Thiébaut Schirmer

Astrophysicist · Postdoctoral Researcher

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Professional Summary

Experienced astrophysicist specializing in dust evolution and radiative transfer modeling with 7+ years of research experience. Expert in JWST and ground-based observations of photon-dominated regions and AGB stars. Proven track record in international collaboration, conference organization, and leading cutting-edge research in cosmic dust physics.

Experience

- **Postdoctoral Researcher — Origin and Fate of Dust in the Universe** *Since August 2021*
  Chalmers University of Technology Gothenburg, Sweden
  - Leading research on dust properties in the inner circumstellar environment of AGB stars using radiative transfer and VLT observations
  - Supporting research on dust properties in water fountains and wind-ISM interactions
  - Supporting PhD student Gustav Olander's lead research with Pr Susanne Aalto on JWST studies of dust in compact obscure nuclei and carbonaceous features in the galaxy merger Zwicky 96
  - Chaired both Local and Scientific Organizing Committees for international conference "Origin and Fate of Dust in Our Universe", leading organization efforts for 100+ participants
  - Organized local ALMA/JWST synergy workshop focused on observational synergies between facilities, coordinating program and logistics for 20+ participants
  - Served on Local Organizing Committee for national conference Astronomdagarna, supporting organization and logistics for 100+ participants
  - Participating in the life of our laboratory by helping organize social events
- **Postdoctoral Researcher — Dust evolution in photon-dominated regions** *October 2020 - July 2021*
  Institut d'Astrophysique Spatiale d'Orsay Orsay, France
  - Extended analysis of dust properties in photon-dominated regions, focusing on IC63 and the Orion Bar PDRs using multi-wavelength observations and radiative transfer modeling
- **PhD Candidate — Dust evolution in photon-dominated regions** *October 2017 - October 2020*
  Institut d'Astrophysique Spatiale d'Orsay Orsay, France
  - Completed PhD thesis under the supervision of Alain Abergel and Laurent Verstraete, focusing on understanding dust evolution in photon-dominated regions (PDRs) as unique laboratories for studying grain processing
  - Modeled dust emission in the optically thin limit using THEMIS interstellar dust model to understand how variations in dust properties affect emission
  - Coupled THEMIS with 1D radiative transfer code DustPDR and 3D radiative transfer code SOC to study radiative transfer effects, comparing 1D versus 3D approaches
  - Conducted detailed analysis of the Horsehead nebula by modeling dust emission with THEMIS and 3D radiative transfer code SOC, comparing results with Spitzer and Herschel observations to constrain the dust properties
  - Prepared synthetic maps of dust emission in the Orion Bar using 3D radiative transfer modeling to support analysis of JWST Early Release Science observations from PDRs4All program
- **Research Assistant — Origin and evolution of the Milky Way in the Gaia era** *August 2016 - June 2017*
  Department of Astronomy and Theoretical Physics Lund, Sweden
  - Conducted 10-month pre-doctoral research under supervision of Thomas Bensby and Iryna Kushniruk
  - Analyzed kinematic groups in the Milky Way by performing wavelet analysis on a sample of stars from Gaia DR1/TGAS with RAVE DR5 radial velocities

- Applied wavelet analysis using the à-trous algorithm combined with auto-convolution histogram filtering, and validated detected structures through Monte Carlo simulations to distinguish real features from velocity uncertainty noise
- Contributed to writing Kushniruk et al. 2017 "Kinematic structures in the solar neighbourhood revealed by Gaia DR1/TGAS and RAVE", focusing on methodology section describing wavelet analysis techniques

