

Quantum phase transition in an atomic
Bose gas with Feshbach resonances

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cond-mat/0312446



See also L. Radzihovsky, J. Park ,
P. Weichman, cond-mat/0312237.



Exotic order in an atomic
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- Can we connect two states by adiabatic evolution of a coupling constant ?

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A quantum phase transition must occur if the states have

- distinct “conventional” order parameters/broken symmetry
- distinct “quantum/topological/exotic” order with distinct quantum numbers of excitations

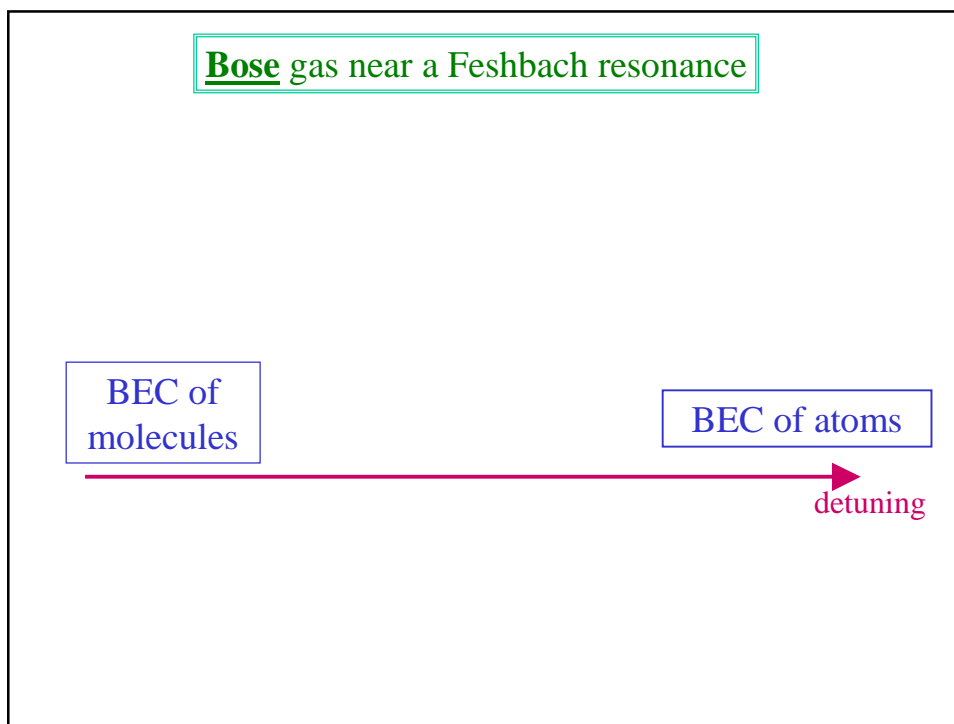
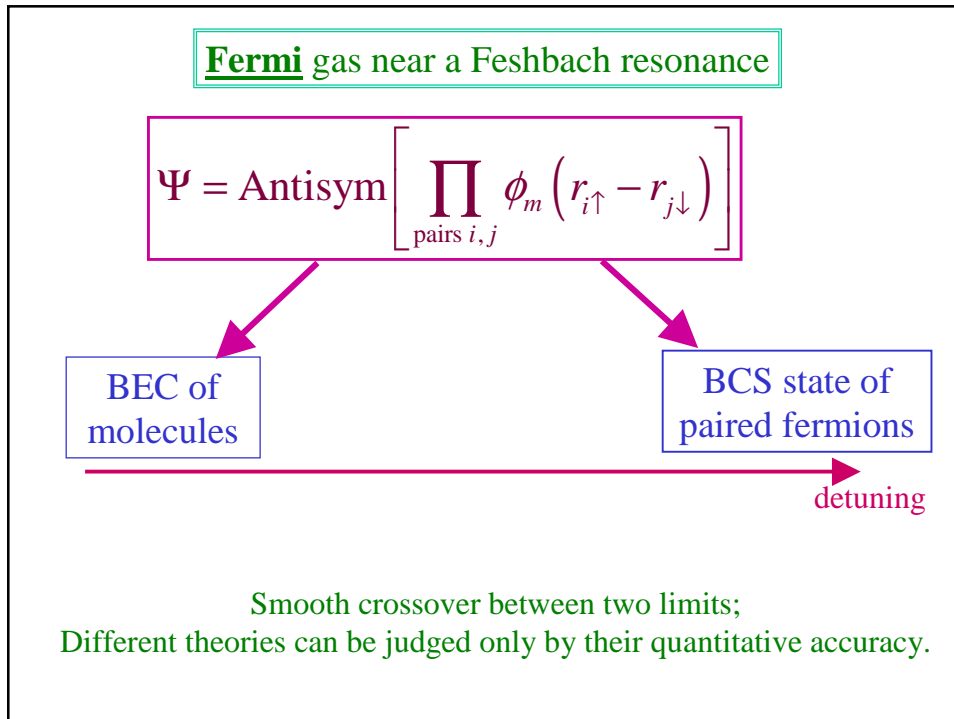
Fermi gas near a Feshbach resonance

