

Leonard Romano

## Curriculum Vitae

### Contact Info

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Work address	Max-Planck-Institut für Extraterrestrische Physik Gießenbachstr. 1 85748 Garching, Germany
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### Education

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02/2022 until now	<b>PhD in computational astrophysics at LMU</b> <b>PhD thesis:</b> "Simulations of Superbubbles in a Shearing, Stratified and Structured Interstellar Medium" <b>Defense date:</b> 27/08/2025 <b>PI:</b> Prof. Dr. Andreas Burkert
10/2019 until 11/2021	<b>Master of Science in nuclear-, particle- and astrophysics at TUM (grade point average: 1.2)</b> <b>Master's thesis:</b> "Simulating the co-evolution of molecular hydrogen and the grain size distribution in an isolated galaxy" (grade point average: 1.3)
10/2016 until 09/2019	<b>Bachelor of Science in physics at TUM (grade point average: 1.6)</b>
10/2018 until 2/2019	<b>Exchange semester at Osaka University and Bachelor's thesis:</b> " <i>Baryonic feedback and small-scale problems in hydrodynamical <math>\Lambda</math>CDM simulations</i> " (grade point average: 1.7)
6/2016	<b>General University Entrance Qualification (grade points: 1.7)</b> + Certificate of the DPG for extraordinary achievements in the physics A-Level exam at Gymnasium Gröbenzell
9/2008 until 8/2016	<b>Gymnasium Gröbenzell (Highschool education)</b>  <b>Seminar thesis:</b> " <i>komplexe Wechselstromrechnung</i> " (grade points: 11)

### Languages

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Englisch	C1
Chinese	A1
French	A2
Japanese	C1 (JLPT N1)
German	C2 (mother-tongue)

## Leonard Romano

### IT-Skills

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<b>Programming</b>	C, C++, Fortran, Python, Julia
<b>Numerical Simulations</b>	GADGET-3/4 (SPH), RAMSES (AMR)
<b>Parallelization</b>	MPI & OpenMP
<b>HPC</b>	> 10 MCPUh on MPCDF Infrastructure (Cobra & Viper)
<b>Github</b>	<a href="https://github.com/leonardromano">github.com/leonardromano</a>

### Teaching & Lab work

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04/2022 – 09/2022	Mentoring of Bachelor student Benedict Röcken “Entstehung der Lokalen Blase aus Supernovae” (engl. “Formation of the Local Bubble from Supernovae”) ( <b>grade point average:1.0</b> )
08/2017 – 03/2022	Tutor for various undergraduate mathematics courses at TUM
08/2019 – 08/2020	Technical student – PanEDM TUM
04/2019 – 09/2019	Technical student – ALICE TUM

### Publications

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- [1] *SISSI: Supernovae in a stratified, shearing interstellar medium – I. The geometry of supernova remnants.* **Romano L. E. C.**, Behrendt M., Burkert A., 2025, *arXiv:2503.12977*
- [2] *Starburst-Driven Galactic Outflows – Unveiling the Suppressive Role of Cosmic Ray Halos.* **Romano L. E. C.**, Owen E. R., Nagamine K., 2025, *arXiv:2503.13261*
- [3] *Radial properties of dust in galaxies: Comparison between observations and isolated galaxy simulations.* van der Giessen S. A., Matsumoto K., De Looze I., **Romano L. E. C.**, Hirashita H., Nagamine, K., Baes, M., Palla M., Hou K.-C., Faesi C., 2024, *A&A*, 692, A39
- [4] *Star Formation by Supernova Implosion.* **Romano L. E. C.**, Burkert A., Behrendt M., 2024, *ApJL*, 971(2), L44
- [5] *Observational signatures of the dust size evolution in isolated galaxy simulations.* Matsumoto K., Hirashita H., Nagamine K., Van der Giessen S. A., **Romano L. E. C.**, Relaño M., De Looze I., Baes M., Nersesian A., Camps P., Hou K. C., Oku Y., 2024, *A&A*, 689, A79
- [6] *Cloud Formation by Supernova Implosion.* **Romano L. E. C.**, Behrendt M., Burkert A., 2024, *ApJ*, 965 (2), 168
- [7] *Dust grain size evolution in local galaxies: a comparison between observations and simulations.* Relaño M., De Looze I., Saintonge A., Hou K. C., **Romano L. E. C.**, Nagamine K., Hirashita H., Aoyama S., Lamperti I., Lisenfeld U., Smith M. W. L.,

## Leonard Romano

Chastenet J., Xiao T., Gao Y., Sargent M., Van der Giessen S. A., 2022, MNRAS, 515, 5306

[8] *The co-evolution of molecular hydrogen and the grain size distribution in an isolated galaxy.* **Romano L. E. C.**, Nagamine K., Hirashita H., 2022, MNRAS, 514, 1461

[9] *Dust diffusion in SPH simulations of an isolated galaxy.* **Romano L. E. C.**, Nagamine K., Hirashita H., 2022, MNRAS, 514, 1441

