Prof. Dr. Christoph Pfrommer

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RESEARCH INTERESTS

Multi-scale Problems in Physics. Study how small scales impact macroscopic systems in astrophysics and climate science using next-generation computer simulations, hybrid modeling, and AI-driven data approaches.

Astrophysical Cosmology. Formation and evolution of galaxies, galaxy clusters, and large-scale structures in the Universe; physics of the interstellar, circum- and intracluster media; physics of galactic feedback processes emerging from star formation and jets in supermassive black holes.

Plasma and High-Energy Astrophysics. Cosmic ray acceleration and transport, magnetic dynamo, plasma instabilities, radiative processes in galaxies and galaxy clusters; radio and gamma-ray astrophysics.

Computational Astrophysics. Code development and high-performance computing with the unstructured moving mesh magneto-hydrodynamics code AREPO and the plasma-kinetic particle-in-cell code SHARP.

ACADEMIC POSITIONS

2025 –	***Full Professor (W3)***
	Faculty of Science, Universität Potsdam, Germany
2017 –	***Head of the Cosmology and High-Energy Astrophysics Group***
	Leibniz-Institut für Astrophysik Potsdam (AIP), Germany
2017 – 2025	***Associate Professor (W2)***
	Faculty of Science, Universität Potsdam, Germany
2016 – 2017	***ERC Group Leader*** *High-Energy Astrophysics and Cosmology*
	Heidelberg Institute for Theoretical Studies (HITS), Germany
2014 – 2017	***Privatdozent***
	Ruprecht-Karls-Universität Heidelberg, Germany
2010 – 2015	***Senior Research Associate***
	Heidelberg Institute for Theoretical Studies, Germany
2008 – 2010	***Senior Research Associate***
	Canadian Institute for Theoretical Astrophysics, Toronto, Canada
2005 – 2008	***Postdoctoral Fellowship***
	Canadian Institute for Theoretical Astrophysics, Toronto, Canada

EDUCATION

2014	***Habilitation:*** *Interfacing high-energy astrophysics and cosmological structure formation*
	University teaching credentials in *Physics*, Ruprecht-Karls-Universität Heidelberg, Germany
2005	***PhD:*** *On the role of cosmic rays in clusters of galaxies*
	Max-Planck-Institute for Astrophysics, Ludwig-Maximilians-Universität München, Germany
2002	***Diploma in Physics*** (comparable to Master Degree)
	Max-Planck-Institute for Astrophysics, Friedrich-Schiller-Universität Jena, Germany

SELECTED FELLOWSHIPS, HONOURS AND AWARDS

2026 –2030	**Leibniz ScienceCampus SCALES** (€ 4.1 million), Lead Institute: AIP *Multiscale Challenges: from Astrophysics to Climate Models* (Speakers: Pfrommer, Dietrich)
2024	***Full Professor (W3)*** (declined), Faculty of Science, Technical University Berlin, Germany
2022 – 2027	***ERC Advanced Grant*** (€ 2.5 million) Project PICOGAL. *Mind the Gap: from Plasma Kinetics to Cosmological Galaxy Formation*
2016 – 2021	***ERC Consolidator Grant*** (€ 2 million) Project CRAGSMAN. *The Impact of Cosmic Rays on Galaxy and Cluster Formation*
2010	***5-year Kavli Fellowship*** (declined), Kavli Institute for Cosmology, Cambridge, UK
2005 – 2008	***Postdoctoral Fellowship***, Canadian Institute for Theoretical Astrophysics, Canada

SELECTED VISITING FELLOWSHIPS (1 MONTH AND LONGER, SINCE 2009)

