

# Curriculum Vitae

## A. Personal Summary

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Name: Andrea Miglio  
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Work Address: [REDACTED]  
email: [andrea.miglio@unibo.it](mailto:andrea.miglio@unibo.it)  
Date of birth: [REDACTED]  
Languages: Italian (native), French (fluent), English (fluent)  
Nationality: Italian

### Academic achievements:

Nov 2007 PhD in Physics, Université de Liège  
Jun 2004 DEA (Diplôme d'Etudes Approfondies) en Science, Université de Liège  
Nov 2002 Laurea in Fisica, Università degli Studi di Milano, Italy (110/110 cum laude)

## B. Career to date

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### Employment / Mobility:

Feb 2021 - present: Full Professor, Dipartimento di Fisica e Astronomia, Università di Bologna  
Aug 2017-Jan 2021: Reader in asteroseismology, School of Physics and Astronomy, University of Birmingham  
Aug 2015-Jul 2017: Senior Lecturer, School of Physics and Astronomy, University of Birmingham  
Jan 2011-Jul 2015: Lecturer, School of Physics and Astronomy, University of Birmingham  
Oct 2008-Dec 2010: Chargé de Recherches FNRS post-doc fellowship, Liège, Belgium  
Dec 2007-Sep 2008: Post-doc at the Institut d'Astrophysique et de Géophysique de l'Université de Liège  
Sep 2003-Nov 2007: PhD student at the Institut d'Astrophysique et de Géophysique de l'Université de Liège  
Jan 2002-Aug 2003: Pre-doctoral fellowship at the Osservatorio Astronomico di Brera Merate, Italy  
Nov 2001-Nov 2002: Erasmus student at the Institut for Fysik og Astronomi in Aarhus, Denmark.

## C. Research

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### C.1 Statement of research interests

The common thread of my research activity is the development and application of asteroseismology (i.e. the study of global, resonant pulsation modes in stars) to improve our understanding of stellar physics, and to infer global stellar properties with unprecedented precision and accuracy.

While my initial career focused primarily on theoretical aspects of asteroseismology and stellar structure, I then developed a strong interest in the direct comparison between models and the exquisite data delivered by space-borne photometric missions. Since the first data from CoRoT became available, I have actively participated in the community-wide exploitation of seismic data, with major contributions in a large number of papers.

At the same time, while continuing detailed studies of local features in the stellar interior, I have followed a definite and distinctive path in recognising the potential, and starting to exploit, asteroseismic constraints to inform studies of the Milky Way galaxy. This line of research represents the main scientific thrust behind the ERC Consolidator Grant I was awarded in late 2018:

The asterochronometry project aims at reconstructing the assembly history of our Galaxy by significantly improving the precision and accuracy of current methods used to age date stars. For this purpose, we are working in an interdisciplinary team combining experts in stellar evolution, stellar seismology and in models of the chemical and dynamical evolution of the Milky Way (<https://www.asterochronometry.eu/team.html>).

In 2022 I was awarded a MUR FARE grant (Duets) to leverage the combination of astrometric, spectroscopic, and, crucially, asteroseismic data to open a new window on the population of (products of) binary systems among red giant stars.

### C.2 Publication record and principal research publications:

My publication record consists of about 270 articles in refereed journals, about 60 in conference proceedings, with an h-index of 81, and a total number of ~25,000 citations (ads). Among the ~330 papers, 14 appeared in Science, Nature, and Nature Astronomy and one appeared in the Annual Review of Astronomy and Astrophysics.

Publications originating from the ERC project can be found here: <https://www.asterochronometry.eu/papers.html>, while science summaries of recent results are available at [https://www.asterochronometry.eu/science\\_summaries.html](https://www.asterochronometry.eu/science_summaries.html).

