

**Tejada *et al.* Reply:** Our suggestion of resonant spin tunneling in ferritin is based upon the earlier measurements of the noise spectrum [1] and nonthermal magnetic relaxation [2], theoretical estimate of the effect [3] and experimental data [3] which are in agreement with that estimate: the anomalous dependence of the blocking temperature  $T_B$  on the magnetic field (also observed in Refs. [4–6]) and the nonmonotonic dependence of the magnetic viscosity on the field.

While admitting, in principle, that effects other than resonant tunneling may be at play in shaping the dependence of the blocking temperature on the magnetic field (see, e.g., Ref. [6]), we would like to point out that the model of Hanson *et al.* [7] may be too simple to apply to the ensemble of ferritin particles. The correspondence between parameters of the Comment and of our Letter is  $B_0 = H'_{an} = 2K/m_0$  and  $M_s = m_0$ . The particles must be randomly distributed on the anisotropy barrier  $KV$ , mainly due to the volume distribution, and on the magnetic moments  $m_0V$ , due to both the volume distribution and the distribution on the noncompensation  $m_0$ . These are two independent distributions which are unknown for ferritin particles. Besides that uncertainty, the dependence of the energy barrier on the magnetic field should be more complicated than for a ferromagnetic particle due to the fact that the noncompensated moment of a ferritin particle arises from the contribution of two sublattices. For the very same reasons, the anomalous  $T_B(H)$  dependence alone would be not enough to defend quantum effects.

Independent experimental evidence that the low temperature relaxation of the ferritin departs from the one expected from classical physics is provided by the data on the magnetic viscosity [3]. According to these data, the relaxation of the magnetic moment of the system of nearly independent ferritin particles towards the direction of the field becomes faster when the field goes to zero. This observation is in apparent disagreement with the common sense and experiments on other systems, except Mn-12 acetate where resonant spin tunneling has been proved unambiguously [8]. The main difference between Mn-12

and ferritin with respect to the resonant tunneling is the size distribution of ferritin particles, which makes the quantum states of all the particles precisely degenerate only at  $H = 0$ . The resonant tunneling between the degenerate spin states is a plausible explanation of the observation that the relaxation towards the direction of the field accelerates at  $H \rightarrow 0$ .

Our recent measurements of the ac susceptibility [9] reveal similar anomalies which have not been observed in other particulate systems with the distribution of barriers but can be explained by resonant tunneling.

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