Vincent Vanlaer

Curriculum Vitae

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VincentVanlaer
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Education

2021-2025 **Doctoral Program in Science: Astronomy and Astrophysics**, *KU Leuven*
Thesis title: Structure and Internal Rotation of Pulsating Stars. Manuscript available online.
Supervisor: Prof. Dr. Conny Aerts.
Degree of *Doctor of Science: Astronomy and Astrophysics* awarded on 12 September 2025

2018-2021 **Master of Astronomy and Astrophysics**, *KU Leuven*, Summa cum laude
Master thesis: Structure Inversions for Massive Stars from their Gravity Modes
Supervisor: Prof. Dr. Conny Aerts.

2018-2021 **Master of Physics**, *KU Leuven*, Magna cum laude
Specialisation in Theoretical Physics
Master thesis: Holography on $AdS_2 \times S^2$
Supervisor: Prof. Dr. Nikolay Bobev

2015-2018 **Bachelor of Mathematics**, *KU Leuven*, Magna cum laude

2015-2018 **Bachelor of Physics**, *KU Leuven*, Cum laude

Research Positions

November 2022 - present **FWO Special Research Associate**, *Department of Physics and Astronomy, KU Leuven*
Funded by the Research Foundation Flanders as part of my PhD Fellowship grant with title "Dissecting pulsating stars: structure inversions from gravity mode oscillations".

October 2021 - November 2022 **PhD Researcher**, *Department of Physics and Astronomy, KU Leuven*

Grants & Prizes

2024 **TESS Guest Investigator Cycle 7**, *NASA*
Co-I (out of 12); PI: D. M. Bowman; G07037

2024 **Awarded competitive grant for a short study visit abroad**, *Research Foundation - Flanders*
Visiting Prof. Earl Bellinger at Yale University

2024 **Awarded competitive grant for participation in a workshop or course abroad**, *Research Foundation - Flanders*
Participation in the MESA Down Under school as invited teaching assistant

2022-2026 **PhD Fellowship fundamental research**, *Research Foundation - Flanders*
PI; Project title: "Dissecting pulsating stars: structure inversions from gravity mode oscillations"

2021 **Best Master Thesis Contest**, *Belgian Physical Society*
Awarded for my master thesis *Structure Inversions for Massive Stars from their Gravity Modes*

2016 **Flemish Programming Competition**, *UCLL*
Third place out of 30 teams from Flemish universities

2015 **Maastricht Math Modelling Competition**, *Maastricht University*
First place out of 40 teams selected from high schools in Germany, Belgium, and the Netherlands

Publications

See `https://undelivered.email/publications` for an up-to-date list.

2025† J. Vandersnickt, **V. Vanlaer**, M. Vanrespaille, C. Aerts. "Asteroseismic detection of an internal magnetic field in the B0.5V pulsator HD 192575", accepted by *A&A* on 24 November 2025.

2025 J. S. G. Mombarg, **V. Vanlaer**, S. Bharati Das, M. Rieutord, C. Aerts, L. Bugnet, S. Mathis, D. R. Reese, J. Ballot, "Is a 1D perturbative method sufficient for asteroseismic modelling of β Cephei pulsators? Implications for measurements of rotation and internal magnetic fields", accepted by *A&A* on 11 November 2025.

2025 P. Huijse, J. De Ridder, L. Eyer, L. Rimoldini, B. Holl, N. Chornay, J. Roquette, K. Nienartowicz, G. Jevardat de Fombelle, D. J. Fritzewski, A. Kemp, **V. Vanlaer**, M. Vanrespaille, H. Wang, M. I. Carnerero, C. M. Raiteri, G. Marton, M. Madarász, G. Clementini, P. Gavras, C. Aerts. "Learning novel representations of variable sources from multi-modal *Gaia* data via autoencoders". *A&A*, 701, A150, 27 pp.p. 3