- **Research Intern — Impact of dust models in photon-dominated regions** *March 2016 - July 2016*
  LERMA / Observatoire de Paris-Meudon Meudon, France
  - 4-month research internship with Jacques Le Bourlot and Franck Le Petit during my master degree at the Observatoire de Paris
  - Partially implemented the Draine & Li dust model in the Meudon PDR Code (Fortran), integrating it into radiative transfer and chemistry calculations while retaining the standard MRN distribution for photoelectric heating
  - Compared simulation results between standard MRN and Draine & Li dust models to evaluate the influence of updated dust properties on PDR physics and chemistry
- **Research Intern — 3D self-consistent model of dust and gas** *April 2015 - July 2015*
  Observatoire de Besançon Besançon, France
  - 4-month research internship under supervision of Julien Montillaud as part of my first year of master degree at the Ecole Normale Superieure Paris-Saclay
  - Used the Besançon Galaxy model to predict the local interstellar radiation field throughout the Milky Way
  - Implemented the DustEM dust emission modeling tool to simulate dust emission based on the predicted radiation field
  - Created 3D maps of expected dust emission that could be compared with observational data
- **Research Intern — Gravitational collapsing of G110-13** *May 2014 - July 2014*
  Observatoire de Besançon Besançon, France
  - 2-month research internship studying molecular cloud dynamics
  - Used the Radex radiative transfer code to model line emission from the collapsing molecular cloud G110-13
  - Analyzed non-LTE excitation conditions to determine density and temperature profiles during cloud collapse
  - Compared model predictions with observational data to constrain the timescale of gravitational collapse

Education

- **Observatoire de Paris** *2015 - 2016*
  Master degree in astrophysics — Astronomy, Astrophysics and Space Engineering (AAIS) Paris, France
  - Advanced coursework in stellar physics: Asteroseismology and stellar interiors, stellar physics and evolution, magnetohydrodynamics
  - Specialized courses in interstellar medium physics, radiative transfer, atoms/molecules/solids, and galaxy formation
  - Hands-on observational training: one-week observing run at Observatoire de Haute-Provence (120cm IR telescope, 152cm spectroscopy) and infrared observations at Meudon Observatory focusing on the BN/KL complex
  - Computational astrophysics projects: developed numerical simulations in Fortran for dissipative systems, used Meudon PDR code and Paris-Durham shock code in Python
  - Completed 4-month research internship at LERMA/Observatoire de Paris-Meudon on dust models in photon-dominated regions
- **Ecole Normale Supérieure Paris-Saclay** *2014 - 2016*
  Master degree in fundamental physics Paris, France
  - Advanced coursework in quantum physics and statistical physics, solid state physics, soft matter physics, and quantum optics
  - Specialized courses in nuclear and particle physics, environmental physics, and astrophysics and cosmology
  - Experimental physics training: photoluminescence of quantum objects, surface wave hydrodynamics, and advanced optics laboratory work
  - Scientific English and professional communication training
  - Completed 4-month laboratory internship at Observatoire de Besançon on 3D self-consistent modeling of dust and gas
- **Ecole Normale Supérieure Paris-Saclay** *2013 - 2014*
  Bachelor degree in fundamental physics Paris, France

- Core physics curriculum: quantum mechanics fundamentals, electromagnetism, statistical physics, and states of matter
- Specialized courses in matter cohesion, optics and lasers, instrumentation and electronics, and information processing
- Mathematical and numerical methods for physicists, including computational techniques
- Experimental physics laboratory work and chemistry coursework
- Research initiation through internship at Observatoire de Besançon on gravitational collapse modeling
- Scientific and practical English training

- **Lycée Albert Schweitzer** *2010 - 2013*
  Preparatory classes (CPGE PCSI/PC) - Intensive program for elite engineering schools entrance exams Mulhouse, France
  - **PCSI (First Year):** Mathematics, Physics, Chemistry, Engineering Sciences, French/Philosophy, English, plus laboratory work and tutorials
  - **PC (Second Year):** Advanced Mathematics, Physics, Chemistry, French/Philosophy, English, TIPE (supervised personal research project)
  - **Curriculum Focus:** Differential and integral calculus, linear algebra, complex analysis, classical mechanics, thermodynamics, electromagnetism, organic and inorganic chemistry, materials science
  - **Program Overview:** Rigorous preparation for prestigious engineering schools and universities through intensive schedule (35+ hours), competitive national entrance exam preparation for leading institutions (ENS, École Polytechnique, Centrale, Mines), with university-level STEM curriculum emphasizing problem-solving and mathematical modeling

