



Contribution ID: 396

Type: **Talk**

## Centre vortices are the seeds of dynamical chiral symmetry breaking

*Friday, July 29, 2016 4:30 PM (20 minutes)*

We reveal a fundamental connection between centre vortices and several key features associated with dynamical chiral symmetry breaking and quark confinement. Calculations are performed in pure  $SU(3)$  gauge theory using the chiral overlap fermion action. Starting from the original gauge field, a vortex identification procedure yields vortex-removed and vortex-only backgrounds. By studying the quark mass function, we demonstrate the removal of dynamical mass generation via the removal of the centre-vortex degrees of freedom from the gauge fields. The low-lying hadron mass spectrum is also calculated, with results that are consistent with the restoration of chiral symmetry on vortex-removed backgrounds at light quark masses.

Remarkably, we observe that the vortex-only degrees of freedom are able to encapsulate the qualitative features of the original gauge fields. Through visualisations of the topological charge density, we find evidence of a link between centre vortices and the instanton structure of the vacuum, specifically vortex-only backgrounds provide gauge-field degrees of freedom sufficient to create instantons upon cooling. Furthermore, after some smoothing, we observe dynamical mass generation on the vortex-only backgrounds consistent with that of the original gauge-field ensemble.

**Author:** Dr KAMLEH, Waseem (University of Adelaide)

**Presenter:** Dr KAMLEH, Waseem (University of Adelaide)

**Session Classification:** Vacuum Structure and Confinement

**Track Classification:** Vacuum Structure and Confinement