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X Marks the Spot: Scanning for Magnetic Scientific Treasure Using Hall-Effect Sensors RICKY CHU, NIGEL DAVID, TARAS CHOUINARD, ADAM SCHNEIDER, DAVID BROUN, Simon Fraser University — Scanning Hall probe microscopy is a quantitative magnetic imaging technique that provides high spatial resolution combined with high flux sensitivity, occupying a unique niche in magnetic microscopy [S.J. Bending, Adv. Phys. **48**, 449 (1999)]. Hall sensors are useful in studying materials with microscopic or nanoscale magnetic structures, like high temperature superconductors and magnetic thin films. Development of conventional semiconductor Hall sensors has stalled due to problems with charge depletion and thermal noise. Sandhu recently produced bismuth Hall probes in an effort to avoid these effects [A. Sandhu *et al.* Jpn. J. Appl. Phys. **40**, L524 (2001)]. The bismuth probes lack a good model to optimize their performance. I will propose a refinement of the current model with an increased emphasis on material parameters that can be more intuitively manipulated. I will show that the fundamental limit of the Hall probe flux sensitivity is comparable to that of a SQUID, the most sensitive known magnetic sensor. I will also propose a definition for spatial resolution to standardize characterization procedures for Hall sensors.

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