

# DANIEL MARÍN PINA

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## RESEARCH ACTIVITIES

I am a theoretical astrophysicist based in the University of Heidelberg, Germany. My main interest is in stellar and black hole dynamics in star clusters, and the formation of dormant star-black hole binaries and gravitational waves from binary black hole mergers. My goal for the next years is to develop models for the population of these dormant star-black hole binaries, in preparation for the next *Gaia* data release and results from other massive surveys. Furthermore, I want to keep working on modelling the dynamical formation of binary black hole mergers in star clusters. This will help us understand the production of eccentric gravitational waves and the seeding and growth of intermediate-mass black holes.

## EDUCATION

- PhD Cum Laude in Astronomy and Astrophysics** Barcelona, Spain  
*Institute of Cosmos Sciences, University of Barcelona* 2021 - 2025
- Thesis title: Black hole dynamics in star clusters: Eccentric mergers and star-black hole binaries
  - Grade: Excellent Cum Laude (maximum possible grade)
  - Advisor: Prof. Mark Gieles
- Master in Astrophysics, Particle Physics and Cosmology** Barcelona, Spain  
*University of Barcelona* 2019 - 2020
- Master's thesis title: Event horizon in a compact binary coalescence
  - Advisor: Prof. Roberto Emparan
- Bachelor in Physics** Barcelona, Spain  
*University of Barcelona* 2015 - 2019  
*NTNU Norwegian University of Science and Technology* 2018

## WORK EXPERIENCE

- DFG Postdoctoral Fellow** Heidelberg, Germany  
*Institute for Theoretical Astrophysics, University of Heidelberg* 2025 - 2028 (ongoing)
- FPI Predoctoral Fellow** Barcelona, Spain  
*Institute of Cosmos Sciences, University of Barcelona* 2021 - 2025
- Gaia DPAC Postgraduate Researcher** Barcelona, Spain  
*Technological Unit, Institute of Cosmos Sciences, University of Barcelona* 2019 - 2021

## AWARDS AND HONORS

- **PhD Thesis Cum Laude** University of Barcelona  
"Black hole dynamics in star clusters: Eccentric mergers and star-black hole binaries" 2025
- **Best Poster Presentation** ESO Garching, Germany  
"Two in a million: The interplay between binaries and star clusters" 2023
- **Best Master's Thesis** University of Barcelona  
"Event horizon in a compact binary coalescence" 2020

## TEACHING AND ADVISING

1. COADVISING MASTER STUDENT BRUNO RANDO FORASTIER 2023-2024
2. COADVISING BACHELOR STUDENT CLÀUDIA GARCIA DIAGO 2024-2025
3. TEACHING ASSISTANT: ALGEBRA AND LINEAL GEOMETRY (12h) 2024-2025
4. TEACHING ASSISTANT: ALGEBRA AND LINEAL GEOMETRY (12h) 2023-2024
5. TEACHING ASSISTANT: ALGEBRA AND LINEAL GEOMETRY (30h) 2022-2023
6. TEACHING ASSISTANT: CALCULUS I (15h) 2021-2022

OTHER  
SCIENTIFIC  
WORK

**Scientific organising committee**

Institute of Space Sciences, 2024

- Member of the SOC for the conference “Cross-Collserola PhD Meeting in Astrophysics, Cosmology and Particles 2024”

**Journal referee**

- Refereed for Astronomy and Astrophysics
- Refereed for Astrophysics and Space Science

**PhD representative**

University of Barcelona, 2022 - 2025

- I contributed to set up a transversal predoctoral community in my local institution (~70 PhD students), and acted as a ‘PhD representative’
- Our goal was to establish a network for informal collaboration, enhance our transversal skills and knowledge and create a safe space to fight against any and all forms of harassment.
- My role as a PhD representative was to organise regular workshops on transversal skills such as public speaking, outreach tips and tricks, Git courses for first-years and career in astronomy.

