

Curriculum Vitae et Studiorum

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PERSONAL INFORMATION

Gioia Rau

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JOB EXPERIENCE

2020–Present **Research Assistant Professor – The Catholic University of America**

I am a [research scientist at NASA/GSFC](#), and a faculty [Research Assistant Professor](#) at the CUA. I work on several projects using data from worldwide interferometric facilities (VLTI, CHARA, ALMA, IRAM), the Hubble Space Telescope, and other NASA missions such as K2/TESS, and modelling them with the latest 3D and 1D state-of-the-art models for cool evolved stars. I also work on exoplanets detection and characterization, analyzing Keck/NIRC2 aperture masking data of a microlensing event, and using neural network algorithms to find exoplanet transits in TESS data. I am involved in the design and building of several space missions concepts and ground-base instruments. I also teach Astronomy to undergrad students.

Parental Leave: February–June 2020

2017–Present **Research Scientist – NASA/Goddard Space Flight Center**

My research focuses on studying cool, evolved stars, and exoplanets. I analyse evolved stars' structure combining high-resolution spectroscopic data from the Hubble Space Telescope/STIS and GHRS instruments (see [Rau et al. 2018](#), [Carpenter et al. 2018](#)), with high-angular resolution interferometric data from the CHARA/VEGA instrument, the Very Large Telescope Instrument (VLTI)/GRAVITY, and VLTI/MATISSE ([Rau et al. in prep](#)), **see also observing run below**. I also study the evolution of these cool, evolved stars using evolutionary tracks. My **unique approach** resides in combining ESO/VLTI and CHARA/VEGA high-angular resolution interferometric observations, with high-resolution spectroscopic HST ones, to unravel the role of the chromospheric layer, in of cool, evolved stars, and of the upper atmosphere in general.

2017 **Visiting scientist – European Southern Observatory (ESO) HQ**

[Visiting position](#) at ESO/Garching for three months. I worked with Dr. Markus Wittkowski on investigating the atmospheric structure of the Oxygen-rich Mira star R Peg. I reduced the **extremely new Science Verification GRAVITY data** GRAVITY of R Peg. We determined its molecular extension by resolving its atmospheric layers with the newest VLTI/GRAVITY instrument ([Wittkowski, Rau et al. 2018](#)), and we model its atmosphere with the CODEX dynamic model atmospheres. This study represents the **first characterization** of the phase lags between Mira angular sizes in continuum and molecular bands and the lightcurve.

2016-2017 **Postdoc – University of Vienna**

Postdoc at the University of Vienna, Institute of Astrophysics, during which I spent three months at ESO HQ (Garching) as a visiting scientist, working with Markus Wittkowski (see above). A project I have been working on include extending the comparison between dynamic model atmospheres and spectro-photometric and interferometric observations, to a grid of dynamic models without the assumption of small particle limit (see also [Rau et al.](#), PhD thesis), which will help to shed new light on the process of mass loss in C-rich stars. This might be of special relevance for the semi-regular variable stars, which have been proved by [Rau et al. \(2017\)](#) to have a more compact structure than Mira stars.

EDUCATION

Oct 2012–Oct 2016 **Ph.D. with Honors University of Vienna**

- Thesis Title: “*Atmospheres of evolved C-rich stars - from observations to models, and back*”
- Supervisors: Ao. Prof. Dr. F. Kerschbaum & Dr. J. Hron
- Description: My PhD research focused on the study of cool, evolved carbon-rich stars, investigating their intriguing atmosphere, and the processes happening in there, such as: pulsation, mass loss and stellar winds, and, in the outer envelope, the formation of molecules and dust. Indeed AGB stars are one of the most important contributors to the enrichment of the interstellar medium, via their mass loss, with heavy elements produced in their core, and with the dust produced in their envelope. I developed a joint use, **for the first time in a consistent way** of spectro-photometric and interferometric measurements of AGB stars in synergy, and compared them to the predictions of different kinds of modelling approaches (radiative transfer code such as Mode of Dusty, hydrostatic model atmospheres such as COMARCS models, and self-consistent state-of-the-art dynamic model atmospheres such as DARWIN models), and geometric model fitting tools such as GEMFIND. My first paper as first author focused on one test-star: the carbon-rich Mira RU Vir (**Rau et al., 2015**). In my second paper as first author I applied the same methodology to a set of C-rich stars for comparison (**Rau et al., 2017**). I was also involved in a publication with the Vienna exoplanets group (Bazso et al., 2017) and with other VLT/MIDI data (Paladini et al., 2017). **I have been the PI of observations** made at ESO/VLT with the MIDI instrument in April 2014 (ID 093.D-0708.A), and Co-I of several other VLT projects (see below). I have established several international collaborations (Italy, Belgium, Sweden). [My PhD thesis is published at this link.](#)