2025 **V. Vanlaer**, D. M. Bowman, S. Burssens, S. Bharati Das, L. Bugnet, S. Mathis, C. Aerts. "Interior rotation modelling of the β Cep pulsator HD 192575 including multiplet asymmetries". *A&A*, 701, A5, 14 pp. 4

2025 A. Kemp, D. J. Fritzewski, T. Van Reeth, L. IJspeert, M. Michielsen, J. S. G. Mombarg, **V. Vanlaer**, G. Li, A. Tkachenko, C. Aerts. "KIC 4150611: A quadruply eclipsing heptuple star system with a g-mode period-spacing pattern". *A&A*, 693, A184, 23 pp. 3

2023 S. Burssens, D. M. Bowman, M. Michielsen, S. Simón-Díaz, C. Aerts, **V. Vanlaer**, G. Banyard, N. Nardetto, R. H. D. Townsend, G. Handler, J. S. G. Mombarg, R. Vanderspek, G. Ricker. "A calibration point for stellar evolution from massive star asteroseismology". *Nat Astron*, 7, p. 913-930. 52

2023 **V. Vanlaer**, C. Aerts, E. P. Bellinger, J. Christensen-Dalsgaard. "Feasibility of structure inversions for gravity-mode pulsators". *A&A*, 675, A17, 20 pp. 15

2021 C. Aerts, K. Augustson, S. Mathis, M. G. Pedersen, J. S. G. Mombarg, **V. Vanlaer**, J. Van Beeck, T. Van Reeth. "Rossby numbers and stiffness values inferred from gravity-mode asteroseismology of rotating F- and B-type dwarfs. Consequences for mixing, transport, magnetism, and convective penetration". *A&A*, 656, A121, 10 pp. 22

Submitted publications

2025 M. Vanrespaille, D. J. Fritzewski, **V. Vanlaer**, C. Aerts. "Asteroseismic forward modelling of Cep pulsators and inferences on their internal differential rotation", submitted to *A&A* on 16 November 2025.

2025 J. M. J. Ong, S. Basu, W. Hoogendam, **V. Vanlaer**. "Can Asteroseismic Structure Inversions Be Performed in Structure-Dependent Coordinates?", submitted to the *ApJ* on 3 August 2025.

2025 **V. Vanlaer**, J. S. G. Mombarg, Z. Guo, R. H. D. Townsend. "StORM: a fast and open source code to compute oscillations for rotationally deformed stars", submitted to *A&A* on 4 July 2025.

†paper led by master student I supervised

Software development

2025-present **Main developer**, *Stellar Oscillations with Rotation and Magnetism (StORM)*
Full implementation of the oscillation code. Available under the GNU General Public License version 3 at `https://stellar-oscillations.org`

2025-present **Developer**, *Modules for Experiments in Stellar Astrophysics (MESA)*
Overhaul of the build system, improving maintainability of the code. Available under the GNU Lesser General Public License version 3 at `https://mesastar.org`

Invited seminars

30 July 2024 **Special ITC Seminar, Center for Astrophysics, Harvard University**

26 July 2024 **Astronomy Colloqium, Department of Astronomy, Yale University**

23 May 2024 **Weekly Seminar Series, Institute of Astronomy, KU Leuven**

Conference & workshop contributions

21–25 August 2025 **International MESA School Leuven**, *Leuven, Belgium*, Main organiser
The MESA School Leuven was the 2025 installment of the yearly MESA School. The school hosted ten lecturers, twenty teaching assistants, and sixty students, most of which were international participants. I organised the selection of the lecturers and teaching assistants, guided the development of the labs and lectures, and acted as the main point of contact for the school.

7–11 August 2025 **9th TESS/16th Kepler Asteroseismic Science Consortium workshop**, *Vienna, Austria*, Posters
First poster title: First detection of an internal magnetic field in a massive star.
Second poster title: StORM: a novel stellar oscillation code

29 July – 2 August 2024 **TESS Science Conference III**, *Boston, Massachusetts, USA*, Poster
Poster title: Beyond forward modelling: rotation, magnetism, and inversions

15–19 July 2024 **8th TESS/15th Kepler Asteroseismic Science Consortium workshop**, *Porto, Portugal*, Poster
Poster title: Beyond forward modelling: rotation, magnetism, and inversions

17–21 June 2024 **MESA Down Under**, *Sydney, Australia*, Invited Teaching Assistant
Design and implementation of the labs. Aiding the students during the school.

