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# Raphaël Fabio Duque

## Personal data

Birth **October 3rd 1994, Paris**

Citizenships **France, USA**

## Languages

**French, English** (Native proficiency).

**Spanish, Italian** (Working proficiency).

**Mandarin Chinese** (Elementary proficiency).

## Education

Since 2018 **Ph.D. in Astrophysics – Sorbonne Université**, *Paris, France*, Prepared under Prof. F. Daigne & Dr. R. Mochkovitch at the Institut d'Astrophysique de Paris. Dissertation entitled "The Physics of Gamma-Ray Bursts in the Gravitational-Wave Era" (defense in June 2021).

2017 – 2018 **Master's degree in Astronomy, Astrophysics and Space Engineering – Université Paris-Diderot**, *Paris, France*, Specializing in compact objects and high-energy astrophysics – *Graduated cum laude*.

2014 – 2017 **École Polytechnique – Université Paris-Saclay**, *Palaiseau, France*, This public engineering school accepts students after a nation-wide selection following a two-year intense scientific preparatory curriculum. While there, I prepared the *Polytechnique Multidisciplinary Diploma*, specializing in astrophysics and theoretical physics – *Prize for remarkable final internship at the European Gravitational Observatory (Cascina, Italy)*.

## Research

My research activity concerns modeling of high-energy astronomical sources, and in particular **gamma-ray bursts** (GRB). My work develops in **three new axes of high-energy astrophysics studies** recently opened by the era of multimessenger astronomy with gravitational waves, which was inaugurated by GW170817.

These axes are **(i) population studies**, predicting features of the forthcoming population of gravitational-wave events with electromagnetic counterparts, **(ii) multimessenger prospective studies**, exploring ways to leverage future multimessenger observations to the benefit of understanding GRBs and their progenitors, and **(iii) upgraded classical GRB studies**, which look back to existing GRB data with a modeling perspective enhanced by the first lessons of the gravitational-wave era.

These last two years, my work already led to **3 peer-reviewed publications** (and 3 in preparation, see below) and was presented at **4 international thematic conferences**, **5 invited seminars** and numerous workshops.

In addition to this theoretical activity, I am invested as a **Burst Advocate** in the French-Chinese high-energy satellite mission SVOM and have led **optical follow-up campaigns** of gravitational-wave alerts with the mission's ground segment.

## Publications

### Refereed

subm. **What role will binary neutron star merger afterglows play in multimessenger cosmology?**, *S. Mastrogiovanni, R. Duque, E. Chassande-Mottin, F. Daigne, R. Mochkovitch*.

A&A 639 (2020) **Probing high-density neutron star mergers with afterglow counterparts**, *R. Duque, P. Beniamini, F. Daigne, R. Mochkovitch*.

MNRAS 492 (2020) **X-ray plateaus in gamma-ray bursts' light curves from jets viewed slightly off-axis**, *P. Beniamini, R. Duque, F. Daigne, R. Mochkovitch*.

A&A 631 (2019) **Radio afterglows of binary neutron star mergers: a population study for current and future gravitational-wave observing runs**, *R. Duque, F. Daigne, R. Mochkovitch*.

### Non-refereed

GCN 26386 (2019) **LIGO/Virgo S191205ah: no counterpart candidate in SVOM/GWAC observations**, *Report on GW signal follow-up with ground segment of SVOM mission*.

PoS 357 (2019) **Neutron star merger afterglows: population prospects for the gravitational-wave era**, *R. Duque, F. Daigne, R. Mochkovitch*.

## Publications (in prep.)

**Prospects for kilonova signals in the gravitational wave era**, *R. Mochkovitch, F. Daigne, R. Duque, H. Zitouni*.

**Gamma-ray burst X-ray flares as off-axis gamma pulses**, *R. Duque, P. Beniamini, F. Daigne, R. Mochkovitch*.

## Seminars and international conferences

Fall & Winter 2020 **Astrophysics Seminars (invited)**, TAPIR at Caltech (USA), Hebrew University Jerusalem (Israel), Columbia University (USA), Osservatorio Astronomico Brera (Italy), Jagiellonian University (Poland).

October 2020 ***General Assembly of the National Gravitational-Wave Working Group***, *Paris, France*, Contributed talk on prospects for multimessenger cosmology and challenges.

December 2019 ***Texas Symposium***, *Portsmouth, UK*, Contributed talk – *Prize for best student talk in the "X-ray messenger" session*.

May 2019 ***Nanjing GRB Conference* & SVOM mission workshop**, *Nanjing, China*, Contributed talk.

March 2019 ***Asterics Radioastronomy Conference***, *Groningen, Netherlands*, Contributed talk & poster.

October 2018 ***Eighth Fermi Symposium***, *Baltimore, USA*, Contributed poster.

August 2018 **Lunch talk (invited)**, *Beijing, China*, Kavli Institute for Astronomy and Astrophysics.

## Teaching and outreach experience

Since 2018 **Instructor for exercise and practical sessions in the Astronomy & Astrophysics Master's curriculum of the *Observatoire de Paris***, Entailed composing and tutoring exercise sessions and homework assignments. Courses were "Statistical Physics", "Astronomical Data Analysis and Image Reduction" and "Astronomical Instrumentation and Observations". 64 hours of teaching per annum.

Summer 2019 **Tutored Master-level interns in gamma-ray burst modeling**, Entailed guiding for analytical and numerical computation in high-energy astrophysics, project reporting and oral defense.

Since 2018 **Gave courses and tutored practical sessions in General Astronomy for the public**, Part of the "Explorer et Comprendre l'Univers" program of the *Observatoire de Paris*. Comprised a yearly week-long observing session with professional astronomical facilities at the *Observatoire de Haute-Provence*.

Since 2018 **Participated in various outreach events in the Paris area**, Involving own work presentation and discussions and astronomical observation sessions.