## Software Products

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- **Osaka-gadget4.** **Romano L. E. C.**, Oku Y., Matsumoto K., Numerical Simulation Code, repository open only to collaborators (for now), due to conflicting data sharing policies
  - Dust grain-size evolution model (**Romano L. E. C.**, Matsumoto K.)
  - Model for dark matter self-interactions (**Romano L. E. C.**)
  - State-of-the-art Feedback Models (**Romano L. E. C.**, Oku Y.)
  - Upgrades and patches to various numerical aspects of the underlying SPH code Gadget-4 (**Romano L. E. C.**, Oku Y., Matsumoto K.)
- Contributed to treatment of dust physics in chemistry and cooling library **Grackle-3** (v.3.2)
  - Implemented new options for H2 and dust physics (PR #94)
  - Repository: <https://github.com/grackle-project/grackle>
- Fixed numerical error in publicly-available hydrodynamics code **RAMSES** (28/06/2023)
  - Fixed error related to scalar advection
  - Repository: <https://bitbucket.org/rteyssie/ramses/src/master/>
  - Commit **f1bd65e**

## Talks & Posters

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[1] *Star formation near the Sun is quenched by expansion of the Local Bubble.* **Romano L. E. C.**, Burkert A., Behrendt M., Garching SN-Meeting (MPA/ESO), 24/07/2025 (invited talk)

[2] *Starburst-Driven Galactic Outflows: Unveiling the Suppressive Role of Cosmic Ray Halos.* **Romano L. E. C.**, Owen E. R., Nagamine K., EAS 2025 Annual Meeting, Cork, 27/06/2025 (poster + 3-min pitch)

[3] *The New Age of the Local Bubble.* **Romano L. E. C.**, Burkert A., Behrendt M., EAS 2025 Annual Meeting, Cork, 27/06/2025 (poster + 3-min pitch)

[4] *Starburst-Driven Galactic Outflows: Unveiling the Suppressive Role of Cosmic Ray Halos.* **Romano L. E. C.**, Owen E. R., Nagamine K., International Workshop on Galaxy Formation, Osaka, 28/05/2025 (talk)

[5] *SISSI: Supernovae in a Shearing, Stratified Interstellar Medium.* **Romano L. E. C.**, Behrendt M., Burkert A., iTHEMS Seminar RIKEN, Wako-shi, 23/05/2025 (invited talk)

## Leonard Romano

- [6]*SISSI: Supernovae in a Shearing, Stratified Interstellar Medium*. **Romano L. E. C.**, Behrendt M., Burkert A., ORIGINS PhD Days, Kufstein, 15/05/2025 (talk)
- [7] *Continuous Simulation Data Stream: A dynamical timescale-dependent output scheme for simulations*. **Romano L. E. C.**, ORIGINS Interdisciplinary Journal Club, 11/03/2025 (talk)
- [8]*SISSI: Supernovae in a Shearing, Stratified Interstellar Medium*. **Romano L. E. C.**, Behrendt M., Burkert A., SESTAS Meeting MPA, Garching, 05/03/2025 (talk)
- [9]*Diffusive shock acceleration of dust grains at supernova remnants*. **Romano L. E. C.**, ORIGINS Interdisciplinary Journal Club, 14/01/2025 (talk)
- [10]*SISSI: Supernovae in a Shearing, Stratified Interstellar Medium*. **Romano L. E. C.**, Behrendt M., Burkert A., Osaka University Theoretical Astrophysics Colloquium, Osaka, 30/10/2024 (talk)
- [11]*SISSI: Supernovae in a Shearing, Stratified Interstellar Medium*. **Romano L. E. C.**, Behrendt M., Burkert A., ORIGINS Turbulence Day 2024, Garching, 16/10/2024 (talk)
- [12]*SISSI: Supernovae in a Shearing, Stratified Interstellar Medium*. **Romano L. E. C.**, Behrendt M., Burkert A., USM Science Day 2024, Munich, 12/10/2024 (5-Minute Pitch)
- [13]*The Need for Dust Diffusion in SPH Simulations of Dust Evolution in the ISM*. **Romano L. E. C.**, Nagamine K., Hirashita H., Annual Meeting of the Astronomische Gesellschaft 2024, Cologne, 13/09/2024 (talk)
- [14]*SISSI: Supernovae in a Shearing, Stratified Interstellar Medium*. **Romano L. E. C.**, Behrendt M., Burkert A., Annual Meeting of the Astronomische Gesellschaft 2024, Cologne, 12/09/2024 (talk)
- [15]*Cloud Formation by Supernova Implosion*. **Romano L. E. C.**, Behrendt M., Burkert A., Annual Meeting of the Astronomische Gesellschaft 2024, Cologne, 10/09/2024 (poster)
- [16]*Efficient formation of massive galaxies at cosmic dawn by feedback-free starbursts*. **Romano L. E. C.**, ORIGINS Interdisciplinary Journal Club, 09/07/2024 (talk)
- [17]*Cloud Formation by Supernova Implosion*. **Romano L. E. C.**, Behrendt M., Burkert A., Supernova Remnants III, Chania, 09/06/2024 (poster)
- [18]*Metal-Rich Star-Formation by Supernova Implosion*. **Romano L. E. C.**, Behrendt M., Burkert A., MPA Cosmology Seminar, Garching, 21/05/2024 (talk)
- [19]*Metal-Rich Star-Formation by Supernova Implosion*. **Romano L. E. C.**, Behrendt M., Burkert A., ORIGINS PhD Days 2024, Grainau, 06/05/2024 (talk)

