

Twistor Theory

2 – 27 September 2024

Twistor theory was originally proposed by Roger Penrose in the 1960s as a geometric framework for physics that aims to unify general relativity and quantum mechanics, but one of the unexpected spinoffs from twistor theory has been its impact on modern pure mathematics. The mathematical underpinnings go back to the 19th century Klein correspondence, and it now finds application to differential geometry, representation theory, integrable systems in addition to fulfilling many of its aspirations to be a powerful tool for the study of problems in basic physics. The last two decades have seen twistor methods re-emerging in several different fields including scattering amplitudes, via twistor and ambitwistor strings, the Bridgeland approach to Calabi-Yau stability conditions, and conformal differential geometry. The aim of this 4-week programme was to take stock of these advances and to identify open problems. Leading international researchers in the various fields that twistor theory can be applied to came together to review progress and to identify and overcome problems at the forefront of these fields and to establish new collaborations. There were around 50 participants from around the world, including both physicists and pure mathematicians. There was one week of general workshop but there were regular seminars, often two or three a day throughout the rest of the programme so that essentially all who wished to speak were able to and to receive feedback on their work. There was much interaction and discussion and the founder of the field, Roger Penrose, visited and gave a talk on his most recent ideas for twistor theory at age 93!