Gabi Wenzel

Research Scientist · Laboratory Astrophysicist
gwenzel@mit.edu · gbwnzl.github.io · Google Scholar · LinkedIn

Education

University of Toulouse — Jun 2017 - Jul 2020
PhD in Laboraotry Astrophysics — Toulouse, France

University of Münster — Oct 2014 - Mar 2017
Master of Science in Physics — Münster, Germany

University of Münster — Oct 2010 - Sep 2014
Bachelor of Science in Physics — Münster, Germany

Experience

Massachusetts Institute of Technology — Dec 2024 – Present
Research Scientist, Laboratory Astrochemistry — Cambridge, MA
Our recent **discovery of PAHs in space** demands a thorough follow-up in the laboratory. Most functionalized PAH spectra are unknown and are the focus of my work at MIT. I continue to supervise graduate students while tailoring my own research profile.

Center for Astrophysics | Harvard & Smithsonian — Oct 2024 – Present
SAO Visiting Scientist Fellowship — Cambridge, MA
The origin and fate of PAHs at low temperatures are not well understood, and our recent detections of such species in a dark molecular cloud challenge our understanding of **PAH chemistry and physics in the interstellar medium**. During this SAO Visiting Scientist Fellowship in the McCarthy Group, I investigate potential formation and destruction pathways of cosmic PAHs.

Massachusetts Institute of Technology — Oct 2022 – Nov 2024
(Senior) Postdoctoral Associate, Laboratory Astrochemistry — Cambridge, MA
Designing, constructing, and leveraging a **cavity-enhanced and chirped-pulse Fourier Transform microwave spectrometer** to study molecular systems of astrochemical interest while leading the rotational spectroscopy efforts in the McGuire Group, including supervision of graduate students in the laboratory and beyond.

Center for Interstellar Catalysis (InterCat), Aarhus University — Oct 2020 – Sep 2022
Postdoctoral Research Fellow, Laboratory Astrophysics — Aarhus C, Denmark
The research concentrated on the experimental investigation of **catalytic effects of astrophysical relevant (functionalized) PAHs** and the potential formation of the molecular building blocks of life on different cosmic dust grain surface analogues. Main responsibilities included laboratory work, data analysis, dissemination of research results, and the supervision of Bachelor, Master, and PhD students in the astrophysics / astrochemistry laboratory.

Institut de Recherche en Astrophysique et Planétologie (IRAP) — Jun 2017 – Jul 2020
Marie Skłodowska-Curie Early Stage Researcher (ESR) — Toulouse, France
Conducted research and received training in the **interdisciplinary field of laboratory astrophysics** within the MSCA ITN EUROPAH under the supervision of Dr. Christine Joblin. This included collaborations with theoretician Dr. Aude Simon (LCPQ) and extended stays at research facilities in the Netherlands, working together with Dr. Sandra Brünken at the FELIX Laboratory, and in Italy, collaborating with Dr. Giacomo Mulas at INAF, Cagliari.

Hiden Analytical Ltd. — Mar 2019 – May 2019
Advanced Systems Analyst — Warrington, United Kingdom
Carried out an internship and gained experience on quadrupole mass spectrometers. Extended surface analysis skills by performing a project combining temperature programmed desorption (TPD) and secondary ion mass spectrometry (SIMS) experiments on differently coated silicon samples.

Institute(s) of (Theoretical) Physics, University of Münster — Nov 2013 – Mar 2017
Student Assistant — Münster, Germany
Teaching undergraduate students. Details see 'Teaching Experience'.

Technologieförderung Münster GmbH — Feb 2013 – Dec 2014
Reception Administrative Assistant — Münster, Germany

Main responsibilities included customer service, tenant support as well as preparation and follow-up processing of business events.

Other Research Experience

Green Bank Telescope (GBO), WV, USA Mar 2024 – present
Active observer in the GOTHAM collaboration using the 100 m Green Bank Telescope to study aromatic molecules in TMC-1 and trace early-stage star formation chemistry.

LISA@FELIX Laboratory, Nijmegen, The Netherlands May 2022, Sep 2022, Aug 2023
Led IR beamtime to study PAH:ice chemistry at the LISA end-station with FTIR spectroscopy on ASW, CO, and methanol ices.

