

Dimitri UNUCHEK

Personal Details

📍 Lausanne, Switzerland
✉ d.s.unuchek@gmail.com
☎ +41 76 817 22 92



Languages

🇬🇧 English ●●●●●
🇷🇺 Russian ●●●●●
🇫🇷 French ●●●●●
🇩🇪 German ●
🇪🇸 Spanish ●

Technical Skills

Cryogenics

- ♦ broad experience in low-T UHV systems
- ♦ setting up and maintaining dilution fridge
- ♦ wet and dry systems with high magnetic fields

Electrical Transport

- ♦ quantum devices design and simulation
- ♦ low-noise / low-current / low-T measurements
- ♦ lock-in and current amplifiers
- ♦ spintronics and spin measurements

Optical Measurements

- ♦ chip integrated photonics (PIC)
- ♦ continuous wave / ultrafast laser spectroscopy
- ♦ optical setup assembly and alignment

Clean Room Microfabrication

- ♦ photo-/ebeam lithography, ALD, PECVD
- ♦ physical deposition, wet and dry etching
- ♦ wafer dicing, wire bonding

Metrology / Material Characterisation

- ♦ AFM, STM, SEM, FIB, PL, Raman, ellipsometry

Computer skills

Programming and Numerical Simulation

- ♦ Python, LabVIEW, C, Mathematica, MATLAB
- ♦ Version control in git, GitLab
- ♦ Zemax - optical design, ray tracing
- ♦ COMSOL - multiphysics device simulation
- ♦ Lumerical - FDTD photonics simulations

Data Analysis and Image Processing

- ♦ Python (SciPy, Matplotlib, Pandas, OpenCV)
- ♦ Igor Pro, Origin, ImageJ, GnuPlot

Design Tools

- ♦ Adobe Illustrator, DesignCAD, SolidWorks

Hobbies

- ♦ Endurance sports, Triathlon
- ♦ IM70.3 in 4h18'
- ♦ Matterhorn summit in 2h26'



PROFESSIONAL EXPERIENCE

2022–present. RnD director, Freshape, Switzerland

- ♦ Leading 30-member RnD division (4 teams, 7 direct reports including HW team)
- ♦ Driving development of 5 products in the fields of electronics and renewable energy
- ♦ Managing a portfolio of patents and steering IP strategy to protect key innovations
- ♦ Launched career-growth initiatives and cross-team chapters to foster innovation
- ♦ Implemented OKR framework aligned to product milestones, boosting delivery quality and shortening cycle times

2020–2022. RnD manager, Freshape (former H.Glass), Switzerland

- ♦ Built and guided cross-disciplinary team of 12 people incl. material scientists, HW (optical, mechanical, electrical) and SW (algo, FW) engineers
- ♦ Drove product development from POC to industrialization
- ♦ Managed a 2-year, \$0.5 M federal-grant collaboration with CSEM

2019–2020. Scientist, H.Glass, Switzerland.

- ♦ Conceived and prototyped a novel photovoltaics product, securing budget for further dev.
- ♦ Doubled efficiency of the organic PV cell with optimization of materials and fabrication

2015–2019. Doctoral Assistant, Nano-Electronics Lab, EPFL, Switzerland

- ♦ Research of quantum phenomena in 2-dimensional systems

Main Achievements:

- ♦ Demonstration of the first excitonic transistors operational at room-temperature
- ♦ 12 publications in high impact journals including Nature

Other Projects:

- ♦ Development of spintronic and opto-spintronic devices based on 2D materials
- ♦ Development of the electrically pumped laser based on 2D materials
- ♦ Integration of 2D LED/photodetector with waveguides and photonic cavities

Key Responsibilities (quantum devices from A to Z):

- ♦ Developing novel device architectures, numerical simulations, experiment design
- ♦ Cleanroom microfabrication of optoelectronic devices and photonic structures
- ♦ Electrical transport and optical measurements of fabricated devices
- ♦ Designing and assembling cryogenic setups for complex optical experiments
- ♦ Mentoring master and PhD students and their research projects



EDUCATION

2015–2019. EPFL, Lausanne, Switzerland

Ph.D. in Electrical engineering

- ♦ Doctoral school of Microsystems and Microelectronics (EDMI) at EE department

2013–2015. Ecole Polytechnique (X), Paris, France

M.Sc. in Physics. Thesis: "Synthesis and characterization of nanomaterials"

- ♦ M1 "Physics for Optics and Nanosciences" and M2 "Nanosciences"
- ♦ Ranked 1st in the class. M1 GPA: 3.91/4. M2 GPA: 3.81/4.

