Contribution ID: **40** Type: **Plenary Talk**

Precision probes of fundamental interactions at particle colliders

Tuesday, 23 June 2026 16:30 (40 minutes)

The discovery of parity violation marked a turning point in fundamental physics: it showed that nature distinguishes left from right, revealing the chiral structure of the weak interaction and paving the way to electroweak theory. This line of inquiry has continued through the discoveries of CP violation, electroweak unification, and the Higgs boson with its associated scalar interactions. Particle colliders have been central to this endeavour, exposing the symmetries, symmetry-breaking mechanisms, and quantum dynamics that govern the microscopic world. This talk will briefly trace the evolution of collider physics toward the modern energy and precision frontier, and discuss how future colliders can provide transformative tests of fundamental physics.

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Session Classification: Session IV(Day2)