Microscopic Theory of Semicondcutor Optics

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**The basic concepts needed for a microscopic description of semiconductor optics are introduced and discussed.
The Coulomb interaction among the photoexcited electrons and holes leads to a genuine many-body problem.
Consistent treatments which include microscopic correlations on different levels lead to Semiconductor Bloch equations containing coherent contributions as well as scattering and relaxation terms.
This theory is applied to analyze a variety of coherent effects in semiconductors.
Examples are the optical Stark effect and coherent oscillations which show up in pump-probe spectroscopy as well as quantum beats and photon echoes which may be observed using four-wave mixing.
Many of the calculated results agree very well with measurements performed on semicondcutor quantum wells.**