2009–2013. MIPT, Moscow, Russia

B.Sc. in Physics and Technology of Nanostructures

- ♦ Faculty of General and Applied Physics. Diploma with high honors. GPA: 4.94/5



TEACHING EXPERIENCE

2015–2019. Teaching Assistant of "Measuring Systems" at EPFL

- ♦ Supervising and guiding electrical engineering students
- ♦ Conducting theoretical and experimental classes
- ♦ Prototyping on NI ELVIS board and LabVIEW programming

2009–10. Teacher, Distance School of Physics and Technology at MIPT

- ♦ Students counseling and correction of their works



EXTRACURRICULAR EXPERIENCE

2018. Organizer, Summer School "Optoelectronics on 2D materials"

- ♦ Fundraising (40k CHF), sponsorship search, and venue arrangement
- ♦ Speakers selection, invitation, and their travel arrangement; participants selection
- ♦ School promotion, website and school's design development

2012. Jury, Final Round of National Physics Olympiad

- ♦ Organization of theoretical and experimental rounds
- ♦ Correcting and grading participants' works including tête-à-tête appeals



SELECTED PUBLICATIONS

First Authorship / Equal Contribution*

- ♦ D. Unuchek et al., "Room-temperature electrical control of exciton flux in a van der Waals heterostructure", **Nature**, 2018
- ♦ D. Unuchek et al., "Valley-polarized exciton currents in a van der Waals heterostructure", **Nature Nano**, 2019
- ♦ A. Ciarrocchi*, D. Unuchek* et al., "Polarization switching and electrical control of interlayer excitons in two-dimensional van der Waals heterostructures", **Nature Photonics**, 2019
- ♦ J. Gonzalez*, D. Unuchek* et al., "MoS₂ photodetectors integrated with photonic circuits", **Nature npj 2D materials**, 2019
- ♦ A. Avsar*, D. Unuchek* et al., "Optospintronics in Graphene *via* Proximity Coupling", **ACS Nano**, 2017

Other Authorship

- ♦ J. Gonzalez, D. Unuchek et al., "Room-temperature electrical control of polarization and emission angle in a cavity-integrated 2D pulsed LED", **Nature Communications**, **2022**
- ♦ A. Avsar, A. Ciarrocchi, M. Pizzochero, D. Unuchek, O. Yazyev, A. Kis, "Layer-modulated magnetism in two-dimensional metallic PtSe₂", **Nature Nanotechnology**, **2019**



CONFERENCE PRESENTATIONS

- ♦ **2019** American Physical Society March Meeting. Boston, USA
D. Unuchek et al., "Electrostatic control of exciton flux in van der Waals heterostructures"
- ♦ **2018** Flatlands Beyond Graphene. Leipzig, Germany
D. Unuchek et al., "Control of interlayer excitons in two-dimensional van der Waals heterostructures"
- ♦ **2018** American Physical Society March Meeting. Los Angeles, USA
D. Unuchek et al., "Reconfigurable Diodes Based on Vertical WSe₂ Transistors with van der Waals Bonded Contacts"
- ♦ **2018** GRC Two Dimensional Electronics Beyond Graphene. Easton, USA
D. Unuchek et al., "Optospintronics in Graphene *via* Proximity Coupling"
- ♦ **2017** Flatlands Beyond Graphene. Lausanne, Switzerland
D. Unuchek et al., "Atomically thin electrically tunable light-emitting diodes"



PATENTS

- ♦ US 17/926,750 - "Multilayer Electronic Device and Method for Producing the Same" - **Granted**
- ♦ EP4152184.A1 - "Process of signing documents" - **Granted**
- ♦ WO2022208130A1 - "Dispersive optical device, dispersive optical system comprising the same"
- ♦ WO2023031655A1 - "Sunlight steering apparatus and solar energy harvesting system comprising the same"
- ♦ WO2023175034A1 - "Light collecting assembly"
- ♦ WO2023175034A1 - "Optical system for a position determination device"
- ♦ WO2024184765A1 - "Method of detecting and processing spatially-distributed two-dimensional markers"
- ♦ WO2019229653A1 - "Excitonic device and operating methods thereof"
- ♦ Not yet published: EP24162349.5, EP24161016.1, EP24161026.0



AWARDS

Scientific recognition

- ♦ **2020** Gilbert Hausmann Award "*For ground-breaking work on the realization of the first room-temperature exciton transistor and exceptional contributions to the understanding of exciton transport in two-dimensional semiconductors.*"
- ♦ **2019** Featured on the cover of the Nature Photonics (volume 13, issue 2)

Scholarships

- ♦ **2013–15** Two years of "Paris-Saclay" master scholarship
- ♦ **2012–13** "Presidential Scholarship" for outstanding academic performance
- ♦ **2012–13** Scholarship "Lift to the Future" for outstanding research and academic performance
- ♦ **2010, 12** Scholarship of "Foundation for the Development of Natural Science Innovation Education"

Awards

- ♦ **2009** Presidential Award for Talented Youth
- ♦ **2007, 08, 09** Moscow Governor's Youth Award

Science Olympiads Medals

- ♦ **2008** Silver medal at International Physics Olympiad "Tuymaada"
- ♦ **2008** Bronze medal at Russian National Physics Olympiad