Nov 2011–Sep 2012 **Post-Master – Università di Roma La Sapienza**

Planck satellite data reduction code development. Advisor: Dr. A. Melchiorri. I developed numerical codes in preparation of the forthcoming data analysis of the Planck satellite mission.

Feb 2011–May 2011 **Visitor student CalTech & NASA/JPL**

Fellowship to develop my Master Thesis abroad

For being one of the four Master student with the highest grades of the entire Faculty of Natural Science of Università La Sapienza, I won one of the 4 awards “Borsa per la Tesi all'estero”, to developed my Master Thesis research at California Institute of Technology (CalTech), & NASA/JPL.

Nov 2009–Oct 2011 **Master degree Summa Cum Laude in Physics and Astrophysics
Università degli Studi di Roma La Sapienza, Facoltà di Fisica**

- Thesis Title: “*Secondary anisotropies in the Cosmic Microwave Background*” – 110/110 **Cum Laude**
- Supervisors: Dr. Graça Rocha (CalTech), Dr. Alessandro Melchiorri (La Sapienza)
- Description: My Master thesis focused on the analysis of the secondary anisotropies in the Cosmic Microwave Background (CMB), their influence on the cosmological parameters, and their correlations. I presented the innovative analysis, conducted at NASA/JPL & Caltech, of the secondary anisotropies in the CMB and foregrounds, particularly taking into account the contributions of the Sunyaev-Zel'dovich-effect and DSFG (Dusting Star Forming Galaxies). To this aim I developed a numerical analysis and implemented numerical codes in IDL, in order to verify the good agreement between the calculated values of the cosmological parameters and those of the Standard Cosmological Model. MCMC were used to obtain samples of cosmological parameters in the phase space. My work included the dataset of the WMAP team, ACT, and ACBAR instruments.

Oct 2006–Oct 2009 **Bachelor degree in Physics and Astrophysics
Università degli Studi di Roma La Sapienza, Facoltà di Fisica**

- Thesis Title: “*Dark energy and the age of the Universe*”
- Supervisors: Dr. Alessandro Melchiorri (La Sapienza)

AWARDS, GRANTS

Awards & Prizes

- 2021 [NASA Astrophysics Science Division Peer Award](#) – “For your excellence in astrophysics research and service, and for your enthusiastic commitment to building a healthy, diverse, and inclusive science community”
- 2021 [Inspiring Fifty Italy](#) – Top 50 women in Tech and Science in Italy awarded by a [prestigious jury](#)
- 2021 [ICS Young Scientist Award](#) awarded the best scientist among NASA, NIH, NIST – “For your work in the application of astronomical and computational techniques to outstanding problems in astrophysics”
- 2021 Top 150 [Women of Inspiration](#)
- 2021 National Women’s History Month at NASA/Goddard Award
- 2020 “Outstanding Researcher” recognition from the US Government (“EB-1B Green Card”)
- 2020 Nomination for the “[2020 Italian Bilateral Scientific Cooperation Award](#)”
- 2019 Nomination for outstanding achievements, Sigma Xi honorary society
- 2018 NASA/GSFC “Science Nuggets”: [my work was selected](#) by the NASA/GSFC 660 Astrophysics Science Division in July 2018 to be presented to the Center management (the Center Director and his Executive Council) to highlight my research as one of the greatest being done in the Division.
- 2005 Local winner of the High-School Mathematics and Physics Italian Olympiads.