Teaching Experience

- **Teaching Assistant — Lycée Raspail** *2015 - 2016*
  Lycée Raspail Paris, France
  - Taught preparatory classes for engineering schools entrance exams (60 hours in Physics and Technology* (PT*) and 30 hours in Technology and Industrial Sciences (TSI))
  - Provided individualized support and exam preparation for students in physics and mathematics
- **Private Tutor — PECES** *2012 - 2015*
  PECES Paris, France
  - Provided one-on-one tutoring for students in preparatory classes for elite engineering schools in Biology-Chemistry-Physics-Earth Sciences (BCPST), Physics-Chemistry (PC), and Mathematics-Physics (MP) tracks
  - Covered advanced topics in physics, chemistry, and mathematics
  - Developed personalized teaching strategies to help students succeed in competitive entrance exams

Science Outreach & Public Engagement

- **Science Communicator — Palais de la Découverte** *During PhD (2017 - 2020)*
  Palais de la Découverte Paris, France
  - Delivered 45-minute public lectures on "The Lifecycle of Matter in the Universe" to diverse audiences including families, students, and science enthusiasts
  - Developed interactive presentations covering stellar formation, evolution, death, and the cosmic recycling of matter through dust and gas
  - Guided visitors through interactive astronomy demonstrations and exhibits, explaining complex concepts like stellar evolution and cosmic dust formation

Conference Organization & Professional Activities

- **Workshop - JWST/ALMA Synergies** *5th December 2024 - 6th December 2024*
  Chair Workshop guide
  - Co-organized with Matthias Maercker and the Nordic ALMA Regional Center (ARC)
  - Led local workshop with 20+ participants exploring complementary capabilities of James Webb Space Telescope and Atacama Large Millimeter Array
  - Coordinated hands-on training sessions developed by Karl Gordon (STScI) and Nordic ALMA Node specialists, covering JWST and ALMA proposal writing, data processing, and joint proposal development
  - Managed complete event logistics including registration, venue coordination, and comprehensive workshop materials (150+ page guide)
- **International conference - Origin and Fate of Dust in Our Universe** *25th September 2023 - 29th September 2023*
  Chair of the Local Organising Committee (LOC) and Scientific Organising Committee (SOC) Conference website
  - Organized major 5-day international conference within the Knut and Alice Wallenberg Foundation-funded Cosmic Dust collaboration, bringing together 110+ researchers from diverse backgrounds
  - Chaired the Scientific Organising Committee (SOC), coordinating abstract reviews, session planning, and invited speaker selection to create a comprehensive scientific program
  - Chaired the Local Organising Committee (LOC), overseeing all logistical aspects including venue arrangements, participant registration, scientific program coordination, social activities, and conference website management
  - Led organizing team of 12 members and oversaw budget planning and execution for all conference activities
- **National conference - Astronomdagarna 2022** *6th October 2022 - 8th October 2022*
  Member of the Local Organising Committee (LOC) Conference guide
  - Member of the local organizing committee for Astronomdagarna, a biennial national conference for Swedish astronomers established in 1999, bringing together 100+ researchers from across the country to discuss all themes in Swedish astronomy
  - Contributed to the creation of the participant guide with local information and conference details, and organized the conference dinner including venue selection and menu planning
  - Coordinated networking activities for early career researchers, including a pub event and a special "1-minute presentation" session under SENECA initiative
  - Assisted with general conference logistics including registration desk management, technical support for presentations, and on-site participant assistance throughout the event
- **SENECA — The Swedish Network for Early Career Astronomers** *Since 2022*
  Founding Member with Bibiana Prinoth and Linn Boldt-Christmas SENECA website
  - Co-organized an online workshop presenting different astrophysical institutions in Sweden and invited successful postdocs to share their experiences in obtaining research grants
  - Helped maintain the network's Slack workspace for community communication
  - Organized satellite events specifically for PhD students and postdocs during Astronomdagarna in Gothenburg (2022) and Lund (2024)
  - Contributed to establishing the network as a supportive community for early career astronomers in Sweden
- **PDRs4All — JWST Early Release Science Program** *Since 2022*
  Extended Core Team Member PDRs4All Team
  - Contributing to a major JWST Early Release Science program studying radiative feedback from massive stars
  - Collaborating with an international team of 50+ researchers from institutions across Europe, North America, and Asia
  - Providing expertise on dust evolution in photon-dominated regions (PDRs)
  - Supporting analysis of JWST observations of the Orion Bar and other PDRs