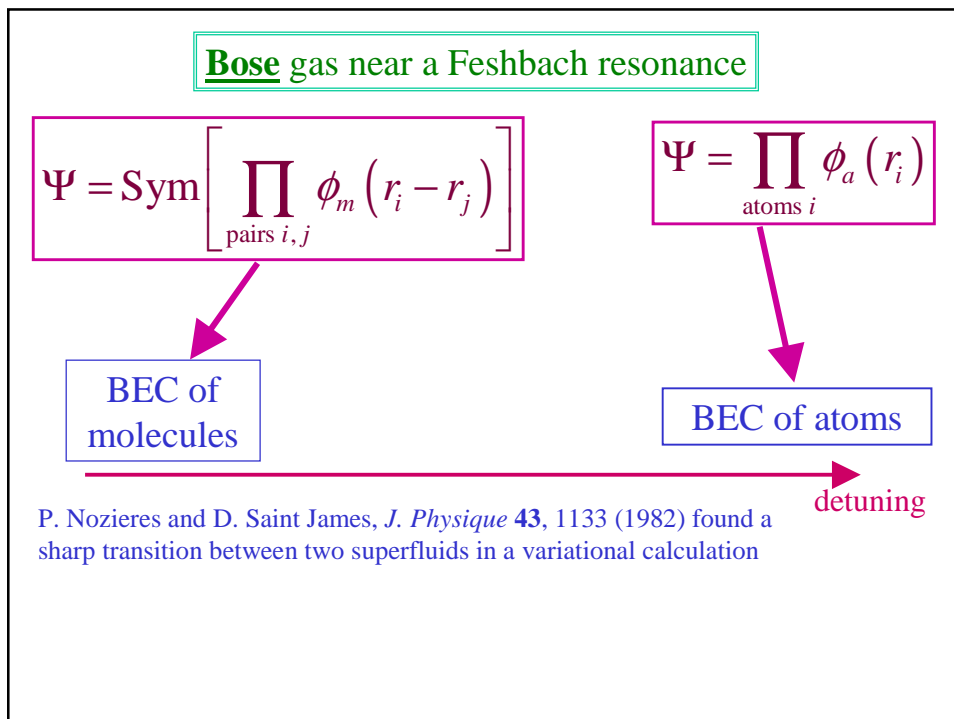
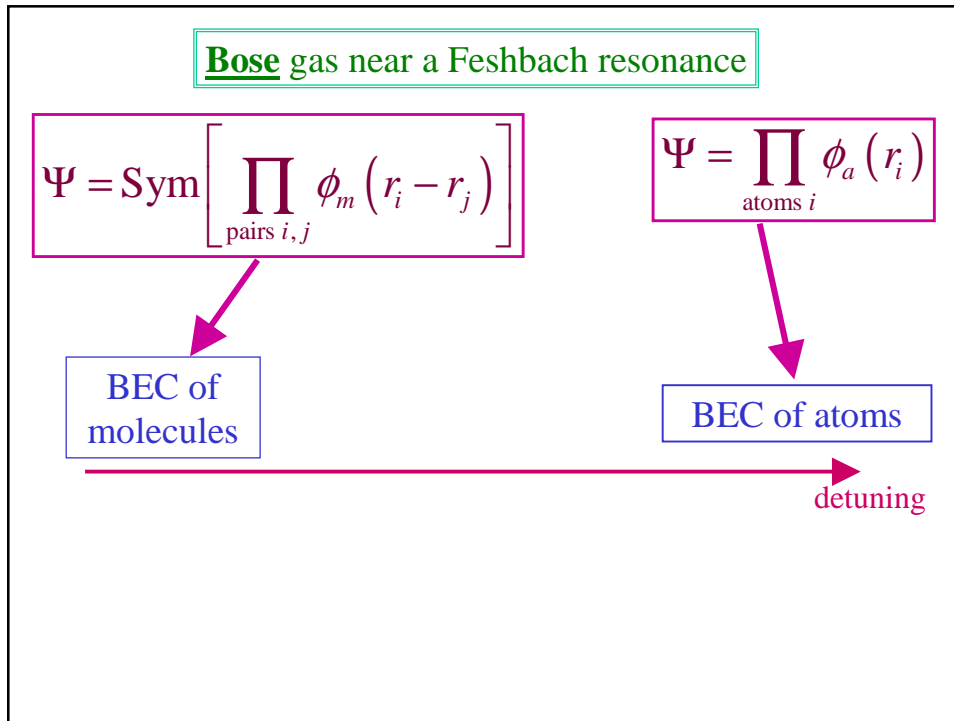
BEC of molecules

