Patrick O'Brien

Cryogenic Engineer | Leiden Cryogenics

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Leiden, South Holland
Born on the 24th of February 1999 from Kilkenny, Ireland

Cryogenic engineer with a robust background in experimental physics and RF techniques. Passionate about the development and applications of quantum technology. Strong understanding of the underlying physics of these devices and the materials used to create them.

Work Experience

Present – April 2024 | **Cryogenic Engineer, Leiden Cryogenics, NL**

- Scientist responsible for the testing and installation of the world's most advanced dilution refrigerators to customers all over the world.
- Project manager for industrial and academic customers. Systems engineer for DC, RF, optical and mechanical components inside cryostats. Experience with regulatory compliance of complex systems
- Developer of user-friendly software and hardware stack to interface cryostat electronics.
- Designer of cryostat probes and plates with CAD software to be built in-house, with a strong knowledge of cryogenic engineering techniques.
- Responsible for installation and site-acceptance-testing of DR systems, including training and support for the end-user.

Dilution Refrigerator | Python | Low-Temperature Physics | Project Management | Customer Support

April 2024 – Nov 2023 | **Support Technician, Delft Circuits, NL**

- Cleanroom technician responsible for the fabrication of high density coax cabling, including the integrated microwave electronic components.
- Measurement team for RF characterisation and quality control of all assemblies at 4K.
- Responsible for leak-testing and vacuum sealing KF flanges. Created plan to vacuum seal 23 KF-40 flanges within two weeks, and carried out the process with 100% yield.

Microwave Electronics | Cryogenics | RF Measurements & Troubleshooting

Education

Grad. 10/2023 — Research Masters in Quantum Matter & Optics, Leiden University
Cum Laude, Grade 8.1 / 10.0

Grad. 10/2021 — Bachelor of Arts in Physical Sciences, Trinity College Dublin
Gold Medal for Academic Excellence, First Class Honours

Research Experience

September 2023 – April 2023 | **Master's Thesis | Chiral Monolayers as Spin Selectors in Graphene Top Contacts, Leiden University, NL**

- Exceeded scope of independent master's research project, without a direct PhD supervisor.
- *Materials Engineering :* Design, fabrication and testing of experimental setup & devices in clean, unreactive environments. Capable of making continuous improvements on repetitive processes.
- *Advanced Numerical Simulations :* First-principles multi-physics simulations in Python to simulate electrical current pathways and magnetic stray field distribution.
- *Automated Measurements :* Applied Python & Lua to integrate experimental setup and automate measurements, storage and plotting of data to significantly improve efficiency.
- *Research Collaboration :* Collaborated with the chemistry department to grow graphene monolayers.

Nanofabrication | Optical Lithography | Chip Design | Python | Lua

February 2023 – October 2022

Master's Thesis | Integrating Superconducting Electronics on a Tuning Fork AFM, QuantaMap, NL

- Prototype development for quantum technology start-up developing novel local microscopy
- *Company Environment :* Experience working in a Quantum start-up environment (QuantaMap)
- *Complex Nanofabrication :* Solved longstanding (1.5 years) problem of patterning films on non-planar substrates by off-axis sputter-deposition atop a tuning fork AFM probe.
- *Material Science :* Changed superconducting film from NbTi to NbTiN to vastly increase device working temperature to 10*K*, by developing and optimizing a reactive sputtering process in the cleanroom.
- *Low-Temp Physics :* Electron beam lithography & cryogenic transport measurements to characterise superconducting thin-films

Superconducting Circuits | Sputtering | Electron Beam Lithography | Autodesk Inventor | Material Science

April 2023 – January 2023

Research Project | Wet Etching Suspended Structures without Lateral Supports, TU Delft, NL

- Extracurricular research project in parallel to master's program.
- *Cleanroom Exp. :* Nanofabrication of suspended SiN structures on silicon pillars in TU Delft cleanroom.
- *Wet Etching :* Pillars formed from anisotropic wet etching of silicon using KOH as an etchant. Critical point drying used to gently wet-etch the nano-membranes
- *Sample Characterisation :* Used SEM and optical microscopy to characterise the structures

Wet Etching | SEM | Cleanroom | Optical Lithography

January 2021 – September 2020

Bachelor's Thesis | Photo-Magnetometry of Spin-Crossover Compounds, Trinity College Dublin, IRE

- SQUID magnetometry of spectrally-excited spin-crossover (SCO) compounds
- *Phontonic Engineering :* Recycling of disused optical spectrometer into monochromatic light source. Designed interface to couple light source to SQUID Magnetometer sample-space
- *Fine-Mechanics Engineering :* Micro-machining of SCO sample holder from quartz glass
- *Material Properties :* Characterisation of samples via magnetometry and optical spectroscopy

SQUID Magnetometry | Optical Spectroscopy | RF Electronics | Micro-Machining | DOS

Skills

Nano-Fabrication	Sputtering (RF, Magnetron, Reactive, Off-Axis), Evaporation, Wet Etching, Wirebonding
Sample Characterisation	SQUID Magnetometry, Cryogenic Transport, Optical Spectroscopy
Programming - Python	Quantum Algorithms (CIRQ, OpenFermion, QuTip), Numerical Simulations, Multi-Physics
Programming - Hardware	Qcodes (Python), Software Integration, Automated Measurements
Programming - Other	Lua (Keithley Test Script Processor), SCPI, Data Extraction & Visualisation
Design Software	CREO, Autodesk Inventor, KiCad, Inkscape

References

Arlette de Waard
General Manager, Leiden Cryogenics
@ Upon request
Upon request

Chantal Noest
Operations Manager, Delft Circuits
@ Upon request
Upon request

Jan van Ruitenbeek
Professor, Leiden University
@ Upon request
Upon request