2021/2024	***Invited Participant****, High-Energy Plasma Phenomena in Astrophysics (1 month workshop split due to Covid),* Munich Institute for Astro-, Particle and BioPhysics, Munich, Germany
Aug – Sep 2019	***Invited Participant****, Multiscale Phenomena in Plasma Astrophysics* Kavli Institute for Theoretical Physics, Santa Barbara, USA
Apr – May 2014	***Invited Participant****, Gravity's Loyal Opposition: the Physics of Star Formation Feedback* Kavli Institute for Theoretical Physics, Santa Barbara, USA
Feb – Apr 2011	***Invited Participant****, Galaxy Clusters: the Crossroads of Astrophysics and Cosmology* Kavli Institute for Theoretical Physics, Santa Barbara, USA
Aug – Sep 2009	***Invited Participant****, Particle Acceleration in Astrophysical Plasmas* Kavli Institute for Theoretical Physics, Santa Barbara, USA

SUPERVISION/MENTORING OF GRADUATE STUDENTS AND POSTDOCTORAL RESEARCHERS

	16 Postdoctoral Researchers:
2016 –	AIP/HITS: Berlok, Bresci, Buck, Girichidis, Keating, Kwak, Ley, Meenakshi, Mohapatra, Pawlowski, Perrone, Schroer, Shalaby, Sparre, Thomas, Whittingham
	16 PhD Students:
2017 –	Universität Potsdam: Dusch, Ehlert, Jlassi, Kalangadan, Lemmerz, Pisharody, Tevlin, Thomas, Weber, Werhahn, Whittingham
2016 – 2020	Universität Heidelberg: Pais, Winner
2009 – 2012	Universidad de Granada, Spain: Zandanel, with Dr. Prada
2006 – 2011	University of Toronto, Canada: Battaglia, with Prof. Dr. Bond
2006 – 2010	Stockholm University, Sweden: Pinzke, with Prof. Dr. Bergström
	19 Master Students:
2017 –	Universität Potsdam: Corobean, Dusch, Emmerich, Franke, George, Jaber, Jolly, Marcos, Thomas, Sagias, Scherrmann, Stachlys, Tevlin, Weber, Whittingham
2014 – 2018	Universität Heidelberg: Jacob, Ehlert; TU Berlin: Werhahn
2011 – 2012	Ludwig-Maximilians-Universität München: Uhlig, with Dr. Enßlin

TEACHING ACTIVITIES – SUMMER AND WINTER SCHOOLS

2023	*A pedagogical introduction to cosmic rays, magnetic fields and galaxy formation* (NCTS Taiwan)
2021	*A pedagogical guide to cosmic rays and magnetic fields in the universe* (Universität Heidelberg)
2008/07	*Non-Thermal Processes* (IUCAA, Pune, India), *Simulating Galaxy Clusters* (Santa Fe, USA)

TEACHING ACTIVITIES – LECTURES, MASTER COURSES ONLY

since 2008 *Cosmology and Galaxies* (6x), Universität Potsdam
Advanced Computational Astrophysics: Concepts and Applications (6x), Universität Potsdam
The Physics of Galaxy Clusters (7x), Universität Potsdam and Heidelberg
Cosmology (3x), Universität Heidelberg
High-Energy Astrophysics (2x), University of Toronto and Universität Heidelberg

SELECTED ORGANISATIONS OF SCIENTIFIC MEETINGS (since 2018)

2027 Chair of the Scientific Organizing Committee, KITP Conference on *The Cosmic Ray Connection: From Heliospheric Plasmas to Galaxies and Clusters,* Santa Barbara, USA
2027 Scientific Organizing Committee, KITP Program on *Cosmic Rays in Astrophysical Systems: From the Sun to Galaxies and Beyond,* Santa Barbara, USA
2026 Scientific Organizing Committee, *8th ICM Theory & Computation Workshop,* Brno, Czech Republic
2025 Chair of the Scientific Organizing Committee, 18th AIP Thinkshop on *The role of feedback in galaxy formation: from small-scale winds to large-scale outflows,* Potsdam, Germany
2024 Scientific Organizing Committee, Aspen Center of Physics Workshop on *Cosmic Ray Feedback in Galaxies and Galaxy Clusters,* Aspen, USA
2024 Scientific Organizing Committee, *7th ICM Theory & Computation Workshop,* Michigan, USA
2023 Program Organizing Committee, *49th European Conference on Plasma Physics,* Bordeaux, France
2022 Scientific Organizing Committee, *6th ICM Theory and Computation Workshop,* Copenhagen, Denmark
2019 Scientific Organizing Committee, *New Perspectives on Galactic Magnetism,* Newcastle upon Tyne, UK
2018 Chair of the Scientific Organizing Committee, 15th AIP Thinkshop on *The role of feedback in galaxy formation: from small-scale winds to large-scale outflows,* Potsdam, Germany
2018 Scientific Organizing Committee, *TeV Particle Astrophysics 2018 (TeVPA 2018),* Berlin, Germany