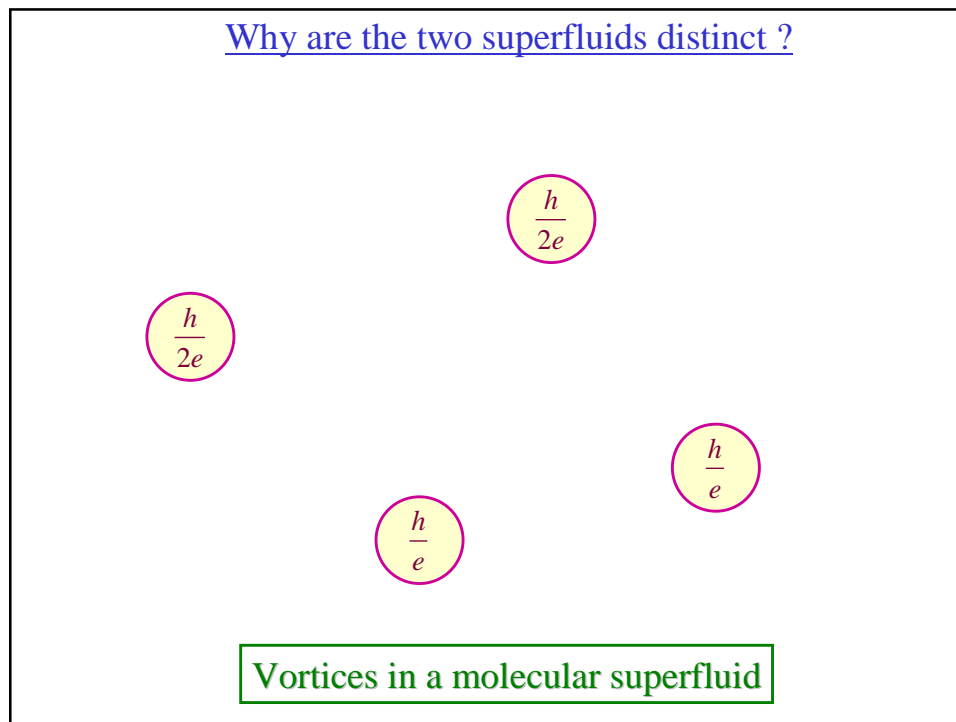
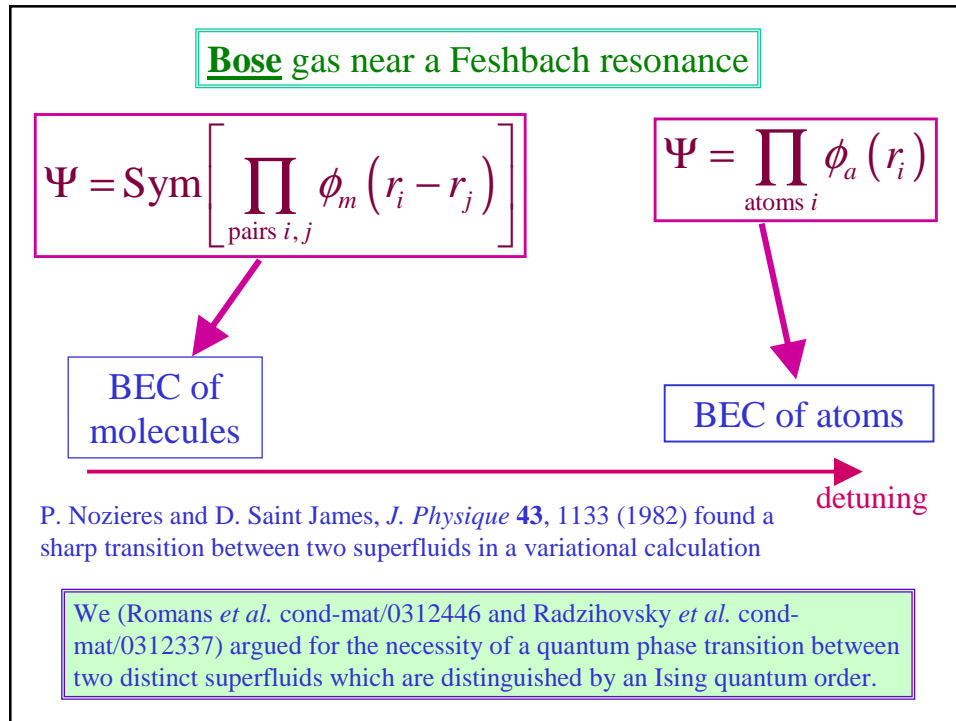
BCS state of paired fermions