ELISA, Aarhus, Denmark Mar 2022 – Jun 2022
Led ion storage ring experiments using visible photodissociation spectroscopy to study photostability trends of oxygen-functionalized PAHs.

ASTRID-2 Synchrotron, Aarhus, Denmark Feb 2021
Performed XPS on oxygen-irradiated C_{60} on HOPG; observed enhanced chemistry under repeated annealing and exposure.

CALMIP HPC Center, Toulouse, France Dec 2019
Ran DFT calculations of PAHs with Turbomole and Octopus; obtained theoretical IR spectra and photoabsorption cross sections.

SOLEIL Synchrotron, France Sep 2017, Jul 2019
Used VUV action spectroscopy to study fragmentation and ionization of large PAHs in a linear ion trap.

FELion@FELIX Laboratory, Nijmegen, The Netherlands Aug 2017, Jun 2019 – Jul 2019
Modified cryogenic ion trap setup; measured IR action spectra of PAH fragments tagged with Ne using FELIX.

DESIREE, Stockholm, Sweden Nov 2018
Studied radiative cooling of anthracene and phenanthrene cations in an electrostatic storage ring.

FLASH, DESY, Hamburg, Germany Aug 2015
Participated in XUV-FEL desorption experiments of astrophysical ices; used TOF-MS to analyze desorption dynamics.

Teaching Experience

Co-Organizer of the Star and Planet Formation Course Apr 2022 – Oct 2022
Mentoring a group of PhD and master level students following the star and planet formation lecture given online by Dr. Melissa McClure at Leiden University. Supervised discussion rounds, seminars, short presentations, and essays.

Tutor for the Undergraduate Modules Physics I – III Mar 2015 – Mar 2017
Marking of first to second year physics students' exercises and giving class explanations of the solutions. These modules covered mechanics, thermodynamics, electromagnetism, analytical mechanics, electrodynamics, optics, special relativity.

Undergraduate Laboratory and General Physics for Scientists Tutor Nov 2013 – Feb 2015
General demonstrating duties assisting undergraduate medical students in their first year performing experimental exercises in the physics laboratory. Responsibilities also included the marking of laboratory reports, students' exercises, and discussions of the solutions during the courses.

Awards & Grants

Women in Chemistry+ Travel Grant MIT, Cambridge, MA, 2025
Infinite Expansion Award MIT, Cambridge, MA, 2024
Best Talk Award PAHRTEA Meeting Nijmegen, 2019
LASERLAB-EUROPE Grant 2-month stay at FELIX Laboratory, 2019
IAU Travel Grant IAU S350 Laboratory Astrophysics, 2019
PCMI Travel Grant Société Française d'Exobiologie, 2018
WE-Heraeus Travel Grant DPG (German Physical Society) Spring Meeting, 2017
DPG (German Physical Society) A-Levels Award Arndt High School, Krefeld, 2010

Publications

[20] Slumstrup, L.; Thrower, J. D.; Schrauwen, J. G. M.; Lamberts, T.; Ingman, E. R.; Laurinavicius, D.; DeVine, J.; Terwisscha van Scheltinga, J.; Santos, J. C.; Noble, J. A.; **Wenzel, G.**; McCoustra, M. R. S.; Brown, W. A.; Linnartz, H.; Hornekær, L.; Cuppen, H. M.; Redlich, B.; Ioppolo, S. IR-Induced CO Photodesorption from Pure CO Ice and CO on Amorphous Solid Water. ACS Earth and Space Chemistry, 2025, 9, 6, 1607–1621.

[19] Toru Shay, H.; Scolati, H. N.; **Wenzel, G.**; Lee, K. L. K.; Marimuthu, A. N.; McGuire, B. A. Exploring Effects of Modified Machine Learning Pipelines of Astrochemical Inventories. The Astrophysical Journal 2025, 985 (1), 123.

[18] **Wenzel, G.**; Gong, S.; Xue, C.; Changala, P. B.; Holdren, M. S.; Speak, T. H.; Stewart, D. A.; Fried, Z. T. P.; Willis, R. H. J.; Bergin, E. A.; Burkhardt, A. M.; Byrne, A. N.; Charnley, S. B.; Lipnicky, A.; Loomis, R. A.; Shingledecker, C. N.; Cooke, I. R.; McCarthy, M. C.; Remijan, A. J.; Wendlandt, A. E.; McGuire, B. A. Discovery of the Seven-Ring Polycyclic Aromatic Hydrocarbon Cyanocoronene ($C_{24}H_{11}CN$) in GOTHAM Observations of TMC-1. The Astrophysical Journal Letters 2025, 984 (1), L36.