During my career I made decisive contributions to the development and application of seismic diagnostic tools to make inferences about local features in several classes of pulsating stars and investigated how systematic uncertainties in stellar modelling impact on our inferences on properties of stars and stellar populations:

- **Miglio, A.**, Brogaard, K., Stello, D., and 21 co-authors, Asteroseismology of old open clusters with Kepler : direct estimate of the integrated RGB mass loss in NGC6791 and NGC6819, (2012), MNRAS 419, 2077,

I led one of the first attempts at detailed modelling red-giant stars including frequencies of individual oscillation modes, which enabled to derive precise and accurate properties of the exoplanetary host star (including the inclination angle of star's spin axis):

- Huber, D., Carter, J.; Barbieri, M; **Miglio, A.** et al. *Stellar Spin-Orbit Misalignment in a Multiplanet System*, (2013), *Science*, 341, 6156, 331

I pioneered and significantly contributed to the use of solar-like oscillators as tracers of properties of the Milky Way and stellar populations:

- **Miglio, A.**, Chiappini, C., Morel, T. et al., *Galactic archaeology: mapping and dating stellar populations with asteroseismology of red-giant stars*, (2013), *MNRAS*, 429, 423, which also appeared in the Science Editors' choice: [www.sciencemag.org/content/339/6120/629.3.full?sid=bede3cc1-eaaa-4e43-bbb0-ed79ad2bd985](http://www.sciencemag.org/content/339/6120/629.3.full?sid=bede3cc1-eaaa-4e43-bbb0-ed79ad2bd985),

including the first detection of solar-like oscillations in a globular cluster, lending confidence to asteroseismic masses in the metal-poor regime, which is key for Galactic studies:

- **Miglio, A.**, Chaplin, W. J., Brogaard, K.; et al *Detection of solar-like oscillations in relics of the Milky Way: asteroseismology of K giants in M4 using data from the NASA K2 mission* (2016) *MNRAS* 461, 760.

and an interdisciplinary community-wide white papers setting the agenda for future steps in Galactic archeology and asteroseismology in the PLATO era (2026+) and beyond

- **Miglio, A. et al.** (+104 coauthors), *PLATO as it is : A legacy mission for Galactic archaeology* (2017), *AN*, 338.
- **Miglio, A. et al.** (+30 coauthors), *HAYDN -- High-precision Asteroseismology of DeNse stellar fields (ESA Voyage 2050 White Paper)*, (2021), *Experimental Astronomy, Volume 51, Issue 3*, p.963-1001

### C.2.1 Full publication record:

An up-to-date publication record, including citation metrics, can be retrieved via this [public ADS library](#).

### C.4 Selected 15 invited presentations at international conferences / colloquia:

1. *The linear oscillation zoo within giant stars: a probe of their deep interiors*, The Impact of Asteroseismology across Stellar Astrophysics, KITP, Santa Barbara, USA, 24-28 October 2011
2. *G and K giants as Galactic probes*, IAU General Assembly, Special Session 13, Beijing, August 2012
3. *Present and future of asteroseismology*, Symposium 6, EWASS 2012, Rome, July 2012
4. *Seismology of red giants and stellar ensembles*, Steps Towards a New Generation of Stellar Models, Lorentz Centre Workshop, July 2013
5. *Asteroseismology of stellar populations in the Milky Way*, ESO/MPA/MPE/USM Munich Joint Astrophysical Colloquium (JAC), November 2013
6. *Basics of asteroseismology*, IAU Symposium 307 New Windows on Massive Stars : Asteroseismology, Interferometry, Spectropolarimetry, 23-24 June 2014
7. *Concluding remarks*, KASC 6 / The Space Photometry Revolution -CoRoT Symposium 3, Kepler KASC-7 joint meeting, Toulouse, July 2014