SHORT  
AUTHOR LIST  
PUBLICATIONS

1. INTERACTIONS AMONG BINARY BLACK HOLES IN STAR CLUSTERS: ECCENTRIC GRAVITATIONAL WAVE CAPTURES AND TRIPLE FORMATION  
**Daniel Marín Pina**, Mark Gieles, Tomas Andrade and Alessandro A. Trani, *A&A*, 698, A229 (2025)
2. DYNAMICAL FORMATION OF GAIA BH<sub>3</sub> IN THE PROGENITOR GLOBULAR CLUSTER OF THE ED-2 STREAM  
**Daniel Marín Pina**, Sara Rastello, Mark Gieles, Kyle Kremer, Laura Fitzgerald and Bruno Rando Forastier, *A&A*, 688, L2 (2024)
3. DEMOGRAPHICS OF THREE-BODY BINARY BLACK HOLES IN STAR CLUSTERS: IMPLICATIONS FOR GRAVITATIONAL WAVES  
**Daniel Marín Pina** and Mark Gieles, *MNRAS*, 527, 8369–8381 (2024)
4. BINARY-SINGLE INTERACTIONS WITH DIFFERENT MASS RATIOS: IMPLICATIONS FOR GRAVITATIONAL WAVES FROM GLOBULAR CLUSTERS  
Bruno Rando Forastier, **Daniel Marín Pina**, Mark Gieles, Simon Portegies Zwart and Fabio Antonini, *A&A*, 697, A118 (2025)
5. EVENT HORIZON OF A CHARGED BLACK HOLE BINARY MERGER  
**Daniel Marín Pina**, Marta Orselli and Daniele Pica, *PhRvD*, 106, 084012 (2022)
6. PRECURSORY COLLAPSE IN NEUTRON STAR-BLACK HOLE MERGERS  
Roberto Emparan and **Daniel Marín Pina**, *PhRvD*, 102, 024009 (2020)

LARGE COL-  
LABORATION  
PUBLICATIONS

- 17 refereed papers in the Gaia Collaboration
- 27 refereed papers in the Virgo Collaboration

GRANTS  
RECEIVED

- **FPI predoctoral grant** (~ 100 000€) Barcelona, Spain  
2021-2025  
Spanish ministry of Education and Professional Formation
- **Summer research contract** (~ 1000€) Barcelona, Spain  
Summer 2019  
Institute of Space Studies of Catalonia (IEEC)
- **Collaboration grant** (2000€) Barcelona, Spain  
2019  
Spanish ministry of Education and Professional Formation
- **Erasmus+** (~ 1000€) Trondheim, Norway  
2019  
European Commission

