Dries Van De Putte

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Skills Profile

- Observational data experience: Writing HST and JWST proposals. Running and adjusting the JWST pipeline for imaging and IFU data, including NIRCam, NIRSpec IFU, MIRI imager, MIRI IFU. Analysis of NIR and MIR spectra (data cubes), spatially mapping lines and broad emission features (e.g. PAHs). Using stellar UV spectroscopy from HST STIS and IUE, and a variety of imaging data from HST, JWST, Spitzer, Herschel.
- Development and use of spectral fitting tools: Decomposition of IR spectra into background components, emission lines, and broad features. Bayesian SED fitting of stellar photometry, to determine stellar properties and dust extinction. Use of statistical techniques to estimate uncertainty and covariance such as Monte Carlo and bootstrapping.
- Development of astrophysical simulations: 3D dust radiative transfer using Monte Carlo techniques. Implementing recipes for the interactions between radiation, dust, and gas, typical of photodissociation region models. Implementing solvers for temperature, simple chemical networks, level populations.
- Computer skills: Collaborative development of Open-Source Python packages, git and GitHub, continuous integration, unit testing. Creating interactive Jupyter notebooks for scientific analysis, and use of various visualization tools. Linux command line tools, using science clusters and HPC systems, multi-processing with MPI, simulation development in C/C++. Simulation development in C/C++.

Research Experience

2024-present ■ **Postdoctoral Associate** University of Western Ontario, Canada

- Published Van De Putte et al. (2025), documenting improvements made to the PAHFIT spectral decomposition tool, its application to JWST spectra of the Orion Bar. This work demonstrates the use of emission band profile diagnostics as tracers of photochemical evolution.
- Leader of the PDRs4All data reduction team. Set up automated packaging of the final data products and a versioning system, and set up and led meetings of the team.
- PI for the the approved HST observing program "Linking Gas-Phase Element Depletions and Extinction Curves in the Small Magellanic Cloud" (GO-17823).
- Set up and maintained a collaborative Python package that gathers commonly used tools for our research group. This includes setting up automated testing, documentation, and performing code review.
- Assisted graduate students with Python programming and JWST data analysis.
- As a co-author of several papers, provided advice to external group and collaborations, concerning data reduction of JWST spectra and the application of PAHFIT (e.g. Y. Clark, K. Sandstrom et al. incl. Van De Putte 2025; and J. Chastenet, I. De Looze et al. incl. Van De Putte in prep).

2021-2024 ■ **Postdoctoral Researcher** Space Telescope Science Institute, Baltimore, MD

- Published Van De Putte et al. (2023): Discovered a linear relationship between the far-UV curvature component of dust extinction curves, and the molecular hydrogen column density. Used UV spectroscopy data from FUSE, HST STIS, and IUE, and existing extinction curve data.
- Key member of the data reduction team for the PDRs4All collaboration, with a focus on NIRSpec IFU and MIRI IFU spectroscopy. Maintained the PDRs4All Python package, containing workarounds to resolve issues with early versions of the JWST pipeline. The data reduction team frequently contacted the JWST helpdesk to report and resolve newly discovered issues. Through the delivery of improved data products, our data contributed to first four PDRs4All papers (Berné et al. 2023, Habart et al. 2023, Peeters et al. 2023, Chown et al. 2023). Published PDRs4All paper V: the overview and initial analysis of the mid-IR emission lines in the Orion Bar.
- Performed data reduction of NIRSpec and MIRI IFU data from the JWST GTO program 1192, observing the Horsehead and NGC 7023. Currently leading a paper concerning the decomposition and spatial mapping of spectral features based on these IFU spectra.

- Became one of the main developers and contact persons for the open-source spectral decomposition tool PAHFIT. Led the redesign of the main user-facing API, participated in efforts to make PAHFIT compatible with JWST data. Developed a Jupyter notebook which explains the new API and concepts, presented at JWebbinar 23, a community telecon for PDRs4All. Supported several researchers that use PAHFIT, and kept track of issues on Github. Developed an additional package (PAHFITcube) to apply PAHFIT to data cubes from JWST and Spitzer.