Grants

- 2021 Accepted proposal “MATISSE: MACHine Intelligence for Small Satellites” (PI Rich Barry, NASA/GSFC)
- 2021 Accepted Step A NIAC proposal “A Lunar Long-Baseline Optical Imaging Interferometer: Artemis-enabled Stellar Imager (AeSI, PI Kenneth Carpenter, NASA/GSFC)”
- 2021 Accepted Step A NIAC proposal “Laser-Guided Space Interferometer” (PI Kerri Cahoy, MIT)
- 2020 Accepted Step A NIAC proposal: “SI-LP: Stellar Interferometer – Lunar Pole” (PI Kenneth Carpenter, NASA/GSFC)
- 2017 [PI of Schrödinger Fellowship, Austrian Science Fund \(FWF\) - “Cool stars winds and chromospheres”](#) – Grant Amount: 164,000 €
- 2017 PI of PSL Fellowship, Paris/Meudon – Grant Amount: 300,000 €
- 2017 Nasa Postdoctoral Fellowship (Pending & Withdrawn), NASA/Goddard – Grant Amount: ~ \$400,000
- 2016 “Abschlussstipendium der Universität Wien”: Selected and fully sponsored as one of the 12 best PhD students out of about 10,000 of all the PhD students of the University of Vienna, for exceptional research and merit – 6,000 €.
- 2011 “Borsa di studio per tesi all’estero”: selected and fully sponsored on the basis of the best GPA as one of the 4 Master students out of about 112,000 of all the Master students of the Natural Science Faculty of the Università di Roma La Sapienza, to develop my Master Thesis abroad - 3,000 €.

Travel Grants

- 2018 Travel grant IAU 2018 - 500 €.
- 2016 Travel grant award sponsored by the Austrian Astronomical Society (OeGAA) to attend the conference “Blowing in the wind” - 350 €.
- 2016 Travel grant award sponsored by University of Vienna under the program “Dissemination”, to attend the conference “Blowing in the wind” - 600 €.
- 2016 Travel grant award sponsored by the Italian Ministry of Foreign Affairs and International Cooperation (MAECI) to attend the conference “Blowing in the wind”. - 1,700 €.
- 2016 Travel grant award sponsored by Observatoire de Paris & CNRS, to attend the conference “Blowing in the wind” - 1,000 €.
- 2016 Travel grant award sponsored by the European Astronomical Society (EAS), to attend EWASS 2016 - 800 €.
- 2015 Travel grant award sponsored by the Austrian Astronomical Society (OeGAA) to attend the conference IAU-GA - 350 €.
- 2015 Travel grant award from the Italian Ministry of Foreign Affairs and International Cooperation (MAECI) to attend the conference IAU-GA - 1,700 €.
- 2015 Travel grant award sponsored by ESO (European Southern Observatory) to attend the ESO STEPS conference - 800 €.
- 2015 Travel grant award sponsored by the competitive contest from the University of Vienna under the program “Dissemination”, to attend the conference EWASS 2015 - 300 €.
- 2012 Winner of the grant to develop my PhD thesis at the University of Vienna.
- 2010 One of the 10 awardee among the whole department of Physics of the University of Rome La Sapienza of the MITO award to join the observational campaign (see Academic Experiences).

