Tram N. Le

Email: lengoctramlyk31@gmail.com
GitHub: github.com/lengoctram
Phone: +4915153208677
LinkedIn: le-ngoc-tram

Research Keywords

- My ultimate overarching goal is to understand the alignment of the dust grains and the polarization characteristics produced by the aligned grains across different physical scales within our Milky Way and extra-galaxies. This understanding of dust polarization has direct implications for various research areas in astrophysics.
- The secondary aim includes various investigations exploring the physics of the interstellar medium and the processes linked to star formation through various observational approaches. One of my primary research projects revolves around investigating the impact of the magnetic field on the evolution of molecular clouds and the star formation processes that take place within them. Another project is dedicated to analyzing the spectral signatures of interstellar gas.

Research Publications

- I have personally authored and collaborated on a total of 41 unique scholarly articles, in addition to one review article published in peer-reviewed journals.
  - 10 publications as the first and corresponding author
  - 2 publications as the second author (for articles only having two authors)
  - 16 publications among the first five authors
- My research papers have played a role in advancing theories related to the alignment of interstellar grains, in analysing of properties of interstellar dust grains through their polarized signal, and in studying of chemical processes taking place on the surfaces of these grains. They have collectively garnered 558 citations. For convenient access, all these articles can be found in my NASA Astrophysics Data System Library.

Research Recognition

- I serve as a reviewer for three prestigious astronomical journals, namely *The Astrophysical Journal* (ApJ), *Monthly Notices of the Royal Astronomical Society* (MNRAS), and *Astronomy & Astrophysics* (A&A).
- I am invited to contribute as an external reviewer for proposals submitted to the James Clerk Maxwell Telescope observatory.

Personal Skills

- **Soft Skills:**
  - Problem solver
  - Team player
  - Fast learner
- **Languages:**
  - Vietnamese (native speaker)
  - English (advanced)
  - French (fluent)
- **Personal Hoppies:**
  - Football, Skiing, Jogging
  - Cooking

Education

Paris Observatory, Paris Sciences & Lettres — Paris, France
Ph.D. in Astronomy & Astrophysics, Advisors: Drs. Pierre Lesaffre, Sylvie Cabrit and Nhung Pham — 2015-2018

- Thesis: “Bow shock chemistry in the interstellar medium”

Université Paris Cité and University of Science and Technology of Hanoi Vietnam & France
Joint M.S. in Space Science & Applications 2012–2014

- Thesis: "The estimation of the photometric redshift of galaxies for cluster reconstruction"

Quynhon University BinhDinh, Vietnam
B.S. in Physics 2008–2012

Experience

Max Planck Institute for Radio Astronomy **Bonn, Germany**
Postdoctoral Researcher | Contact: Prof. Karl M. Menten 2021–Current

- The further development of the theory of grain alignment and induced polarization of interstellar dust grains
- The refinement of a simplified model (namely DustPOL) to interpret single-dish observations
- The improvement of a complex model (namely POLARIS+) to interpret interferometry observations
- The conduction of observations with APEX-12 m (in Chile) and Effelsberg-100 m (in Germany) telescopes

Leiden Observatory/Leiden University **Leiden, The Netherlands**
Guest Researcher | Contact: Prof. Serena Viti 09/2023–Current

- The incorporation of the innovative non-thermal desorption processes of complex organic molecules in interstellar space that I am involved in discovering into the UCLCHEM astrochemical model.

SOFIA-USRA/NASA Ames Research Center **California, USA**
SOFIA Postdoctoral Fellow | Contacts: Drs. William T. Reach & James Jackson 2019–2021

- The advancement of the grain alignment theory and induced dust polarization.
- The development of a numerical model (namely DustPOL) for the prediction of dust polarization.
- The investigation of the impact of magnetic fields and stellar feedback in star-forming regions.
- The study of spinning dust emission in the envelopes of evolved stars.
- The conduction of observations with SOFIA (in USA) telescope

Korea Astronomy and Space Science Institute **Deajeon, South Korea**
Invited Researcher | Contacts: Dr. Thiem Hoang 09/2018–11/2018

- The discovery of dust grain disruption in strong radiation fields.
- The model of spinning dust emission in shocked environments.

