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Classical Hall Effect without Magnetic Field NICHOLAS SCHADE, CHIAO-YU TAO, DAVID SCHUSTER, SIDNEY NAGEL, The University of Chicago — We show that the sign and density of charge carriers in a material can be obtained without the presence of a magnetic field. This effect, analogous to the classical Hall effect, is due solely to the geometry of the current-carrying wire. When current flows, surface charges along the wire create small electric fields that direct the current to follow the path of the conductor. In a curved wire, the charge carriers must experience a centripetal force, which arises from an electric field perpendicular to the drift velocity. This electric field produces a potential difference between the sides of the wire that depends on the sign and density of the charge carriers. We experimentally investigate circuits made from superconductors or graphene to find evidence for this effect.

Nicholas Schade
The University of Chicago

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