Observing Proposals
PI ~ 30 hours
Co-I ~ 260 hours

- 2021 Co-I on Cycle P108 VLT/MATISSE Large Program - 180 h
- 2021 Co-I of accepted Cycle 29 and Cycle 30 HST proposal – 40 h
- 2021 Co-I of accepted NRAO proposal – 8 h
- 2020 Co-I of the observing runs at IRAM/NOEMA – 16 h
- 2020 Co-I of the observing runs at NOIRLab/CTI/SVC/CHIRON – 30 h
- 2020 Co-I of the observing runs at ESO/VLTI (ID: 106.217) – 27 h
- 2019 **PI** of the scheduled observing runs at ESO/VLTI with the MATISSE instrument (ID:0105.20BT) – 9 h
- 2019 Co-I of the observing runs at ESO/VLTI with the MATISSE instrument (ID: 105.0354) – 9 h
- 2019 Co-I of the monitoring proposal at ESO/VLTI with the GRAVITY instrument, spanning 4 periods: 105-106-107-108 – 54 h
- 2019 **PI** of the scheduled observing runs at ESO/VLTI with the MATISSE instrument (ID:0104.D-0279) – 12.5 h
- 2019 Co-I of the accepted Cycle 7 ALMA proposal 2019.1.00796.S
- 2019 Co-I of the accepted ALMA DDT proposal 2018.A.00026.S
- 2018 Co-I of the observing run at VLT/GRAVITY (ID: 0102.D-0197) - 24h
- 2018 Co-I of the observing run at VLT/SPHERE and VLT/GRAVITY (ID: 0102.D-0240) - 20h
- 2017 Co-I of the observing run at VLT/GRAVITY (ID: 0101.D-0616) - 31h
- 2014 **PI** of the observing runs at ESO/VLTI with the MIDI instrument (ID: 093.D-0708) - 6 h
- 2014 Co-I of the observing run at ESO/VLTI with the MIDI instrument (ID: 092.D-0152) - 9 h
- 2013 Co-I of the observing run at ESO/VLTI with the MIDI instrument (ID: 092.D-0665)- 7.5 h

LEADERSHIP &
COMMUNITY
SERVICE

Leadership

- 2022 Board member of the Italian Scientist & Scholar In North America Foundation (ISSNAF) DMV area Chapter
- 2022-2025: Advisory Board member of the European Commission funded project [DivAirCity](#), in the last round of the H2020 calls, to address air pollution and Nature Based Solutions in cities
- 2021: Selected Fellow of the [ISPI Future Leader Program 2022](#)
- 2021: PhD thesis committee member - Skarleth Motino
- 2021: MPL (Mission Planning Lab) run for CU μ LUS (now CLEoPATRA) mission
- 2021: Chair of the [IAU WG on red Giants And Supergiants](#)
- 2020–Ongoing: Chair organizer of the [conference: "GAPS 2021: unsolved problems in red Giants And suPergiantS"](#), 14-18 June 2021
- 2021–Ongoing: CHARA/SPICA instrument [working group "WP12 – Winds & Environment"](#)
- 2020–Ongoing: Evolved Stars science case lead for the space mission concept JUSTIINE (PI David T. Leisawitz, NASA/GSFC)
- 2020–Ongoing: NASA/GSFC Diversity, Equity, Inclusion, and Accessibility (DEIA) Advisory Committee Selected Member
- 2020–Ongoing: NASA/GSFC Hiring and Promotion Working Group Volunteer
- 2020–Ongoing: Evolved Stars science case lead for the AeSI space mission concept (PI Kenneth Carpenter, NASA/GSFC)
- 2019–Ongoing: [Organising Committee of the IAU Working Group on Red Giants and Supergiants](#)
- 2021: Chair of the AAS 237's Meeting Session #116: "Stellar Atmospheres and Winds"
- 2020/2021: Leader, proposer, and organizer of the panel "*What's Next?*" on career for NASA/GSFC interns, which received mentions as best activity for the interns
- 2019–2021: NASA/GSFC Summer Interns Working Group Organizer
- 2017–2019: Leader, proposer, and organizer of the two-monthly 'HARIM' (High-Angular Resolution Interferometric Meeting) meeting at NASA/GSFC
- 2017: LOC at the symposium "Environments of Terrestrial Planets Under the Young Sun: Seeds of Biomolecules 2018" at NASA/GSFC
- 2015: Chair of the IAU 2015 Focus Meeting 7 conclusive session "Stellar Physics in Galaxies throughout the Universe"
- 2012–2014: Organizer of the weekly "Dust meeting" at the Institute of Astrophysics in Vienna

