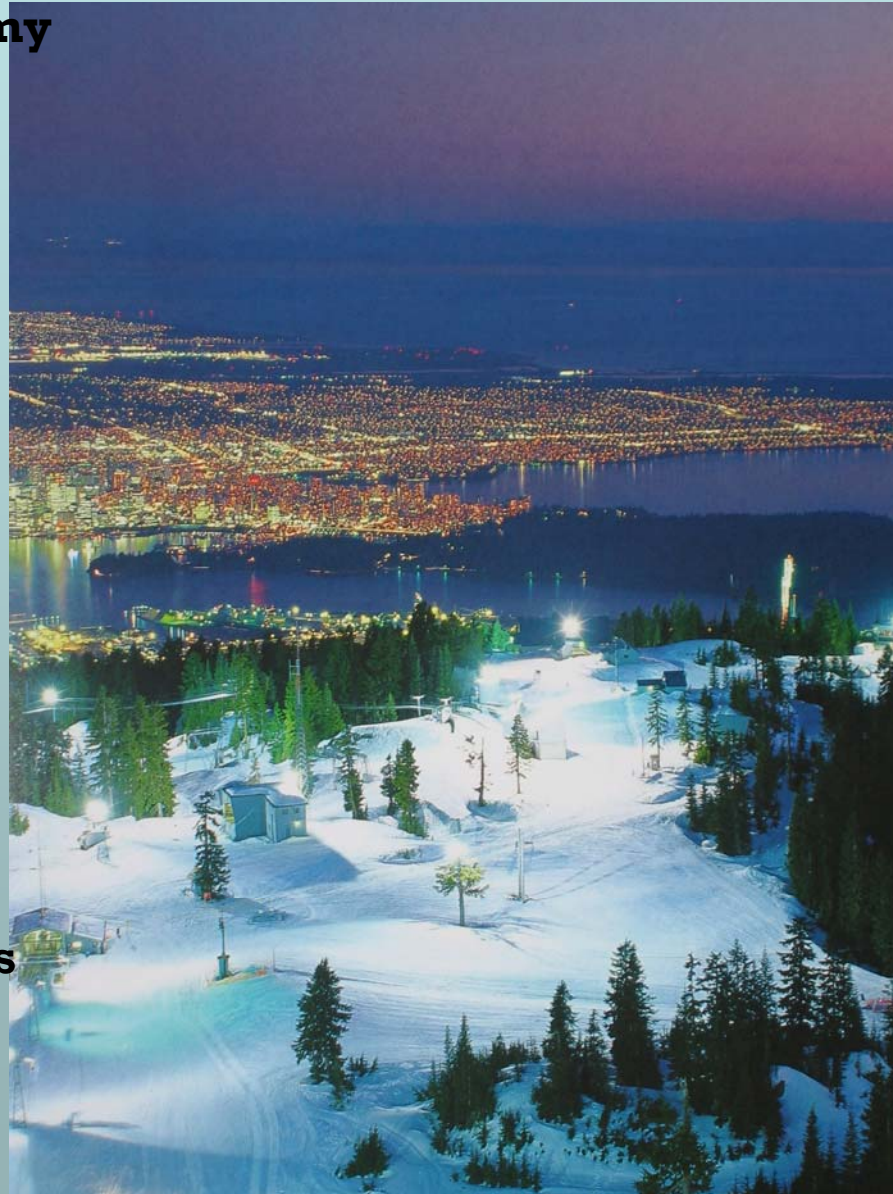


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**Physics & Astronomy
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RESEARCH THEMES