[17] **Wenzel, G.**; Holdren, M. S.; Stewart, D. A.; Toru Shay, H.; Byrne, A. N.; Xue, C.; McGuire, B. A. Laboratory Rotational Spectra of Cyanocyclohexane and Its Siblings (1- and 4-Cyanocyclohexene) Using a Compact CP-FTMW Spectrometer for Interstellar Detection. Journal of Physical Chemistry A 2025, 129 (18), 3986–4001.

[16] **Wenzel, G.**; Jiménez-Redondo, M.; Ončák, M.; McGuire, B. A.; Brünken, S.; Caselli, P.; Jusko, P. Infrared Spectroscopy of Pentagon-Containing PAHs: Indenyl and Fluorenyl Anions and Indenyl Cation. Journal of Physical Chemistry Letters 2025, 16 (16), 3938–3944.

[15] Remijan, A. J.; Changala, P. B.; Xue, C.; Yuan, E. Q. H.; Duffy, M.; Scolati, H. N.; Shingledecker, C. N.; Speak, T. H.; Cooke, I. R.; Loomis, R.; Burkhardt, A. M.; Fried, Z. T. P.; **Wenzel, G.**; Lipnicky, A.; McCarthy, M. C.; McGuire, B. A. The Missing Link of Sulfur Chemistry in TMC-1: The Detection of c-C_3H_2S from the GOTHAM Survey. The Astrophysical Journal 2025, 982 (2), 191.

[14] **Wenzel, G.**; Speak, T. H.; Changala, P. B.; Willis, R. H. J.; Burkhardt, A. M.; Zhang, S.; Bergin, E. A.; Byrne, A. N.; Charnley, S. B.; Fried, Z. T. P.; Gupta, H.; Herbst, E.; Holdren, M. S.; Lipnicky, A.; Loomis, R. A.; Shingledecker, C. N.; Xue, C.; Remijan, A. J.; Wendlandt, A. E.; McCarthy, M. C.; Cooke, I. R.; McGuire, B. A. Detections of Interstellar Aromatic Nitriles 2-Cyanopyrene and 4-Cyanopyrene in TMC-1. Nature Astronomy 2025, 9 (2), 262–270.

[13] Remijan, A. J.; Fried, Z. T. P.; Cooke, I. R.; **Wenzel, G.**; Loomis, R.; Shingledecker, C. N.; Lipnicky, A.; Xue, C.; McCarthy, M. C.; McGuire, B. A. High Spectral Resolution Observations of Propynal (HCCCHO) toward TMC-1 from the GOTHAM Large Program on the GBT. The Astrophysical Journal 2024, 976 (1), 105.

[12] **Wenzel, G.**; Cooke, I. R.; Changala, P. B.; Bergin, E. A.; Zhang, S.; Burkhardt, A. M.; Byrne, A. N.; Charnley, S. B.; Cordiner, M. A.; Duffy, M.; Fried, Z. T. P.; Gupta, H.; Holdren, M. S.; Lipnicky, A.; Loomis, R. A.; Shay, H. T.; Shingledecker, C. N.; Siebert, M. A.; Stewart, D. A.; Willis, R. H. J.; Xue, C.; Remijan, A. J.; Wendlandt, A. E.; McCarthy, M. C.; McGuire, B. A. Detection of Interstellar 1-Cyanopyrene: A Four-Ring Polycyclic Aromatic Hydrocarbon. Science 2024, 386 (6723), 810–813.

[11] Fried, Z. T. P.; El-Abd, S. J.; Hays, B. M.; **Wenzel, G.**; Byrne, A. N.; Margulès, L.; Motiyenko, R. A.; Shipman, S. T.; Horne, M. P.; Jørgensen, J. K.; Brogan, C. L.; Hunter, T. R.; Remijan, A. J.; Lipnicky, A.; Loomis, R. A.; McGuire, B. A. Rotational Spectrum and First Interstellar Detection of 2-Methoxyethanol Using ALMA Observations of NGC 6334I. The Astrophysical Journal Letters 2024, 965 (2), L23.