- Editor**
- 2021: Guest Editor of MDPI's Special Issue: "Atmospheres of Cool Evolved Stars"
 - 2021–ongoing: Editorial Topics Board member of MDPI's journal: "Atmosphere"
 - 2019–ongoing: Editorial Board member of the IAU's AGB Newsletter

- Referee**
- 2018–ongoing: ApJ, A&A, MNRAS
 - 2016: IBVS ("Information Bulletin on Variable Stars")

- Panel reviews**
- 2022: Confidential
 - 2022: Confidential
 - 2021: NOIRLab
 - 2021: JWST Cycle 1
 - 2019: HST
 - 2019: TESS Cycle 1
 - 2018: CHANDRA
 - 2018: K2
 - 2018: ESO/DPR
 - 2018: NASA/SMD Independent Product Review

- Visiting positions**
- 2018: Visiting scientist ESO HD (Garching) 1 week, to work with Dr. Markus Wittkowski
 - 2017: Visiting scientist ESO HD (Garching) 3 months, to work with Dr. Markus Wittkowski
 - 2011: Visiting student at Caltech & NASA/JPL 4 months, to develop my Master thesis

- Selected Summer schools**
- 2013: VLTI Summer School - High angular resolution for stellar astrophysics September 2013 (Barcelonnette, France).
 - 2010: Educational Excursion at Testa Grigia Observatory, MITO Telescope, for an observational campaign headed by Prof. Marco de Petris to test the atmospherical spectrometer CASPER2, in the contest of studying the SZ effect (Breuil-Cervinia, Italy).
 - 2010: Cosmology Summer School: The CMB at High Angular Resolution 5-10 July 2010 (IESC, Cargese, Corsica, France).

TALKS & POSTERS

- Invited Conference Plenary Talks**
- June 2021: **Invited** GAPS 2021 conference talk
 - Jan 2020: **Invited** conference talk, AAS 235's Session: "[Imaging Stars A Century of Advances in High Angular Resolution Astronomy](#)"
 - Nov 2018: **Invited** conference talk at the [CRESST II retreat](#), Baltimore
 - Mar 2018: Presenting the **Invited** conference talk on behalf of Dr. Carpenter at the conference "[Imaging of stellar surfaces](#)", ESO/Garching

- Invited Seminar Talks**
- Dec 2021: The Catholic University of America
 - July 2021: University of British Columbia, Vancouver
 - June 2021: Portsmouth University
 - June 2021: Space Telescope Science Institute
 - Dec 2020: Yale University
 - Apr 2019: University of Vienna, Institute for Astrophysics
 - Feb 2019: The Catholic University of America
 - Dec 2018: INAF/OAR (Observatory of Rome)
 - Dec 2018: ESO HQ in Garching
 - Dec 2018: Center for Astrophysics | Harvard & Smithsonian (CfA)
 - Nov 2018: Macquarie University
 - Nov 2018: University of Melbourne
 - Sept 2018: Nice observatory (OCA)
 - Aug 2018: NASA/Goddard SED director series
 - May 2016: Budapest Astronomical Observatory (Host: Prof. Maria Lugaro)
 - Apr 2016: University of Padova - Starkey meeting (Host: Prof. Paola Marigo)

Selected Contributed
Talks/Posters (first
author only)

- Jan 2020: Contributed poster at the AAS 2020
- Jan 2019: Contributed poster at the AAS 2019
- Aug 2018: Contributed poster at EWASS 2018
- Aug 2018: Contributed poster at the IAU-GA Symposium "Why Galaxies Care About AGB Stars"
- Mar 2018: Contributed talk at the conference "Imaging of stellar surfaces"
- Jul 2017: Contributed talk at the conference "Physics of evolved stars"
- Jun 2017: Contributed talk at the conference "EWASS 2017"
- Aug 2016: Contributed talk at the conference "Blowing in the Wind" (Quy Nhon, Vietnam)
- Jul 2016: Contributed talk at EWASS 2016
- Aug 2015: Contributed talk at the IAU XXIX General assembly Focus Meeting 7
- Jun 2015: Contributed talk at EWASS 2015
- Jul 2015: Poster contribution at ESO STEPS, ESO/Garching
- Jul 2014: Two Poster contributions at "Why Galaxies Care About AGB Stars III" Vienna, Austria
- Jan 2014: Poster contribution at "VLT community days" Grenoble, France
- Sep 2013: Poster contribution at VLT summer school, Barcelonnette, France
- Jul 2012: Participation Marcel at the Grossmann 13th conference, Stockholm, Sweden

