Benoît MOSSER
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CV BM 2022/03
January 3rd,1965
nationality: French
married
3 children

PROFESSOR IN ASTROPHYSICS AND SPACE SCIENCE

Positions

2000-present	**Professor** at Paris Observatory (since 2017: exceptional class professor)
1993-2000	**Assistant professor**, Université Pierre et Marie Curie (Paris 6)
1990-1993	**Professeur agrégé préparateur** (teaching duty equivalent to an assistant professor) École Normale Supérieure de Paris
1988-1990	Fellowship: **Ancien normalien doctorant**, Université Paris-Sud

Education

2000	**Habilitation à diriger des recherches : Jovian seismology** (Université Pierre et Marie Curie)
1988-1992	**PhD in astrophysics**: *Etude théorique et observationnelle des oscillations de Jupiter* (supervisor D. Gautier, Université Paris-Sud)
1988	**Université Paris-Sud:** Master degree in astrophysics
1984-1988	**Ecole Normale Supérieure de Cachan,** agrégation de sciences physiques (1987)

Teaching responsabilities

Physics, Astrophysics: beginners to graduate students
Planetary and stellar interior structure and evolution: graduate students
Space science: graduate students

2021-present **Founder and head of the M2 International Research Track**
This degree is designed according to the priorities of the Graduate Program in astrophysics, with a tight coupling between academic education and research in laboratories. The training offer is based on competitive projects in astrophysics and engineering for astrophysics conducted in PSL.
💻 https://www.observatoiredeparis.psl.eu/international-research-track

2020-present **Founder and Director of** the Graduate Program in astrophysics AStroParis for the graduate school of the University Paris, Science & Lettres.
💻 https://www.observatoiredeparis.psl.eu/programme-gradue
AStroParis is training directly backed by research, offering several periods in the PSL astrophysical labs, possible long internships during the Master and/or during a gap-year, new pedagogical approaches, and a strong international opening. Opening of the program in 2020.

2020-present **Pedagogical deputy director the Student Space Campus CENSUS of the University PSL** (Centre for Nanosatellites in ScienceS of Universe), formerly C²ERES).
💻 https://census.psl.eu/

2012-2020 **Co-founder and co-head of the Student Space Campus C²ERES** (Campus et Centre de Recherche pour l'Exploration Spatiale), campus spatial de PSL).
The development of nanosatellite projects allows students to share the skills of engineers and develop serious professional skills. This project is supported by Airbus Space Industry, supported and funded by the Laboratoire d'Excellence ESEP, by the Observatory of Paris and by PSL.
310 k€ funding for the Concurrent Design Facility and the Test Facilities.

2012-present **Co-founder and co-head of the SPACE Master at USTH (**Université des Sciences et Technologies d'Hanoi).
USTH is a French-Vietnamese University. The Observatory of Paris is involved in the creation of the Master Space & Application, aiming at developing space science in Vietnam. This operation follows the successful launch of the satellite VNREDSat-1, built by EADS/Astrium, and is conducted with the French space agency.

2006-present	**President of the steering committee** of the project 'Astro à l'Ecole' (l'Univers à portée de main) *Science à l'École promotes the development of practical sciences in secondary and high schools. In astronomy, this corresponds to the distribution of reflectors and refractors to be used by the pupils, with the corresponding training of tutoring. As president of the committee 'Astro à l'École', I have to manage the selection of the projects.*
2001-2011	**Founder and PI of the e-learning** project 'Fenêtres sur l'Univers', which is now part of the ensemble "*Lumières sur l'Univers*" https://media4.obspm.fr/public/ressources_lu/
2000-2020	**Founder and head of the Master degree** 'Astronomical and Space-based Systems Engineering" *I have created this degree supported by the space laboratories in Île-de-France, by space and high-technology agencies, and by leading industrialists. The degree trains physicists to space engineering. 85% of the graduates work as engineers in high-technology industry, after a PhD in instrumental engineering for 22 % of them.* http://osae.obspm.fr/

Teaching administration

2012-2016	**Advisor of the education board of PSL**
2012	President of the hiring committee for an assistant-professor position in stellar physics at Université Paul Sabatier, Toulouse
2007-2008	Commission de spécialistes (hiring committee), section 37 (geophysics), Institut de Physique du Globe de Paris. Nominated member
2006-2011	Head of the hiring committe for ATER (1-year position, with teaching and research) and 'moniteurs' (3-year teaching service, in parallel to a PhD), at Observatory of Paris
2005-2008	**President of the hiring commitee,** section 34 (astronomy-astrophysics), Observatoire de Paris. *This council is responsible for hiring assistant-professors and lecturers*
2002-2004	Member of the working group for implementing the LMD system at Observatoire de Paris (M and D level)
2002-2004	Hiring commitee, section 34 (astronomy-astrophysics), Observatoire de Paris. Elected member
2001-2008	Hiring commitee, section 34 (astronomy-astrophysics), Université Pierre et Marie Curie. Nominated in 2001, 2004 and 2007.
2001-2014	Education board, Observatoire de Paris. Nominated member
2000-2004	Education board of Ecole Doctorale d'Astronomie et Astrophysique d'Île-de-France. Nominated member
1999-2000	Hiring commitee, section 34, Observatoire de Paris. Nominated member
1997-2006	Examiner of the competitive exam, École Polytechnique (2e épreuve de physique, concours MP)
1995-2000	Commission de spécialistes, section 34, Université de Versailles-St-Quentin-en-Yvelines. Nominated member
1995-2000	Hiring commitee, section 34, Université Pierre et Marie Curie (Paris 6). Elected member
1990-2000	Examiner of the preparation cursus for the "agrégation de sciences-physiques"

