURES"**
Heidelberg-wide Cluster of Excellence
Associate member (CP1: Cosmic Structure Formation): funds for a postdoctoral position

2017-2018 **"IllustrisTNG-Dwarf**: Predictive galaxy formation from the smallest to the largest scales"
Gauss Center for Supercomputing: Computing Proposal Extensions / 44101 / GCS-Dwar
Co-PI and principal author
30+25 million core hours allocated on HazelHen at HLRS (value: approx. €2,100,000)

2016 **"IllustrisTNG-Dwarf**: Predictive galaxy formation from the smallest to the largest scales"
Gauss Center for Supercomputing: Computing Proposal / 44101 / GCS-Dwar
Co-PI and principal author
84 million core hours allocated on HazelHen at HLRS (value: approx. €3,155,000)

2016 **"The Illustris++ Project: Predicting galaxy formation in a representative volume…"**
Gauss Center for Supercomputing: Computing Project Extension / 44057 / GCS-ILLU
Co-I and principal author
19.5 million core hours allocated on Hazel Hen at HLRS (value: approx. €730,000)

2014 **"IllustrisTNG:The Next Generation Cosmological Hydrodynamics Simulations"**
XSEDE Computing Proposal: TG-AST140063
PI and principal author
5 million core hours allocated on TACC/Stampede (value: approx. USD173,000)

2014 **"Clusters of Galaxies in the last 5 Billion Years: from the Brightest Cluster Galaxy to the Intra-Cluster Light"**
HST, Cycle 22, Theory Proposal: AR-13897
PI and principal author: USD100,251

2010 **Swiss National Science Foundation Fellowship for Prospective Researcher**

2000 - 2005 **Undergraduate Fellowship "Fondazione Collegio Puteano", Pisa, Italy**

SOC CHAIR AND PRIMARY ORGANIZER OF INTERNATIONAL SCIENTIFIC MEETINGS

2019 Ringberg Workshop "Machine learning tools for research in astronomy", ~ 60 participants
2018 MPIA Conference "Stellar Halos across the Cosmos",, ~100 participants
2017 Ringberg Workshop "Galaxy evolution in groups and clusters", ~ 60 participants

+ SOC member of another dozen scientific conferences

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LEADERSHIP AND PROFESSIONAL SERVICES

I regularly contribute to the progress of the international scientific community via a series of professional services:

2022 — 2024 Member of the ADS User Group

2016 — Reviewer for Supercomputing Time Allocations:
DiRAC High Performance Computing resource (UK)
Leibniz-Rechenzentrum (SuperMUC; Germany)

2012 — Reviewer for peer-review journals:
MNRAS, APJ, JCAP, ASCOM, Universe, A&A, Science, Nature Astronomy

2009 — Reviewer for funding agencies and Review panel member (alphabetical order):
Austrian Science Fund (FWF, Austria)
Dutch Research Council (NWO, The Netherlands)
European Research Council, ERC Starting and Advanced Grants (EU)
Hubble Space Telescope, Cycle 21 (HST; USA)
Humboldt Foundation (Germany)
Israel Science Foundation (Israel)
NASA Hubble Fellowship Program (NHFP; USA)
National Fund for Scientific and Technological Development (Fondecyt, Chile)
National Commission for Scientific and Technological Research(ALMA-CONICYT , Chile)
Natural Sciences and Engineering Research Council of Canada (NSERC; Canada)
National Science Foundation (NSF; USA)

INVITED RESEARCH COLLOQUIA AND SEMINARS AT SCIENTIFIC INSTITUTES

Over the last ten years, I have been invited to about 40-50 colloquia and seminars at institutes in North/South America, Europe, Australia, …

