

## CURRICULUM VITAE ABREVIADO (CVA)

### Part A. PERSONAL INFORMATION

First name	MICHELE			
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### A.1. Current position

Position	Ramón y Cajal Fellow		
Initial date	01/01/2025		
Institution	Centro de Astrobiología (CAB) CSIC - INTA		
Department/Centre	Astrofísica		
Country	Spain	Phone number	+393472319720
Keywords	Galaxy evolution, Space Astronomical Instrumentation, Active Galactic Nuclei, Ultraluminous Infrared Galaxies, Integral field spectroscopy		

### A.2. Previous positions

Period	Position/Institution/Country		
07/2019 - 12/2024	Postdoctoral Researcher, CAB, Madrid, ES		
05/2019 - 05/2023	Atracción de Talento Fellow, Postdoctoral Researcher, CAB, Madrid, ES		
01/2019 - 04/2019	Visiting scientist at the European Southern Observatory (ESO), Garching, DE		
01/2017 - 01/2019	Postdoctoral Researcher at the Arcetri Astrophysical Observatory (AAO), IT		

### A.3. Education

PhD, Graduate Degree	University/Country	Year
PhD in Astrophysics	Università di Bologna, IT	11/2016
Visiting PhD student	(3-months at) University of Sussex, UK	2016
Laurea Magistrale in Astronomia e Astrofísica	Università di Roma La Sapienza, IT	01/2012
Laurea Triennale in Fisica e Astrofísica	Università di Roma La Sapienza, IT	12/2009

### Part B. CV SUMMARY (*links to external pages in blue*)

My research career is framed in the field of observational Astronomy. The main goal is to understand how galaxies form and evolve, with a particular interest in the role of Active Galactic Nuclei (AGN) and starbursts, and their feedback effects.

In a nutshell, my activities led to

- Refereed publications (see [NASA ADS](#))
  - 120 papers, with 9800+ citations (H-index=53)
  - 33 papers as 1<sup>st</sup>, 2<sup>nd</sup> or 3<sup>rd</sup> author
  - 14 as 1<sup>st</sup> author, with 680+ citations
- Dissemination activities
  - 50+ talks in international conferences
  - 19+ invited lectures and talks
  - SOC and LOC for *JWST data reduction workshop NOVA* (2022), *Achieve your JWST data: getting ready for Cycle 4* (2024), and *GA-NIFS* workshops (2023-2025)
  - LOC for the conferences *Crossing the Rubicon. The fate of gas flows in galaxies* (2016) and *Galaxy origins in the JWST era* (2025); LOC for the workshop *JWST Cyl proposal preparation* (2020)
  - Outreach: several press releases and collaboration with media (see [here](#))
- Leadership in major projects
  - Science: JWST [GA-NIFS](#) (*Galaxy Assembly with NIRSpec IFS*, 330h of JWST time) and [PUMA](#) (*Physics of ULIRGs with MUSE* (70h) and *ALMA* (50h)) surveys

- Data treatment: JWST GTO IFS extragalactic surveys, and **SUPER** survey
- Participation in other major projects: **JADES** (*JWST Advanced Deep Extragalactic Survey*), **HARMONI** (ELT instrument), **SUBWAYS** and **HYPERION** (XMM-Newton large programs), among others
- Projects funding: 1.4 M€ for 7 projects (550 k€ as PI of 3 projects)
- Awarded observing time: >4000h in major facilities as co-I (>80h as PI on optical, near-infrared, sub-mm, and X-ray telescopes); observing experience at LBT (18 nights)
- Awarded post-doc positions (accepted & declined) at KIAA-PKU (2016), AAO (2017-2019; 2023; 2024), CAB (*Atracción de Talento, 2019; 2023-2024*), and Scuola Normale Superiore (2023)
- Awarded travel grants
  - 4months at ESO Garching (DE)
  - 3months at University of Sussex (UK)
  - 3weeks at MIAPP (DE)
  - workshops at the Lorentz Center (NL), STScI (US), and IFPU (IT)
- Training and mentoring: supervision of 2 PhD students (started in 2023); contribution to the training of 4 graduate/PhD students; reviewer and member of a thesis defense committee
- Reviewing activities: referee for A&A, ApJ, MNRAS, Science; peer review for GTC and ALMA

