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 focus: probing the interface of quantum physics and relativity through precision metrology

Master of Physics (4-year MPhys) | University of Oxford, United Kingdom 10/2016 - 7/2020
Degree classification: First class

- Graduate concentration: Laser Physics and QIP (laser physics, non-linear and quantum optics, quantum information processing, quantum 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 9/2014 - 6/2016
Score: 42/45

- Subjects: Physics HL, Mathematics HL, English B HL, German B SL, Psychology SL, Slovak A SL.

RESEARCH EXPERIENCE

Student Researcher | Beecroft Institute of Particle Astrophysics and Cosmology, Oxford, UK 10/2017 - present
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 14.2%.

Cooling in 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 7/2019 - 9/2019
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 7/2018 - 9/2018
Supervisor: Professor Nergis Mavalvala, PhD

- Designed and built an opto-electronic control system called the laser intensity stabilisation servo to produce a shot-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 6/2017 - 8/2017
Supervisor: Daniel Nagaj, PhD

- Completed a project on the Quantum Approximate Optimization Algorithm (QAOA) and its possible variations in relation to the NP-complete problem called MAXCUT.

Co-Researcher | M.R. Štefánik Observatory, Hlohovec, Slovakia 2/2015 - 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 in Astrophysics	2020
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

CONFERENCES & TALKS

Recorded talk:	*Neural networks for the early Universe*, Summer All Zoom Epoch of Reionization Astronomy Conference (SAZERAC)	7/2020
Attendee:	APS Virtual Division of Atomic, Molecular and Optical Physics Meeting	6/2020
Poster:	*Neural networks for the early Universe*, Royal Society-FAPESP Frontiers of Science Meeting, Sao Paulo	3/2020
Talk:	*Neural networks for the early Universe*, Particle Physics/Astrophysics/Machine learning Seminar, Oxford	2/2020
Attendee:	First Light and Reionisation Epoch Meeting at Royal Astronomical Society, London	2/2020
Poster:	*Developing a motion-weighted micro-optical coherence tomography for in vivo dynamical imaging*, Wellman Scientific Retreat, Boston, MA	9/2019
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	8/2019
Talk:	*Dynamical micro-OCT: principles and challenges*, Harvard-MIT Summer Institute for Biomedical Optics Presentations, Boston, MA	7/2019
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	8/2018
Talk:	*Squeezed States of Light & GW detection*, Presentations at New College, Oxford	2/2018

PUBLICATIONS

1. Bosman, S.E., **Ďurovčíková, D.**, Davies, F.B. and Eilers, A.C., 2020. A comparison of quasar emission reconstruction techniques for $z \geq 5.0$ Lyman-α and Lyman-β transmission. arXiv preprint arXiv:2006.10744.
2. 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.
3. 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. arXiv preprint arXiv:2005.01734.
4. **Ďurovčíková, D.**, Katz, H., Bosman, S.E.I., Davies, F.B., Devriendt, J., Slyz, A., 2019. 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.

COMMUNITY ENGAGEMENT

Co-Founder, BoD Member | Encouraging Women Across All Borders (EWAAB) | ewaab.org 6/2019 - present
Co-designed a mentorship program targeting first-year female undergraduate students. We aim to encourage women to be more confident and open-minded, to provide them with a set of leadership and communication tools, and to connect them to a global network of inspirational women currently spanning 8 universities around the world.

President, STEM Leader, STEM Advisor | Unimak 9/2016 - present
Leading over 60 members 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 3/2017 - 3/2018
Co-organized 15 events throughout the year, ranging from the annual dinner commemorating the Velvet Revolution, discussions with interesting Czech and Slovak citizens, to movie nights, thus connecting Czechs and Slovaks in Oxford.

SKILLS & INTERESTS

IT Proficiency: Python, MATLAB, GitHub, Zemax, Muniwin
Language Proficiency: Slovak (native), Czech (native), English (fluent), German (advanced), Spanish (beginner)
Interests: ukulele, drawing and painting, baking