TEACHING &
SUPERVISION

- 2021–Ongoing: Supervision of Joshua Ingram, NASA/GSFC summer & winter undergrad intern
- 2021–Ongoing: Official supervisor of Jonathan Brashear, CUA PhD student
- 2021: co-supervision of NASA/GSFC summer intern Lori Huseby
- 2020–Ongoing: Mentoring CUA PhD Student Stela Ishitani Silva, NASA/GSFC Postdoc Greg Olmschenk
- 2019: Stellar Astrophysics module of the Fall Astronomy course for Undergrads at The Catholic University of America – Invited Guest lecturer of Prof. Duilia de Mello
- 2019: Supervision of the teaching assistant of Prof. De Mello

PRESS RELEASES,
MEDIA, OUTREACHScientific Press
Releases

- 2021 Highlight on CRESST II website of [my co-authored Nature paper](#)
- 2021 [The Great Dimming of Betelgeuse](#) (in Italian) – (see Nature article below)
- 2020 [ESO press release on Betelgeuse](#)
- 2020 [CUA major news webpage on my participation in the study on Betelgeuse](#)
- 2020 NASA communication [Twitter account post](#) on my participation in the study on Betelgeuse
- 2020 Facebook [CUA/News account](#) press release on my participation in the study on Betelgeuse
- 2020 Facebook [CUA/Physics account](#) press release on my participation in the study on Betelgeuse
- 2018 NASA/GSFC communication accounts, [Twitter](#) and [Facebook](#), on my 2018 first-author publication
- 2017 [Press release of my grant at the University of Vienna](#)

Media Interviews

- 2022 Interview for the new The Golden Record [published on YouTube](#)
- 2021 Live interview at the BBC News, for JWST Launch Day (25 December 2022)
- 2021 Mentioned as “Orgoglio Italiano nel mondo” (“Italian pride in the world”) on [il Corriere](#)
- 2021 [Il Corriere](#) spotlight on Inspiring Fifty Italy
- 2021 [Il Corriere](#) another spotlight on Inspiring Fifty Italy
- 2021 [Yahoo Finance](#) and [ELLE](#) interview
- 2020 [Early Career Scientist Spotlights](#) of NASA Goddard Space Flight Center’s Science and Exploration Directorate Code 600
- 2020 [WTOP website article interview on Betelgeuse](#)
- 2020 Two radio interviews on Betelgeuse for WTOP-FM
- 2020 [Interview for the prestigious Italian journal “Civiltà delle Macchine”](#)
- 2019 Interview for the major Italian Newspaper “il Giornale”, published on July 13th 2019
- 2019 [Interview for the major Italian Newspaper “La Repubblica”](#), published on January 21st 2019
- 2018 Interview for RaiNews24, which has been featured in the news on December 28th, 2018, and in 2019 in the the “Rubrica Societa’ di RaiNews24: Non solo 8 Marzo”, for Italian talented women.
- 2018 Interview for the Australian Triple R radio station (from minute 36 [here](#))
- 2018-2019 Three video interviews for RaiNews24, featured: (1) on the news; (2) in the column for Italian talented women [Rubrica Societa’ di RaiNews24: Non solo 8 Marzo](#); (3) in the column “Futuro 24” ([here from min. 8:29](#))

