Theodoros Topkaras

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Education

University of Cologne — *Cologne, Germany*

PhD Candidate within the DFG Collaborative Research Centre 1601 Habitats Of Massive Stars Across Cosmic Time — *Dec 2024 - Present*

- Numerical modeling of Photon-dominated regions
- Spectral fitting of new PDR observations with the KOSMA-tau PDR model

Leiden University — *Leiden, The Netherlands*

M.Sc in Astronomy (120 ECTS) — *Sept 2020 - Aug 2022*

- Astronomy Research
- **Courses:** Interstellar Medium, Radio Astronomy, Stellar Structure and Evolution, Theory of General Relativity, Galaxies: Structure, Dynamics and Evolution

Aristotle University of Thessaloniki — *Thessaloniki, Greece*

B.Sc in Physics (240 ECTS) — *Sept 2013 - Aug 2020*

- Sector of Astronomy, Astrophysics, and Mechanics
- Worked as a Teaching Assistant
- **Courses:** Cosmology, Astrophysics, Observational Astronomy, Planetary Systems

Research and Work Experience

University of Cologne — *Cologne, Germany*

Bachelor's Thesis Co-Supervisor — *April 2024 - July 2024*

- Co-supervised the Bachelor's Thesis titled 'Sensitivity analysis of atomic carbon abundance in the interstellar medium of single reaction rates'

University of Cologne — *Cologne, Germany*

Teaching Assistant — *April 2024 - July 2024*

- Teaching assistant for the elective course: Physics of the ISM
- Responsible for making, distributing, and grading weekly assignments for the corresponding topic
- Weekly lecture presenter (1.5 hours) regarding exercise solutions and discussion

Aristotle University of Thessaloniki — *Thessaloniki, Greece*

Teaching Assistant — *Feb 2018 - Feb 2019*

- Teaching assistant for the elective course: Observational Astronomy
- Laboratory work, on how to use the optical telescope of the Observatory, and extract, analyze, and evaluate the observed data
- Responsible for conducting laboratory tests for students

Aristotle University of Thessaloniki — *Thessaloniki, Greece*

Teaching Assistant — *Sept 2017 - Feb 2018*

- Teaching assistant for the compulsory course: Astronomy and Astrophysics
- Responsible for grading weekly assignments for the corresponding topic
- Discussing with each student about their personal grade

Research Projects

Weighing the star-forming gas in distant galaxies — *Leiden, The Netherlands*

M.Sc. Thesis: Supervisors Dr. Jacqueline Hodge (Associate Professor, Leiden University) and M.Sc. Marta Frias Castillo (PhD Candidate, Leiden University) — *Sep 2021 - June 2022*

- Analyzed the observational data of [CI](1-0) and CO(1-0) for a sample of 13 lensed and non-lensed high redshift ($z > 2$) submillimetre galaxies (SMG)
- Compared the two ground state transitions to determine a possible correlation between them
- Usage of *3D-PDR* and *PDRToolBox* models to constrain key characteristics of the ISM, such as the cosmic ray ionization rate (ζ_{CR}), the UV field strength (G), and the number density (n)

Molecular outflows from QSOs at z > 6 — *Leiden, The Netherlands*

First M.Sc. Project: Supervisors Dr. Paul van der Werf (Professor of Extragalactic Astrophysics, Leiden University) and M.Sc. Kirsty Butler (PhD Candidate, Leiden University) — *Sep 2020 - Jul 2021*

- Analyzed observational data for four distant ($z > 6$) QSOs, acquired by the Atacama Large Millimeter Array - ALMA Radio Telescope
- First confirmation of a molecular outflow utilizing the OH molecule in such a high redshift QSO

Exploration of strong molecular hydrogen winds in galaxies: OH data from Herschel / PACS *Thessaloniki, Greece*

B.Sc. Thesis: Supervisors Dr. Kalliopi Maria Dasyra (Assistant Professor in Observational Astrophysics National and Kapodistrian University of Athens (UoA)) and Dr. Padelis Papadopoulos (Assistant Professor in Aristotle University of Thessaloniki) See project *Sep 2019 - Aug 2020*

- Analyzed observational data taken by Herschel / PACS, of the Hydroxyl (OH) molecule, for 67 local galaxies
- Computation of the molecular outflowing mass using a toroidal theoretical model
- Results were used for a publication

Publications

Globules and pillars in Cygnus X

Schneider,...,**Topkaras** et al., See Publication *Dec 2025*

Tight correlation of star formation with [CI] and CO lines across cosmic time

Topkaras et al., See Publication *Sept 2025*

A Comparative Study of the Ground State Transitions of CO and C i as Molecular Gas Tracers at High Redshift