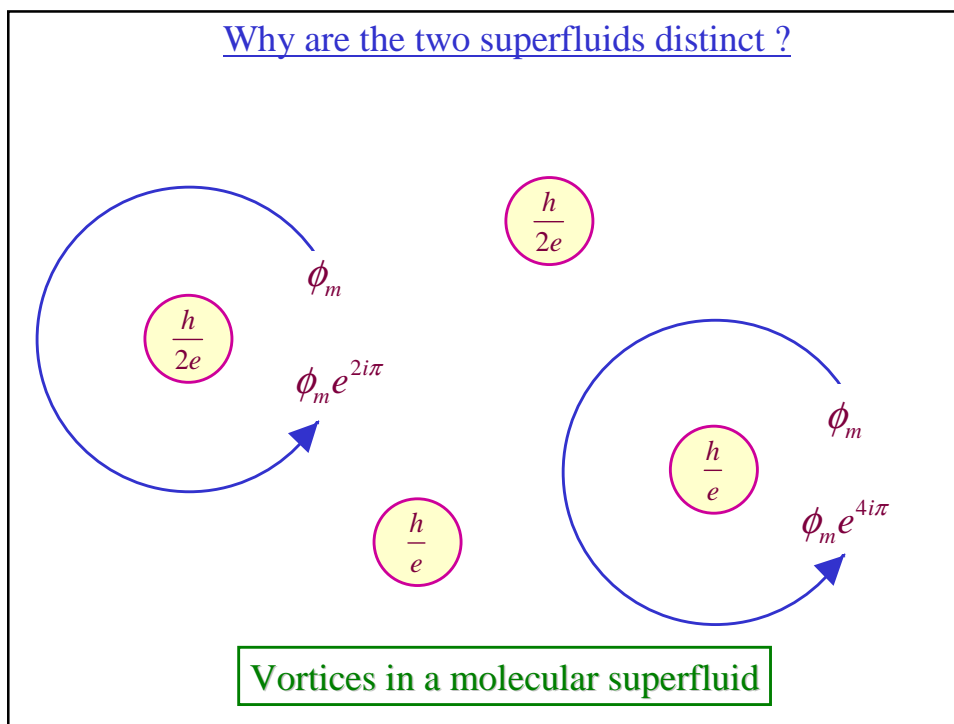
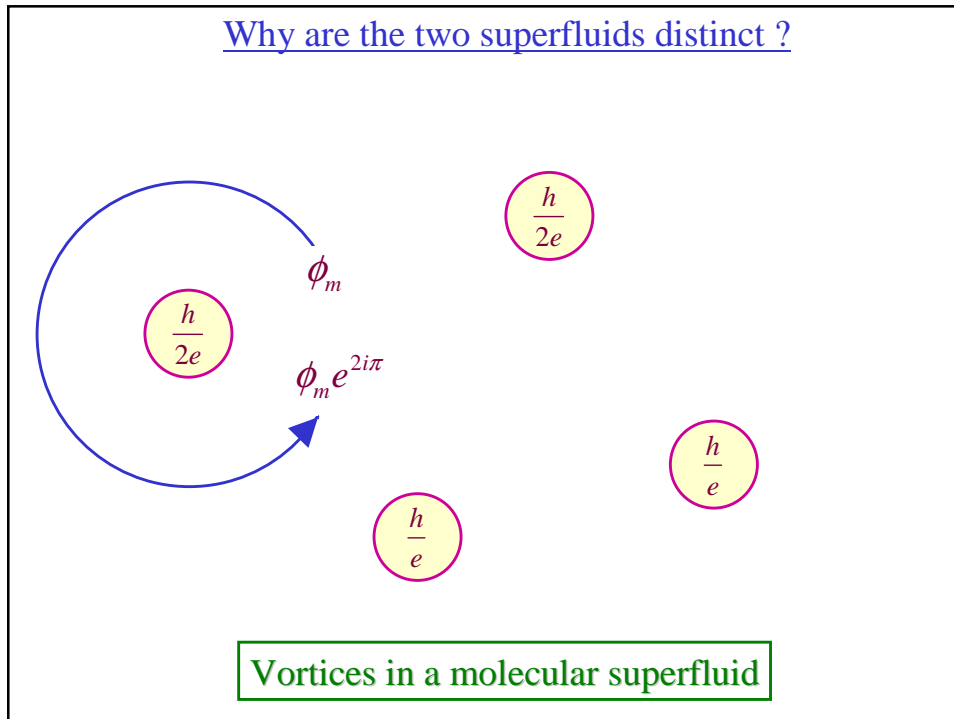
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