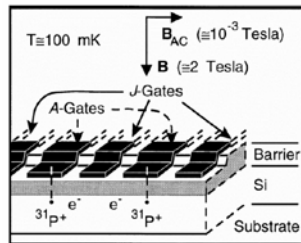
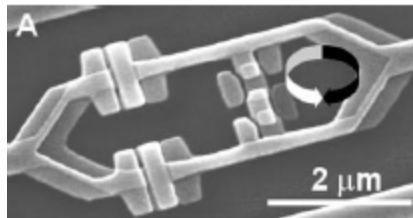
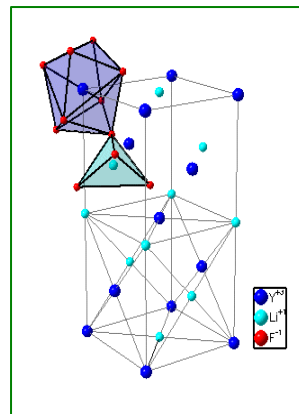
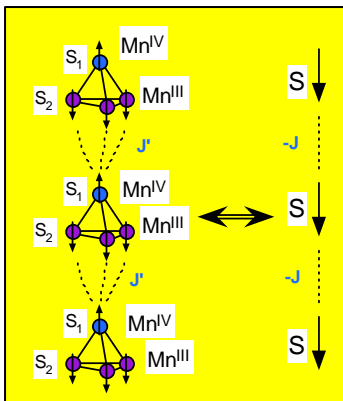
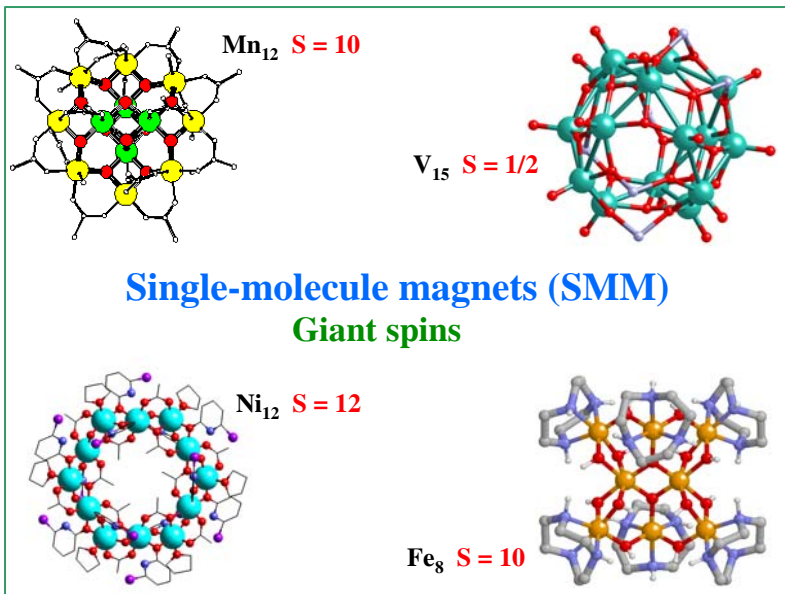
Large-Scale
Quantum Phenomena

Quantum Magnetism

Quantum Information

Nanoscience

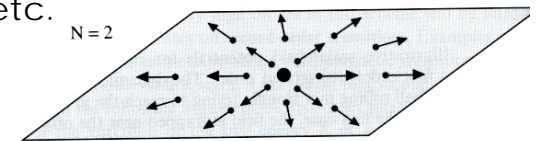
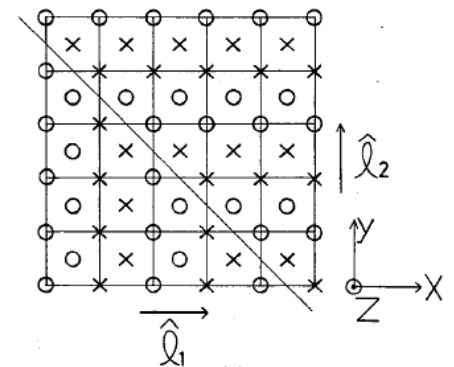
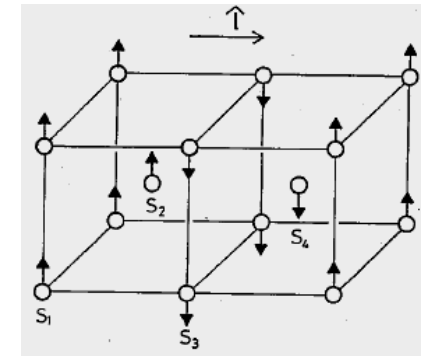
Decoherence &
Q Dissipation



(1) Magnetic Qubits:

Decoherence and dissipation in qubit networks, from nuclear spins, phonons, etc., dynamics of dipolar networks, Quantum Spin Glasses, influence of spin bath on Q Critical points, etc.

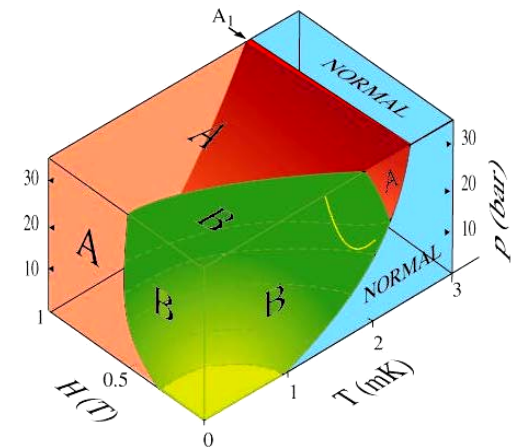
Exploration of similar issues in superconducting and Quantum Dot qubit networks. General theory of solid-state qubit systems.

