

# Preface

When we started preparing for the School in late 2010, the Large Hadron Collider (LHC) at CERN had been colliding beams for the first year with fast increasing luminosities. At that time we expected that, in 2011 and 2012, the LHC would provide large data samples such that the LHC experiments would take over the baton of particle physics at the frontier of energy and luminosity from the Tevatron and the B-factories. This made 2012 an opportune time to organise a Summer School with the topic of LHC results and phenomenology. However, the performance of the LHC exceeded all our expectations and, 1 month before the School was held in August 2012, the ATLAS and CMS experiments at CERN announced the discovery of a Higgs boson, making this result the hot topic of discussion at the School. This set the scene for a very successful 2 weeks. Furthermore, Peter Higgs himself came along to the School and gave a special lecture on how his ideas of electroweak symmetry breaking developed in the 1960s. He also highlighted the difference in the speed of communication now, with instant response available via email compared to taking several weeks via letter.

Following the pattern of many recent successful schools, we held the School in St. Andrews in August 2012, using the facilities of the Physics Department and accommodation at University Hall. This location is ideal for a School of this size (70 students and 10 lecturers and other staff) and character. The 70 participants came from 41 institutions, from Europe (Belgium, Denmark, Germany, Ireland, Italy, Norway, Poland, Spain, Switzerland and the UK), as well as Brazil, Chile, China, India, Mexico, Turkey and the USA.

The aim of the School was to equip young particle physicists with the basic tools to extract the maximum benefit from the various LHC experiments. This was achieved through a series of lectures providing an introduction to the theoretical and phenomenological framework of hadron collisions, and covering the recent results from the LHC. There were also lectures on the tools required by any particle physicist, theoretical or experimental, covering Monte Carlo models of interactions and statistical methods. The lectures were complemented by lively discussion classes covering the topics covered in the lectures and more widely.

With the European Particle Physics community preparing to review its strategy in Krakow in September 2012, the School held its own strategic review with a lively discussion amongst the lecturers and students on the future of particle physics in the Parliament Hall. The School hosted an outreach afternoon devoted to Schools that consisted of hands-on displays and experiments provided by the Edinburgh and Glasgow Particle Physics Experiment groups and a public lecture by Dr. Aidan Robson on the excitement of LHC physics. These proceedings provide a record of the lectures and will provide a valuable reference for those at the School and anyone wanting to develop a knowledge of the current status of particle physics.

Summer Schools are not just about science; they are about dialogue, discussion, meeting people from many backgrounds and forming lifelong friendships. The SUSSP has a tradition of hard work complemented by a lively social programme that brings together all the participants of the School. There were opportunities to sample Scottish culture, starting with a traditional ceilidh, through trips to local castles at Dunnottar and Glamis, a hill walk up Ben Vrackie, a memorable whisky tasting led by David Wishart, a very interesting walking tour of St. Andrews, a visit to Edinburgh with the opportunity to see the arts festival and the putting competition on the Himalayas. The School finished with a traditional Scottish banquet that included “haggies, neeps and tatties” accompanied by a piper. The after-dinner speech was given by Alan Walker (SUSSP Secretary/Treasurer), who presented a very humorous and entertaining account of the history and traditions of the SUSSP and there was a SUSSP first with participants performing a play, written by Jeff Richman, about the Higgs boson.

We would like to thank the lecturers for coming to St. Andrews and taking the time to assemble the lecturers and provide a written version for the proceedings. We also want to thank very much all the students for coming from far and wide. We also thank our co-organisers Sean Benson, Stephan Eisenhardt, Colin Froggatt, Einan Gardi, Nigel Glover, Victoria Martin, Aidan Robson and Suzanne Scott from the universities of Edinburgh, Glasgow and the Institute for Particle Physics Phenomenology in Durham, for all their hard work. Everyone contributed to the lively and constructive atmosphere in the School, whether it was discussing the finer points of electroweak symmetry breaking, the future direction of particle physics or which is the best whisky.

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