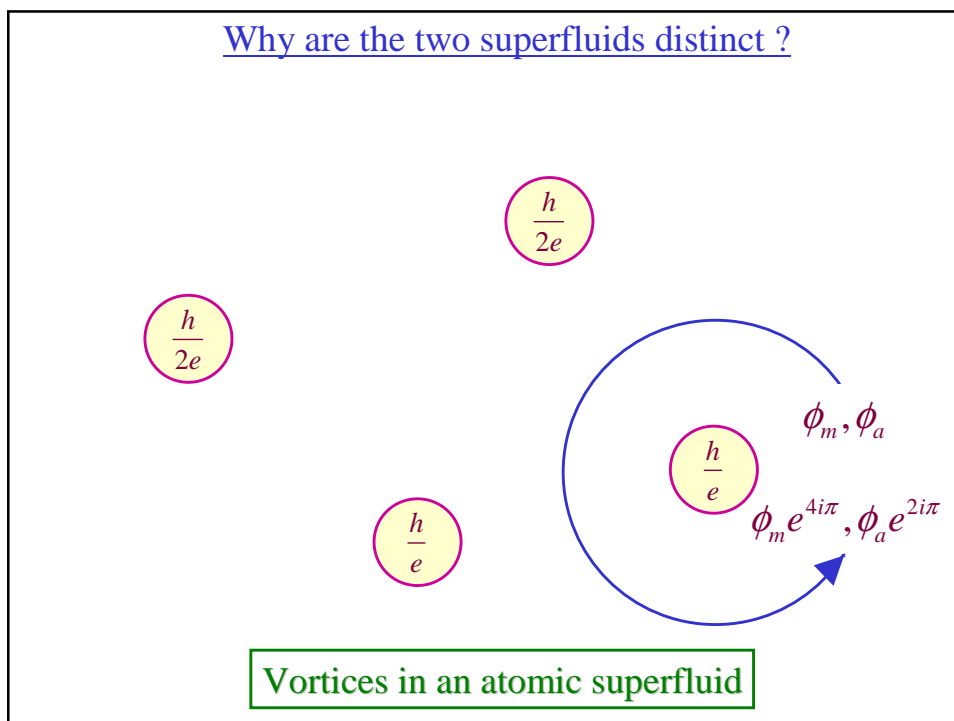
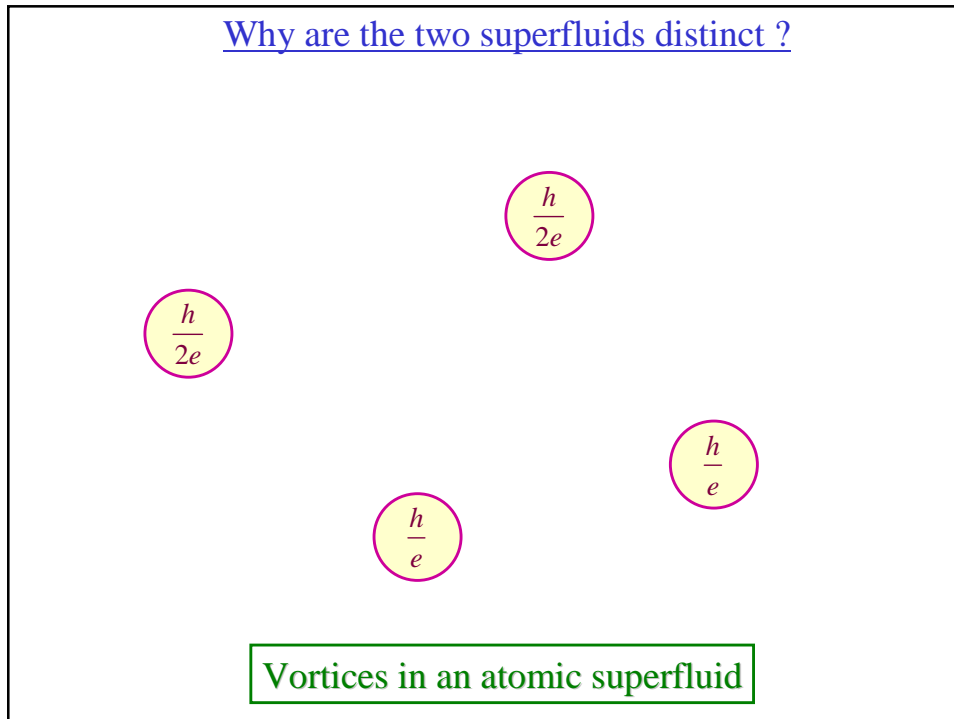