SELECTED INSTITUTIONAL RESPONSIBILITIES (SINCE 2020)

2026 – 2030 ***Speaker of the Leibniz Campus SCALES: Multi-scale Challenges – from Astrophysics to Climate Modelling,*** Potsdam/Berlin, Germany
2019 – 2022 ***Chair of the AIP Science Strategy Committee, Member of the Institutes Regulations Committee,*** Leibniz-Institut für Astrophysik Potsdam (AIP), Germany
2020 – 2021 ***Chair of the Institute's Heads Meetings*** Leibniz-Institut für Astrophysik Potsdam (AIP), Germany

SELECTED ACTIVITIES OF TRUST

2012 – ***Scientific Referee*** for the Science Associations:
European Research Council, (EU), Alexander-von-Humboldt Foundation (Germany), Deutsche Forschungsgesellschaft (Germany), New Zealand Marsden Fund (New Zealand)
2005 – ***Scientific Referee*** for the Journals:
Astronomy & Astrophysics, Astrophysical Journal, Astrophysics & Space Science, Journal of Cosmology and Astroparticle Physics, Monthly Notices of the Royal Astronomical Society, Nature Astronomy, New Astronomy, Physical Review Letters, Physical Review D

PUBLICATIONS

Summary statistics: 178 published peer reviewed articles; 22 1st-author or corresponding-author articles in an alphabetically ordered list; > 12,400 citations; *h*-index = 66; 42 well-known articles (> 100 citations) as of 11/2026, ADS.

For a complete list of referred publications, please refer to https://pages.aip.de/pfrommer/Publications/

Please explore my metrics, citations, reads, publication indices and more, including my collaboration network.

SCIENTIFIC TALKS

I typically deliver around twelve invited talks and several contributed talks at conferences each year. A complete list of invited and contributed presentations is available at my webpage.

PUBLIC OUTREACH ACTIVITIES

02/2027 *Cosmic Rays: From Their Birth Sites in Supernovae to Shaping Entire Galaxies*
Main coordinator of a conference for US physics teachers at high-school and college level

10/2026 *Wie kosmische Strahlung Galaxien formt*,
Talk and discussion at #FasziAstroOnline, Haus der Astronomie

04/2024 *Digitale Herausforderungen in der Astrophysik*
Talk and discussion at 1. Digitalministerkonferenz Berlin Brandenburg

02/2024 *Vom Urknall bis heute: unser modernes Verständnis der Kosmologie*
Talk at Hochschultage 2024 – Neue Erkenntnisse in der Astronomie, Universität Marburg

10/2023 *From the Big Bang until today: our modern understanding of cosmology*
Lecture within the Lecture Series "Finding our ways in space and time", University of Potsdam

07/2023 *Einfluss supermassereicher Schwarzer Löcher*
Talk at Babelsberger Sternennächte Online hosted by Urknall, Weltall und das Leben

03/2023 *Faszination Galaxienhaufen – die größten kollabierten Objekte im Universum*
Talk at Universe on Tour, Potsdam

02/2023 *Faszination Schwarze Löcher – rotierende Schwarze Löcher & Akkretionsscheiben*
Talk at Babelsberger Sternennächte Online hosted by Urknall, Weltall und das Leben

05/2022 *Faszination Galaxienhaufen – die größten kollabierten Objekte im Universum*
Talk and discussion at #FasziAstroOnline, Haus der Astronomie

11/2021 *Schwarze Löcher im Universum*
Talk at Babelsberger Sternennächte Online hosted by Urknall, Weltall und das Leben