## Leonard Romano

- [20]*Metal-Rich Star-Formation by Supernova Remnant Implosion*. **Romano L. E. C.**, Behrendt M., Burkert A., MIAPbP: ABUNDANCE GRADIENTS IN THE LOCAL UNIVERSE (ADONIS), Garching b. München, 18/04/2024 (talk)
- [21]*Cloud Formation by Supernova Implosion*. **Romano L. E. C.**, Behrendt M., Burkert A., Building Galaxies from Scratch, Vienna, 18/02/2024 (poster)
- [22]*FORGE'd in FIRE: Resolving the End of Star Formation and Structure of AGN Accretion Disks from Cosmological Initial Conditions*. **Romano L. E. C.**, ORIGINS Interdisciplinary Journal Club, 09/01/2024 (talk)
- [23]*Cloud Formation by Supernova Implosion*. **Romano L. E. C.**, Behrendt M., Burkert A., ORIGINS Science Week 2023, Irsee, 05/12/2023 (talk)
- [24]*Cloud Formation by Supernova Implosion*. **Romano L. E. C.**, Behrendt M., Burkert A., ORIGINS PhD Days 2023, Seeon, 28/08/2023 (talk)
- [25]*SISSI: Supernovae In a Shearing, Stratified Interstellar Medium*. **Romano L. E. C.**, Behrendt M., Burkert A., Modelling Multiphase Astrophysical Systems, Kochel am See, 31/05/2023 (talk)
- [26]Smallr, scalar advection errors and how to avoid them. **Romano L. E. C.**, Behrendt M., Burkert A., Ramses User Meeting 2023, Oxford University, 18/04/2023 (talk)
- [27]*SISSI: Supernovae In a Shearing, Stratified Interstellar Medium*. **Romano L. E. C.**, Behrendt M., Burkert A., 14<sup>th</sup> IMPRS Symposium, European Space Organization, 12/05/2022 (talk)
- [28]*Evolution of the Grain Size Distribution and Molecular Hydrogen in SPH Simulations of an Isolated Galaxy*. **Romano L. E. C.**, Nagamine K., Hirashita H., From Stars to Galaxies II, Chalmers University, 06/22/2022 (poster)
- [29]*Simulating the Evolution of the Grain Size Distribution (GSD) and H<sub>2</sub> in an isolated galaxy*. **Romano L. E. C.**, Nagamine K., Hirashita H., 13<sup>th</sup> IMPRS Symposium, Max-Planck Institute for astrophysics, 06/09/2022 (talk)

## Outreach

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- *Strange metal-rich stars may come from stellar implosions*. Interview with writer Leah Crane for popular science article featured in Issue 31 August 2024 - New Scientist International Edition, 31/08/2024
- *Die Urknalltheorie im Zeitalter von JWST*. **Romano L. E. C.**, PepperMINT, Gymnasium Gröbenzell, 24/10/2023 (public talk)
- *15 Minutes about Pedestrian Dynamics*. **Romano L. E. C.**, (Ig-) Nobel prize event, 15x4 Munich, 05/19/2022 (public talk)

## Workshop Organization

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- **ORIGINS PhD Days 2025**, Kufstein, Austria, 3-day workshop (May 14-16 2025) with 19 participants, co-organizer: L. Meyer-Hetling

## Leonard Romano

- **ORIGINS PhD Days 2024**, Grainau, Germany, 3-day workshop (May 6-8 2024) with 32 participants, co-organizers: Dr. A. Mazoun, L. Meyer-Hetling
- **ORIGINS PhD Days 2023**, Seeon, Germany, 3-day workshop (Aug. 28-30 2023) with 26 participants, co-organizer: Dr. A. Mazoun

### Awards & Scholarships

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- **PhD position (01.02.2022 – 31.12.2025)** funded by the **Deutsche Forschungsgemeinschaft** (DFG, German Research Foundation) under **Germany's Excellence Strategy – EXC 2094 – 390783311**
- **PhD Representative Travel Fund 2024**, 24.05.2024, 3000 EUR, “In recognition of [...] work as a PhD representative”
- **TUM Exchange** Scholarship for an exchange Semester at Osaka University (WS 2018/2019)
- **DPG Certificate of the DPG for extraordinary achievements in the physics A-Level exam** at Gymnasium Gröbenzell (2016)

### Extracurricular Activities

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- **ORIGINS Interdisciplinary Journal Club (organizer)** at ORIGINS Excellence Cluster Munich, 09/2023 – now
- **ORIGINS PhD Representative** at ORIGINS Excellence Cluster Munich, 02/2023 – now
- **Osaka University International Students Association** at Osaka University, WS 2018/2019

Munich, Aug 6, 2025