### Career highlights

During my PhD (2013-2016) and my two-year post-doc at the AAO, I gained in-depth knowledge in the field of galaxy evolution, and I learned the state-of-art methods for the treatment of multi-wavelength data coming from world-leading telescopes. It follows a selection of my main contributions during this period of my career

- I reported the first detailed characterization of outflow properties - and their *feedback effects* - in AGN host galaxies at  $z \sim 2$  (e.g. [MP+15a,b](#)). Among these sources, XID2028 can be now considered one of the best galaxies to perform feedback studies in the distant Universe
- By analysing a large sample of  $\sim 650$  AGN ([MP+17a,b](#)), I constrained fundamental outflow properties, and I discovered a significant correlation between outflow and AGN power. The latter is now implemented in many cosmological simulations (e.g. [Davé+19](#))
- I presented the first statistically-sound investigation of AGN feedback effects at  $z > 1$  ([MP+18b](#)).
- I reported the first scientific demonstration of adaptive optics spectroscopy with *curved slits*, studying the gas metallicity and kinematics in  $z \sim 2$  lensed galaxies ([MP+18a](#))
- I measured the black hole mass of the most luminous AGN at  $z \sim 2$  (e.g. [MP+14](#), *COSPAR paper award for young scientists*), analysing spectro-photometric data collected over 11 years

At CAB (2019-present) I have extended my expertise by working on nearby starbursts, and establishing solid grounds for advancing in galaxy evolution studies through a very active participation in JWST projects, as part of the NIRSpec GTO team; I also participate in ELT/HARMONI projects as a member of its science team. My contributions include

- I have a leading role in PUMA, a survey aimed to study 25 nearby ULIRGs with VLT/MUSE and ALMA. So far, this work led to 5 refereed papers: for instance, [MP+20](#) shows the most detailed characterization of feedback effects in Arp220, the archetypical ULIRG; [MP+21, +22](#) present the stellar and gas kinematics of the entire sample
- Within the JWST/NIRSpec activities,
  - I was responsible for the development of IFS simulations before the JWST launch
  - I contributed to the evaluation of the JWST science performance during its commissioning, within the ‘NIRSpec Science Readiness Team’ (NSRT, [Böker+23](#), [Rigby+23](#))
  - I co-lead the GA-NIFS survey, overseeing various science projects and meetings
  - I am responsible of data reduction for 17 extragalactic programs, with contributions to the STScI pipeline (Sec. C.4)
  - I published 50+ refereed papers since 2023, 15 of them as 1<sup>st</sup>, 2<sup>nd</sup> or 3<sup>rd</sup> author
- I developed a tool to generate mock data simulating the 3D galaxy morpho-kinematics, to be ingested in the NIRSpec and HARMONI pipelines, and used to test the performance of these instruments for outflow studies

## Part C. RELEVANT MERITS

### C.1. Publications

 (complete list of 120 refereed publications [here](#))

I select five 1<sup>st</sup> author refereed papers (out of 14):

(1/13) Perna M., Brusa M., Cresci G., Mignoli M., 2015, ‘*Galaxy-wide outflows in z~1.5 luminous obscured QSOs revealed through near-IR slit-resolved spectroscopy*’, [A&A, 574, 82, 16pp. \[97 cit.\]](#)

This paper presents a detailed spectroscopic study of AGN feedback. It is a part of a series of publications providing an in-depth, multiwavelength analysis of outflow properties in z~2 AGN (e.g. [MP+15b](#); [Brusa, MP+16](#); [Brusa+18](#); [Cresci, Tozzi, MP+23](#)).

(1/5) Perna M., Lanzuisi G., Brusa M., Mignoli M., Cresci G., 2017a, ‘*An X-ray/SDSS sample. I. Multi-phase outflow incidence and dependence on AGN luminosity*’, [A&A, 603, 99, 15pp. \[76 cit.\]](#)

In this work I analysed the optical spectra of ~650 AGN at z<0.8, deriving the incidence of ionised and neutral outflows, and discovering a significant correlation between outflow power and AGN luminosity. This relation is now implemented in important cosmological simulations (e.g. [Bradley+22](#)). This paper also motivated the development of the [SUBWAYS](#) survey, and two follow-up projects ([MP+17b](#), [+19](#)).