Selected Outreach

- 2022 Honorary speaker at the Catholic University of America (CUA) event, faculty Arts & Science
- 2022 Invited outreach talk for the Women in Aerospace-Europe (WIA-E) group ([recording here](#))
- 2022 Invited outreach talk for the Women in Science day (February 11) at Centro Nazionale delle Ricerche (CNR - Italian National Research Council) [published on YouTube](#)
- 2021 [YouTube Live Talk](#) sponsored by the Italian Ministry, for Italian high schoolers
- 2021 [Henkel event](#) Keynote Speaker
- 2021 Generation Female Global Summit 2021 [Keynote Speaker](#)
- 2021 [Podcast Interview](#) (in Italian)
- 2020–Ongoing NASA Education System Virtual Connections with students
- 2020 Keynote speaker for the [She Can STEM](#) event
- 2020 [Talk with >3,400 views](#) on the Facebook outreach page [Passione Astronomia](#)
- 2019 NASA Media Training
- 2019 [Invited public talk at the Italian Embassy in the USA](#)
- 2019–Ongoing Collaboration and review work for [“Art of the Cosmos”](#)
- 2018 Invited Keynote speaker, as NASA expert, for the virtual exchange program, organised by the Bureau of Educational and Cultural Affairs’ Collaboratory, between three schools in Pennsylvania, South Carolina, and Pistoia, Italy, to increase knowledge in the field of exoplanets (see those three pages: [first](#), [second](#), and [third](#)).
- 2018–Ongoing Scientist behind the [“Ask a NASA Scientist”](#)
- 2012-2017 Contributing in various outreach activities at the University of Vienna (e.g. “Nachts auf der Sternwarte”)
- 2014 Collaborating with the association “TEDxVienna” (2014 conference)
- 2015 **Invited** public talk [“We are all Stardust”](#) at the University of Vienna.
- 2011-2012 Scientific guide and teacher in Planetarium and astronomical museum of Rome, and for ATA (Associazione Tuscolana di Astronomia).
- 2009-2010 Several outreach events at University of Rome La Sapienza.
- 2010 Scientific guide with the portable planetarium in schools and public events in Rome.
- 2009 Scientific guide of the exhibition “Expo Astri e Particelle” at Palazzo delle Esposizioni, Rome.
- 2009 Scientific explainer at the Festival of Science: “L’Universo”, Rome
- 2009 Scientific explainer for the event “XLuna” (40th anniversary of the moon landing)
- 2009 Scientific explainer for the Research week - Frascati Scienza
- 2008–2010 Permanent public outreach laboratory at Planetarium of Rome
- 2008–2009 Training course at Planetario di Roma.

LANGUAGE SKILLS

Mother tongue Italian

Other languages

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C2	C2	C2	C2	C2
German	B2	B1	B2	B2	B2
Spanish	A1	A2	A1	A1	A1
French	A1	A1	A1	A1	A1

Levels: A1 and A2: Basic user – B1 and B2: Independent user – C1 and C2: Proficient user
[Common European Framework of Reference for Languages](#)

PROFESSIONAL SKILLS

Observations UV high-resolution spectroscopy. Optical/IR and radio/sub-mm interferometry at high angular resolution, spectroscopy, photometry. Observational proposal writing (VLT/MIDI, VLT/MATISSE, VLT/GRAVITY, CHARA/VEGA, CHARA/MIRCX, NOEMA, JCMT, ALMA).

Modeling Modeling stellar chromospheres, atmospheres, dust, circumstellar environments. Using stellar evolutionary models. Computing synthetic spectra, synthetic photometry, and synthetic interferometric visibilities. 1D and 3D radiative transfer modeling.

Data handling Dealing with: UV data, IR spectroscopic, photometric and interferometric data. Interferometric data reduction: EWS+MIA pipeline for VLT/MIDI, and ESO/REFLEX pipeline for VLT/GRAVITY.

Computer

- Languages: Python (Astropy, NumPy, Pandas, Matplotlib, Jupyter Notebook environment, basic ML – Scikit-learn, TensorFlow), AWK, bash, IDL, Fortran, basic C
- Text Editing: L^AT_EX, Microsoft Office
- OS: Mac OS X, Linux

Organisational & Managerial

- Strong dedication to diversity and inclusion in my day-to-day work and life
- Leadership: leader and organizer of multiple projects, proposals for funding and for observations, international meetings, and working groups
- Problem-solving and organizational skills
- Time management: always concluded on time all my leading projects
- Budget management
- Ability to work independently and in team environments.

