IAS Colloquium (I) -- CERN and its Particle Physics Programme

CERN is the European Laboratory for Particle Physics, the world’s largest particle physics research centre. Founded in 1954, the Laboratory was one of Europe’s first joint ventures and has become a premier example of international collaboration. CERN’s subject of study is pure science and is concentrated on exploring the Universe’s most fundamental questions, such as What is it made of? and How did it come to be the way it is? The Laboratory’s tools, the particle accelerators and particle detectors, are amongst the world’s largest and most complex scientific instruments.

The Large Hadron Collider (LHC) at CERN has recently started operations, launching a new era of research in particle physics. By colliding unparalleled high-energy and high-intensity beams, it will open up previously unexplored territory at the TeV scale in great detail, allowing the experiments to probe deeper inside matter and providing an understanding of processes that occurred very early in the history of the Universe. The results from the initial running at the LHC will provide the directions for the future of particle physics.

In this presentation, the Laboratory’s primary aims will be presented. The basic ingredients of the LHC programme – the superconducting accelerator, the high-precision particle detectors and the high-performance computing – will be described. Starting from the fundamental physics questions that the LHC is expected to address, possible routes to be taken for the future advancement of particle physics will be explored. Opportunities for collaboration with CERN will also be outlined.