Research

Asteroseismology	- Derivation of global seismic parameters; seismic indices - Stellar evolution; Galactic archeology; red giant interior structure; core rotation
Instrumentation	- Fourier transform spectrometry and tachometry; radial velocity measurements - Space observations; ultra-precise photometry - Ground-based asteroseismic observations in Antarctica
PhD management	I supervised the PhD theses of Patrick Gaulme (2002-2005) in Jovian seismology, Supakrit Maharakkhaka (2005- abandonment in 2007 for family reasons) in instrumentation, Mathieu Vrard (2012-2015) and Charlotte Gehan (2015-2018) in asteroseismology. Patrick is a Research Astronomer in the Department of Astronomy at MPI Göttingen, Supakrit is a full-time lecturer at the Assumption University of Thailand, Mathieu is a post-doc at the Columbus University (Ohio) after a 3-year post-doc at the University of Porto, and Charlotte is post-doc at the University of Porto after a 1-year ATER positions at the Observatoire de Paris.

Currently, I supervise the PhD thesis of Guillaume Dréau, started in October 2019, on the seismic analysis of evolved red giants (either on the RGB or on the AGB).

I also supervised two PhD theses in space engineering: on attitude control (Boris Segret, 2016-2019) and propulsion (Gary Quinsac, 2015-2019). These theses, hosted by the space pole CENSUS of PSL, promote the self-navigation ability of nanosatellites.

Research administration

2022-present Coordinator of the Etoile group, at LESIA

2016-2021 **Elected president of the CoNRS section Solar system and Universe** (Section 17 du Comité National de la Recherche Scientifique). *This council is responsible for hiring, promoting and assessing French researchers in astronomy and astrophysics. The president represents this council at the Institut des Sciences de l'Univers (INSU, CNRS), being in charge of putting the priorities into practice. This task is equivalent to a 35 % FTE.*

2019, 2014, 2009
2003, 1998 Participation to the last five 'colloques de prospective' of INSU / CNRS
These colloquia are equivalent to decadal surveys; in 1998 I received an invitation as young researcher; the following participations were motivated by various responsibilities; in 2019, I was member of the steering committee and head of the working group on astrophysical topics

2011-2015 **Elected president of the French national council of Astronomy** (CNAP: Conseil National des Astronomes et Physiciens). *This council is responsible for hiring, promoting and assessing French Astronomers, in charge of 236 researchers in 14 observatories. As president, I represent this council at the Institut des Sciences de l'Univers (INSU, CNRS), being in charge of putting the priorities into practice. I interact with the French Ministery and with the observatories.*
This task is equivalent to a 25 % FTE.

2006-2009 Member of the consortium ARENA (Antarctic Research, a European Network for Astrophysics), activity: 'Toward Large Astronomical Instruments in Antarctica'

2001-2006 Appointed member of the GTSS (working advisory group for planetary science), CNES (French space agency)

1995-1999 Member of the scientific committee "Saturn' of the Programme National de Planétologie (CNRS/INSU)

1998-2000 **Expert for astrophysics and space science** at the Direction for Research (Ministère de la Recherche*).*

I had to supervise all actions and operations related to Astronomy, Astrophysics and Space (Astronomy & Astrophysics at INSU, large facilities (CFHT, Themis, ESO…), astronomy and planetology space mission conducted by the French space agency). This task represented a 50% FTE.

1997-2000 Member of the French TAC (comité français des grands télescopes, CNRS/INSU)

Project management

2013-2017 **Co-PI of IDEE ANR Project:** Interaction des Étoiles et des Exoplanètes = Stellar Driving on Exoplanets (IAS: F. Baudin; LESIA: B. Mosser; Sap/CEA: R. Garcia); Funding = 372 k€
This project aims at precisely characterizing the stars in order to determine their influence on their possible planetary system. As the determination of the size and mass of an exo-planet depends on that of the star, one of our goals is to obtain precise stellar mass and radius measurements

2010-present **Co-I of the ESA mission PLATO**
PLATO is the third medium-class mission in ESA's Cosmic Vision program. Its objective is to find and study a large number of extrasolar planetary systems.
I am in charge of one work package on stellar evolution (WG 127: seismic constraints from ageing stars)

2007-2012 **Co-I of the CNES mission CoRoT**
Analysis of stellar activity and granulation. Analysis of the red giant data; population study

2003-2009 **PI of the SIAMOIS project** (Seismic Interferometer Aiming to Measure Oscillations in the Interior of Stars).
SIAMOIS is a project devoted to ground-based asteroseismology, using an instrument to be installed at the Dome C Concordia station in Antarctica. The project was developed up to phase A/B.

