

# DOMINIKA ĎUROVČÍKOVÁ

CIRRICULUM VITAE

Massachusetts Institute of Technology  
McNair Building (MIT Building 37)  
70 Vassar St, Cambridge, MA 02139

Email: [dominika@mit.edu](mailto:dominika@mit.edu)  
Website: [dominikadu.github.io](https://dominikadu.github.io)  
ORCID: [0000-0001-8986-5235](https://orcid.org/0000-0001-8986-5235)

## EDUCATION

### PhD in Physics

2020 - 2026 (*expected*)

Massachusetts Institute of Technology, Cambridge, MA, USA

- Advisors: Prof. Anna-Christina Eilers, Prof. Robert A. Simcoe
- Primary research area: high-redshift astrophysics
- Other research areas: precision quantum metrology (with Prof. Vivishek Sudhir)

### Master of Physics (4-year MPhys)

2016 - 2020

University of Oxford, Oxford, United Kingdom

- Degree classification: First class
- Graduate thesis in astrophysics with Prof. Adrianne Slyz and Prof. Julien Devriendt
- Graduate concentration in theoretical physics, laser physics and quantum information processing

### International Baccalaureate Diploma

2014 - 2016

Gymnazium Jur Hronec, Bratislava, Slovak Republic

- Score: 42/45 (top of the class)
- Subjects: Physics HL (high-level), Mathematics HL, English B HL, German B SL (standard-level), Psychology SL, Slovak A SL

## RESEARCH EXPERIENCE

### Astrophysics:

#### PhD Research | [Cosmic Dawn Group](#), [MIT Kavli Institute](#)

2022 - present

- Advisors: Prof. Anna-Christina Eilers, Prof. Robert A. Simcoe
- Projects: constraining the timing of Epoch of Reionization and quasar lifetimes using quasar damping wings and proximity zones (1 publication), measuring quasar lifetimes using extended nebular emission with IFU spectroscopy (1 publication, 1 publication in preparation), possible signatures of Population III stars in damped Lyman  $\alpha$  systems (1 publication).

#### Undergraduate Research | [Beecroft Institute of Particle Astrophysics and Cosmology](#)

2017 - 2020

- Advisors: Prof. Adrianne Slyz, Prof. Julien Devriendt
- Projects: role of cooling in galaxy formation simulations (using the FIRE simulation), using machine learning to predict quasar continua for constraining the Epoch of Reionization (1 publication), super-resolution imaging of galaxies using machine learning (Master's thesis).

#### High-School Thesis | [M.R. Štefánik Observatory](#)

2015 - 2016

- Advisor: Dr. Karol Petrík
- Co-initiated transiting exoplanetary research at the observatory and published observations through the Exoplanet Transit Database.

### Quantum sensing:

#### PhD Research | [Quantum and Precision Measurements Group](#), MIT

2020 - 2022

- Advisor: Prof. Vivishek Sudhir
- Designed an experiment that promises to use a single trapped electron to perform precision force sensing to study quantum-gravitational effects (1 publication).

#### Laidlaw Scholar | [LIGO Laboratory](#), MIT

2018

- Advisor: Prof. Nergis Mavalvala
- Designed and built an opto-electronic control system to stabilize a laser to its quantum limit, enabling the preparation of a squeezed light state for the improvement of gravitational wave detectors.

## Other:

**Internship** | [Tearney Laboratory](#), Massachusetts General Hospital 2019

- Advisor: Prof. Guillermo J. Tearney, M.D.
- Developing a new modality of micro-optical coherence tomography.

**Internship** | [Research Center for Quantum Information](#), Bratislava 2017

- Advisor: Dr. Daniel Nagaj
- Simulated the Quantum Approximate Optimization Algorithm (QAOA) in MATLAB.

## AWARDS AND HONORS

MIT School of Science Service Fellowship 2022  
MIT Physics Graduate Service Award 2021  
Bruno Rossi Graduate Fellowship 2020 - 2021  
Scholarship of the College of the Blessed Mary of Winchester 2017 - 2020  
Harvard-MIT Summer Institute for Biomedical Optics Completion Certificate 2019  
Institute of Leadership & Management (ILM) Certificate Level 3 2019  
McKinsey&Company Next Generation Women Leaders Award 2019  
Laidlaw Research and Leadership Scholarship 2018  
Distinction in Physics 2017

## TELESCOPE USE

**Keck/MOSFIRE (PI, 0.5 nights)** 2025  
*A potential weak-line quasar transition at  $z \sim 6$*

**Magellan/FIRE, LDSS3 (PI, 1 nights)** 2024  
*A candidate metal-poor absorption system at  $z \sim 6$*

**Magellan/FIRE (PI, 7 nights)** 2024  
*Exploring the connection between supermassive black hole lifetimes and the history of their galactic environment*

**Magellan/FIRE (PI, 1 night)** 2023  
*Chronicle the reionization history with redshift  $z \sim 6.5$  quasars*

**Co-I:** JWST Cycle 2 GO #3079 (NIRSpec IFU), JWST Cycle 4 GO #6827 (NIRCam WFSS, MIRI), Magellan/LLAMAS, multiple Magellan/FIRE proposals

**Observing experience:** Magellan/FIRE (24 nights), Magellan/LDSS3 (0.5 night), Magellan/LLAMAS (2 nights), Keck/MOSFIRE (0.5 night)

**Data reduction experience:** JWST reduction pipeline, PyPeIt

**Other astronomical data/tool use:** SDSS, DESI, VLT/MUSE, CLOUDY

## TEACHING AND MENTORING

**Research Mentor** | [MIT Undergraduate Research Opportunities Program](#) 2023 - 2024

- Supervised two undergraduate students on a high-redshift quasar research project.