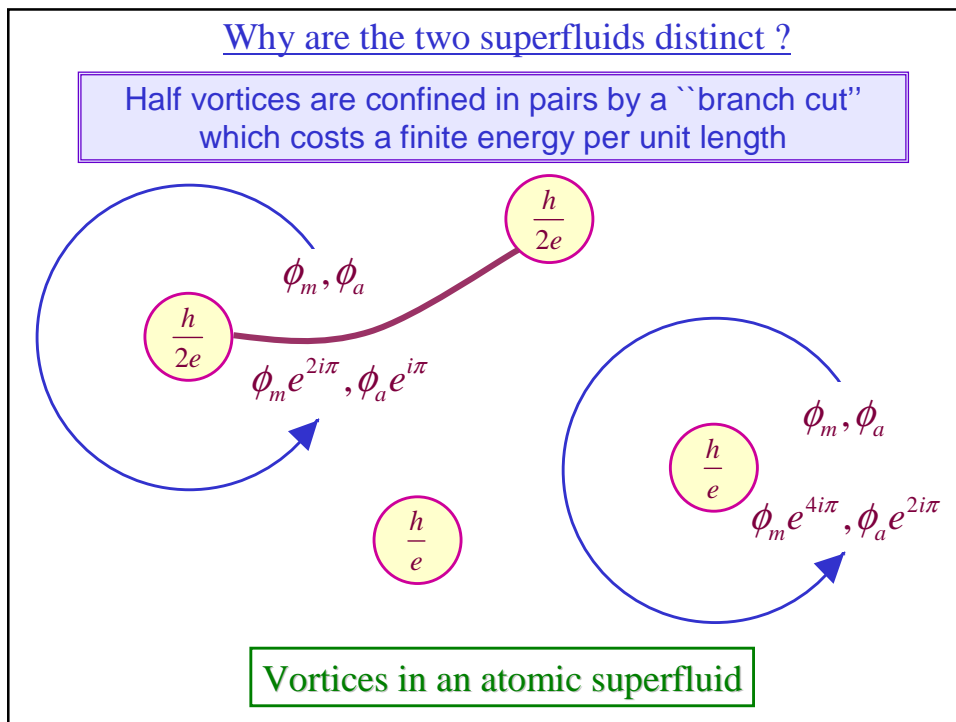
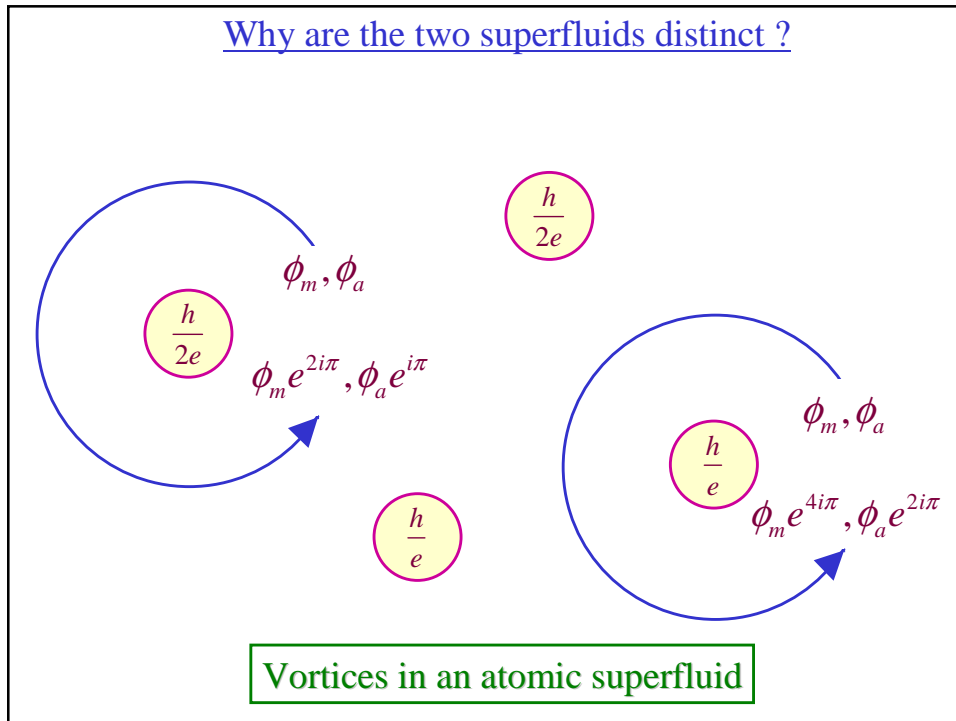