Supervision Experience

- **PhD Student: Gustav Olander** *2023 - Present*
  Co-supervision with Prof. Susanne Aalto
  - Co-supervising PhD research on dust properties in Compact Obscured Nuclei
  - Guiding analysis of JWST spectroscopic data for the Zwicky 96 galaxy merger study
  - Mentoring on characterization of carbonaceous features at 3.3 μm, 6.2 μm, 7.7 μm, and 11.3 μm

First-Authored Publications

1. **Schirmer, T.-A.** et al. (2025). **R Doradus challenges the dust-driven wind theory**. *Nature Astronomy*, Submitted in June 2025.
2. **Schirmer, T.-A.** et al. (2022). **Nano-grain depletion in photon-dominated regions**. *A&A*, 666, A49.
3. **Schirmer, T.-A.** et al. (2021). **Influence of the nano-grain depletion in photon-dominated regions. Application to the gas physics and chemistry in the Horsehead**. *A&A*, 649, A148.
4. **Schirmer, T.-A.** et al. (2020). **Dust evolution across the Horsehead nebula**. *A&A*, 639, A144.

Co-Authored Publications

1. Jolly, J.-B. et al. (2025). **ALMA Lensing Cluster Survey: Dust mass measurements as a function of redshift, stellar mass, and star formation rate from z = 1 to z = 5**. *A&A*, 693, A190.
2. Van De Putte, D. et al. (2024). **PDRs4All. VIII. Mid-infrared emission line inventory of the Orion Bar**. *A&A*, 687, A86.
3. Zannese, M. et al. (2024). **OH as a probe of the warm-water cycle in planet-forming disks**. *Nature Astronomy*, 8, 577–586.
4. Elyajouri, M. et al. (2024). **PDRs4All. V. Modelling the dust evolution across the illuminated edge of the Orion Bar**. *A&A*, 685, A76.
5. Chown, R. et al. (2024). **PDRs4All. IV. An embarrassment of riches: Aromatic infrared bands in the Orion Bar**. *A&A*, 685, A75.
6. Peeters, E. et al. (2024). **PDRs4All: III. JWST's NIR spectroscopic view of the Orion Bar**. *A&A*, 685, A74.
7. Habart, E. et al. (2024). **PDRs4All. II. JWST's NIR and MIR imaging view of the Orion Nebula**. *A&A*, 685, A73.
8. Khouri et al. (2024). **An empirical view of the extended atmosphere and inner envelope of the asymptotic giant branch star R Doradus. I. Physical model based on CO lines**. *A&A*, 685, A11.
9. Berné, O. et al. (2024). **A far-ultraviolet–driven photoevaporation flow observed in a protoplanetary disk**. *Science*, 383, 988–992.
10. Berné, O. et al. (2023). **Formation of the methyl cation by photochemistry in a protoplanetary disk**. *Nature*, 621, 56–59.
11. Hernández-Vera, C. et al. (2023). **The extremely sharp transition between molecular and ionized gas in the Horsehead nebula**. *A&A*, 677, A152.
12. Gobrecht, D. et al. (2023). **Editorial: Cosmic dust—its formation, processing, and destruction**. *Frontiers in Astronomy and Space Sciences*, 10, 1242545.
13. Le Gouellec, V. J. M. et al. (2023). **The Origin of Dust Polarization in the Orion Bar**. *ApJ*, 951(2), 97.
14. Habart, E. et al. (2023). **High-angular-resolution NIR view of the Orion Bar revealed by Keck/NIRC2**. *A&A*, 673, A149.
15. Berné, O. et al. (2022). **PDRs4All: A JWST Early Release Science Program on Radiative Feedback from Massive Stars**. *PASP*, 134(1035), 054301.
16. Kushniruk, I. et al. (2017). **Kinematic structures of the solar neighbourhood revealed by Gaia DR1/TGAS and RAVE**. *A&A*, 608, A73.