2025 Colloquium, University of Oslo, Institute for Theoretical Astrophysics, Norway
2024 Colloquium, University of Cologne, Dept. Of Astronomy, D (virtual)
Colloquium, University of Geneva and EPFL, Dept. Of Astronomy, CH
2023 Colloquium, FORTH Institute of Astrophysics, Grece (virtual)
Seminar at the IAC Tenerife, Spain (virtual)
Colloquium, Leibniz-Institut für Astrophysik Potsdam, IAP, D
Seminar at Lund University, Sweden (virtual)
2022 Colloquium, University of Warwick, Dept. Of Physics, UK (virtual)
Colloquium at Symposium in Computational Physics May 2022, Heidelberg, D
Institute seminar at ICRAAR, Perth, Australia
Colloquium, University of Vienna, Dept. Of Astronomy, Austria (virtual)
Colloquium, Universita' La Sapienza, Rome, Italy (virtual)
2021 OSU Colloquium, Ohio State University, USA (virtual)
Seminar at the IAC Tenerife, Spain (virtual)
Seminar at Universidade Cruzeiro do Sul, Sao Paulo, Brazil (virtual)
IAP Colloquium, Paris, France (virtual)
2020 Seminar at University of Victoria, Canada (virtual)
Colloquium at ICRAR/University of Western Australia, Australia (virtual)
Colloquium at CU Boulder, USA (virtual)
ITC Colloquium at Harvard University, USA (virtual)
Astronomy Colloquium at University of Sussex, UK
2019 Public Colloquium at Reykjavik University, Iceland
Colloquium at IRAP Toulouse, France
Seminar at Liverpool University, UK
Seminar at MPE, Germany
Colloquium at ASIAA, Taipei, Taiwan
2018 Seminar at the Institute for Astronomy, Tenerife, Spain
Joint Astronomy Colloquium at Garching, Germany
Colloquium at Durham, UK
Colloquium at UC Santa Cruz, USA
Cosmology Seminar at Stanford University, USA
Colloquium at ETH Zurich, Switzerland

	Seminar at the 73rd Netherlands Astronomers Conference, Netherlands
	Colloquium at INAF Osservatorio Astronomico di Trieste, Italia
2017	Colloquium at Universite' de Montpellier, France
	Colloquium at St. Andrews University, UK
	Colloquium at the Universitäts-Sternwarte München, Germany
	Heidelberg Joint Astronomical Colloquium, Germany
	Colloquium at the CCA Simons Foundation, New York, USA
	Keynote Seminar at the 22nd Symposium for Astroparticle Physics,Netherlands
2016	Koenigstul Colloquium, Heidelberg, Germany
2015	Lunch Seminar, Tufts University, USA
	Brown Bag Talk, Harvard University, USA
2014	Cosmology Seminar at the Univ. of Minnesota, Minneapolis, USA
2013	Colloquium at IPMU, Kashiwa, Japan
	Seminar at the "CITA Seminar Series", Toronto, Canada
2012	Colloquium at UW Astronomy Department, Seattle, USA
2010	Colloquium at MPE, Garching, Germany
	Colloquium at the Institut de Physique Theorique, CEA, France
2008	Colloquium at the Lab. de Phys.Subatomique et Cosmologie, Grenoble, France

+ tens of other self-initiated seminars and scientific presentations seminars, also at local institutions

***INVITED* TALKS AT INTERNATIONAL CONFERENCES, MEETINGS AND SCHOOLS (>55 INVITED TALKS)**

Over the last ten years I have been invited to give scientific talks at international scientific meetings, i.e. conferences, workshops, etc, in about 40-50 occasions:

2024 *"A decade of Illustris", Gargonza, IT*
Plenary at German Astronomical Society meeting, Cologne, D
"7th ICM Theory & Computation Workshop", Ann Arbor, USA
"To Our Cosmic Horizon and Beyond: A Celebration of 20 Years of ITC", Harvard, USA

2023 *"New simulations for new problems in galaxy formation", Paris, France*
"MIST2023 : Cosmic turbulence and Magnetic fields: physics of baryonic …", Cargese, France