2000-2004 **PI of the project** 'un sismomètre performant pour l'astérosismologie'
Funding = 170 k€, Action concertée incitative of MENRT.

1997-2002 **PI of the JOVIS project** (Jupiter: observation of variability, imaging and seismometry).
JOVIS was proposed to the French space agency as a micro-satellite dedicated to the observations of

the Jovian variability.

Publications

1990-present

214 articles in peer-reviewed journals, 40 as first author, which received more than 19k citations (as of February 2022; source SAO/NASA Astrophysics Data System).The typology of my track record is related to my different activities.

In the period 1990-2000 publications dealing with giant-planet seismology have addressed major aspects of this topic (theoretical development, observations, and data analysis). Activities in the year 2000-2008 were mostly devoted to instrumentation, in order to enhance the sensitivity of ground-based planetary and stellar Doppler seismometers.

Since 2009, publications based on CoRoT, Kepler, K2 and TESS data are much more visible than previous ones, due to the increasing importance of asteroseismology. I participate to the advent of this new topic as an expert in the analysis of seismic data, especially for red giants. My publications as first author and the publications of PhD students under my supervision show that I play a leading role in red giant seismology. My work since 2012 aims at deciphering the properties of the so-called mixed modes that probe the stellar core of evolved low-mass stars.

Five recent significant publications

- **Mosser, B**.; Benomar, O.; Belkacem, K.; Goupil, M. J.; Lagarde, N.; Michel, E.; Lebreton, Y.; Stello, D.; Vrard, M.; Barban, C and 11 coauthors. Mixed modes in red giants: a window on stellar evolution. *Astronomy and Astrophysics,* 2014, vol. 572, L5.
- **Mosser B.**, Michel E., Belkacem K., Goupil M.J., Baglin A., Barban C., Provost J., Samadi R., Auvergne Michel, Catala C. Asymptotic and measured large frequency separations. *Astronomy and Astrophysics,* 2013, vol. 550, pp. 126.
- **Mosser B**., Goupil M-J., Belkacem K., Michel E., Stello D., Marques J. P., Elsworth Y., Barban C., Beck P. G., Bedding T. R., and 8 coauthors. Probing the core structure and evolution of red giants using gravity-dominated mixed modes observed with Kepler. *Astronomy and Astrophysics*, 2012, vol. 540, pp. 143.
- **Mosser B**., Goupil M.J., Belkacem K., Marques J. P., Beck P. G., Bloemen S., de Ridder Joris, Barban C., Deheuvels S., Elsworth Y., and 11 coauthors. Spin down of the core rotation in red giants. *Astronomy and Astrophysics*, 2012, vol. 548, pp. 10.
- Bedding T.R., **Mosser B**., Huber Daniel, Montalbán Josefina, Beck P., Christensen-Dalsgaard Jørgen, Elsworth Y.P., García Rafael A., Miglio Andrea, Stello D., and 24 coauthors. Gravity modes as a way to distinguish between hydrogen- and helium-burning red giant stars. *Nature*, 2011, vol. 471, pp. 608-611.

2007-present

Referee for the Polish National Science Centre, the Research Service and Career Development of the Wien University, the Belgian Fund for Scientific Research, the English Science and Technology Facility Council

1993-present

Referee for A&A, ApJ, ApJL, Icarus, MNRAS, Planetary and Space Science, Advances in Space Research

Observations with large international facilities

2009-present

Member of the KASC consortium. CoI of the Working Group ‘stars in cluster’
Analysis of the red giant data; population study

2007-2013

CoI of CoRoT; seismic analysis of HD 175726, 175272
Analysis of stellar activity and granulation
Analysis of the red giant data; population study

2004-06

11 + 5 nights with the high-resolution spectrometer HARPS at ESO 3.6-m telescope (HD 49933, HD 203608)

1994

12 half-nights for observing the impacts of the SL9 cometary fragments on Jupiter. ESO 3.6-m telescope + TIMMI infrared detector

1991-99

5 observing runs (total = 27 nights) with the Fourier Transform Spectrometer at the 3.6-m CFH Telescope (Hawaii); asteroseismic observation of Jupiter, Saturn, Procyon

Outreach

1990-present

8 articles in scientific journals with a broad audience (The Messenger, La Recherche, L’Astronomie, JAF…)
24 public lectures

Memberships

1989-present	Société Française d'Astronomie et d'Astrophysique
1988-2007	Division for Planetary Sciences, American Astronomical Society

Awards

Nov, 2016	Chevalier dans l'Ordre National du Mérite
July 14, 2013	Chevalier dans l'Ordre des Palmes Académiques
2000-present	Annual bonus awarding research and teaching quality (PEDR, PES).

Personal involvement

2005-2016	President of the local association FCPE (Fédérations des Conseils de Parents d'Élèves), collège Alain-Fournier (Orsay), lycée Blaise-Pascal (Orsay)
1998-2016	Involved in the schools of my children (primary school, secondary school, high school). Elected member of the Conseil d'École, then of the Conseil d'Administration (board of directors)