Communication & interpersonal

- Ability to effectively communicate results to a broad range of audiences
- Team work: I have worked in 4 different nations, with different cultural environments and diverse research teams
- Intercultural skills: I am experienced in working in several countries across Europe and the US

Professional Memberships

- Sigma Xi honorary society – nomination for outstanding achievements
- IAU (International Astronomical Union)
- AAS (American Astronomical Society)
- EAS (European Astronomical Society)
- SIF (Società Italiana di Fisica)
- ISSNAF (Italian Scientists and Scholars in North America Foundation)
- ASciNA (Austrian Scientists & Scholars in North America)

Other Lover of space, nature, philosophy. I believe that sport is life; my favourites are: volleyball, skiing, hiking, climbing, and running. I enjoy writing, and always carry with me a book. Occasionally I play guitar and am learning piano. I enjoy leadership opportunities in organizing working groups, volleyball tournaments, and fundraising campaigns for my daughter's daycare at NASA.

Bibliography

- Editorial Pieces**
- **Rau 2020** [“On the role of Chromospheres in cool, evolved stars”](#)
- Journal Articles**
- Ishitani Silva et al. (ApJ, submitted) “MOA-2020-BLG-135Lb”
 - Sciluna et al., 2021, MNRAS, 512, 1091 “The Nearby Evolved Stars Survey II: Constructing a volume-limited sample and first results from the James Clerk Maxwell Telescope”
 - Montarges et al., 2021 (**Nature**, 594, 365) “A dusty veil shading Betelgeuse during its Great Dimming”
 - **Rau 2021**, RNAAS, 5, 96 “3D radiative transfer simulations of the atmospheric environment of the carbon-rich AGB star RU Vir”
 - **Rau et al. 2021**, RNAAS, 5, 73 “A new view into K-giants chromospheres”
 - Olmschenk, Ishitani Silva, **Rau et al.** 2021, AJ, 161, 273 “Identifying Transit Candidates in TESS Full-Frame Image Light Curves via Convolutional Neural Networks”
 - Morris et al., 2020, ApJ, 892, 2, L23 **Letter** “CO, Water, and Tentative Methanol in Carinae Approaching Periastron”
 - **Rau et al., 2019**, ApJ, 882, 37 “Constraining stellar parameters and atmospheric dynamics of the carbon AGB star V Oph”
 - Dharmawardena et al., 2019, MNRAS, 489, 3218 “The Nearby Evolved Stars Survey: I. JCMT/SCUBA-2 Sub-millimetre detection of the detached shell of U Antliae”
 - Brunner et al., 2019 A&A, 621, 50 “ALMA observations of the “fresh” carbon-rich AGB star TX Piscium: The discovery of an elliptical detached shell”
 - **Rau et al., 2018**, ApJ, 869, 1 “HST/GHRS Observations of Cool, Low-Gravity Stars. VI - Mass-Loss Rates and Wind Parameters for M Giants”
 - Carpenter et al., 2018, ApJ, 869, 157 “The Advanced Spectral Library (ASTRAL): Reference Spectra for Evolved M-Stars”
 - Wittkowski, **Rau et al.** 2018, A&A, 613L, 7 **Letter**: “VLTI-GRAVITY measurements of cool evolved stars I. Modeling R Peg”
 - **Rau et al., 2017**, A&A, 600, 92 “The adventure of carbon stars. Observations and modeling of a set of C-rich AGB stars”
 - Cikota et al., 2017, MNRAS, 471, 2111 “Common continuum polarization properties: a possible link between proto-planetary nebulae and Type Ia Supernova progenitors”
 - Bazso et al., 2017, MNRAS, 466, 1555 “Dynamics and habitability in circumstellar planetary systems of known binary stars”
 - Paladini et al., 2017, A&A, 600, 136 “A joint venture in the infrared: the MIDI+VISIR+Herschel view on the mass loss of evolved stars. I. The inner scales as seen by MIDI”
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Last update: April 15, 2022