Magnetization Reversal of Nanomagnets
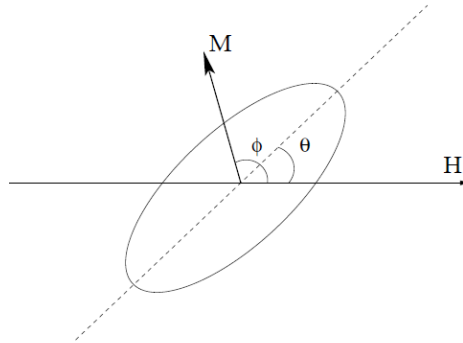

Consider a simple case with an ellipsoid nanomagnet made of $Fe_{20}Ni_{80}$ (permalloy) with polar axis a and equatorial axis b (for example, a = 100 nm and b = 30 nm). This is a single domain system where all spins are aligned in the same direction by exchange interaction.

1. With a mangetic field applied with an angle θ to the long axis, find out how M depends on H for a few discrete θ values ($0°$, $30°$, $45°$, $60°$, $90°$, and $18°$). Describe in detail how the plots are generated. (Hint: wirte down the total energy of the nanomagnet and find out the relationship of $\cos\phi$ and H by setting 1st and 2nd derivitive of total energy to zero)

2. Plot the MH curve of an ensemble of 300 such nanomagnets fixed in space. What are the features of the hysteresis loop?