Contribution ID: **19** Type: **not specified**

MPP Colloquium: The DNA of Particle Scattering

Tuesday, 16 December 2025 16:00 (2 hours)

At the Large Hadron Collider, the copious scattering of quarks and gluons in quantum chromodynamics (QCD) produces Higgs bosons as well as many backgrounds to searches for new physics. Better theoretical precision for Standard Model cross sections is needed to match experimental improvements with the high-luminosity LHC upgrade. Quark and gluon scattering in QCD can be evaluated in perturbation theory and leads to highly intricate, multivariate mathematical functions. To gain further insight into these functions, one can study a simpler cousin of QCD called planar N=4 SYM. The structural features of these intricate results can be decoded – using "symbology" – in a way analogous to sequencing DNA. Each derivative reads off a letter, like the A,T,G,C letters of the DNA code. Understanding the alphabet, and then reading the code, exposes the physics and mathematics of quantum scattering. Bizarre new symmetries have been unveiled by humans staring at this theoretical data. For example, two different scattering amplitudes are secretly related to each other by reading the code backwards. The next hidden symmetries may be revealed by machine learning models "staring at" the data.

Presenter: DIXON, Lance (SLAC/Stanford University)