2016 - 2020 **PhD of Science in Astronomy** — Ghent University, Ghent, Belgium; Space Telescope Science Institute, Baltimore, MD

- Four year fellowship obtained by submitting a research plan and application to BOF (*bijzonder onderzoeksfonds*), the "exceptional research fund" provided by Ghent University.
- *PhD thesis:* "Self-consistent modelling of radiation, dust, and gas in the interstellar medium". Developed RADAGAST, a new astrophysical C++ code that calculates the local properties of interstellar gas, under the effect of a given local radiation field and dust grain properties, forming a simplified photodissociation region model (see research statement for details). RADAGAST was coupled to SKIRT, a 3D dust radiative transfer code, to enable a self-consistent treatment of the gas, dust, and radiation field in 3D, including all the dust absorption, scattering, and emission details available in SKIRT. Supervision: Maarten Baes, Karl Gordon, Julia Roman-Duval.
- Visited STScI (Apr 2017 - Apr 2018), collaborating with the ISM*@ST group. Published Van De Putte et al. (2020): evidence of dust evolution in the IC 63 photodissociation region, by using a Bayesian stellar and extinction fitting code (BEAST), applied to HST UV and IR photometry. Added stellar distance fitting support to the BEAST code, as well as some tools to better manage its memory usage.
- Teaching assistant for the course "Statistics and data processing" for two semesters (Fall 2018, 2019). Supervised the exercise sessions, and set up three Python programming challenges which introduced the students to essential packages such as *numpy* and *scipy*, and numerical statistical tasks such as error propagation and bootstrapping.

Education

2011 - 2016 **BS and MS in Physics and Astronomy** — Ghent University, Ghent, Belgium

- *Master's thesis:* "Data parallelization with MPI in a 3D Monte Carlo dust radiative transfer code". Implemented distributed-data multi-processing in the SKIRT code, making it possible to distribute memory usage across compute nodes. This enabled the user to run models that exceed the memory capacity of a single machine. Implemented inter-process communications using the industry-standard Message Passing Interface (MPI), in the existing C++ codebase. Co-authored Verstocken et al. (2017), by including a description of this method. *Supervision:* Maarten Baes.
- *Internship at the Royal Observatory of Belgium:* Developed a new pipeline step in Python for the HERMES spectrograph of the Mercator Telescope, which removes a bias introduced by the spectrum of the flat-field calibration lamps.
- *Notable elective course:* "Software Development I" in C and C++.

Teaching and Mentoring

- Led several tutorial sessions for the research group at Western University, to introduce Python programming and JWST data reduction practices.
- Assisted in mentoring the graduate students at Western University, providing advice about processing and analyzing JWST spectroscopic data and Python programming.
- Fall 2018 and 2019: Teaching assistant for a second year Bachelor course of Ghent University "Statistics and data processing".
- Guest lecturer for one lesson of a summer series organized by an amateur astronomer organization in Belgium. Taught the concepts and excercises of stellar spectral classification to a mixed-age audience of astronomy enthusiasts.

Awards

Observing time

- PI of Hubble Space Telescope program GO-17823 (55 orbits); "Linking Gas-Phase Element Depletions and Extinction Curves in the Small Magellanic Cloud".
- Co-I for a set of successful JWST and HST proposals including:
  GO-8007 (Tielens et al.): Characterizing C60 cations in the cavity of NGC 7023
  GO-7772 (Peeters et al.): Interstellar PAHs: separating the neutrals from the ions
  GO-7396 (Tarantino et al.): Exploring the Last Watering Hole of Low Metallicity PAH Emission: Deep Spectroscopic Observations of Sextans A
  GO-5168 (Gordon et al.): First Direct Measurements of Interstellar Silicate Dust in the Magellanic Clouds
  GO-5952 (Roman-Duval et al.): Zooming-in on the sub-grid physics of PAHs at 20% solar metallicity
  GO-4551 (Gordon et al.): MIR Extinction for ice sightlines with measured UV extinction
  GTO-1192 (Misselt et al.): Physics and Chemistry of PDR Fronts
  GO-17516 (Decleir et al.): Dust extinction at its extremes - from the smallest to the largest dust grains
  GO-17488 (Yanchulova Merica-Jones et al.) Unraveling the mystery of the rare 2175 A extinction bump in the SMC

Funding

- 2024 – US$157k budget approved for HST GO-17823 (U.S. admin PI: K. Gordon).
- 2016 – Four-year PhD fellowship: Ghent University Bijzonder Onderzoeksfonds ("exceptional research fund").