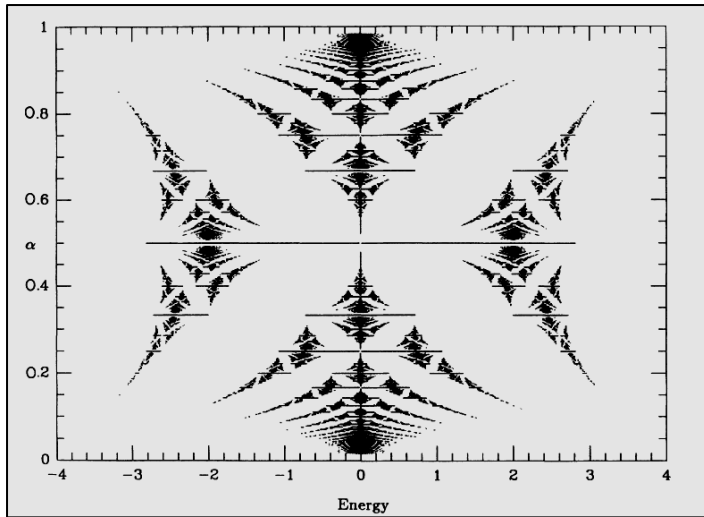


(2) large-scale quantum phenomena in magnets

Dynamics of Q solitons in magnets, exotic behaviour in solid He-3, superfluid He-3, etc.

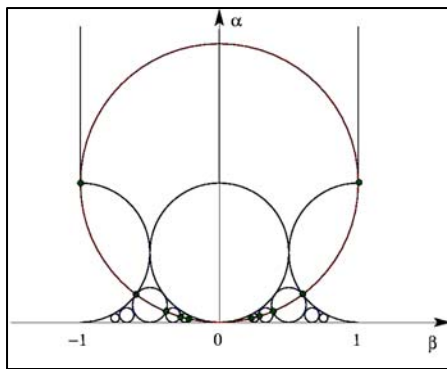
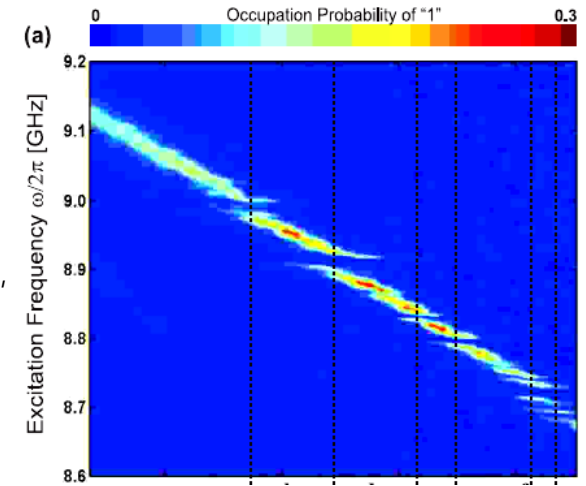
Q. nucleation of soliton formation in magnets and superfluids.





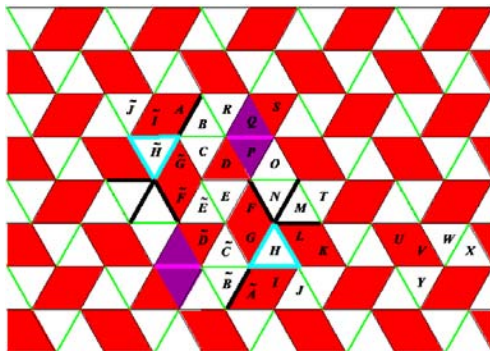
(1) Decoherence & Q. Dissipation

Theory of decoherence, involving different Q Environments; importance of spin bath. Effect on expts in magnets, superconductors, Q Dots, and superfluids. General understanding of important issues in Q Mmt, etc., and also Q Information & Q Communication.



(2) Interesting Q Statistics Problems

Interesting models involving decoherence, non-trivial Quantum Phase effects, dissipation; often these are field theoretical. 2-d lattice models, particularly involving topological phase effects. Exploration of non-trivial questions for effective Hamiltonians in some of these systems.



(3) NanoScience Interesting current problems in nanoscience, particularly involving the STM (eg., Q Mirage effects), or those arising from study of qubits. The understanding of 'designer Hamiltonians', particularly for magnetic systems. Exploration of Q. Diffusion in some of these systems

