

AXEL WIDMARK

Physicist & Astronomer

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EMPLOYMENT & EDUCATION

Marie Skłodowska-Curie Actions: Global Fellowship

Columbia University (two years); Stockholm University (one year)

📅 01-06-2024 – 31-05-2027

📍 New York City, USA; Stockholm, Sweden

I was awarded an MSCA Fellowship with an evaluation score of 95.60%

Post-doctoral researcher, short term

Physics Department, Stockholm University

📅 01-09-2023 – 28-02-2024

📍 Stockholm, Sweden

A short term hire in the interim between other positions

DARK-Carlsberg Foundation Fellow

Dark Cosmology Centre, Niels Bohr Institute, Copenhagen University

📅 01-09-2020 – 31-08-2023

📍 Copenhagen, Denmark

Employed as a post-doctoral researcher pursuing independent research

PhD in theoretical physics

Physics Department, Stockholm University

📅 05-09-2016 – 31-08-2020

📍 Stockholm, Sweden

Title of dissertation: *Dark Matter in the Solar System, Galaxy, and Beyond*

PhD defence and award dates: 25-05-2020, 18-06-2020

Supervisor: Jens Jasche, jens.jasche@fysik.su.se

Assistant supervisor: Joakim Edsjö, edsjo@fysik.su.se

MSc Physics and Astronomy; BSc Engineering Physics

Chalmers University

📅 2011 – 2016

📍 Gothenburg, Sweden

Master's Thesis: *Dark Matter Capture by the Sun via Self-Interaction*

Supervisor: Riccardo Catena, riccardo.catena@chalmers.se

Exchange studies, EPFL Lausanne, Switzerland, two semesters (fall 2014, spring 2015)

ACADEMIC SERVICE, STIPENDS & AWARDS



Referee

- Monthly Notices of the Royal Astronomical Society (MNRAS)
- Journal of Cosmology and Astroparticle Physics (JCAP)
- The Astrophysical Journal (ApJ)
- OPTICON telescope access programme



Invited author

Snowmass2021 Cosmic Frontier White Paper: Dark Matter Physics from Halo Measurements



Winner of the Astrostatistics Student Paper Competition

The competition was sponsored by the Astrostatistics Interest Group of the American Statistical Association. It took place at the Joint Statistical Meetings of August 2019 in Denver, Colorado.



Interest group organisation

- I initiated the **Data Mining Club** and organise its bi-weekly meetings at NBI (2021–2023)
- I initiated the **Gaia Working Group** and organised its weekly meetings at SU (2019–2020)



Teaching

At NBI: Teacher in the course *Galactic Dynamics and Galaxy Formation*; succesful supervision of a Master's project, as well as an ongoing project with a PhD student

At SU: Teaching assistant in courses *Thermodynamics* and *Cosmology and Astroparticle Physics*, and administrative responsibilities for course evaluations

At Chalmers: Teaching assistant for the Mathematics Department



Public/student outreach

At NBI: Participated in "Bestil en Forsker" ("Order a scientist")

At SU: Science presentations for local high school classes over three years (2017–2020); Scientific Fika presentation (2023); News & Views presentation (2024)



Collaborative visits and stipends

- **Royal Observatory, University of Edinburgh** (22-05-2023 – 26-05-2023)
- **Institut de Ciències del Cosmos (ICCUB), Universitat de Barcelona** (20-06-2022 – 24-06-2022)
- **Center for Cosmology and Particle Physics (CCAPP), Ohio State University** (10-01-2022 – 14-01-2022; 12-08-2019 – 16-08-2019), first visit sponsored by the Astroparticle Student and Postdoc Exchange Network (CASPER) and a travel stipend from Kyltekniska fonden
- **Center for Computational Astrophysics (CCA), Flatiron Institute** (17-01-2022 – 21-01-2022; 18-09-2017 – 30-09-2017), first visit sponsored by CASPER
- **University College London** (23-04-2018 – 04-05-2018), sponsored by CASPER

SELECTED PRESENTATIONS

- 09-09-2024 **Invited** speaker at the *Waves in the Milky Way Disk* conference in Shanghai (upcoming)
- 19-04-2024 **Invited** seminar at Strasbourg University
- 29-02-2024 **Invited** seminar at Uppsala University
- 08-06-2023 Talk at the Annual Danish Astronomy Meeting 2023
- 25-05-2023 Presentation at The Royal Observatory (Edinburgh, Scotland)
- 22-06-2022 **Invited** seminar at Institut de Ciències del Cosmos, Universitat de Barcelona (Spain)
- 05-05-2022 **Invited** Astrophysics Seminar at the University of Surrey (remote, Surrey, England)
- 29-03-2022 **Invited** Galaxy Group Meeting seminar at MPA (remote, Heidelberg, Germany)
- 20-01-2022 **Invited** presentation with the Dynamics Group at Flatiron Institute (New York, USA)
- 27-10-2021 **Invited** seminar at King's College (remote, London, England)
- 26-10-2021 **Invited** seminar at CCAPP, Ohio State University (remote, Columbus, USA)
- 28-09-2021 **Invited** Astronomy Seminar at Queen's University (remote, Kingston, Canada)
- 20-09-2021 **Invited** seminar with the Gaia interest group (remote, Cambridge, England)
- 09-09-2021 **Invited** seminar at the Kapteyn Astronomical Institute (remote, Groningen, Netherlands)
- 23-06-2021 **Invited** seminar at Harvard's Particle Theory Journal Club (remote, Cambridge, USA)
- 22-06-2021 **Invited** MPA Cosmology Seminar (remote, Munich, Germany)
- 04-06-2021 **Invited** seminar at Observatoire de Strasbourg (remote, Strasbourg, France)
- 29-01-2021 **Invited** seminar with the Gaia interest group (remote, Cambridge, England)
- 03-09-2019 Gaia Treasure Hunt conference (Cambridge, England)
- 12-08-2019 CCAPP Summer Lecture Series, Ohio State University (Columbus, USA)
- 30-07-2019 Joint Statistical Meetings (Denver, USA)
- 19-12-2018 Annual Paris-Amsterdam-London-Stockholm meeting (December 2018, London, England)