[10] Rasmussen, A. P.; **Wenzel, G.**; Hornekær, L.; Andersen, L. H. Gas-Phase Electronic Action Absorption Spectra of Protonated Oxygen-Functionalized Polycyclic Aromatic Hydrocarbons (OPAHs). Astronomy & Astrophysics 2023, 674, A103.

[9] **Wenzel, G.**; Simon, A.; Banhatti, S.; Jusko, P.; Schlemmer, S.; Brünken, S.; Joblin, C. Infrared Spectroscopy of the Benzylium-like (and Tropylium-like) Isomers Formed in the –H Dissociative Ionization of Methylated PAHs. Journal of Molecular Spectroscopy 2022, 385, 111620.

[8] Banhatti, S.; Rap, D. B.; Simon, A.; **Wenzel, G.**; Leboucher, H.; Joblin, C.; Redlich, B.; Schlemmer, S.; Brünken, S. Formation of the Acenaphthylene Cation as a Common C2H2-Loss Fragment in Dissociative Ionization of the PAH Isomers Anthracene and Phenanthrene. Physical Chemistry Chemical Physics 2022, 24, 27343–27354.

[7] **Wenzel, G.**; Joblin, C.; Giuliani, A.; Castillo, S. R.; Mulas, G.; Ji, M.; Sabbah, H.; Quiroga, S.; Peña, D.; Nahon, L. Astrochemical Relevance of VUV Ionization of Large PAH Cations. Astronomy & Astrophysics 2020, 641, A98.

[6] Joblin, C.; **Wenzel, G.**; Castillo, S. R.; Simon, A.; Sabbah, H.; Bonnamy, A.; Toublanc, D.; Mulas, G.; Ji, M.; Giuliani, A.; Nahon, L. Photo-Processing of Astro-PAHs. Journal of Physics: Conference Series 2020, 1412, 062002.

[5] Bernard, J.; Ji, M. C.; Martin, S.; **Wenzel, G.**; Al-Mogeeth, A.; Stockett, M. H.; Schmidt, H. T.; Zettergren, H.; Joblin, C. Radiative Cooling Dynamics of Anthracene Cations Stored in DESIREE Studied via the Time Evolution of 2-Photon-Absorption Induced Dissociation Rate. Journal of Physics: Conference Series 2020, 1412, 232013.

[4] **Wenzel, G.**; Castillo, S. R.; Mulas, G.; Ji, M.-C.; Bonnamy, A.; Sabbah, H.; Giuliani, A.; Nahon, L.; Joblin, C. Photoprocessing of Large PAH Cations. Proceedings of the International Astronomical Union 2019, 15 (S350), 388–389.

[3] Kleimeier, N. F.; **Wenzel, G.**; Urban, A. J.; Tchalala, M. R.; Oughaddou, H.; Dedkov, Y.; Voloshina, E.; Zacharias, H. Unoccupied Electronic Band Structure of Pentagonal Si Nanoribbons on Ag(110). Physical Chemistry Chemical Physics 2019, 21 (32), 17811–17820.

[2] Jusko, P.; Simon, A.; **Wenzel, G.**; Brünken, S.; Schlemmer, S.; Joblin, C. Identification of the Fragment of the 1-Methylpyrene Cation by Mid-IR Spectroscopy. Chemical Physics Letters 2018, 698, 206–210.

[1] Espeter, P.; Keutner, C.; Roese, P.; Shamout, K.; Berges, U.; **Wenzel, G.**; Bignardi, L.; Kleimeier, N. F.; Zacharias, H.; Westphal, C. Facing the Interaction of Adsorbed Silicon Nano-Ribbons on Silver. Nanotechnology 2017, 28 (45), 455701.