SKILLS

**Languages:** English (C2), Spanish (Native), Catalan (Native), Japanese (B1), Chinese (B1).

**Programming:** Python, Mathematica, Bash, Java, Fortran, C/C++.

**Specific software:** PeTar, NBODY6++, Tsunami, clusterBHBdynamics.

TALKS AND  
POSTERS

1. INVITED SEMINAR: “THE DYNAMICAL ORIGIN OF GAIA BH<sub>3</sub>”  
MPIA Galaxy Coffee  
Max Planck Institute for Astronomy, Heidelberg, Germany December 11, 2025
2. CONTRIBUTED TALK: “THE FORMATION OF GAIA BH<sub>3</sub>”  
The Lifecycle of Stellar Black Holes  
Kavli Institute for Theoretical Physics, Santa Barbara, USA November 18, 2025
3. SEMINAR: “THE DYNAMICAL ORIGIN OF GAIA BH<sub>3</sub>”  
STRAND Theory Meeting  
University of California San Diego, San Diego, USA (online due to transportation issues)  
December 6, 2025
4. CONTRIBUTED TALK: “THE DYNAMICAL ORIGIN OF GAIA BH<sub>3</sub>”  
IAU Symposium 398/MODEST-25: Compact Stars and Binaries in Dense Star Clusters  
Seoul National University, Seoul, South Korea June 15–20, 2025
5. CONTRIBUTED TALK: “THE DYNAMICAL ORIGIN OF GAIA BH<sub>3</sub>”  
IAU Symposium 398/MODEST-25: Compact Stars and Binaries in Dense Star Clusters  
Seoul National University, Seoul, South Korea June 15–20, 2025
6. CONTRIBUTED TALK: “THE DYNAMICAL ORIGIN OF GAIA BH<sub>3</sub>”  
MODEST-25SPZ: Advanced Simulations and Modeling in Astrophysics  
Academiehuis Zwolle, Zwolle, the Netherlands May 19–23, 2025
7. INVITED SEMINAR: “INTERACTIONS AMONG BINARY BLACK HOLES IN STAR CLUSTERS”  
Cardiff Astro Seminar series  
Cardiff University, Cardiff, United Kingdom January 22, 2025
8. CONTRIBUTED TALK: “BBH-BBH INTERACTIONS: ECCENTRIC GRAVITATIONAL WAVE CAPTURES AND TRIPLE FORMATION”  
New ideas on the origin of black hole mergers  
Niels Bohr International Academy, Copenhagen, Denmark August 12–16, 2024
9. CONTRIBUTED TALK: “WHERE DO GRAVITATIONAL WAVES WITH NON-NEGLIGIBLE ECCENTRICITY COME FROM?”  
Cross-Collserola PhD Meeting in Astrophysics, Cosmology and Particles 2023  
Institute of Cosmos Sciences, Barcelona, Spain October 6, 2023
10. CONTRIBUTED TALK: “DYNAMICAL BBH FORMATION AND DISRUPTION: IMPLICATIONS FOR GRAVITATIONAL WAVES”  
MODEST-23: Star clusters in the post-pandemic era  
Northwestern University, CIERA, Evanston, USA August 28-September 1, 2023
11. CONTRIBUTED TALK: “THE DEMOGRAPHICS OF DYNAMICALLY-FORMED BBHS IN STAR CLUSTERS”  
Nordic Winter School on Gravitational Astrophysics  
Niels Bohr International Academy, Skeikampen, Norway January 29-February 3, 2023
12. CONTRIBUTED TALK: “BLACK HOLE MERGERS FROM STAR CLUSTERS”  
IEEC Forum  
Institute of Space Studies of Catalonia, Barcelona, Spain June 2, 2022
13. INVITED TALK: “BLACK HOLE MERGERS FROM STAR CLUSTERS”  
ICCUB Winter Meeting  
Institute of Cosmos Sciences, Barcelona, Spain February 7-8, 2022
14. POSTER: “DYNAMICAL BBH FORMATION AND DISRUPTION: IMPLICATIONS FOR GRAVITATIONAL WAVES”  
Two in a million: The interplay between binaries and star clusters  
European Southern Observatory (ESO), ESO Garching, Germany September 11-15, 2023
15. POSTER: “THE DEMOGRAPHICS OF DYNAMICALLY-FORMED BBHS IN STAR CLUSTERS”  
SEA XV Scientific Meeting  
Spanish Astronomical Society, La Laguna, Spain September 5-9, 2022

SELECTED  
OUTREACH

1. PASSEIG VIRTUAL PER LA GALÀXIA  
Outreach activity for kids  
Centre cívic Vil·la Urània, Barcelona, Spain May 26, 2025
2. PASSEIG VIRTUAL PER LA GALÀXIA  
Outreach activity for kids  
Centre cívic Vil·la Urània, Barcelona, Spain May 14, 2025
3. INTERVIEW #MOTORDELA RECERCA  
Instagram interview  
@ubdivulga, Barcelona, Spain April 29, 2025
4. UNIVERSITAT DE L'EXPERIÈNCIA – L'UNIVERS COM UN TOT: L'UNIVERS EN CONTÍNUA EXPANSIÓ I, II, III  
Outreach lecture series for senior citizens (6h)  
Universitat de Barcelona, Barcelona, Spain April 1, 8 and 22, 2025
5. TELENOTÍCIES - GRAN ALINEAMENT DELS PLANETES  
TV interview  
TV3 - National Catalan TV, Barcelona, Spain February 28, 2025
6. UNIVERSITAT DE L'EXPERIÈNCIA – L'UNIVERS COM UN TOT: L'UNIVERS EN CONTÍNUA EXPANSIÓ I, II, III  
Outreach lecture series for senior citizens (6h)  
Universitat de Barcelona, Barcelona, Spain April 2, 16 and 18, 2024
7. EXPERIMENTS DE FÍSICA 2024  
Outreach lecture for high school students (8h)  
Universitat de Barcelona, Barcelona, Spain January 23 and 31, 2024
8. L'UNIVERS ÉS PLE DE COLORS: L'ASTROFÍSICA A TRAVÉS DE MÚLTIPLES MIRADES  
Outreach lecture series  
Biblioteca Gabriel García Márquez, Barcelona, Spain September 26, 2023
9. IL·LUMINEM ELS FORATS NEGRES: INICIACIÓ A L'ASTROFÍSICA I LA GRAVITACIÓ  
Outreach lecture series (12h)  
Centre Cívic Casa Golferichs, Barcelona, Spain April 27-June 29, 2023
10. CONSTEL·LACIONS EN 3D  
Outreach activity for kids  
Biblioteca Municipal de Bellavista, Les Franqueses del Vallès, Spain February 4, 2023
11. FORATS NEGRES AMB DANI MARÍN  
Radio interview  
La Caravana de Ràdio Estel, Barcelona, Spain February 1, 2023
12. EXPERIMENTS DE FÍSICA 2023  
Outreach lecture for high school students (8h)  
Universitat de Barcelona, Barcelona, Spain January 23 and 25, 2023
13. APADRINA UN DOCTORAND ROAST BATTLE (ENCONTRES TERCER CICLE)  
Outreach lecture for undergraduate students  
Universitat de Barcelona, Barcelona, Spain November 15, 2022
14. CONSTEL·LACIONS EN 3D  
Outreach activity for kids  
15a festa de la ciència, Barcelona, Spain May 29, 2022
15. IL·LUMINEM ELS FORATS NEGRES: INICIACIÓ A L'ASTROFÍSICA I LA GRAVITACIÓ  
Outreach lecture series (12h)  
Centre Cívic Casa Golferichs, Barcelona, Spain April 28-June 16, 2022
16. MIREM LA LLUNA DES DE LA PLAÇA DE LA PALMERA  
Astronomical observation  
Pla d'Acció Comunitària de la Verneda i la Pau – Associació ÀGORA, Institut de Ciències del Cosmos de la Universitat de Barcelona, Barcelona, Spain June 10, 2022

