Dr. Tobias Buck

Curriculum Vitæ

Leibniz-Institut für Astrophysik (AIP)
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Research Interests

- Numerical Cosmology and cosmological simulations of galaxy formation
- Interpretable machine learning algorithms and their applicability to natural science problems
- Galactic Archeology, the structure and build-up of Milky Way's stellar disc
- Improving modelling techniques for galaxy formation simulations

Academic Background

Since Dec. 2018	**Postdoc**, *Leibniz-Institut für Astrophysik*, Potsdam, Cosmology and High-energy Astrophysics group, Christoph Pfrommer.
Nov. 2018	**Postdoc**, *Max-Planck Institut for Astronomy*, Heidelberg, Milky Way group, Hans-Walter Rix.
June 2015 - Oct. 2018	**Ph.D.**, *Max-Planck Institut for Astronomy*, Heidelberg, *On the formation of the MW system in cosmological context* Supv.: Prof. Dr. Hans-Walter Rix (MPIA), Prof. Dr. Andrea V. Macciò (NYUAD), *'grade: summa cum laude'*.
Oct. 2013 - June 2015	**Master of Science (Physics)**, *Ruprecht-Karls University*, Heidelberg, *The Emergence of spatially and kinematically coherent Planes of Satellite Galaxies in high-resolution Dark Matter only simulations* (Supv.: Prof. Dr. Andrea V. Macciò), *'grade: A'*.
Oct. 2010 - July 2013	**Bachelor of Science (Physics)**, *Ruprecht-Karls University*, Heidelberg, *Dynamical analysis of the Hyades star cluster using direct N-body simulations* (Supv.: Prof. Dr. Andreas Just)*'grade: A'*.

Scholarships and Grants

Jan. 2019	**Nominee for Wilhelm und Else Heraeus-Dissertationspreis für Physik and Astronomie**, *University Heidelberg*.
2017-2019	**30M CPUh computing time**, *Leibniz SuperComputing Centre*, SuperMUC, co-I.
2010 - 2015	**Scholarship of the German National Academic Foundation**.
Nov. 2014	**Grant for DWIH Indo-German Winter School for Astrophysics**, *India, Mumbai*.

Teaching Experience

since March 2020	**Master student supervision**, *Univ. Potsdam*, The impact of stellar winds in hydrodynamical simulations.
Jan. 2019	**2 Invited Lectures**, *12th Winter School of the Heidelberg Graduate School for Fundamental Physics (HGSFP)*, Galaxy Formation and Cosmology.
Sep.-Dec. 2017	**Summer Student Supervision**, *Diane Salim*, MPIA Heidelberg.
Sep. 2016	**Teaching assistant**, *Univ. Heidelberg*, Tutor physics block course 'Cosmology'.

Oct. 2015 - Feb. 2016	**Teaching assistant**, *Univ. Heidelberg*, Tutor physics course 'Introduction to Astronomy'.
Feb.-Jul. 2015	**Teaching assistant**, *Univ. Heidelberg*, Tutor physics lab course I+II.
Oct. 2014 - Feb. 2015	**Teaching assistant**, *Univ. Heidelberg*, Tutor theoretical physics course 'Electrodynamics'.
Apr.-Jul. 2014	**Teaching assistant**, *Univ. Heidelberg*, Tutor theoretical physics course 'Classical Mechanics'.

Organizational experience

	Refereeing experience, *Nature Astronomy, ApJ, MNRAS, A&A.*
since 2018	**Organization Committee**, *AIP monthly talk series, AIP Kaffeerunde.*
2018	**Organization Committee**, *11th Winter School of the Heidelberg Graduate School for Fundamental Physics (HGSFP)*, Obergurgl, Austria.
2016, 2017	**Organization Committee**, *Max-Planck Institute for Astronomy, Patzer's Student Retreat.*
2015 - 2018	**Student representative**, *International Max-Planck Research School*, Heidelberg, Germany.

Invited Talks

24. June. 20201	2021 GALAH Science meeting, Sydney, Australia, **The challenge of simultaneously matching the observed diversity of chemical abundance patterns in cosmological hydrodynamical simulations**.
23. March. 2021	Erwin Schrödinger Institut workshop: Tomographic Reconstructions and their Startling Applications, Vienna, Austria, **Reconstructing galaxy properties from multi-band images**.
2. Nov. 2020	Max-Planck Institut für Intelligente Systeme, Tübingen, Germany, **Exploring causal generative models for usage in astronomical modelling**.
24. Jan. 2020	Price Colloquium Wilhelm und Else Heraeus-Dissertationspreis für Physik and Astronomie, Heidelberg, Germany, **High resolution cosmological simulations of Milky Way mass galaxies**.
24. July 2018	Columbia University, New York, USA, **High resolution cosmological simulations of Milky Way mass galaxies**.
10. Jan. 2018	Max-Planck Institute for Astrophysics, Munich, Germany, **Cosmological simulations of Milky Way mass galaxies**.
13. April 2018	Max-Planck Institute for Astronomy, Heidelberg, Germany, **High-resolution cosmological simulations of Milky Way mass galaxies**.

