Dimitri UNUCHEK

Personal Details

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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

2022–2025. RnD director, **Freshape, Switzerland**
- Led 30-member RnD division (4 teams, 7 direct reports including HW team)
- Drove development of 5 products in the fields of electronics and renewable energy
- Managed a portfolio of patents and steered 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
- Led product development from POC to industrialization, resolving cost-perf trade-offs
- Drove system-level integration across hardware, algorithms and software
- 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
- Received 2 awards for outstending thesis

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., "MoS_2 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 $PtSe_2$", **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 WSe_2 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 semicondcutors.*”
- **2020** EDMI Thesis Distinction Award
- **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