(2) An iron wire 3 cm long and 1 mm in diameter, suspended with its axis vertical, and free to rotate about that axis, is suddenly magnetized by a field parallel to its axis. How large is the resulting increment in its angular velocity?

Let M be the mass of the wire in grams. Then its rotational inertia is $0.5\ M\ (0.05)^2$ g cm^2, and the number of iron atoms it contains is $M \times 6 \times 10^{23}/56$. In the saturation magnetization of iron two electron spins on each atom are lined up, which is an increment in angular momentum amounting to $\hbar$, or 10^{-27} g cm^2 s^{-1} per atom. The equal and opposite angular momentum thus evoked in the wire as a whole will cause the angular velocity of the wire to change by 0.008 rad/s. This was the famous Einstein–de Haas experiment, first carried out in 1916.