(1/14) Perna M., Sargent M., Brusa M., Vignali C., 2018b, ‘*Molecular gas content in obscured AGN at z > 1*’, [A&A, 619, 90, 21pp. \[50 cit.\]](#)

In this work I proved that outflows can significantly reduce the cold gas content of AGN host galaxies with respect to inactive galaxies, by exploiting interferometric data of a large sample of z>1 galaxies. Within the [SUPER](#) collaboration, we are expanding the sample and corroborating these early results (e.g. [Circosta+21](#); [Bertola+24](#); [Ricci+25](#), in prep.).

(1/12) Perna M., Arribas S., Catalan Torrecilla C., Rodriguez del Pino B., 2020, ‘*MUSE view of Arp 220: Kpc-scale multi-phase outflow and evidence for positive feedback*’, [A&A, 643, 139, 34pp. \[53 cit.\]](#)

This study is part of the PUMA project, a survey of 25 ULIRGs observed with MUSE and ALMA (see also e.g. [MP+21](#), [+22](#)). It presents the first detailed characterization of the gas and stellar conditions in the prototypical ULIRG Arp220. These results have been combined with JWST follow-up data in two sibling papers (led by me and a supervised PhD student, [MP+24](#), [Uliivi](#), [MP+25](#)).

(1/18) Perna M., Arribas S., Marshall M., Scholtz J., 2023, ‘*GA-NIFS: The ultra-dense, interacting environment of a dual AGN at z~3.3 revealed by JWST/NIRSpec IFS*’, [A&A, 679, 89, 23pp. \[82 cit.\]](#)

This study shows some of the earliest JWST data, targeting the most distant spectroscopically-confirmed dual AGN at that time (see also [MP+25b](#)). It also presents key improvements of the STScI data reduction pipeline, and provides a tool to remove instrumental features affecting point source data (Sec. C.4).

(1/25) Perna M., Arribas S., Lamperti I., Witstok J., 2025b, ‘*GA-NIFS: A high number of dual AGN at z>3*’, [A&A, 696, 59, 25pp. \[38 cit.\]](#)

This paper announces the discovery of four AGN pairs and a triple AGN at z>3. This study doubles the count of known multiple AGN systems in the remote Universe, and challenges prevailing theories of galaxy evolution that predict their scarcity. Other closely related works include [MP+23a](#), [Marshall](#), [MP+23](#), [Übler+23](#), and [Zamora+24](#) (the latter reporting the discovery of another AGN pair at z=4.7).

### C.2. Congress

 (Complete list [here](#))

I select 10 contributions in international conferences (among 40+) and invited lectures/talks (among 19+) in the last two years:

- [Invited talk](#) (11 June 2025): “GA-NIFS: a high number of dual AGN at z>3”, IFPU Focus Week Luminous quasars as laboratories for the evolution of SMBH/galaxy systems, Trieste, IT
- [Invited lecture](#) (26 May 2025): “The GA-NIFS approach to JWST NIRSpec IFU data reduction & Insights from a z~3 ring galaxy”, ESO seminar, Garching, DE
- [Invited talk](#) (23 Apr. 2025): “The GA-NIFS initiative for a shared approach to refine JWST NIRSpec IFU data processing”, MIRI European Consortium, Madrid, ES
- [Invited talk](#) (13 Jan. 2025): “GA-NIFS: a high number of dual AGN at z> 3”, IFPU Focus Week The quest for dual and binary SMBHs in the multi-messenger era, Trieste, IT
- [Invited lecture](#) (4 June 2024): “GA-NIFS: the dense environment of AGN at z> 3”, Osservatorio Astronomico di Brera colloquium, Milan, IT