PUBLICATIONS

- [1] A. Widmark and A. Naik, *First spiral arm detection using dynamical mass measurements of the Milky Way disk*, arXiv:2401.04571, submitted to A&A.
- [2] S.M. Delos, M. Korsmeier, A. Widmark, C. Blanco, T. Linden and S.D.M. White, *Limits on dark matter annihilation in prompt cusps from the isotropic gamma-ray background*, arXiv:2307.13023, submitted to PRD.
- [3] A. Widmark, T.D. Yavetz and X. Li, *Fuzzy dark matter dynamics in tidally perturbed dwarf spheroidal galaxy satellites*, arXiv:2309.00039, accepted for publication in JCAP.
- [4] A. Naik and A. Widmark, *The missing radial velocities of Gaia: a catalogue of Bayesian estimates for DR3*, arXiv:2307.13398, accepted for publication in MNRAS.
- [5] A. Widmark, M. Korsmeier and T. Linden, *Weighing the Local Interstellar Medium using Gamma Rays and Dust*, PRL **130** (2023) 16.
- [6] A. Widmark, L.M. Widrow and A. Naik, *Mapping Milky Way disk perturbations in stellar number density and vertical velocity using Gaia DR3*, A&A **668** (2022) A95.
- [7] A. Naik and A. Widmark, *The missing radial velocities of Gaia: blind predictions for DR3*, MNRAS **516** (2022) 3.
- [8] K. Bechtol et al., *Snowmass2021 Cosmic Frontier White Paper: Dark Matter Physics from Halo Measurements*, arXiv:2203.07354.
- [9] A. Widmark, J.A.S. Hunt, C.F. Laporte and G. Monari, *Weighing the Galactic disk using phase-space spirals IV. Tests on a three-dimensional galaxy simulation*, A&A **663** (2022) A16.
- [10] A. Widmark, C.F. Laporte, P.F. de Salas and G. Monari, *Weighing the Galactic disk using phase-space spirals III. Probing distant regions of the disk using the Gaia EDR3 proper motion sample*, A&A **663** (2022) A15.
- [11] S. Sivertsson et al., *Estimating the local dark matter density in a non-axisymmetric wobbling disc*, MNRAS **511** (2022) 2.
- [12] P.F. de Salas and A. Widmark, *Dark matter local density determination: recent observations and future prospects*, Rep. Prog. Phys. **84** (2021) 104901.
- [13] A. Widmark, C.F. Laporte, P.F. de Salas and G. Monari, *Weighing the Galactic disk using phase-space spirals II. Most stringent constraints to a thin dark disk using Gaia EDR3*, A&A **653** (2021) A86.
- [14] A. Widmark, C.F. Laporte and P.F. de Salas, *Weighing the Galactic disk using phase-space spirals I. Tests on one-dimensional simulations*, A&A **650** (2021) A124.
- [15] A. Widmark, P.F. de Salas and G. Monari, *Weighing the Galactic disk in sub-regions of the solar neighbourhood using Gaia DR2*, A&A **646** (2021) A67.
- [16] A. Widmark, K. Malhan, P.F. de Salas and S. Sivertsson, *Measuring the matter density of the Galactic disc using stellar streams*, MNRAS **496** (2020) 3.
- [17] A. Widmark, *21 cm cosmology and spin temperature reduction via spin-dependent dark matter interactions*, JCAP **1906** (2019) 014.
- [18] A. Widmark, *Measuring the local matter density using Gaia DR2*, A&A **623** (2019) A30.
- [19] A. Widmark, D. Mortlock and H.V. Peiris, *Inferring properties of the local white dwarf population in astrometric and photometric surveys*, MNRAS **485** (2019) 1.
- [20] A. Widmark and G. Monari, *The dynamical matter density in the solar neighbourhood inferred from Gaia DR1*, MNRAS **482** (2019) 1.
- [21] A. Widmark, B. Leistedt and D.W. Hogg, *Inferring binary and trinary stellar populations in photometric and astrometric surveys*, ApJ **857** (2018) 2.
- [22] A. Widmark, *Thermalization time scales for WIMP capture by the Sun in effective theories*, JCAP **1705** (2017) 046.
- [23] R. Catena and A. Widmark, *WIMP capture by the Sun in the effective theory of dark matter self-interactions*, JCAP **1612** (2016) 016.