17–21 July 2023 **7th TESS/14th Kepler Asteroseismic Science Consortium workshop**, *Honolulu, Hawai'i, USA*, Contributed talk
Talk title: Asteroseismic constraints on the internal magnetic field of the TESS beta Cepheid pulsator HD 192575.

11–15 July 2022 **6th TESS/13th Kepler Asteroseismic Science Consortium workshop**, *Leuven, Belgium*, Contributed talk
Talk title: Are structure inversions from gravity modes feasible?

Additional conference participation and graduate training initiatives

3–7 June 2024 Astrostatistics School, *Online, organised by Penn State University*

3–5 April 2024 N-Ways to GPU Programming Bootcamp, *Online, organised by the Vienna Scientific Cluster Research Center*

4–6 July 2023 Let's talk science workshop, *Gent, Belgium*

3–7 April 2023 SDSS-V/IReNA Science Festival as LOC member, *Leuven, Belgium*

8–12 August 2022 MESA Summer School, *Santa-Barbara, California, USA*

2016-2025 Free and Open Source Developers European Meeting (FOSDEM), *Leuven, Belgium*, held yearly during the first weekend of February

Observing experience

2024 Mercator Telescope (1.2m) at La Palma, with HERMES (High-Efficiency and high-Resolution Mercator Echelle Spectrograph), 13 nights

Teaching and supervision experience

2025-2026 **Starquakes and Exoplanets**, *World Science Festival*
Teaching assistant and report grading responsibilities

2025-present **Master thesis supervision of Marijn Everaert**, *KU Leuven*
Draft title: Asteroseismic derivation of the internal rotation profile of selected intermediate-mass main-sequence stars

2024-2025 **Master thesis supervision of Jelle Vandersnickt**, *KU Leuven*
Thesis title: Hunting the internal magnetic field of the beta Cep HD 192575
Paul Smeyers prize 2025 for best master thesis.

2024 **MESA Down Under school**, *Sydney*
Invited teaching assistant

2023 **Bachelor thesis supervision**, *KU Leuven*

2021-2025 **Physics II: Electromagnetism and Modern Physics**, *Faculty of Bio-engineering, KU Leuven*
Teaching assistant and exam grading responsibilities

Outreach

2024 **Flemish amateur astronomical society (VVS) summer school**, *Leuven, Belgium*
This school is aimed at high-school students interested in astronomy and astrophysics. I presented a lecture on asteroseismology.

2023 **Invited participant to the symposium SPACE: From cross border collaborations to infinity and beyond**, *Berlin, Germany*
State visit of the Belgian King and Queen. Active participation in a roundtable conversation with the Belgian Queen.

2023 **Invited talk at the variable star day of the Flemish amateur astronomical society (VVS)**, *Volkssterrenwacht Urania, Belgium*
Talk title: Pulsating stars: from observations to stellar structure

Other services to the community

2025-present **Reviewer**, *ApJ, A&A*

2015-2024 **Member**, *ULYSSIS*
ULYSSIS is a student association with the goal of making IT more accessible to students of the KU Leuven Association, with a focus on Free and Open Source technologies (FOSSH). Responsibilities include: maintenance of the webhosting infrastructure, aiding with workshops of technologies like LaTeX and Git, development of a new ticketing system and virtualisation infrastructure, ...

2016-2019 **President**, *ULYSSIS*
Chairman of the board of directors, general assembly and members assembly. Final responsibility for all aspects of ULYSSIS. Organisation of the ULYSSIS Open Source Job Fair and Capture The Flag competition. General coordination of the lap counting system at the 24 hour run in Leuven. Representing ULYSSIS with sponsors and other external partners.