2022 *"Multi-phase, Multi-temperature and Complex: how AGN feedback…", ESO, Germany*
"What is the Milky Way telling us about galaxy formation", Perth, Australia
"What matter(s) around galaxies 2022", Champoluc, Italy
"6th ICM Theory and Computation Workshop", Copenhagen, Denmark
Plenary at IAU2022 on "Resolving the Rise and Fall of Star Formation in Galaxies", Busan, Korea
"The Physical Properties of Groups of Galaxies", Bertinoro, Italy
"Properties and impact of large-scale multiphase AGN outflows", EAS2022, Valencia (ES)
"SynCRETism 2022 - Particle physicists dining with Astrophysicists", Crete, Greece
"Special session on Line Emission Mapper", 240th AAS meeting, Pasadena, USA (virtual)
"LEGA-C" meeting, Bruges, Belgium
"Galaxy Clusters 2022: Challenging Our Cosmological Perspectives", STScI, USA (virtual)
"Ringberg Workshop on Computational Galaxy Formation", Germany
"Dawn Winter School", Copenhagen, Denmark (virtual)

2021 *"Dark World to Swampland" Workshop, Korea/Spain (virtual)*
"Predictive Power of Computational Astrophysics", IAU362, Chamonix, France (virtual)
"ML4Jets" i.e. ML for particle physics, Heidelberg, Germany (virtual)
"XXXII IUPAP Conference on Computational Physics", Coventry, UK (virtual)
"Gamma rays to shed light on dark matter", ISAPP School, Spain (virtual)
"Fundamentals of Gaseous Halos", KITP, Santa Barbara, USA (virtual)

2020 *"Linking the Galactic and Extragalactic", Wollongong, Australia (virtual)*
"Virgo Consortium Meeting", Durham, UK

2019 *"Subaru Telescope 20th anniversary Conference", Hawaii, USA*
"Fornax3D Collaboration Meeting", Heidelberg, DE
"22th Results and Review Workshop of the HLRS", Stuttgart, DE
"Extremely big eyes on the Early Universe", Rome, IT
"Tracing cosmic evolution with clusters of galaxies", Sexten, IT

"Stars without borders", Ljubljana, Slovenia
"Light in the suburbs: structure and chemodynamics of galaxy halos", Sexten, IT
"News from the Dark", Montpellier, France
"Metals in galaxies, near and far", Leiden, Netherlands
"Physics of the Intracluster Medium: Theory and Computation", Budapest, HU
"Panchromatic Panoramic Studies of Galaxy Clusters", Taipei, Taiwan
"Linking galaxies from the epoch of initial star formation to today", Sydney

2018 *"Virgo Consortium Meeting", Leiden, Netherlands*
"Cosmology in Dubrovnik 2018", Dubrovnik, Croatia
"Birth, life and fate of massive galaxies…", Favignana, Italy
"The Physics of Galaxy Scaling Relations", Kingston, Canada
"eROSITA Consortium meeting", Garching, Germany
"Mock Durham: Galaxy Formation for Surveys", Durham, UK
"EWASS: Unveiling the low surface brightness Universe", Liverpool, UK
"Computational galaxy formation", Ringberg, Germany
"SnowCluster 2018", Salt Lake City, USA
"ASPECS team meeting", Ringberg, Germany

< 2017 *"Carving through the Codes: Challenges in Computational…", Davos, CH*
"Baryonic Stellar Haloes", Galapagos, Ecuador
"The Galaxy Ecosystem", ESO, Garching, Germany
"A Decade of the Star-Forming Main Sequence", Leiden, Netherlands
"Fornax Deep Survey Meeting", Groningen, Netherlands
"Dwarf Galaxy Workshop", ESO Garching, Germany
"Computational galaxy formation", Ringberg, Germany
"eROSITA and followup", Ringberg, Germany
"Cosmology with Galaxy Clusters in the XXI Century", Madrid,Spain
"Arepofest-1", Heidelberg, Germany
"The almost-Gaussian Universe", CEA, France

+ tens of contributed seminars at other international and collaboration meetings.

