Abstract for an Invited Paper
for the MAR09 Meeting of
The American Physical Society

Understanding the 5/2 fractional quantum Hall effect without the Pfaffian wave function

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The fractional quantum Hall effect (FQHE) in the second Landau level has attracted attention, because the lowest Landau level theories do not straightforwardly generalize to these states, and several of the porposed models feature excitations with non-Abelian braiding statistics, with possible applications in topological quantum computing. In particular, the FQHE states at $\nu = 5/2$ and $7/2$, which have no lowest Landau level analogons, are usually understood in terms of the paired composite fermion model proposed by Moore and Read. I present an alternative understanding of the 5/2 FQHE within the composite fermion theory. I argue that the residual interaction between composite fermions plays a crucial role in establishing incompressibility at 5/2. The low-energy spectrum and the activation gap are estimated with the help of a perturbative procedure that incorporates inter-composite- fermion interactions. This approach is amenable to systematic improvement, and produces ground as well as excited states. It, however, does not relate to non-Abelian statistics in any obvious manner. The emergence of incoompressiblity due to inter-composite-fermion interactions is also observed other fractions in the second Landau level, notably at $\nu = 2 + 2/5$ and 2+3/8.