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Nanomechanical detection of the spin Hall effect JOSEPH BOALES, CARL BOONE, PRITIRAJ MOHANTY, Boston University — The spin Hall effect creates a spin current in response to a charge current in a material that has strong spin-orbit coupling. The size of the spin Hall effect in many materials is disputed, requiring independent measurements of the effect. We develop a novel mechanical method to measure the size of the spin Hall effect, relying on the equivalence between spin and angular momentum. The spin current carries angular momentum, so the flow of angular momentum will result in a mechanical torque on the material. We determine the size and geometry of this torque and demonstrate that it can be measured using a nanomechanical device. Our results show that measurement of the spin Hall effect in this manner is possible and also opens possibilities for actuating nanomechanical systems with spin currents.

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