École Normale Supérieure de Paris **Paris, France**
Research Assistant | Contacts: Dr. Pierre Lesaffre 03/2018–06/2018

- The development of a 1D spherical model for steady stellar winds.

Teaching

- **Teaching Assistant** at University of Science and Technology of Hanoi (Vietnam) 2020–current
  Numerical Methods | 30 hours
- **Lecturer** at University of Science and Technology of Hanoi (Vietnam) 2017
  Introduction to Python | 30 hours
- **Lecturer** at SAGI Observational Astronomy School (Vietnam) 2023
  Spectroscopy for Astrophysics | 4 hours
- **Mentor** at Interstellar Shock School (France) 2022
  Hands-on exercises | 3 days

- **Mentor** at International Summer School on the Interstellar Medium of Galaxies (France) 2021
  Hands-on exercises | 10 days
- **Lecturer** at Bootcamp in Magnetic Fields in the Universe 7 conference (Vietnam) 2020
  Analysis Astrophysical Data | 1 day
- **Lecturer** at Public Online Course 2022
  Python Programming | 12 weeks

Supervising

- **Co-superivsor** a Ph.D. thesis at University Nicolaus Copernicus (Poland) 2021–2023
  Title : "Mapping and characterizing magnetic fields in the ρ Ophiuchus–A molecular cloud with SOFIA/HAWC+"
  Product : Lê et al. (submitted)
- **Supervisor** a Master thesis at University of Science and Technology of Hanoi (Vietnam) 2021
  Title: "Gas kinematics and dynamics of Carina Pillars: A case study of G287.76-0.87"
  Product : Tung et al. (submitted)
- **Co-supervisor** a Bachelor thesis at University of Science and Technology of Hanoi (Vietnam) 2023
  Title: "Correlation of dust polarization & MID-IR emission in Orion Nebula"
- **Supervisor** a group project at University of Science and Technology of Hanoi (Vietnam) 2022
  Title : "Molecular gas in Carina Keyhole"
  Product: Tram et al. (in prep.)
- **Supervisor** a Bachelor thesis at International Univeristy – Vietnam National Univeristy (Vietnam) 2021
  Title : "Modelling the impact of radiative feedback from a Red Supergiant on circumstellar dust"
  Product: Truong et al. (2022, **DOI***)*
- **Supervisor** a Bachelor thesis at International Univeristy – Vietnam National Univeristy (Vietnam) 2020
  Title : "Modeling high-J CO line profiles in shocks"
  Product: Fuda, Tram & Reach (2023, **DOI***)*
- **Co-supervisor** a Bachelor thesis at University of Science and Technology of Hanoi (Vietnam) 2019
  Title : "Time-varying extinction, polarization, and color of Type 1A Supernovae induce by Radiative Torque Disruption mechanism of dust grains"
  Product : Giang, Hoang & Tram (2020, **DOI***)*

Conferences and Seminars

Invited talks

• 2024	Heritage of SOFIA – Scientific Highlights and Future Perspectives (conference)	Stuttgart, Germany
• 2024	Science Seminar at Bochum University (seminar)	Bochum, Germany
• 2023	Dust Polarimetry and Applications in Astrophysics (workshop)	ICISE, Vietnam
• 2023	Science Seminar at Cologne University (seminar)	Cologne, Germany
• 2023	Dust, near, and far (conference)	Göteborg, Sweden
• 2023	Lunch Talk at Leiden University (colloquium)	Leiden, The Netherlands
• 2023	Stanford/KIPAC Tea Talk/group meeting (colloquium)	California, USA
• 2023	Midwest Magnetic Fields Workshop (online workshop)	Wisconsin, USA
• 2022	SOFIA tele-talks (online seminar)	California, USA
• 2022	New Frontiers of Astrophysics in the Golden Era of Dust Polarimetry (online workshop)	ICISE, Vietnam
• 2022	Institut de Recherche en Astrophysique et Planétologie (colloquium)	Toulouse, France
• 2022	Korea Astronomy and Space Science Institute (online colloquium)	Daejeon, South Korea

