Marina Gomes Rachid

Leiden – The Netherlands
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Research interests: Vibrational spectroscopy of organic molecules / Molecular composition of interstellar ice and the link between the solid and gas phase inventory in the ISM / Interstellar ice morphology / Optical properties of thin films / Solid-state science / Laboratory Astrophysics / Infrared astronomy

Education

Laboratory for Astrophysics - Leiden University — **Leiden, The Netherlands**
Ph.D. in Astronomy — *09/2018–Current (Ph.D. Defense: 03/2023)*
Promotors: Prof. Harold Linnartz and Prof. Ewine van Dishoeck

- Development of an ultra-high vacuum system to systematically acquire Fourrier Transform InfraRed (FTIR) spectra and measure refractive index of thin films at cryogenic temperatures
- Systematic measurements of the infrared spectra and refractive index of organic molecules in thin films
- Characterization of morphological changes in frozen H_2O, CO, CO_2, N_2, and CH_3OH using optical interference
- Interpretation of astronomical infrared observations of interstellar ice using laboratory data
- Part of the Leiden Ice Database team, led by Dr. Will Rocha

Universidade do Vale do Paraíba — **São Jose dos Campos, Brazil**
Master in Physics and Astronomy — *09/2016–08/2018*
Supervisor: Prof. Sergio Pilling

- Infrared characterization of thin films containing H_2O,CO_2,CH_4, and NH_3 irradiated with oxygen ions
- Infrared characterization of thin films containing acetic acid and glycolaldehyde irradiated with soft X-rays

Universidade de São Paulo — **São Paulo, Brazil**
Bachelor in Physics — *02/2012–02/2016*
Bachelor project: Determination of spectral signatures of biomolecules essentials to life
Supervisor: Prof. Eduardo Janot Pacheco

Universidade de São Paulo — **São Carlos, Brazil**
Bachelor in Chemistry — *02/2008–12/2011*
Bachelor project: Study of the electronic structure of diatomic systems containing elements from groups 14 and 16
Supervisor: Prof. Roberto Luiz Andrade Haiduke

Internships

GANIL (Grand Accélérateur National d'Ions Lourds) — **Caen, France**
09/2017–03/2018
Project title: Processing of warm ices by low energy ions: Probing the effects of solar wind and low energy magnetospheric ions on frozen solar system bodies
Supervisor: Prof. Phillipe Boduch

Leiden Observatory — **Leiden, the Netherlands**
LEAPS Summer School 2017 — *06/2017–08/2017*
Project title: Characterizing the largest interstellar molecules
Supervisor: Dr. Alessandra Candian

Awards and grants

Young Research Awards for outstanding research — **Katwijk, The Netherlands**
"Processing of cometary surface by swift ions" — *12/2017*
Poster presentation in the 51st Eslab Symposium "Extreme Habitable Worlds" - ESA

FAPESP scholarship for internship abroad of Brazil — **Caen, France**
Prestigious scholarship awarded for developing research projects outside of Brazil — *09/2017-03/2018*
Full project description

FAPESP fellowship master students **S J dos Campos, Brazil**
Prestigious scholarship awarded to master research projects in the State of São Paulo *09/2016-08/2018*
Full project description (in Portuguese)

FAPESP fellowship for undergraduate students **São Paulo, Brazil**
Prestigious scholarship awarded to bachelor research projects in the State of São Paulo *08/2014-07/2015*
Full project description (in Portuguese)

Observing programs

Co-I of the JWST Cycle 1 GO program: It's COMplicated: Disentangling the formation pathways of complex organic molecules from molecular clouds to comets, 1854, 17.7 hours, PI: Prof. Melissa McClure.

Teaching experience

Leiden University
Teaching assistant of several courses of Experimental Optics & Electromagnetism *2020–2022*

Students supervision

- "Wavelength dependent refractive index measurements of CO_2 ice in the UV-vis regime", **Thesis for Bachelor of Science in Astronomy, 2022**, Rastko Hadži-Cenić.
- "Preparing for JWST: the infrared spectrum of frozen glycolaldehyde", **Thesis for Bachelor of Science in Astronomy, 2021**, Casper Spijker.
- "Wavelength dependent refractive index measurements of interstellar ice analogs", **Thesis for the graduation internship - The Hague University of Applied Sciences**, 2020, Pien Vinke.
- "High resolution infrared spectroscopy of interstellar ice analogues", **Thesis for Bachelor of Science in Astronomy, 2019**, Dani de Boe & Nashanty Brunken.

Computer skills

- Programming languages: Python
- Microsoft Office
- Labview (basic)
- Origin
- Linux
- LaTeX

Languages

- Portuguese - Mother tongue
- English - Fluent
- Spanish - Advanced
- Dutch - Intermediate
- French - Basic

Selected conference attendance and presentations

- "From laboratory to space: JWST observations of interstellar ices" – Oral presentation - European Science Open Forum (ESOF) - Leiden, The Netherlands 2022
- "Providing essential laboratory data to detect complex organic molecules in JWST observations of interstellar ices" - Oral presentation - European Astronomical Society (EAS) - Valencia, Spain 2022
- "Infrared spectra of methylamine in astronomically relevant ice mixtures" - Poster presentation - European Conference on Laboratory Astrophysics (ECLA) – Anacapri - Italy, 2021.
- "Laboratory data in support of JWST observations of interstellar ices" - Poster presentation at Torun Astrophysics, Spectroscopy, and Quantum chemistry school (TASQ), Torun – Poland, 2019. **Awarded with a full sponsor for attendance**)
- "Laboratory data in support of JWST observations of interstellar ices" - Poster presentation - IAU Symposium S350—Laboratory Astrophysics: From observations to interpretation - Cambridge, UK, 2019.
- "Processing of cometary surface by swift ions", poster presentation in 51st Eslab Symposium "Extreme Habitable Worlds", European Space Agency ESA/ESTEC - The Netherlands, 2017 .