TEACHING ACTIVITY

I regularly teach at the University of Heidelberg at the Master and PhD level and I have taught or assisted courses also in my previous host institutions:

2019 —	**Heidelberg University, Block Course (SS24, SS22, SS21, SS20, SS19)** For Master and PhD students: **"Cosmology"**
2020	**Heidelberg University, Master Seminar (WS20/21)** For Master students: **"Observational and Numerical Elements of Galaxy Evolution"**
2019	**Heidelberg University, Master Seminar (WS19/20)** For Master students: **"Numerical Galaxy Formation"**
2018	**Heidelberg University, 41st Heidelberg Physics Graduate Days** For Master and PhD students: **"Simulations for galaxy formation and evolution"**
2005-2010	**ETH Zürich, Teaching Assistant for undergraduate-level courses:** • 2 semesters in Electromagnetism (frontal class) • 1 semester in Introduction to Quantum Mechanics (frontal class) • 1 semester in Astrophysics (exercise responsible) • 3 semesters in Advanced Physics Laboratory Courses

SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS

Prior to my current post, I have been the main scientific contact of a few more junior colleagues at my previous host institutions, in particular of 5 PhD students at Harvard University. Since 2016, I have been the official and/or day-to-day supervisor of a number of postdocs, PhD students, and undergraduate students at the University of Heidelberg and at MPIA:

Team postdocs:

2024/11 —	Dr. Joey Braspenning
2024/11 —	Dr. Akanksha Kapahtia
2023/11 - 2024/08	Dr. Urmila (Mila) Chadayammuri (now astronomy editor at Nature)
2020/07 - 2023/03	Dr. Nhut Truong (now research associate at NASA/Goddard)
2018/09 - 2021/12	Dr. Martina Donnari (SFB881 funding)
2017/09 - 2020/08	Dr. Elad Zinger (now researcher at Hebrew University)
2017/11 - 2021/07	Dr. Gandhali Joshi (now postdoc at University College London)
2016/09 - 2017/08	Dr. Mark Lovell (now fellow at Univ. of Durham and Univ. of Iceland)

Postdoctoral MPIA fellows and postdoctoral researchers shared between my group and the University:

2024/12 —	Dr. Eric Rohr (STRUCTURES funding; soon postdoc at MPA)
2021/10 - 2023/08	Dr. Matthew Smith (STRUCTURES funding; then postdoc at MPA)
2020/10 - 2023/09	Dr. Joe Lewis (STRUCTURES funding; then postdoc at IAP Paris)
2019/09 - 2021/03	Dr. Maxime Trebitsch (STRUCTURES funding; the postdoc in Groeningen)
2017/09 - 2021/08	Dr. Allison Merritt (then in industry)
2017/09 - 2019/05	Dr. Gergo Popping (then staff at ESO)

*PhD Students: (*Official and day-to-day Advisor for PhD Thesis at MPIA, IMPRS Heidelberg, and HGSFP)

2025-2028 Maxim Oweyssi
2024-2028 Bipradeep Saha
2023-2027 Dimitris Chatzigiannakis
2023-2027 Anirudh Ravishankar
2023-2027 Marine Prunier, with University' de Montreal
2020-2024 Eric Rohr, then postdoc at Heidelberg University and MPIA
2020-2024 Lukas Eisert, then Research Associate, LSST at SLAC, Stanford and Rubin Observing Specialist
2019-2024 Diego Sotillo-Ramos, then postdoc in Madrid
2018-2022 Christoph Engler, then in industry
2016-2020 Kiyun Yun

Master Students and long-term interns:

2025 Shera Jafaritabar: "The merger history of massive galaxy clusters from their X-ray and radio maps"
2025 Shalini Kurinchi-Vendhan: "Effects of SMBH feedback in a multi-phase cold ISM"
2025 Ainhoa Zubiaur Arsuaga: "eROSITA-like bubbles with different SMBH feedback models? "
2025 Maitri Purohit: "Cosmological parameters from galaxy cluster counts"
2025 Maulik Parekh: "The Gas Fraction of Mock-Observed Galaxy Groups with Cosmological Simulations"
2024 Shalini Kurinchi-Vendhan (Fulbright): "Jellyfish galaxies with IllustrisTNG and their SMBH activity"
2024 Florian Lacroix (with Anna de Graaff): "Mock kinematics of TNG50 galaxies with JWST/NIRSpec"
2024 Florian Dedieu: "Perpendicular or tilted? On the inclination of eROSITA-like CGM bubbles"
2024 Shravani Pandit: "Physical properties of the intra-group medium with TNG50"
2023 Noa Hoffmann: "Characterizing and Mocking the Stellar Halos of TNG50 Milky Way & M31-like Galaxies"
2022 Martin Fournier: "Properties of the Magellanic Cloud Analogs in TNG50"
2022 Nikhil, Bisht: "Radial Migration of Stars of Milky Way/M31 analogs in TNG50"
2021 Junia Goeller: "The Star Formation Properties of Jellyfish Galaxies in TNG50"
2020 Rahul Ramesh: "The stellar mass assembly of galaxies in groups and clusters"
2019 Lukas Eisert:"From the morphologies of stellar haloes to the assembly histories of galaxies"
2018 Sebastian Schulz:"The IRX - beta dust attenuation relation: Insights from IllustrisTNG"
2018 Moritz Fischer:"How different are in-situ and ex-situ stellar population properties?"