Marta Frias Castillo,...,**Topkaras** et al., See Publication *July 2025*

Metallicity dependence of the CO-to-H_2 and the [CI]-to-H_2 conversion factors in galaxies

Bisbas,...,**Topkaras** et al., See Publication *May 2025*

α-enhanced astrochemistry: the carbon cycle in extreme galactic conditions

Bisbas,...,**Topkaras** et al., See Publication *Dec 2023*

Molecular Outflows in z > 6 Unobscured QSO Hosts Driven by Star Formation

Butler, Van der Werf, **Topkaras** et al., See Publication *Dec 2022*

α-enhanced astrochemistry: the carbon cycle in extreme galactic conditions

Bisbas,...,**Topkaras** et al., See Publication *Dec 2023*

Skills

Operation Systems	Linux (Ubuntu), Microsoft Windows
Programming	Python (NumPy, Pandas, SciPy, Matplotlib, Seaborn, Astropy, Plotly, Scikit-learn), C, Fortran, Bash
Databases	SQL
Astronomy/Astrophysics Software	CASA, DS9, AstroPy, 3D-PDR, PDFChem, KOSMA-τ
Stellar Evolution codes	MESA
Document Creation	Microsoft Office Suite, LibreOffice Suite, Latex

Volunteering Experience

Lange Nacht der Astronomie (Long night of Astronomy *Cologne, Germany*

University of Cologne

- Responsible for VR glasses presentations
- Discuss and explain basic Astrophysical and Astronomical concepts with the public

Astronomy on Tap organizer *Cologne, Germany*

University of Cologne *Sept 2024 - ongoing*

- Lead and organize the AoT event
  - Speakers
  - Venue
  - Presentations

Guide and Telescope Operator at Aristotle's Observatory *Thessaloniki, Greece*

Aristotle University of Thessaloniki *Sept 2018 - Aug 2020*

- Responsible for touring Primary, Junior and High school students at the Observatory
- Explaining the fundamental features of the optical telescope
- Discuss and explain basic Astrophysical and Astronomical concepts with the students

Participation in "Aristotle's in Sunday" (Annual Celebration of the Aristotle University) *Thessaloniki, Greece*

Aristotle University of Thessaloniki *May 2018 - May 2018*

- Organizing and participating at "Open nights" at the observatory, where the observatory was open to the public

Seminars and Conferences

- **Cologne-Bonn Symposium 2026 (*Oral contribution*)**, 17-21/08/2026
- **Olympian Symposium 2026 (*Oral contribution*)**, 18-22/05/2026
- **Cosmic Rays 3: The Salt of the Star Formation Recipe (*Oral contribution*)**, 22-24/10/2024
- **Annual Meeting of the Astronomische Gesellschaft 2024 (*Oral contribution*)**, 09-13/09/2024
- **Heritage of SOFIA – Scientific Highlights and Future Perspectives**, 22-26/04/2024
- **IR2022: An Infrared Bright Future for Ground-based IR Observatories in the Era of JWST**, 14-18/02/2022
- 5th **Netherlands ALMA Science Day**, Allegro team, Leiden, The Netherlands, 29/11/2021
- 4th **Netherlands ALMA Science Day**, Allegro team, Leiden, The Netherlands, 25/01/2021
- **ALMA Data Reduction Training Day 2021**, Allegro team, Leiden, The Netherlands
- **Quasar and Galaxies through Cosmic Time**, 24-27/01/2022
- **The Future of Airborne Infrared/Submm Astronomy: Prospects and Opportunities**, Berlin, 26-28/07/2021
- **The Olympian Symposium 2018: Gas and stars from milli- to megaparsecs**
- 17th **Hellenic National Conference Of Hellenic Physicists Association**, 2017
- **DAAD Winter School: Neutron Stars in the Era of Gravitational Waves. Dr. Kostas Kokkotas "An Overview of Neutron Stars", Dr. Giorgos Lalazisis "High-Density Equation of State", Dr. Theodoros Gaitanos "Nuclear Astrophysics", Dr. S.Voelkel "Exotic Compact Objects", Dr. Charalampos Moustakidis "Neutron Stars Structure", Dr. S.Nampalliwar "Black Hole Astrophysics", Dr. Nikos Stergioulas "Binary Neutron Star Mergers"**, 30/11/2017
- **A Step in the Dark: The Initial Conditions of Star Formation and how they can be reset**, Dr. P.Papadopoulos, Thessaloniki, Greece, 13/05/2014

Interests

Snowboarding National Champion, Participation in European Youth Olympic Winter Festival 2011 and Participation in World Championship in Spain 2012

Skateboarding

Bouldering

Languages

Greek Native

English Proficient speaker (Test of Interactive English (Tie) on Advance Level (C2))