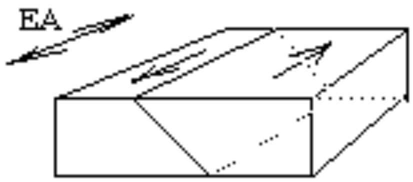
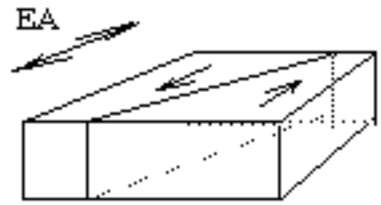
Ch. 8 PROBLEMS

8.1. The figures below depict two orientations of domain walls in a uniaxial material. Explain why each is unlikely.





8.2. Calculate the domain wall thickness and energy density for Co, $Nd_2Fe_{14}B$ and $Ni_{80}Fe_{20}$ from data in Ch. 6 assuming in each case $A = 2 \times 10^{-11}$ J/m.

8.3. Solve the uniaxial domain wall problem with magnetoelastic energy included. Work out the solution for three cases: i) uniaxial strain along the easy axis, ii) perpendicular to the EA and parallel to the magnetization at the center of the wall, and iii) perpendicular to the EA and to the magnetization at the center of the wall.

8.4. Evaluate the constant in Eq. 8.10 for uniaxial anisotropy for the two wall profiles: $\theta(-\infty) = 0$ and $-\pi/2$ (in both cases $\theta' = 0$). Can you find a solution to the integral equation for the second set of boundary conditions?

8.5 Write the exchange, anisotropy and magnetostatic energy expressions for a Néel wall in a film of thickness t. Compare the relative magnitude of these terms. Why does the magnetostatic energy not appear in the minimization of the wall energy per unit area to determine the wall width?

8.6 Relate the energy of the flux distribution about a sample in a state of remanent magnetization ($H_{ext} = 0$) to that of the configuration of least magnetostatic energy inside the sample. Use the i^2R power density analogy. How is this energy minimized?

8.7 a) Calculate the radius r_c of a sphere for which the magnetostatic energy of the single-domain state is exactly equal to the energy needed to create a 180^o domain wall through the middle of the sphere. b) Calculate this radius for iron. c) Compare this radius with the domain wall thickness δ_{dw} for iron. d) Express r_c and δ_{dw} in terms of the domain wall energy density σ_{dw} and discuss the difference between these two expressions.

8.8 Calculate the superparamagnetic dimensions for an acicular iron particle with a 10:1 aspect ratio and anisotropy due only to its shape.