**Teaching Assistant** | MIT Department of Mechanical Engineering 2022

- Co-developed a new course on classical and quantum stochastic processes (course number 2.S982).
- Created and marked 7 problem sets, hosted weekly office hours, and marked final presentations.

**Lecturer** | [Discover Summer Academy](#) 2022

- Designed and taught a week-long course on quantum physics (twice) and on black holes (once) to high school students from Slovakia and Czech Republic.
- Facilitated team-building and self-reflection sessions in three teams of  $\sim 10$  students.

**Research Mentor** | EWAAB Young Professionals Program 2021

- Supervised a team of 5 female undergraduate students for a period of 6 weeks on a research project related to simulating electric fields in an electromagnetic trap.
- Led online workshops on solving the Laplace equation and building precision force detectors.

INVITED TALKS	ENIGMA Group Meeting, UC Santa Barbara, Santa Barbara, CA	05/2025
	Astro Lunch, UC Santa Barbara, Santa Barbara, CA	05/2025
	High-redshift Meeting, Harvard & Smithsonian Center for Astrophysics, Cambridge MA	04/2025
	Slovak Technical University, Trnava, Slovak Republic	03/2025
	IEEE Buenaventura Section	11/2024
	Summer Conference on Particle Physics Solid State Physics, University of Tennessee, TN	07/2024
	Science coffee at Charles University, Prague, Czech Republic	02/2024
	State of the Universe seminar, Tata Institute of Fundamental Research, Mumbai, India	12/2023
	Modern statistics of galaxies seminar, University Observatory of LMU, Munich, Germany	09/2023
	MIT Kavli Institute Journal Club, Cambridge, MA	02/2022
CONFERENCE TALKS	Particle Physics/Astrophysics/Machine learning Seminar, Oxford, UK	02/2020
	The First Gigayear(s) Conference, Hilo, HI	10/2024
	EREBUS/JWST workshop, Hilo, HI	09/2024
	First Stars VII, New York City, NY	05/2024
	Reionization in the Summer, Heidelberg, Germany	06/2023
	* First Light Conference, Cambridge, MA	06/2023
	Conference on Lasers and Electro-Optics (CLEO), San Jose, CA	05/2022
	* MIT QSEC Annual Research Conference, Cambridge, MA	02/2022
	Global Young Scientists Summit, Singapore	01/2021
	Summer All Zoom Epoch of Reionization Astronomy Conference (SAZERAC)	07/2020
	* Royal Society-FAPESP Frontiers of Science Meeting, São Paulo, Brazil	03/2020
	* Wellman Scientific Retreat, Boston, MA	09/2019
	* Harvard-MIT Summer Institute for Biomedical Optics Poster Day, Boston, MA	08/2019
	Harvard-MIT Summer Institute for Biomedical Optics Presentations, Boston, MA	07/2019
	* Laidlaw Research and Leadership Programme Poster Event, Oxford, UK	10/2018
	MIT Kavli Institute Undergraduate Research Symposium Cambridge, MA	08/2018
	* poster presentations	
CONFERENCE ATTENDANCE	Boston-Area Black Hole Accretion Meeting,	10/2023
	Harvard & Smithsonian Center for Astrophysics, Cambridge, MA	
	APS Virtual Division of Atomic, Molecular and Optical Physics (DAMOP) Meeting	06/2020
	First Light and Reionisation Epoch Meeting at Royal Astronomical Society, London, UK	02/2020
PUBLIC TALKS	FUTURE of Physics at California Institute of Technology, Pasadena, CA	11/2018
	Slovak PRO Summit, Consulate General of Slovakia in New York, New York City, NY	09/2024
	Slovak Astrophysicists in Boston, Cambridge, MA	03/2024
OUTREACH AND SERVICE WORK	<b>Referee for:</b> The Astrophysical Journal, Physical Review Journals	
	<b>Co-director</b>   <a href="#">MIT Astrogazers</a>	2023 - 2024
	• Bringing the wonders of observational astronomy to the streets of Cambridge and Boston (and occasionally beyond).	
	<b>Local Organizing Committee Member</b>   <a href="#">First Light Conference</a>	2023
	<b>Vice-President for Admissions</b>   MIT Physics Graduate Student Council	2021 - 2022
	• Oversaw and coordinated student initiatives related to improving equity in admissions to the MIT Physics graduate program.	
	• Collaborated with the Physics Graduate Student Council leadership on improving the student experience at MIT Physics.	

