

Careers Through Maths: Quantum Physicist



Job Overview

Quantum physicists research and develop theories and applications based on quantum mechanics principles. They work in academia, national research facilities (like the National Quantum Technologies Programme), and increasingly in private sector roles with companies developing quantum computing, cryptography, and sensing technologies. Their work involves mathematical modelling of quantum systems, conducting simulations, and designing experiments to test quantum phenomena.

Key responsibilities include developing quantum algorithms, analysing quantum system behaviour using advanced mathematics, and collaborating with engineers to translate theoretical models into practical technologies. This role sits at the intersection of theoretical physics, applied mathematics, and engineering, requiring strong analytical capabilities to solve complex quantum problems.

Key Maths Applications

Primary Areas:

Essential Skills & Tools

Skill	Application
Python/QuTiP	Quantum system simulations and quantum algorithm development
Dirac Notation	Compact representation of quantum states and operations
Quantum Mechanics	Deep understanding of postulates and interpretation
Numerical Methods	Solving intractable quantum equations through computation

Typical Pathway

Requires a first-class or upper second-class honours degree in physics or mathematics, followed by a PhD specialising in quantum mechanics or quantum information science from institutions like Oxford, Cambridge, UCL, or Bristol. Postdoctoral research positions typically lead to permanent academic roles or industry positions in quantum technology companies. Professional development often involves specialised training programmes like the UK National Quantum Technology Hubs.

Industry Demand

The UK government has committed £1 billion to quantum technologies through the National Quantum Strategy, creating strong demand for quantum physicists. Job growth is projected at 15-20% annually in the quantum sector, with particular demand in quantum computing, secure communications, and sensing applications. Major employers include Riverlane, Quantinuum, and academic research centres across the UK.

Real-World Impact

Quantum physicists drive revolutionary technologies including ultra-secure quantum encryption for banking, advanced drug discovery through molecular simulation, and optimisation algorithms that could transform logistics and AI. Their work addresses global challenges like climate change through improved battery material design and medical imaging advancements for early disease detection.

Quick Facts

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