# Flavour physics

Warwick Week 2018

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## Lecture 1: Origin of flavour in the Standard Model

- Origin of flavour in the Standard Model

- Isospin

- The quark model

- The GIM mechanism

- C, P and CP violation

- The Cabibbo-Kobayashi-Maskawa quark mixing matrix

- Baryon asymmetry of the Universe and the Sakharov conditions

- Low energy flavour observables

## Lecture 2: Neutral meson mixing

- The Cabibbo-Kobayashi-Maskawa quark mixing matrix

- Types of CP violation

- Flavour mixing

- Neutral meson mixing and coupled systems

- The neutral kaon system

- CP violation in neutral $B$ mesons

- The neutral $D$ system

## Lecture 3: CP violation in the Standard Model

- Angles and sides of the Unitarity triangle

- CP violation in the kaon system

- Direct CP violation

- CPT and T violation

## Lecture 4: Flavour changing neutral current processes

- Effcetive theories

- Flavour-changing neutral-current processes

- Constraints on BSM effects from neutral meson mixing

- Constraints on BSM effects from rare decay processes

- Lepton flavour violation

# Background reading

There are a number of good books/review articles on CP violation and rare decays. A small selection of these are indicated below.

Books:

- "CP violation", I. I. Bigi and A. I. Sanda

- "CP violation", G.C.Branco, L.Lavoura and J.P.Silva

Review articles:

- "Flavor physics and CP violation", G. Isidori
  https://arxiv.org/abs/1302.0661

- "Rare $b$ hadron decays at the LHC ", T. Blake, T. Gershon and G. Hiller
  https://arxiv.org/abs/1501.03309

More advanced review articles on mixing/rare decay processes:

- "Weak Hamiltonian, CP Violation and Rare Decays", A. Buras
  https://arxiv.org/abs/hep-ph/9806471

- "Effective Field Theory and Heavy Quark Physics", M. Neubert
  https://arxiv.org/abs/hep-ph/0512222

Resources:

- Particle Data Group (http://pdg.lbl.gov/)

- Heavy Flavour Averaging group (http://www.slac.stanford.edu/xorg/hflav/index.html)

- CKMfitter (http://ckmfitter.in2p3.fr/)

- UTFit (http://www.utfit.org/UTfit/)

- Heavy Flavour Lattice Averaging Group (http://flag.unibe.ch/)