- 2021 École Normal Supérieure de Paris Lunch Talk (colloquium) Paris, France
- 2020 SOFIA tele-talks (online seminar) California, USA
- 2020 SN/Dust tele-talks (online seminar) California, USA
- 2018 Korea Astronomy and Space Science Institute Deajeon, South Korea

Contributed talks

- 2023 Windows on the Universe (conference) ICISE, Vietnam
- 2023 European Astronomical Society Annual Meeting (conference) Ice Kraków, Poland
- 2023 James Clerk Maxwell Telescope User Meeting (workshop) London, UK
- 2023 Science with the Atacama Pathfinder Experiment (APEX) (workshop) Ringberg, Germany
- 2022 Our galactic ecosystem: Opportunities and Diagnostics in the IR and Beyond (conference) California, USA
- 2022 Evolved Stars and Their Circumstellar Environments (online conference) California, USA
- 2021 Star Formation and Stellar Feedback (online workshop) Vietnam
- 2021 Royal Astronomical Society meeting (online workshop) UK
- 2021 The future of Airborne IR/submm Astronomy (online workshop) Stuttgart, Germany
- 2020 Magnetic Field in the Universe 7 (conference) ICISE, Vietnam
- 2016 Blowing in the wind (conference) ICISE, Vietnam
- 2016 Shocks 2016 (conference) Torún, Poland

Organizations

- **Vietnam Astrophysics Research Network** 2020–current
  supported by Astrophysics Group (SAGI) – Simon Foundation funds SAGI
  – I am a co-founder
  – The scientific mission is to understand the effects of magnetic fields and dust in star formation and stellar feedback by linking the new frontier of dust physics to magnetic fields and dust polarization
- **Dust Polarimetry and Applications in Astrophysics** 2023
  International workshop organized at ICISE, Vietnam
  – I am a member of the Scientific Organization Committee
  – The scientific mission is to gather experts to discuss the physics of dust polarization and important appli- cations in astrophysics
  – Workshop attracted 49 participants from 10 different countries and territories
- **New Frontiers of Astrophysics in the Golden Era of Dust Polarimetry** 2022
  International workshop organized at ICISE, Vietnam
  – I am a member of the Scientific Organization Committee
  – The scientific mission is to gather experts on the physics of dust polarization to address many long-standing questions and potentially open new frontiers of astrophysics
  – Workshop attracted 40 participants from 7 different countries and territories
- **Star Formation and Stellar Feedback** 2021
  International workshop organized virtually
  – I am a member of the Scientific Organization Committee
  – The scientific mission is to discuss many aspects related to star formation and stellar feedback
  – Workshop attracted 84 participants from 9 different countries and territories
- **Magnetic Fields in the Universe 7** 2020
  International conference organized at ICISE, Vietnam
  – I am a member of the Local Organization Committee
  – The scientific objective is to discuss the role of magnetic fields in the evolution of baryonic matter
  – Conference attracted 70 participants from 21 countries and territories

Theoretical Projects as PI/co-PI

Grain Dynamics and Surface Chemistry 2023–current

Advancement of astrochemical models

- **Aim** : Incorporation of the new desorption mechanism (rotational desorption) into the comprehensive astrochemical model (UCLCHEM) at Leiden University.