8. Asteroseismology and Galactic populations, The Milky Way and its Stars: Stellar Astrophysics, Galactic Archaeology, and Stellar Populations, KITP, February 2015
9. *Basics of asteroseismology*, Reconstructing the Milky Way's History: Spectroscopic Surveys, Asteroseismology and Chemodynamical Models, 1-5 June 2015
10. *Recent results and future prospects for asteroseismic studies*, IAU Division G meeting, IAU General Assembly, Hawaii, 10 August 2015
11. *Galactic asteroseismology*, Seismology of the Sun and the Distant Stars 2016, Joint TASC2 & KASC9 Workshop – SPACEINN & HELAS8 Conference, 11-15 July 2016
12. *Galactic archaeology*, PLATO Mission Conference, 5-7 September 2017
13. *Seismic mass determinations: method(s), successes, problems, some examples, future potential*, "Weighing Stars from Birth to Death: How to Determine Stellar Masses? " Lorentz Centre Workshop, 19-23 Nov 2018
14. Asteroseismology & magnetic fields: results and perspectives invited talk at IAUS354 Solar and Stellar Magnetic Fields: Origins and Manifestations, 30 June - 6 July 2019
15. The assembly history and evolution of the Milky Way as seen through the lens of asteroseismic ages. Heidelberg Joint Astronomical Colloquium, 21 Dec 2021

## D. Supervision of postdoctoral and PhD fellows 2012-

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Postdoctoral fellows:

- Supervisor (Scientist in charge) of the IEF Marie Curie Fellow Dr N. Lagarde, 2013-2015
- Co-supervisor of postdoctoral fellows Dr T. Campante, Dr G. Davies, Dr R. Handberg - STFC grant "Sounding the Stars: The Birmingham and Queen Mary Seismology Programme" (main supervisor Prof. W. J. Chaplin)
- Co-supervisor of Dr D. Reese - SPACEINN consortium, (2014-2016)
- Main supervisor of Dr K. Broogard, STFC grant (2016), W. Ball, UKSA PLATO grant (2017-)
- Main supervisor of Dr G. Buldgen (09/2017-09/2018), Dr T. Mackereth (12/2018- 09/2020), Dr F. Vincenzo (01/2019 - 09/2019), Dr A. Joergensen (11/2019- 12/2020), Dr J. Montalbán (12/2018-), Dr G. Casali (5/2021-10/2023), Dr M. Tailo (7/2021-), Dr A. Stockholm (8/2021-8/2023), Dr V. Grisoni (10/2021-08/2023) , Dr A. Mazzi (09/2023 -)

Main supervisor of 9 PhD students:

- D. Bossini, *Asteroseismology of red-giant stars: a tool for constraining stellar models*, PhD awarded 07/2016, now post-doc in Porto, Portugal
- H. Coelho, *Asteroseismology of cool stars: testing scaling laws and detecting signatures of rapid structure variation*, PhD awarded 01/2017, now CNPQ post-doctoral fellow in Brazil
- Ben Rendle, *Galactic archaeology with K2*, PhD awarded 06/2019, now graduate technical analyst with Broadridge financial services
- Saniya Khan, *The fine structure of the red clump as seen by Gaia and Kepler*, PhD awarded June 2021
- Walter van Rossem, *Seismic signatures of products of binary evolution*, PhD awarded October 2023
- Emma Willett, *Galactic archaeology with K2 and TESS*, started: 09/2019, awarded October 2023
- Massimiliano Matteuzzi, started 11/2021.
- Jeppe Thomsen, started 03/2023
- Lorenzo Briganti, started 11/2023

and co-supervisor of 5 students.

## E. Teaching / Administration

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2022-	Supervisor of MSc thesis (6)
2022-	Coordinator PhD in Astrophysics, Università di Bologna
2022-	Lecturer: Asteroseismology and advanced stellar physics, Università di Bologna
2022-	Lecturer: Fisica T-B, Ingegneria Gestionale, Università di Bologna
2012/13- 2021	Lecturer - Graduate course "Stars" for the Midlands Physics Alliance Graduate School (together with Dr Gaensicke)

2012/13- 2021	Supervision of final (4th) year project (2 students/year)
2013/14-2018/2019	Lecturer - Y3 Group studies on asteroseismology and planet finding
2014/15-2020/2021	Y2 Tutor
2015/16-2020/2021	Lecturer - Y3 Life and Death of Stars
2017/18-2018/2019	Lecturer Y3/Y4 Numerical Modelling module
2018- 2021	PhD admission tutor, Astrophysics
2019- 2021	Deputy Director of Graduate Studies, School of Physics

## F. Widening participation

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I have been involved in several outreach activities including the preparation of multimedia material for the exhibit "Sound of the stars" at ThinkTank, and for a Discovery Channel program about Solar activity.