- "Destruction of $C_2H_4O_2$ isomers in ice-phase by X-rays and implication on their abundance in the ISM", Oral presentation in AbGradCon - 2017- Charlottesville – USA, 2017. **Awarded with a full sponsor for attendance**)
- "Destruction of $C_2H_4O_2$ isomers in ice-phase by x-rays and implication on their abundance in the ISM", poster presentation at IAU Symposia 332: Astrochemistry VII – Through the Cosmos from Galaxies to Planets, Puerto Varas, Chile, 2017. **(Awarded with a partial sponsor for attendance**)
- "Processing of Cometary Surfaces by Swift Ions", Poster presentation - ESA Conference "Ices in the Solar System", Madrid - Spain - 2017. **(Awarded with a partial sponsor for attendance**)
- "Peering on biomolecules spectral fingerprints with FRACS", Poster presentation - First Astrobiology School at Observatório Nacional- Rio de Janeiro, Brazil - 2014.
- "Semi classical orbits and antidots lattices in Hall systems" - Oral presentation - 22º International symposium of undergraduate research at USP - 2014.

Publications

- Rocha, W., **Rachid, M. G.**, B. Olsthoorn, E. F. van Dishoeck, M. K. McClure, H. Linnartz (2022). LIDA - The Leiden Ice Database for Astrochemistry, Astronomy Astrophysics, in press. ArXiv preprint arXiv:2208.12211 (2022).
- **Rachid, M. G.**, Rocha W., Linnartz, H., (2022). Infrared spectra of complex organic molecules in astronomically relevant ice mixtures - V. Methyl cyanide (acetonitrile), Astronomy Astrophysics, 665, A89.
- He, J., Diamant, S. J., Wang, S., Yu, H., Rocha, W. R., **Rachid, M. G.**, Linnartz, H. (2022). Refractive Index and Extinction Coefficient of Vapor-deposited Water Ice in the UV–vis Range. The Astrophysical Journal, 925(2), 179.
- **Rachid, M. G.**, Brunken, N., De Boe, D., Fedoseev, G., Boogert, A. C. A., Linnartz, H. (2021). Infrared spectra of complex organic molecules in astronomically relevant ice mixtures - IV. Methylamine. Astronomy Astrophysics, 653, A116.
- **Rachid, M. G.**, van Scheltinga, J. T., Koletzki, D., Linnartz, H. (2020). Infrared spectra of complex organic molecules in astronomically relevant ice mixtures - II. Acetone. Astronomy Astrophysics, 639, A4.
- **Rachid, M. G.**, Pilling, S., Rocha, W. R. M., Agnihotri, A., Rothard, H., Boduch, P. (2020). Processing of 72-K water-rich ices by keV and MeV oxygen ions: implications for the Saturnian moon Enceladus. Monthly Notices of the Royal Astronomical Society, 494(2), 2396-2409.
- Candian, A., **Gomes Rachid, M.**, MacIsaac, H., Staroverov, V. N., Peeters, E., Cami, J. (2019). Searching for stable fullerenes in space with computational chemistry. Monthly Notices of the Royal Astronomical Society, 485(1), 1137-1146.
- **Rachid, M. G.**, Faquine, K., Pilling, S. (2017). Destruction of $C_2H_4O_2$ isomers in ice-phase by X-rays: Implication on the abundance of acetic acid and methyl formate in the interstellar medium. Planetary and Space Science, 149, 83-93.
- Terrabuio, L. A., Teodoro, T. Q., **Rachid, M. G.** Haiduke, R. L. (2013). Systematic theoretical study of non-nuclear electron density maxima in some diatomic molecules. The Journal of Physical Chemistry A, 117(40), 10489-10496.

Submitted articles

- McClure, M., Rocha, W.R.M., Pontoppidan, K., Crouzet, N., Chu, L., Dartois, E., Lamberts, T., Noble, J., Pendleton, Y., Perotti, G., Qasim, D., **Rachid, M. G.**, et al., Nature Astronomy, in review.

Other activities

Organization of the Ph.D. seminars at the Leiden Observatory, 2019.

Talks to the general public at the Observatory of Universidade do Vale do Paraíba - São José dos Campos - SP, Brazil, 02/2017 - 08/2017.

References

The following faculty members and collaborators can attest to my professional experience:

- Prof. Harold Linnartz - Head of the Laboratory for Astrophysics at Leiden University - Leiden, the Netherlands.
- Dr. Jiao He - Head of the Origins of Life laboratory at Max Planck Institute for Astronomy - Heidelberg, Germany.
- Dr. Danna Qasim - Research Scientist Space Science at Southwest Research Institute - San Antonio - Texas, United States.

- Dr. Will Rocha - Postdoc at Leiden Observatory - Leiden University - Leiden, the Netherlands.