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Domain walls in ultrathin magnetic nanowires at finite temperatures THOMAS MICHAELS, ALESSANDRO VINDIGNI, DANILO PESCIA, Laboratory for Solid State Physics, ETH Zurich, Switzerland — The possibility of inducing domain-wall (DW) motion in magnetic nanowires by means of electric currents has recently renewed theoretical interest in this field. The problem is usually modelled on a micromagnetic approach, but ignoring thermal fluctuations. However, some relevant experimental facts - like the correct order of magnitude of the critical current needed for DW motion - still lack satisfactory explanations. We thus developed a one-dimensional stochastic model for DW dynamics, which allowed us to take into account both thermal fluctuations and external drifts (magnetic field and electric spin-polarized current) simultaneously. We also provided a general theoretical framework, which highlights the crucial role played by thermal fluctuations at the centre of DWs. The latter, for example, qualitatively accounts for the shrinking of magnetic domains observed in Fe films on Cu(001) with increasing temperature and the renormalisation of the critical current for DW motion in magnetic nanowires at finite temperatures.

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