Specifically, I developed an interest in the sonification of pulsation modes and how that could be used to bridge music and science and to explain our scientific activities to a wider audience.

Examples of the former are my review on stellar sounds at King's College Research Exchange evening "Music in the Universe, from stars to animals", 8 July 2016, Cambridge, and my exchanges with composer Andrea Granitzio (Birmingham Conservatoire) on analogies between natural resonances in rocks on the Earth and in stars, and how these "instruments" could be incorporated into music composition.

Results on the sonification of stellar pulsation models have also been used in the dissemination of scientific results by generating interactive webpages <https://www.birmingham.ac.uk/news/latest/2016/06/asteroseismologists-listen-to-relics-of-the-milky-way.aspx>, which generated high-profile publicity for the University.

This work has been recently extended by developing a interactive poster where the user can trigger sound using proximity sensors. The acoustic pulsations of a solar mass star have been sonified in a way that would help an interested member of the public get an intuitive understanding of what happens to stars as they evolve. This creates a tool which allows members of the public to intuitively understand the changes to stars during their evolution. A first prototype has been and presented at an international conference by Year2 students (Emma Willett and Rafail Panagi), see <http://www.asterostep.eu/Outreach.html#zero>.

## G. Citizenship

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### External Engagement

#### Reviewer for:

- Astronomy & Astrophysics
- Communications in Asteroseismology
- Publications of the Astronomical Society of Japan
- Astrophysics & Space Science
- Astrophysical Journal

- Astrophysical Journal Letters
- Monthly Notices of the Royal Astronomical Society
- Agence Nationale de la Recherche (French National Research Agency)
- Polish National Science Centre
- Fonds Wetenschappelijk Onderzoek (Research Foundation Flanders, Belgium)
- ESO Observing Programmes Committee, division D for P95-96 (2014-2015)
- Science and Technology Facilities Council, UK
- FWF Austrian Science Fund
- NASA Postdoctoral Program
- ERC - Starting Grant, external referee
- NSERC- Natural Sciences and Engineering Research Council of Canada

### **PhD examinations**

Jury member of the PhD dissertation by:

- M. Desmet, KULeuven, Leuven, Belgium, December 2009
- O. Moreira, Université de Liège, Liège, Belgium, October 2010
- V. Sangaralingam, University of Birmingham, November 2011
- M. Bouabid, Université de Liège, Liège, Belgium, December 2011
- I. Brandao, University of Porto, Porto, Portugal, December 2012
- S. Salmon, Université de Liège, May 2014
- M. Vrad, Observatoire de Paris, September 2015
- T. Rodrigues, Università di Padova, April 2017
- S. Stevenson, University of Birmingham, July 2017
- G. Buldgen Université de Liège, Liège, Belgium, September 2017
- C. Pinçon, Observatoire de Paris, September 2017
- S. Christophe, Observatoire de Paris, September 2019
- G. Costa, SISSA, Trieste, October 2019
- C. Bellhouse, University of Birmingham, November 2019
- M. Farnir, Université de Liège, Liège, Belgium, August 2021
- F. Zainol, University of Birmingham, October 2021
- J. Mombarg, KULeuven, Belgium, January 2022
- Pierre Houdayer, Observatoire de Paris, November 2022
- Dinil Bose Palakkatharappil, Observatoire de la Cote d'Azur, January 2023

### **Memberships of scientific societies, scientific responsibilities held and participation in international research projects:**