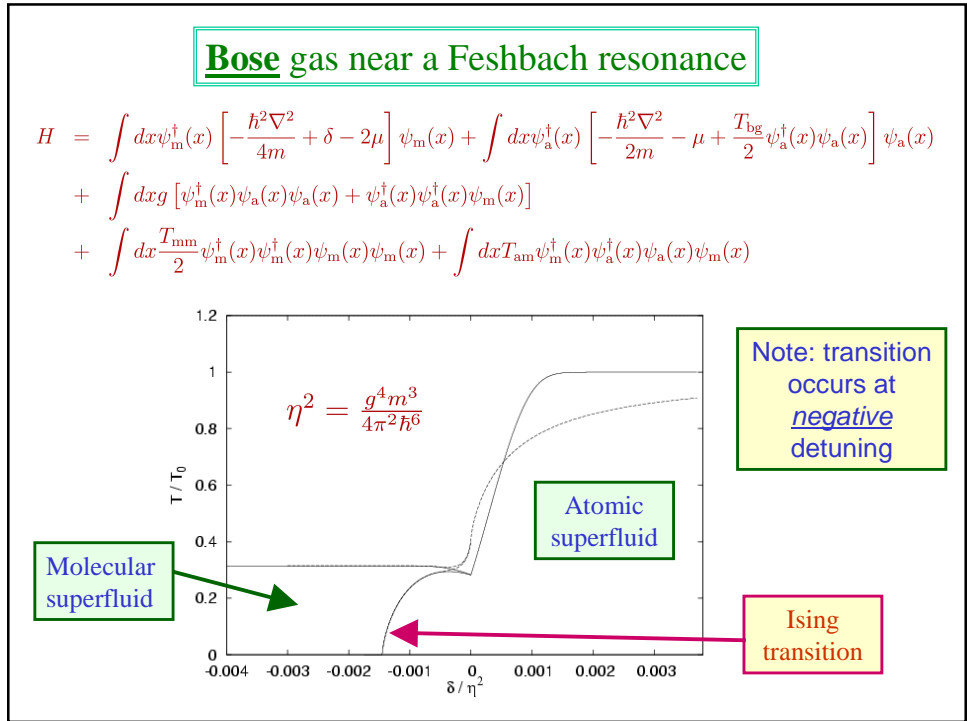
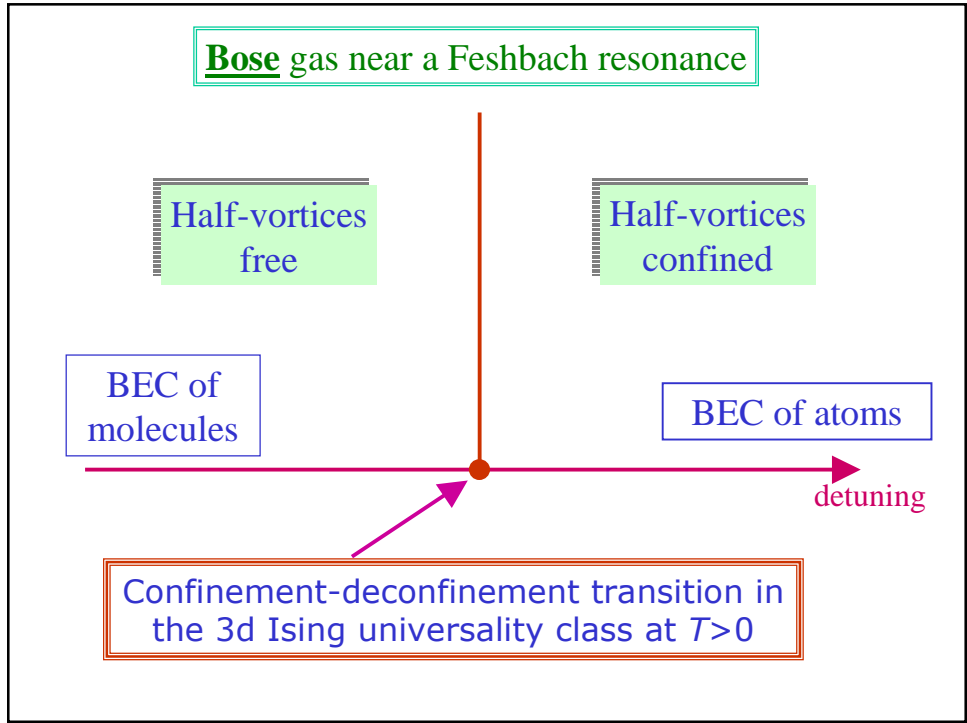












Bose gas near a Feshbach resonance

Detecting the Ising transition:

- Observation of vortices
- Non-analytic increase in atomic density
- “Critical slowing down” : strong damping of collective modes and decay of atomic density fluctuations into critical fluctuations