Invited Talks & Seminars

Committee on Space Research (COSPAR) Meeting — Florence, Italy, Aug 2026
Virtual International Microwave Seminar — Hamburg, Germany, Jul 2025
Press Briefing at the 246th Meeting of the American Astronomical Society — Anchorage, AL, USA, Jun 2025
3rd COST NanoSpace Joint Scientific Meeting — Kaunas, Lithuania, May 2025
Atomic and Molecular Physics Seminar, CfA — Cambridge, MA, USA, Mar 2025
InterCat Seminar, Aarhus University — Aarhus, Denmark, Mar 2025
Green Bank Telescope (GBT) Webinar — Green Bank, WV, USA, Dec 2024
Öberg & Andrews Seminar, CfA — Cambridge, MA, USA, Nov 2024
Annual German LabAstro Meeting — Tegernsee, Germany, Sep 2024
CfA Seminar, Center for Astrophysics | Harvard & Smithsonian — Cambridge, MA, USA, Mar 2024
CFEL Molecular and Ultrafast Science Seminars, DESY — Hamburg, Germany, Jan 2023
Colloquium at the Istituto Nazionale di Astrofisica (INAF) — Cagliari, Italy, Dec 2018

Conference Contributions

International Symposium on Molecular Spectroscopy (ISMS) (2 Talks) — Champaign, IL, USA, Jun 2025
American Astronomical Society, 246th Meeting (Talk) — Anchorage, AK, USA, Jun 2025
International Symposium on Molecular Spectroscopy (ISMS) (2 Talks) — Champaign, IL, USA, Jun 2024
IAU S383: Astrochemistry VIII (Poster) — Traverse City, MI, USA, Jul 2023
International Symposium on Molecular Spectroscopy (ISMS) (Talk) — Champaign, IL, USA, Jun 2023
Life Cycle of Cosmic PAHs Symposium (Talk & Poster) — Aarhus, Denmark, Sep 2022
739th WE-Heraeus-Seminar (Talk) — Bad Honnef, Germany, Feb 2022
PAHRTEA Meeting (Talk) — Nijmegen, The Netherlands, Sep 2019
Physics and Chemistry of the Interstellar Medium (Poster) — Avignon, France, Sep 2019
IAU S350: Laboratory Astrophysics Symposium (Poster) — Cambridge, UK, Apr 2019
EPoLM-4 Conference (Talk) — Madrid, Spain, Mar 2019
PCMI National Program Symposium (Poster) — Marseille, France, Jun 2018
Cosmic Dust Symposium (Poster) — Copenhagen, Denmark, Jun 2018
DPG Spring Meeting of the Condensed Matter Section (Talk) — Dresden, Germany, Mar 2017

Research & Technical Skills

Vacuum systems: Ultra-high vacuum (UHV) and high vacuum (HV) equipment use and maintenance
Surface science techniques: AES, LEED, UPS, XPS, IPE, SIMS, STM, TPD, FTIR/RAIRS
Mass spectrometry: Gas-phase ion trap and storage experiments; FT-ICR MS, quadrupole MS (QMS)
Rotational spectroscopy: CP-FTMW, cavity-enhanced FTMW spectroscopy
Photon sources: Use of free electron lasers and synchrotron radiation facilities
Programming and software: Python, LaTeX, C++
Quantum chemistry software: Psi4, Orca, Turbomole, Octopus
Data acquisition and control: LabVIEW, C++/QtCreator
Languages: German (mother tongue), English (fluent, C2), French (advanced, B1/B2), Danish (beginner, A2)

Extracurricular Activities

Postdoc Representative – Deptartment of Physics & Astronomy — Aarhus University, 2021 – 2022
Early Stage Researcher Representative — EUROPAH Network, 2018 – 2021
Active Member of UniverSCiel — Science outreach for children, 2017 – 2020
Second PhD Student Representative — IRAP Toulouse, 2017 – 2019

Referees

Supervisor (MIT)
Dr. Brett A. McGuire
MIT
77 Mass Ave
Cambridge, MA 02139
USA
brettmc@mit.edu
+1 (617) 253-2457

Supervisor (CfA)
Dr. Michael C. McCarthy
CfA | Harvard & Smithsonian
60 Garden St
Cambridge, MA 02138
USA
mmccarthy@cfa.harvard.edu
+1 (617) 495-7262

Collaborator
Dr. Sandra Brünken
RU / FELIX Laboratory
Toernooiveld 7c
6525ED Nijmegen
The Netherlands
sandra.bruenken@ru.nl
+31 24 365 3944

PhD Advisor
Dr. Christine Joblin
IRAP / CNRS / UPS
9 Avenue du Colonel Roche
31028 Toulouse
France
christine.joblin@irap.omp.eu
+33 5 61 55 86 01