Contributed Conference Talks and Poster

20.11.2020	N-Body Shop Excellence Conference, USA, **An improved chemical enrichment implementation in GASOLINE2**.
20.11.2020	Linking the Galactic and Extragalactic, Australia, **Tracing the formation history of simulated Milky Way analogues with stellar population kinematics**.
23.9.2020	Astronomische Gesellschaft Annual meeting, Germany, **PICASSSO: Painting IntrinsiC Attributes onto SDSS Objects**.
23.4.2020	AIP Workshop on Machine Learning, Potsdam, Germany, **PICASSSO: Painting IntrinsiC Attributes onto SDSS Objects**.
17.2-21.2.2019	Dynamical Reconstruction of Galaxies, Leiden, Netherlands, **Dynamical components of the Milky Way in cosmological hydrodynamical simulations**.

9.12.-13.12.2019	Machine Learning Tools for Research in Astronomy, Ringberg, Germany, **PICASSSO: Painting IntrinsiC Attributes onto SDSS Objects**.
2.9.-6.9.2019	CLUES collaboration meeting, Lyon, France, **The effects of Cosmic Rays on the formation of Milky Way-like galaxies**.
25.6.-29.6.2019	Feedback and its Role in Galaxy Formation, Spetses, Greece, **The effects of Cosmic Rays on the formation of Milky Way-like galaxies**.
Sept. 2018	15th Potsdam Thinkshop: The role of feedback in galaxy formation, *AIP Potsdam*, Potsdam, Germany, **The importance of feedback in forming realistic dwarf galaxies**.
July 2018	The physics of galaxy scaling relations, Kingston, Canada, **Scaling relations for Milky Way satellites**.
June 2018	CLUES collaboration meeting, Puerto de la Cruz, Teneriffe, **High resolution simulations of the Milky Way system**.
Oct. 2017	Piercing the Galactic Darkness, Heidelberg, Germany, **The Milky Way Bulge/Bar in a high-resolution cosmological simulation**.
Oct. 2017	The Role of Gas in galaxy dynamics, Valetta, Malta, **Clumpy galaxies at high-redshift: Insights from the NIHAO simulations**.
Aug. 2017	Challenges in Galaxy Evolution: from black holes to the cosmic web, Florence, Italy, (Fast Talk), **Insights into high-redshift clumpy galaxies from the NIHAO simulations**.
July 2017	Rediscovering our Galaxy, *IAU Symposium 334*, Potsdam, Germany, **NIHAO-UHD: High-resolution simulations of Milky Way mass galaxies**.
Sept. 2016	The Milky Way and its Environment, Paris, France, **Poster: The clumpy nature of star formation in NIHAO**.
March 2016	13th Potsdam Thinkshop: Near field cosmology, *AIP Potsdam*, Obergurgl, Austria, **Simulated thin planes of satellites in ΛCDM are not kinematically coherent**.
March 2016	Formation and Evolution of Galaxy Outskirts, *IAU Symposium 321*, Toledo, Spain, **Poster: Thin planes of satellites in ΛCDM are not kinematically coherent**.

Conferences, Workshops and Schools

16.9.-17.9.2020	**Machine Learning: practical application to Astrophysics**, Potsdam, Germany.
23.9.-27.9.2019	**IWR Summer School on Machine Learning**, Heidelberg, Germany.
Sept. 2018	**12th IMPRS Summer School**, *Gaia Data & Science*, Heidelberg, Germany.
Jan. 2018	**11th HGSFP Winter School**, Obergurgl, Austria.
May. 2017	**3rd OBSPM/LAM Galaxy Formation School**, Spetses, Greece.
Jan. 2017	**10th HGSFP Winter School**, Obergurgl, Austria.
Sept. 2016	**IMPRS Summer School**, *Astrostatistics & Data Mining*, Heidelberg, Germany.
July 2016	**Discs in Galaxies**, *Munich Joint Conference*, Munich, Germany.
Sept. 2015	**Astro Hack Week**, *New York University*, New York, USA.
17.4.-22.4.2014	**String Steilkurs - Part I**, *DESY Hamburg*.
2015-2018	**Visiting Ph.D. Student**, *New York University Abu Dhabi*, Abu Dhabi, Supervisor: Prof. Dr. Andrea V. Macciò (Nov. 2015, Febr. 2016, Nov. 2016, March 2017, Dez. 2017).
since 2018	**Regular Visiting Research Scholar**, *New York University Abu Dhabi*, Abu Dhabi.

Skills

Languages   German, English, Spanish, Latin

IT skills   Gasoline2, C (with OpenMP, MPI), Python, LaTeX , Matlab/Mathematica, HTML, Gnuplot