CONCLUSION

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It can be concluded from these studies that,

1. Oxamide is a very efficient mediator of spin exchange. As the *ab-initio* quantum mechanical calculations have shown, the efficacy of these bridging moieties is due to the delocalization of π-electron density over the oxamide, which can provide a continuous path for spin exchange.

   The functionalization of oxamide with aliphatic bridges (Ch.2) makes the spin exchange ferromagnetic while incorporation of additional functional groups enhancing π-delocalization (Ch.4) can make the interaction strongly antiferromagnetic.

2. Aromatic dihydroxy benzene derivatives as ligands also prove to be efficient mediators of antiferromagnetic exchange.
3. A comparison of the values of coupling constants evaluated using variable temperature magnetic data with geometrical parameters calculated using molecular geometries optimized by quantum mechanical calculations suggest that the coupling constants and overall magnetic property of the complexes depend largely on the planarity of the complexes and the dihedral angle between the metal co-ordination planes.
4. Thus, in presence of strong mediators of spin exchange such as, oxamide and hydroxy benzenes, the magnetic property of a complex can be modulated by changing the additional bridging parts and the functional groups over the ligands.
5. The presence of aliphatic bridging moieties brings in orthogonality between the interacting orbitals and leads to ferromagnetism. The calculations also suggest that, the bulkiness of functional groups can significantly affect the dihedral angle and increase the ferromagnetic interaction.

   This promises the use of such systems in designing of molecular ferromagnets.
6. Copper(II) ion can form a trinuclear complex with *myo*-inositol, a bio-molecule, which is capable of forming a two component stable hydrogel in basic media. Scanning electron micrographs show these to be fibrous super structures.

The fuller understanding of the effect of structural parameters which affect the spin/electron exchange in these systems can lead to "Tailor Making" of the molecular magnetic materials and further help in the development of multi-metallic catalysts to suit the needs for specific industrial applications. The present study is a step towards "outside the laboratory" design of molecules having desired magnetic, redox or catalytic properties.

The last chapter can open up the new area of discrete multimetallic complexes forming Metallogels.