Bachelor Students and short-term interns;

2025 Sunna Gottschewski: "The star-forming (and disky) past of brightest cluster galaxies"
2024 Lokesh Manickavasaham: "Evolution Across Cosmic Times of the Most Massive Clusters"
2024 Archis Mukhopadhyay (DAAD-WISE): "The magnetic fields of jellyfish galaxies in IllustrisTNG"

2022 Maria Renee Meza (MPIA summer intern): “Star formation, bars and SMBHs of Milky Way-like galaxies”
2020 Kaj Kramer: “The alpha abundances of satellite and halo stars in TNG50 MW/M31-like galaxies”
2020 Rahul Ramesh (DAAD-WISE): “The stellar mass assembly of galaxies at the centers of groups and clusters”
2018 Lisa-Marie Zessner (now PhD student at MPS): “Stellar metallicity Gradients in IllustrisTNG Stellar Halos”
2018 Patrick Ondratschek (now PhD student at MPS): “The stellar density profiles of IllustrisTNG stellar haloes”
2017 Luis Hellmich (summer intern): “Effects of baryons on the subhalo mass function”
2017 Max Sasserath (with Hans-Walter Rix): “Predicted satellite galaxy abundance around the Milky Way”

MAIN SCIENTIFIC COLLABORATIONS

I am part of, or lead, the following international scientific collaborations (highlights):

2022–	TNG-Cluster team (co-PI) - https://www.tng-project.org/cluster/
2022-2024	Line Emission Mapper (LEM) X-ray Probe for the 2030s, Science Team (PI: Ralph Kraft)
2019-2026	EXC 2181 STRUCTURES (associate member, “Cosmic Structure Formation”)
2016-2024	Collaborative Research Center SFB881 "The Milky Way System” (co-I)
2014-2024	IllustrisTNG Collaboration (co-PI) - https://www.tng-project.org/
2012 —	eROSITA German Consortium (external collaborator)

SCIENTIFIC PUBLICATION METRICS

(see attached Publication List, if applicable — source ADS, as of 03.2025)

Total of >200 refereed publications in peer-review journals,
of which 13, 43, and 30 as 1st, 2nd and 3rd author, respectively

Total of >25’400 citations, of which > 4’700 from first-author papers
h-index = 69
first-author papers with > 1000 citations = 2
first-author papers with > 100 citations = 7

OUTREACH

2022	Vortrag at “Die lange Nacht der Astronominnen”, Garching b. München
2021	“Cosmological Jellyfish”, citizen science project, on Zooniverse.org
2020	”Universi al Computer”, article for the astronomy magazine Coelum
2018	”Abbiamo messo l’Universo in una scatola”, article for La Lettura - Corriere della Sera

ACADEMIC SUPERVISORS AND MENTORS

- Prof. Prof. Hans-Walter Rix, Max Planck Institute for Astronomy, Heidelberg, Germany
- Prof. Lars Hernquist, Harvard University, Cambridge, USA
- Prof. Volker Springel, Max Planck Institute for Astrophysics, Munich, Germany
- Prof. Piero Madau, University of California Santa Cruz, USA
- Prof. Cristiano Porciani (PhD advisor), University of Bonn, Germany