**Student Leader** | MIT Physics Department Graduate Admissions Advisory Council 2020 - 2022

- Co-designed and launched three new student-led resources under the umbrella of [PhysGAAP](#) to increase equity in the MIT Physics graduate admissions process.
- Collaborated with student leaders from other MIT departments to achieve a more uniform change in admissions across MIT.

**Co-Founder** | [EWAAB Nonprofit Organisation](#) 2019 - present

- Co-founded EWAAB as an initiative to support confidence in university-level women. We aim to encourage young women to step out of their comfort zone, to provide them with a set of leadership and communication skills to be able to do so, and to connect them to a global network of peers and supporters. Featured in the [Scientific American](#) and [SME](#) (the largest Slovak newspaper).
- Transformed the original initiative into a 501(c)3 nonprofit organization supported by 9 Trustees.
- Co-designed the curriculum of the 2019/20 mentorship program and managed a successful launch of its inaugural year at 8 universities around the world, spanning Canada to Australia, together impacting 27 mentees in 6 countries.

**President, STEM Leader, STEM Advisor** | Unimak 2016 - 2020

- Led over 80 members of this organisation to spread awareness of the possibilities for young Slovaks and Czechs to study at world leading universities via outreach talks, online media, and advice on issues related to choosing and applying to universities.

## PUBLICATIONS

12. **Ďurovčíková**, Eilers, Simcoe, Welsh, Meyer, Matthee, Ryan-Weber, Yue, Katz, Satyavolu, Becker, Davies, Farina. An extremely metal-poor Lyman- $\alpha$  emitter candidate at  $z = 6$  revealed through absorption spectroscopy. [ApJL 987 L33 \(2025\)](#).
11. **Ďurovčíková**, Sudhir. Scheme for continuous force detection with a single electron at the level of  $10^{-27}$  N. [PR Applied 23\(5\) p.054088 \(2025\)](#).
10. **Ďurovčíková**, Eilers, Meyer, Farina, Bañados, Davies, Hennawi, Mazzucchelli, Simcoe, Walter. Quasar lifetime measurements from extended Ly $\alpha$  nebulae at  $z \sim 6$ . [arXiv:2505.00080 \(2025\)](#).
9. Greig, Bosman, Davies, **Ďurovčíková**, Fathivavsari, Liu, Meyer, Sun, D'Odorico, Gallerani, Mesinger, Ting. Blind QSO reconstruction challenge: exploring methods to reconstruct the Ly $\alpha$  emission line of QSOs. [MNRAS 533\(3\) pp.3312–3343 \(2024\)](#).
8. **Ďurovčíková**, Eilers, Chen, Satyavolu, Kulkarni, Simcoe, Keating, Haehnelt, Bañados. Chronicling the reionization history at  $6 \lesssim z \lesssim 7$  with emergent quasar damping wings. [ApJ 969 162 \(2024\)](#).
7. Soria, De, **Ďurovčíková**, Simcoe, Karambelkar, Hankins, Kasliwal, Sokoloski, Ashley, Babul, Lau, Moore, Ofek, Sharma, Soon, Travouillon. Magellan/FIRE spectroscopy of AT2023tow: Confirmation of a young, highly reddened Galactic Fe II nova with CO emission. [ATel #16255 \(2023\)](#).
6. Eilers, Simcoe, Yue, Mackenzie, Matthee, **Ďurovčíková**, Kashino, Bordoloi, Lilly. EIGER III. JWST/NIRCam observations of the ultra-luminous high-redshift quasar J0100+2802. [ApJ 950 68 \(2023\)](#).
5. Komori, **Ďurovčíková**, Sudhir. Quantum theory of feedback cooling of an anelastic macro-mechanical oscillator. [PRA 105\(4\) p.043520 \(2022\)](#).
4. Bosman, **Ďurovčíková**, Davies, Eilers. A comparison of quasar emission reconstruction techniques for  $z \geq 5.0$  Lyman- $\alpha$  and Lyman- $\beta$  transmission. [MNRAS 503\(2\) pp.2077–2096 \(2021\)](#).
3. Reiman, Tamasas, Prochaska, **Ďurovčíková**. Fully probabilistic quasar continua predictions near Lyman- $\alpha$  with conditional neural spline flows. [arXiv: 2006.00615 \(2020\)](#).
2. Katz, **Ďurovčíková**, Kimm, Rosdahl, Blaizot, Haehnelt, Devriendt, Slyz, Ellis, Laporte. New Methods for Identifying Lyman Continuum Leakers and Reionization-Epoch Analogues. [MNRAS 498\(1\) pp.164–180 \(2020\)](#).
1. **Ďurovčíková**, Katz, Bosman, Davies, Devriendt, Slyz. Reionization history constraints from neural network based predictions of high-redshift quasar continua. [MNRAS 493\(3\) pp.4256–4275 \(2020\)](#).