

Particle Physics Theory

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Particle Physics Theory

21 permanent members of staff15 postdocs28 PhD students





Part of the Higgs Centre for Theoretical Physics Very active programme of workshops, visitors....

Annual summer school for PhD students





What do we do?

Ask big questions about fundamental theory!

What do we work on?

■ Lots of topics! →





Collider physics

Precision tests of the Standard Model

Is there "new physics" beyond the Standard Model?

How do we model & analyse data from the LHC?





- Parton Distribution Functions
- Jet cross sections
- Resummation
- Flavour Physics
- Non-perturbative methods
- Effective field theory





Fundamental theory from small to large scales

•What the fundamental laws governing the universe?

•How do we use QFT to probe gravity?

Non-perturbative aspects of QFT?



Scattering Amplitudes Quantum gravity Black holes Quantum chaos QFT in extreme regimes



Credit: EHT collaboration





Lattice field theory, High Performance Computing

- Non-perturbative properties of QCD
- Applications of Generative AI in physics?
- Exchange of ideas between Lattice and HPC





- Lattice Field Theory
- Renormalisation Group
- Scattering on the lattice
- High Performance Computing





Fundamental cosmology

- How did the universe evolve from the big bang?
- What is the origin of matter-antimatter asymmetry?





- Particle Cosmology
- Models of inflation
- Data from e.g. Planck
- Cyclic Universe
- Quantum cosmology





Applications and advice

- Application deadline in January, interviews in February, decisions soon after.
- Research proposal **not needed** (independent of what is said on the forms).
- Tell us **briefly** what physics you are interested in, what you want to work on and why.
- We are looking for students who **share** our excitement for physics and **want** to work with us!

Contact me if you have questions: <u>anton.Ilderton@ed.ac.uk</u>





Brand new opportunity:

- Doctoral Training Centre
- Algebra, Geometry and Quantum fields
- Mathematical aspects of fundamental physics
- https://www.agq-cdt.org/
- Several Higgs Centre & PPT supervisors involved