- Member of *Kepler* Asteroseismic Science Consortium Working group on: solar-like oscillations in main-sequence stars and red-giant stars,  $\gamma$  Dor stars, and oscillations in clusters

- Member of the Gaia Research for European Astronomy Training (GREAT) WGB2: Stellar variability
- Member of the WG4 and WG5 of the GAIA-ESO Survey
- CoRoT Co-Investigator (2012-2015)
- Core member of the APOGEE-KASC (APOKASC) and APOGEE-CoRoT working groups
- Board member of the APOGEE-K2 working group
- IAU Member of Division G (Stars and Stellar Physics), Division H (Interstellar Matter and Local Universe) and Division G Commission 27 (Variable Stars)
- Co-I of the K2 Galactic Archeology Programme
- PI of the ISSI International Team *asteroSTEP* (2016-2020) <http://www.issibern.ch/teams/asterostep/>
- Coordinator of WorkPackage 125000 (Determination of stellar parameters) and 127200 (Seismic tools for red giants) within the PLATO Stellar Science Preparation Management
- Coordinator of WorkPackage 37400 (Seismic tools) and 374210 (Forward seismic tools) in the PLATO Data Centre
- Co-I and deputy leader of the WG2 - MW-Gaia COST action <https://www.mw-gaia.org>
- Member of the [WEAVE](#) Consortium - calibrators and Galactic archaeology
- Member of the 4MOST Consortium
- Since 2022 I am the PI of the ESA candidate M-class mission HAYDN <https://www.cosmos.esa.int/web/call-for-missions-2021/update-on-the-f2-and-m7-mission-opportunity>

#### Conferences and workshops organised:

- CoRoT Red-giant team meeting Liège 27-28 October 2008, Liège 6-7 October 2009 (main organiser)
- *Red Giants as Probes of the Structure and the Evolution of the Galaxy*, Academia Belgica, Roma, November 15-17 2010 (main organiser) <http://astrotheor3.astro.ulg.ac.be/miglio/Roma/>
- *Asteroseismology of stellar populations*, Sexten Center for Astrophysics, Sexten, July 22-26 2013 (main organiser) <http://www.sexten-cfa.eu/en/conferences/2013/details/36-asteroseismology-of-stellar-populations>
- 5th Aarhus Red Giants modelling Workshop, Birmingham, 5-9 October 2015 (main organiser)
- *Industrial revolution in Galactic astrophysics*, Sexten Center for Astrophysics, Sexten, July 18-22 2016, (main organiser) <https://sites.google.com/site/asterostepsexten2016/>
- *Royal Astronomical Society Specialist Discussion Meeting*, London, 14 October 2016, (main organiser) <https://sites.google.com/site/rasspecialistirga/home>
- TASC3-KASC10 workshop TESSting stellar astrophysics, July 2017 (co-organiser) <http://www.tasc3kasc10.com>
- EWASS 2018, SS22 : Open problems in modelling chemical element transport in stars (co-organiser) <http://eas.unige.ch/EWASS2018/session.jsp?id=SS22>

#### Editorial experience

- Co-editor of the proceedings of the "38th Liège International Astrophysical Colloquium – 7-11 July", appeared as a special volume of *Communications in Asteroseismology*, 2009, CoAst 158 (eds. C. Aerts, A. Noels, J. Montalbán, A. Miglio, M. Briquet)

- Main editor of the proceedings of "Red giants as probes of the structure and evolution of the Milky Way", *Astrophysics and Space Science Proceedings*, Springer, ISBN-978-3-642-18417-8 (eds. A. Miglio, J. Montalbán, A. Noels) <http://arxiv.org/html/1108.4406v1>
- Main editor of the proceedings of "Asteroseismology of stellar populations in the Milky Way", *Astrophysics and Space Science Proceedings*, Springer, 2014 (eds. A. Miglio, L. Girardi, P. Eggenberger)

Bologna, 14 October 2024

Andrea Miglio

