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Mesoscopic valley-Hall effect in graphene JOHAN NILSSON, Leiden University — An intriguing property of graphene is the existence of a degree of freedom associated with the two inequivalent valleys in the Brillouin zone. A controlled manipulation of this degree of freedom may potentially be used in novel electronic devices. We study the mesoscopic valley-Hall effect that may provide a route toward the desired control. The effect appears when the inversion symmetry of the crystal is broken, and it can generate a transverse valley current in response to an applied electric field. We look at a few sample setups and discuss the dependence on the geometry and the appearance of valley-Hall edge states. We also compare and contrast our results with those obtained from linear response theory in bulk samples.

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