03/2019 *Cosmology and Galaxy Formation*
Talk at Jürgen Ehlers Spring School, AEI Potsdam

03/2018 *Cosmology and Galaxy Formation*
Talk at Jürgen Ehlers Spring School, AEI Potsdam

06/2017 *Schwarze Löcher im Universum*
Talk at Babelsberger Sternennächte

10/2013 *Schwarze Löcher im Universum*
Talk at Faszination Astronomie, Haus der Astronomie

15 SELECTED 1ST AUTHOR (OR SHARED 1ST AUTHOR) PUBLICATIONS

1. Ruszkowski, M., **Pfrommer, C.** 2023, Astron Astrophys Rev, 31, 4, *Cosmic ray feedback in galaxies and galaxy clusters – A pedagogical introduction and a topical review of the acceleration, transport, observables, and dynamical impact of cosmic rays* [shared 1st author]
2. **Pfrommer, C.**, Werhahn, M., Pakmor, R., Girichidis, P., Simpson, C. M. 2022, MNRAS, 515, 4229, *Simulating radio synchrotron emission in star-forming galaxies: small-scale magnetic dynamo and the origin of the far-infrared–radio correlation*
3. **Pfrommer, C.**, Pakmor, R., Schaal, K., Simpson, C., Springel, V. 2017, MNRAS, 465, 4500, *Simulating cosmic ray physics on a moving mesh*
4. **Pfrommer, C.**, Pakmor, R., Simpson, C., Springel, V. 2017, ApJL, 847, L13, *Simulating gamma-ray emission in star-forming galaxies*
5. **Pfrommer, C.** 2013, ApJ, 779, 10, *Toward a comprehensive model for feedback by active galactic nuclei: new insights from M87 observations by LOFAR, Fermi and H.E.S.S.*
6. **Pfrommer, C.**, Chang, P., Broderick, A. E. 2012, ApJ, 752, 24, *The cosmological impact of luminous TeV blazars. III. Implications for galaxy clusters and the formation of dwarf galaxies*
7. **Pfrommer, C.**, Jones, T. W. 2011 ApJ, 730, 22, *Radio Galaxy NGC 1265 Unveils the Accretion Shock Onto the Perseus Galaxy Cluster*
8. **Pfrommer, C.**, Dursi, L. J. 2010, Nature Phys., 6, 520, *Detecting the orientation of magnetic fields in galaxy clusters*
9. **Pfrommer, C.** 2008, MNRAS, 385, 1242, *Simulating cosmic rays in clusters of galaxies – III. Non-thermal scaling relations and comparison to observations*
10. **Pfrommer, C.**, Enßlin, T. A., Springel, V. 2008, MNRAS, 385, 1211, *Simulating cosmic rays in clusters of galaxies – II. A unified scheme for radio halos and relics with predictions of the gamma-ray emission*
11. **Pfrommer, C.**, Enßlin, T. A., Springel, V., Jubelgas, M., Dolag, K. 2007, MNRAS, 378, 385, *Simulating cosmic rays in clusters of galaxies – I. Effects on the Sunyaev-Zel'dovich effect and the X-ray emission*
12. **Pfrommer, C.**, Springel, V., Enßlin, T. A., Jubelgas, M. 2006, MNRAS, 367, 113, *Detecting shock waves in cosmological smoothed particle hydrodynamics simulations*
13. **Pfrommer, C.**, Enßlin, T. A., Sarazin, C. L. 2005, A&A, 430, 799, *Unveiling the composition of radio plasma bubbles in galaxy clusters with the Sunyaev-Zel'dovich effect*
14. **Pfrommer, C.**, Enßlin, T. A. 2004, A&A, 413, 17, *Constraining the population of cosmic ray protons in cooling flow clusters with gamma-ray and radio observations: are radio mini-halos of hadronic origin?*
15. **Pfrommer, C.**, Enßlin, T. A. 2004, MNRAS, 352, 76, *Estimating galaxy cluster magnetic fields by the classical and hadronic minimum energy criterion*