Dominika Ďurovčíková

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EDUCATION

Doctor of Philosophy in Physics | Massachusetts Institute of Technology, USA 09/2020 - present
Research advisor: Professor Vivishek Sudhir, PhD
Research area: Precision Quantum Metrology

Master of Physics (4-year MPhys) | University of Oxford, United Kingdom 10/2016 - 07/2020
Degree classification: First class
Graduate concentration:
- Laser Physics and QIP: laser physics, non-linear and quantum optics, quantum information and computing
- Theoretical Physics: classical and quantum field theory, Landau theory, introduction to stochastic processes

Graduate thesis: Cross-Telescopic Super-Resolution Galaxy Images from Generative Adversarial Networks

International Baccalaureate Diploma | Gymnazium Jur Hronec, Bratislava, Slovak Republic 09/2014 - 06/2016
Score: 42/45
Subjects: Physics HL, Mathematics HL, English B HL, German B SL, Psychology SL, Slovak A SL.

RESEARCH EXPERIENCE

Bruno Rossi Graduate Fellow | Quantum and Precision Measurements Group, MIT, USA 09/2020 - present
Supervisor: Professor Vivishek Sudhir, PhD
Designing a precision metrology experiment for Unruh radiation detection to illuminate the interface between quantum physics and general relativity.

Student Researcher | Beecroft Institute of Particle Astrophysics and Cosmology, Oxford, UK 10/2017 - 08/2020
Supervisor: Professor Adrianne Slyz, PhD, Professor Julien Devriendt, PhD
Galaxy super-resolution imaging:
Implemented a super-resolution generative adversarial network to increase the resolution and denoise galaxy images from ground-based telescopes, thus transforming them to Hubble Space Telescope-like quality.

Quasar continua & Epoch of Reionization:
Developed a machine learning based approach to reconstructing high-redshift quasar spectra around Ly-α to study the Epoch of Reionization that improves on the state-of-the-art model by 14%.

Cooling in galaxy formation simulations:
Completed a project on the effect of radiative cooling on galaxy star formation rates in cosmological simulations, comparing the RAMSES and FIRE cooling functions.

Student Intern | Tearney Laboratory, Massachusetts General Hospital, Boston, MA 07/2019 - 09/2019
Supervisor: Professor Guillermo J. Tearney, MD, PhD
Created a proof of concept of a new version of the micro-optical coherence tomography, which extends the medical imaging technology to include information about cellular dynamics in addition to the currently available structural information.

Laidlaw Scholar | LIGO Laboratory, Massachusetts Institute of Technology, Cambridge, MA 07/2018 - 09/2018
Supervisor: Professor Nergis Mavalvala, PhD
Designed and built an opto-electronic control system called the laser intensity stabilisation servo to produce a quantum-noise limited laser beam at 100 Hz - 50 kHz. This system is now used to produce optomechanically squeezed states of light to explore their possible use in future gravitational wave detectors.

Student Intern | Research Center for Quantum Information, Bratislava, Slovakia 06/2017 - 08/2017
Supervisor: Daniel Nagaj, PhD
Completed a project on the Quantum Approximate Optimization Algorithm (QAOA) and its possible variations and applied the algorithm to the NP-complete problem MAXCUT.

Co-Researcher | M.R. Štefánik Observatory, Hlohovec, Slovakia 02/2015 - 10/2016
Supervisor: Karol Petrík, PhD
Co-initiated exoplanetary research at the observatory and investigated the transiting exoplanet TrES-1 b in Lyra through multi-band photometric observations, data reduction in Muniwin, and transit light curve analysis.

CERTIFICATES & SCHOLARSHIPS

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

PUBLICATIONS

4. Bosman, S.E., **Ďurovčíková, D.**, Davies, F.B. and Eilers, A.C., 2021. A comparison of quasar emission reconstruction techniques for $z \geq 5.0$ Lyman-α and Lyman-β transmission. Monthly Notices of the Royal Astronomical Society, Volume 503, Issue 2, May 2021, Pages 2077–2096.
3. Reiman, D.M., Tamanas, J., Prochaska, J.X. and **Ďurovčíková, D.**, 2020. Fully probabilistic quasar continua predictions near Lyman-α with conditional neural spline flows. arXiv preprint arXiv:2006.00615.
2. Katz, H., **Ďurovčíková, D.**, Kimm, T., Rosdahl, J., Blaizot, J., Haehnelt, M.G., Devriendt, J., Slyz, A., Ellis, R. and Laporte, N., 2020. New Methods for Identifying Lyman Continuum Leakers and Reionization-Epoch Analogues. Monthly Notices of the Royal Astronomical Society, Volume 498, Issue 1, October 2020, Pages 164–180.
1. **Ďurovčíková, D.**, Katz, H., Bosman, S.E.I., Davies, F.B., Devriendt, J., Slyz, A., 2020. Reionization history constraints from neural network based predictions of high-redshift quasar continua. Monthly Notices of the Royal Astronomical Society, Volume 493, Issue 3, April 2020, Pages 4256–4275.

