

Valentín Peña-Donaire (he/him)

CONTACT INFORMATION	Quintay 4559A, depto. 34 Block 17, Villa Frei. 7760035 Ñuñoa, Santiago, Región Metropolitana, Chile	(+56) 9 7981 4066 vipena@uc.cl vipena-astro.github.io
EDUCATION	Pontificia Universidad Católica de Chile (UC Chile), 7820436 Macul, Chile MSc in Astrophysics March 2023 – present	
	UC Chile Licenciate in Astronomy March 2017 – July 2022	
	The University of Texas at Austin (UT Austin), 78712 Austin TX, USA Exchange student January – May 2021	
ACADEMIC EXPERIENCE	School of Mathematics, UC Chile Grading teaching assistant (TA) August – November 2018 <ul style="list-style-type: none">Grading of written exams for “Calculus II” (MAT1620) for STEM students, focused on convergence of series and multivariate calculus.	
	Institute of Astrophysics, UC Chile Lecturing TA March – June 2019 <ul style="list-style-type: none">Planning and developing TA sessions for “Introduction to Data Analysis” for Astronomy students (AST0212), oriented to computational applications of statistical concepts to astronomical settings, using Python in Jupyter notebooks after the lectures by the instructor.Homework grading.	
	Scientific research technical staff January 2022	
	BSc thesis-level student March – July 2022 <ul style="list-style-type: none">Research under the supervision of C. Petrovich.Algebraic modelling of kicks exerted by stellar flybys onto black hole binaries under the impulse approximation.Computational modelling of the stochastic evolution of the problem using Rebound in Python.Presentation of results before a grading committee and peers.	
	MSc thesis-level student March 2023 – present <ul style="list-style-type: none">Research under the supervision of C. Petrovich.Application of the protoplanet-disc interaction formalism to computationally derive a migration itinerary for stellar (sBH) and intermediate mass (IMBH) black holes at the central parsec of active galactic nuclei (AGN) accretion discs, aimed at predicting timelines of sBH binary capture and eventual hierarchical mergers into IMBHs at migration traps.Analysis of the evolution of the probability density function for the sBH-IMBH mass during the hierarchical merger process, with special emphasis on the mass ratio spectrum for the IMBHs that inspiral into the central supermassive black hole.Theoretical approaches to the gravitational wave (GW) imprint of such timelines in the LISA band.	

**Department of Astronomy, School of Physics, College of Natural Sciences,
UT Austin**

Student researcher

February 2021 – July 2022

- Research under the supervision of [K. Gebhardt](#).
- Data reduction of spectral cubes, observed by the NIFS instrument at the Gemini North Observatory, containing images of the central region in M87.
- Automated, pixel-to-pixel interpretation of the implications of the red- (or blue-) shift of absorption Gaussian curves, as well as the deviations from a theoretical Gaussian in terms of Gauss-Hermite polynomials, in order to study the velocity dispersion in the central region of M87, as in [Gebhardt et al. \(2011\)](#).
- Usage of equations from stellar dynamics to interpret a density distribution from the dynamics described in the previous item.

Institute of Physics, UC Chile

Lecturing TA

March – June 2021

- Planning and development of TA sessions for “[Physics for the Sciences](#)” (FIS109C) about basic Physics for health sciences students.
- Grading of written exams.

Lecturing TA

August – November 2022

- Planning and development of TA sessions for “[Classical Mechanics II](#)” (FIZ0222) about Lagrangian Mechanics for Physics, Astronomy, and Engineering students. The instructor was [E. Stockmeyer](#).
- Proposal of challenging problems that favour homework-based learning.
- Grading of homeworks and written exams.

PUBLICATIONS	M. Winter-Granic, C. Petrovich, V. Peña-Donaire, & C. Hamilton. (2024). <i>Binary Mergers in the Centers of Galaxies: Synergy between Stellar Flybys and Tidal Fields</i> , The Astrophysical Journal, 973 (1), 53. DOI: 10.3847/1538-4357/ad61e1
CERTIFICATIONS	TOEFL iBT (110/120 points) January 2025 Reading: 30/30, Listening: 26/30, Speaking: 24/30, Writing: 30/30.
PROGRAMMING LANGUAGES	Advanced: Python, \LaTeX Intermediate: Wolfram Mathematica Beginner: Excel, Bash, HTML, Javascript, CSS
RELEVANT COURSEWORK	Below you can find the elective courses I have taken since the bachelor’s level. For each course, the final grade is shown in parentheses (in the Chilean 1,0 - 7,0 linear scale), and there is a link to the official program (in Spanish) when available. <ul style="list-style-type: none">• March–June 2020: Fluid Mechanics for engineering students (5,3)• August–November 2020: Fundamentals of Image Processing (5,8)• August–November 2021: Dynamics of Stellar and Planetary Systems (6,3)• August–November 2021: Super-Massive Black Holes (6,4)• March–June 2023: Advanced Classical Mechanics (6,9)• August–November 2023: Advanced Stellar Astrophysics (5,0)• March–June 2024: Advanced Mathematical Physics Methods (5,0)

REFERENCES

Petrovich, Cristobal, PhD. Department of Astronomy, College of Arts and Sciences, Indiana University Bloomington, (+1) 812 855-6912, cpetrovi@iu.edu

Stockmeyer, Edgardo, PhD. Institute of Physics, School of Physics, Pontificia Universidad Católica de Chile, (+56) 22 354 7619, stock@uc.cl

Gebhardt, Karl, PhD. Department of Astronomy, School of Physics, College of Natural Sciences, UT Austin, (+1) 512 590-5206, gebhardt@astro.as.utexas.edu