- Invited lecture: 7 Dec. 2023: “Galaxy Assembly with JWST/NIRSpec IFS (GA-NIFS): the dense environment of AGN at  $z > 3$ ”, European Space Agency (ESA) SCI-S seminar (virtual)
- Invited talk: 14-17 Nov. 2023: “The GA-NIFS initiative for a shared approach to refine JWST NIRSpec IFU data processing”, Improving JWST data products workshop, STScI, Baltimore, US
- Invited talk: 18-22 Sept. 2023: “The environment of quasars in the early Universe – First results from the JWST GTO programme GA-NIFS”, ESA/ESAC ‘Engage Meeting’, Madrid, ES
- Invited lecture: 30 May 2023: “First results from the JWST programme GA-NIFS: the gaseous environment and ISM properties of quasars at  $z \sim 3-7$ ”, Osservatorio Astronomico di Roma, IT
- Invited lecture: 17 May 2023: “The ultradense, interacting environment of a dual AGN at  $z \sim 3.3$  revealed by JWST/NIRSpec IFS”, University of Cambridge IoA, UK

### C.3. Research projects

**Funded projects:** It follows a list of present and past funded projects in which I have participated. It includes JWST programs in which I am currently deeply involved (with a leading role for some of them), as well as projects related to the latest and next generation of IFS instruments (e.g. VLT/ERIS, ELT/HARMONI).

- as principal-investigator: ‘*Proyectos de Generación de Conocimiento*’ proposal titled ‘Unveiling AGN Feeding and Feedback Across Cosmic Time with the James Webb Space Telescope’, reference: PID2024-159902NA-I00; funds: 160 k€.
- as principal-investigator: Ramón y Cajal at CAB, CSIC-INTA (Spain), code: RYC2023-044853-I, funds: 250 k€, period: 01/2025-01/2030; role: post-doctoral researcher
- as principal-investigator: Atracción de Talento Fellow at CAB, CSIC-INTA (Spain), code: 2018-T2/TIC-11715, funds: 140 k€, period: 05/2019-05/2023; role: post-doctoral researcher
- as co-investigator: ‘The metal circle: a new sharp view of the baryon cycle up to Cosmic Dawn with the latest generation IFU facilities, PI: G. Cresci (INAF- Arcetri Observatory, Italy), code: CUP C13C22000740005, capitolo 1.01.01.01.009, funds: 200 k€; period: 2023-2024; roles: development of the project ‘HIPER’, preparation of observations, data reduction and analysis
- as co-investigator: ‘Participación Española en el telescopio espacial James Webb’; PIs: S. Arribas and L. Colina (CAB, CSIC-INTA, Spain); code: PID2021-127718NB-I00; funds: 400 k€; period: 2022-2026; roles: GA-NIFS co-lead, responsible for data processing of GTO NIRSpec IFS data
- as co-investigator: ‘Participación Española en el telescopio espacial James Webb’; PIs: S. Arribas and A. Labiano Ortega (CAB, CSIC-INTA, Spain); code: PID2019-106280GB-I00; funds: 221 k€; period: 2020-2022; roles: development of simulations, responsible for data processing of NIRSpec IFS data, member of the JWST/NIRSpec Science readiness team
- as co-investigator: ‘Participación del centro de Astrobiología en el desarrollo del instrumento HARMONI para el ELT: fase D1’, PI: M. Pereira Santaella (CAB, CSIC-INTA, Spain); code: PID2019-105423GA-I00; funds: 433 k€; period: 2020-2022; roles: development of simulations to test the instrument capabilities

**Other international research projects:** In addition to the projects in which I have a leading role (e.g. JWST/GA-NIFS), I also participate in other projects that allow me to expand and enrich my expertise in the field of extragalactic astronomy. Among them, JWST/JADES, for which I contributed to the development of the pipeline and collaborated to >20 refereed papers, and other projects awarded with significant amount of observing time on world’s top telescopes: e.g. SUPER (ESO large program (280h) with several follow-up), PUMA (granted with MUSE (70h) and ALMA (50h) time), SUBWAYS and HYPERION (XMM-Newton large programs (1400h) with several follow-up), KateMOSS (KMOS, 1300h). These projects involve major experts worldwide in the galaxy evolution field and cutting-edge instrumentation.

### C.4. Contracts, technological or transfer merits

In the framework of the JWST/NIRSpec team, I am developing specialized tools and scripts for the data processing and reduction that are used for the analysis of NIRSpec IFS scientific data; these open access tools (see MP+23, GitHub webpage) benefit the whole community.

Similarly, as part of the ELT/HARMONI team at CAB, I'm developing analysis tools for this future first-light instrument, that will eventually transfer to the ESO community at large.