17. DESENVOLUPAMENT DE LA CARRERA PROFESSIONAL  
Round table  
IEEC Forum 2022, Barcelona, Spain

June 2, 2022

## CONFERENCES

1. STELLAR-MASS BLACK HOLES AT THE NEXUS OF OPTICAL, X-RAY, AND GRAVITATIONAL WAVE SURVEYS  
Kavli Institute for Theoretical Physics  
Santa Barbara, California, USA  
November 3-December 4, 2025
2. THE LIFECYCLE OF STELLAR BLACK HOLES  
Kavli Institute for Theoretical Physics  
Santa Barbara, California, USA  
November 17-20, 2025
3. IAU SYMPOSIUM 398/MODEST-2.5: COMPACT STARS AND BINARIES IN DENSE STAR CLUSTERS  
Seoul National University  
Seoul, South Korea  
June 15–20, 2025
4. MODEST-2.5SPZ: ADVANCED SIMULATIONS AND MODELING IN ASTROPHYSICS  
Academiehuis Zwolle  
Zwolle, the Netherlands  
May 19–23, 2025
5. CHALLENGES AND FUTURE PERSPECTIVES IN GRAVITATIONAL- WAVE ASTRONOMY: O4 AND BEYOND  
Lorentz Center  
Leiden, the Netherlands  
October 14–18, 2024
6. NEW IDEAS ON THE ORIGIN OF BLACK HOLE MERGERS  
Niels Bohr Institute  
Copenhagen, Denmark  
August 12–16, 2024
7. TWO IN A MILLION: THE INTERPLAY BETWEEN BINARIES AND STAR CLUSTERS  
European Southern Observatory (ESO)  
ESO Garching, Germany  
September 11-15, 2023
8. MODEST-2.3: STAR CLUSTERS IN THE POST-PANDEMIC ERA  
Northwestern University, CIERA  
Evanston, USA  
August 28-September 1, 2023
9. XV SCIENTIFIC MEETING  
Spanish Astronomical Society (SEA)  
Tenerife, Spain  
September 5-9, 2022

## SCHOOLS

1. NORDIC WINTER SCHOOL ON GRAVITATIONAL ASTROPHYSICS  
Niels Bohr International Academy  
Skeikampen, Norway  
January 29-February 3, 2023
2. WORKSHOP ON GRAVITATIONAL WAVE MODELLING  
University of Barcelona  
Barcelona, Spain  
October 10-11, 2022
3. GRAVITATIONAL WAVE OPEN DATA WORKSHOP  
University of Heidelberg  
Heidelberg, Germany (Online)  
May 23-25, 2022
4. N-BODY SIMULATION LECTURE  
University of Heidelberg  
Heidelberg, Germany (Online)  
September 27-29, 2021
5. SUMMER SCHOOL ON GRAVITATIONAL WAVE ASTROPHYSICS  
Niels Bohr International Academy (NBIA)  
Copenhagen, Denmark (Online due to COVID)  
August 2-6, 2021