Alignment Physics of Interstellar Dust Grains 2021–current

Advancement of theories and development of numerical models

- **Aim** : Investigation of the mechanisms of grain alignments under different physical conditions
  - **Selected products** : Lopez-Rodriguez & Tram (2024, **DOI**); Hoang, Minh Phan & Tram (2023, **DOI**); Hoang, Tram et al. (2022, **DOI**); Tram & Hoang (2022, **DOI**), Hoang, Tram, Lee, Diep & Ngoc (2021, **DOI**)
- **Aim**: Development of numerical models
  - **Products** : DustPOL (Tram et al. 2021, **DOI**); POLARIS^{+} (Giang, Hoang, Kim & Tram, 2023, **DOI**)

Grain Growth and Evolution in Envelopes of Evolved Stars 2020–current

Combination of multiple theories of dust grains

- **Aim** : Investigation of the information and evolution of grains in the envelopes of evolved stars using spinning dust emission, absorption polarization of starlight, and thermal dust polarization
  - **Products** : Tram et al. (2020, **DOI**); Truong, Tram et al. (2022, **DOI**)

Dust Rotational Dynamics 2019–2020

Development of theories

- **Aim** : Exploration of the rotational motion of dust particles when subjected to a radiation field.
  - **Product** : Hoang, Tram, Lee & Ahn (2019, **DOI**)
- **Aim** : Investigate the impact of dust rotation motion on surface chemistry
  - **Products** : Hoang & Tram (2020, **DOI**); Tram et al. (2021, **DOI**)
- **Aim** : Exploration of the rotational motion of dust particles in interstellar shocks
  - **Products** : Hoang & Tram (2019, **DOI**); Tram & Hoang (2019, **DOI**)

Observational Projects as PI/co-PI

Multi-band Radio Polarized Observations of the Crab Nebula 2023–current

6 hours observations with the Effelsberg-100m telescope

- **Aim** : Search for the polarized signal of anomalous microwave emission (AME) in the Crab nebula

High spatial-resolution of AME toward Ophiuchus cloud 2022–current

21 hours observations with the Effelsberg-100m telescope

- **Aim** : Confirmation of the AME feature toward the Ophiuchus and refine the model of spinning dust.

Grain Alignment and Polarization in Filaments 2022–current

9 hours observations with JCMT telescope and available archival SOFIA data

- **Aim** : Characterization of magnetic fields and dust properties in a sample of filaments in the Milky Way.
  - **First product** : Ngoc, Diep, Hoang, Tram et al. (2023, **DOI**)

Dust Polarization and Magnetic Fields in Photo-Dissociation Regions 2020–current

Available archival SOFIA data

- **Aim** : Investigation of the dust polarization and the role of magnetic fields in some well-known nearby photo-dissociation regions

– **Selected products** : Tram et al. (2021, **DOI**); Hoang, Ngoc, Diep, Tram et al. (2022, **DOI**); Tram et al. (2023, **DOI**)

Gas Kinematics and Photo-Dissociation in Carina Nebulae 2020–current

150k USD funded by the SOFIA Archival Research Program

- **Aim** : Investigation of the physical and chemical properties of interstellar gas surrounding a luminous source

Supernova Remnant-Molecular Cloud Interactions 2019–current

14 hours observations with SOFIA telescope

- **Aim** : Identification of the most significant supernova-molecular cloud interactions using H_2 and CO molecules.
  – **Products** : Reach, Tram et al. (2019, **DOI**); Fuda, Tram & Reach (2023, **DOI**)

Scholarships and Awards

- 72.31 hours for conducting measurements with astronomical instruments. 2019–2024
- 150k US Dollars from a NASA Research Program. 2021–2013
- 35k US Dollars for the graduate scholarship. 2015 –2018
- The Best Poster at the International Astronomical Union Symposium 2021
- The Best Presentation at Consortium of French Institutions of Higher Education and Research 2015, 2016
- 800 US Dollars for a young researcher from the Odon Vallet Foundation 2013
- Silver Prize at Vietnam National Physics Olympiad 2010