CONFERENCES & TALKS

Talk:	*On the Unruh effect and its measurement*, MIT Kavli Institute Graduate Lunch	04/2021
Workshops:	*Solving Laplace equation; A single electron as an Unruh radiation detector*, EWAAB Young Professionals Program	03/2021
Video:	*Exploring the Quantum-Gravity Interface through Precision Measurements* Global Young Scientists Summit	01/2021
Talk:	*Neural networks for the early Universe*, Summer All Zoom Epoch of Reionization Astronomy Conference (SAZERAC)	07/2020
Attendee:	APS Virtual Division of Atomic, Molecular and Optical Physics (DAMOP) Meeting	06/2020
Poster:	*Neural networks for the early Universe*, Royal Society-FAPESP Frontiers of Science Meeting, São Paulo	03/2020
Talk:	*Neural networks for the early Universe*, Particle Physics/Astrophysics/Machine learning Seminar, Oxford	02/2020
Attendee:	First Light and Reionisation Epoch Meeting at Royal Astronomical Society, London	02/2020
Poster:	*Developing a motion-weighted micro-optical coherence tomography for in vivo dynamical imaging*, Wellman Scientific Retreat, Boston, MA	09/2019
Poster:	*Developing a motion-weighted micro-optical coherence tomography for in vivo dynamical imaging*, Harvard-MIT Summer Institute for Biomedical Optics Poster Day, Boston, MA	08/2019
Talk:	*Dynamical micro-OCT: principles and challenges*, Harvard-MIT Summer Institute for Biomedical Optics Presentations, Boston, MA	07/2019
Attendee:	FUTURE of Physics at California Institute of Technology, Pasadena, CA	11/2018
Poster:	*Building a laser intensity stabilisation servo (ISS) for the use of optomechanical squeezing in future GW detectors*, Laidlaw Research and Leadership Programme Poster Event, Oxford	10/2018
Talk:	*How to quiet a laser? Laser Intensity Stabilisation Servo for Optomechanical Squeezing Experiment*, MIT Kavli Institute Undergraduate Research Symposium, Cambridge, MA	08/2018
Talk:	*Squeezed States of Light & GW detection*, Presentations at New College, Oxford	02/2018

COMMUNITY ENGAGEMENT

Student Representative | MIT Physics Department Graduate Admissions Advisory Council 07/2020 - present

Co-designed and launched two new student-led resources [link] to increase equity in the MIT Physics graduate process. One of these is the graduate admissions assistance program (PhysGAAP) which aims to provide mentors

to applicants who are disadvantaged in the MIT Physics graduate admissions process due to a lack of resources and historical underrepresentation.

Participated in weekly council meetings focused on analysing and assessing the current graduate admissions process and improving its equity and inclusivity to applicants from diverse and untraditional backgrounds.

Co-Founder | EWAAB Nonprofit Organisation | ewaab.org 06/2019 - 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.

Transformed the original initiative into a 501(c)3 nonprofit organisation currently supported by 3 board members, 15 admin volunteers and 9 high-profile advisors.

Co-designed the curriculum of the EncourageHer 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.

Featured in the Scientific American and SME (the largest Slovak newspaper).

President, STEM Leader, STEM Advisor | Unimak 09/2016 - 09/2020

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.

Vice-President | Oxford University Czech and Slovak Society 03/2017 - 03/2018

Built the Slovak-Czech community in Oxford by co-organizing 15 events throughout the year, ranging from the annual dinner commemorating the Velvet Revolution, discussions with interesting Czech and Slovak citizens, to movie nights.

SKILLS

IT Proficiency: Python, MATLAB, Mathematica, GitHub, CAD, COMSOL, Zemax, Muniwin

Language Proficiency: Slovak (native), Czech (native), English (fluent), German (advanced), Spanish (beginner)