Talks

- **R Doradus challenges the dust-driven wind theory** — *June 2025*
  European Week of Astronomy and Space Science (EWASS) — *International conference* — Cork, Ireland
- **Constraining the dust properties around R Doradus** — *April 2025*
  Institut d'Astrophysique Spatiale Visit — *Invited seminar* — Orsay, France
- **Radiative pressure on dust grains in AGB** — *November 2023*
  AGB Workshop — *Departmental workshop* — Gothenburg, Sweden
- **Dust evolution in photon dominated regions** — *October 2022*
  Physics and Chemistry of the Interstellar Medium (PCMI) — *National conference* — Paris, France
- **Dust evolution in photon dominated regions** — *June 2022*
  French Society of Astronomy and Astrophysics (SF2A) — *National conference* — Besançon, France
- **Dust evolution in photon-dominated regions** — *December 2021*
  Dust Wallenberg Workshop — *Specialized workshop* — Gothenburg, Sweden
- **Dust evolution in the context of the JWST** — *November 2019*
  Physics of the Two Infinities and the Origins — *Project meeting* — Saclay, France
- **Dust evolution in the Horsehead** — *November 2019*
  Physics of the Two Infinities and the Origins — *JWST project meeting* — Orsay, France
- **Dust evolution in the Horsehead** — *June 2019*
  European Week of Astronomy and Space Science (EWASS) — *International conference* — Lyon, France
- **Dust evolution in the Horsehead** — *June 2018*
  Physics of the Two Infinities and the Origins — *JWST project meeting* — Orsay, France
- **Dust evolution in photodominated regions** — *June 2018*
  French Program on ISM Physics and Chemistry — *National conference* — Marseille, France
- **Modelling photodominated regions: Gas-grain coupling** — *June 2017*
  Physics of the Two Infinities and the Origins — *JWST project meeting* — Orsay, France
- **Physics of the Two Infinities and the Origins** — *June 2017*
  Modelling photodominated regions: Gas-grain coupling — *JWST project meeting* — Orsay, France

Skills

- **Programming Languages:** Python (advanced), LaTeX (advanced), Bash (intermediate), IDL (basic), C++ (basic), SQL (basic)
- **Web Technologies:** HTML (basic), CSS (basic)
- **Data Science & Machine Learning:** Scikit-learn (basic), TensorFlow (basic)
- **DevOps & Version Control:** GitHub (intermediate)
- **Specialized Area:** Astrophysics, Astronomy, Astrophysical Modelling
- **Mathematical & Statistical Tools:** NumPy (advanced), SciPy (advanced), Matplotlib (advanced), Astropy (advanced), SAOImage DS9 (intermediate)
- **Research Skills:** Astrophysical Modelling, Data Analysis, Scientific Writing, Project Management

Additional Information

Languages: French (Native), English (Fluent/C1), Swedish (Basic/A1)
Interests: Literature, Nature, Triathlon, Trail Running, Artificial Intelligence, Cooking, Baking, Learning

References

1. **Alain Abergel**
   Professor, Institut d'Astrophysique Spatiale
   Université Paris-Saclay, France
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   Relationship: PhD Supervisor

2. **Laurent Verstraete**
   Professor, Institut d'Astrophysique Spatiale
   Université Paris-Saclay, France
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   Relationship: PhD Supervisor

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