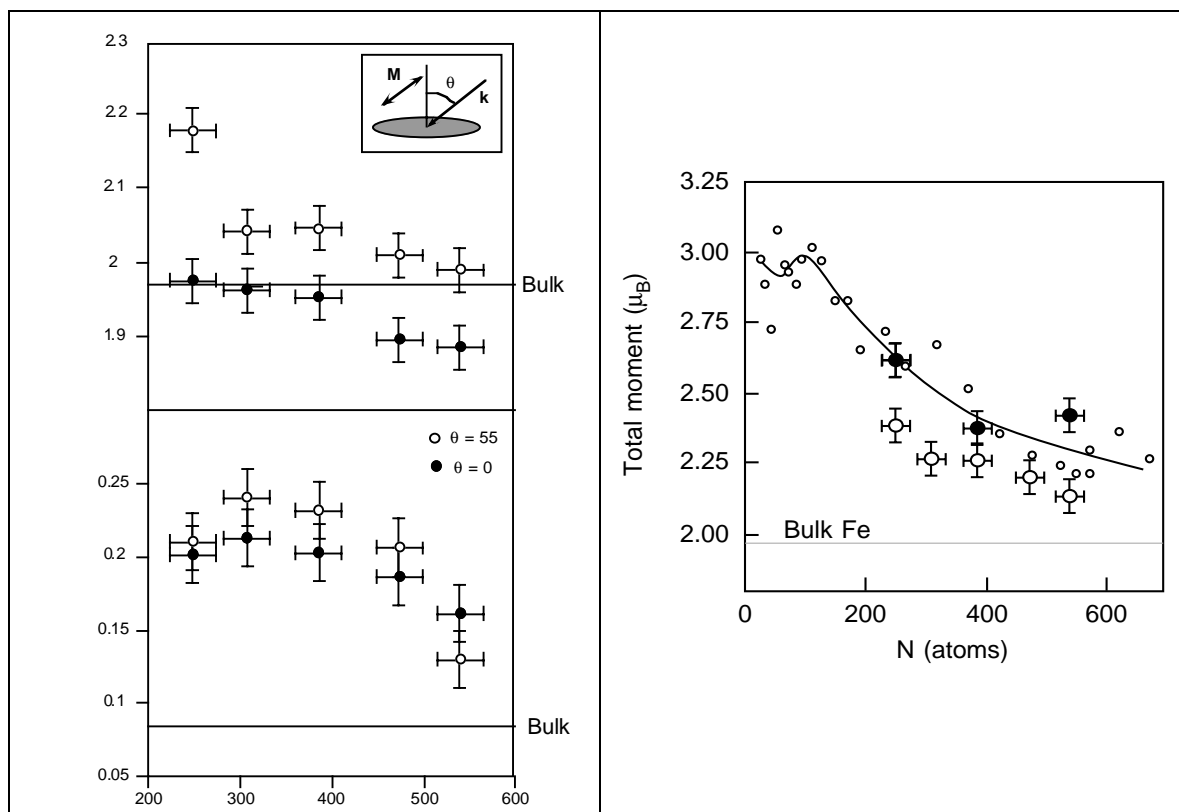


# MXCD Study of Mass-Selected Fe Clusters Embedded in Co

## Report on Experiment HE-860 on Beamline ID12B

The experiment was carried out on beamline ID12B in September 2000. It was part of a programme pursued by the nanoclusters group at the University of Leicester, UK to measure the fundamental orbital ( $m_L$ ) and spin ( $m_S$ ) moments in magnetic nanoclusters as a function of their size using MXCD. The experiments utilise a portable UHV-compatible gas aggregation source built at Leicester that is able to deposit clusters with tight mass filtering *in situ*. The group from Leicester was the first to apply MXCD to exposed nanoclusters supported on a surface in UHV and we were able to demonstrate that the particles have enhanced magnetic moments that increase with decreasing size and that a significant fraction of this enhancement comes from the orbital component[1-3]. The aim of this experiment was to extend the size range under study and to determine the effect of coating the exposed Fe clusters with a Co film *in situ*.



**Figure 1**  
Orbital and spin magnetic moments measured by XMCD for two different angles,  $\theta$ , of the applied field and photon angular momentum relative to the surface normal. The pure spin moment is the value at  $\theta=55^\circ$ . For  $N=250$ ,  $m_L$ , and  $m_S$  are enhanced by 150% and 10% respectively relative to the bulk. The inset shows the geometry of the measurement.

**Figure 2**  
Total magnetic moment in *Fe* clusters vs. size for exposed clusters on HOPG (filled circles), *Co*-coated clusters on HOPG (open circles), and free clusters [7] (dots + line).

The experiment was highly successful and we were able to extend the size range to include clusters containing down to 250 atoms and up to 550 atoms. In addition depositions of three cluster sizes (250, 400 and 550 atoms) were coated with Co and the changes in the  $m_L$   $m_S$  components were determined. The results of the experiment have been widely disseminated at conferences and have been published in three papers [4-6]. All the details are in the relevant references but the most important results are presented in figures 1 and 2.

## References

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