Service

- Jan 2025 – External panel member for JWST cycle 4 time allocation committee.
- 2025 – Referee for two papers in Astronomy & Astrophysics

Selected Publications

- Van De Putte, Gordon, Misselt, et al. in prep. – *JWST observations of photodissociation regions. IV. Carbonaceous emission band sub-components in NGC 7023 have distinct spatial distributions*
- Van De Putte, D., Peeters, E., Gordon, K. D., et al. 2025, A&A, 701, A111 – *PDRs4All. XVI. Tracing aromatic infrared band characteristics in photodissociation region spectra with PAHFIT in the JWST era*
- Van De Putte, D., Meshaka, R., Trahin, B., et al. 2024, A&A, 687, A86 – *PDRs4All. VIII. Mid-infrared emission line inventory of the Orion Bar*
- Van De Putte, D., Cartledge, S. I. B., Gordon, K. D., Clayton, G. C., & Roman-Duval, J. 2023, ApJ, 944, 33 – *Far-ultraviolet Dust Extinction and Molecular Hydrogen in the Diffuse Milky Way Interstellar Medium*
- Van De Putte, D., Gordon, K. D., Roman-Duval, J., et al. 2020, ApJ, 888, 22 – *Evidence of Dust Grain Evolution from Extinction Mapping in the IC 63 Photodissociation Region*
- Verstocken, S., Van De Putte, D., Camps, P., & Baes, M. 2017, Astronomy and Computing, 20, 16 – *SKIRT: Hybrid parallelization of radiative transfer simulations*

Talks and conferences

Invited talks –

"JWST observations of photodissociation regions: Tracing the chemical evolution of interstellar dust"

2025/12/04 – London, ON — *Western University physics and astronomy colloquium*

2025/09/25 – Kingston, ON — *Queen's University physics and astronomy seminar*

Conferences –

2025/11/10 – Tucson, AZ	Poster at *Dusty Universe 2025:* "Carbonaceous emission band subcomponents in NGC 7023 have distinct spatial distributions"
2025/06/12 – Baltimore, MD	Poster at *Inter+Stellar: Harnessing the Intersection Between Stars and the Interstellar Medium:* "Spectral Decomposition of the Aromatic Infrared Bands in Photodissociation Regions"
2023/11/14 – Baltimore, MD	Poster at *Improving JWST Data Products Workshop:* "Tools and corrections for imaging and IFU spectra of the Orion Bar"
2023/10/29 – Florence, Italy **Contributed talk**	*Illuminating the Dusty Universe: A Tribute to the Work of Bruce Draine:* "Spatially resolved maps of the IR emission bands in photodissociation regions"
2023/09/26 – Gothenburg, Sweden **Contributed talk**	*Origin and Fate of Dust in Our Universe:* "Far-UV extinction and H_2; Decomposing and mapping IR bands near the HI-H_2 transition"
2022/12/16 – Remote	*JWebbinar 23: PDRs4ALL Community Telecons in Support of JWST Cycle 2 Proposals; Webinar 3: Tools To Quantify the Spectral Information:* Live PAHFIT demo
2022/11/30 – Ghent, Belgium **Contributed talk**	*SKIRT Days 2022:* implementation of the RADAGAST gas model and its use in SKIRT
2022/07/11 – Paris-Saclay, France	*Interstellar Institute #5 - With Two Eyes:* Discuss PDRs4All and PAHFIT
2022/06/12 – Pasadena, CA	*240th Meeting of the American Astronomical Society:* Poster about the far-UV exinction rise to H_2 relationship
2022/03/15 – Baltimore, MD	*STScI Discovery Seminar Series:* "Far-UV Dust Extinction and Molecular Hydrogen in the diffuse Milky Way Interstellar Medium"
2019/06/24 – Lyon, France	*EWASS2019, Cosmic dust (r)evolution:* Poster about IC 63 project
2018/11/05 – Leiden, Netherlands	*Hendrik van de Hulst Centennial Symposium:* Poster about IC 63 project
2018/06/11 – Copenhagen, Denmark	*CPHDUST2018: Cosmic Dust: origin, applications & implications:* Poster about IC 63 project
2016/10/28 – Florence, Italy **Contributed talk**	*DustPedia meeting:* the parallelization of SKIRT
2016/10/04 – Ghent, Belgium **Contributed talk**	*CHARM meeting:* the parallelization of SKIRT