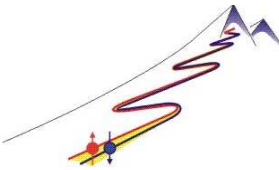


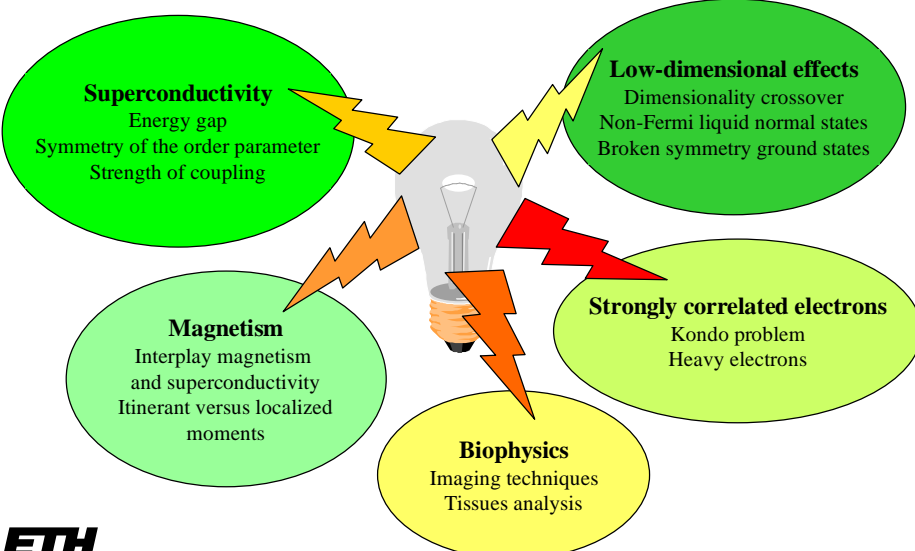
**Optical Properties of
Correlated Systems**



Leonardo Degiorgi
Laboratorium für Festkörperphysik
ETH Zürich, Switzerland

ETH zürich

Motivation



Superconductivity
Energy gap
Symmetry of the order parameter
Strength of coupling

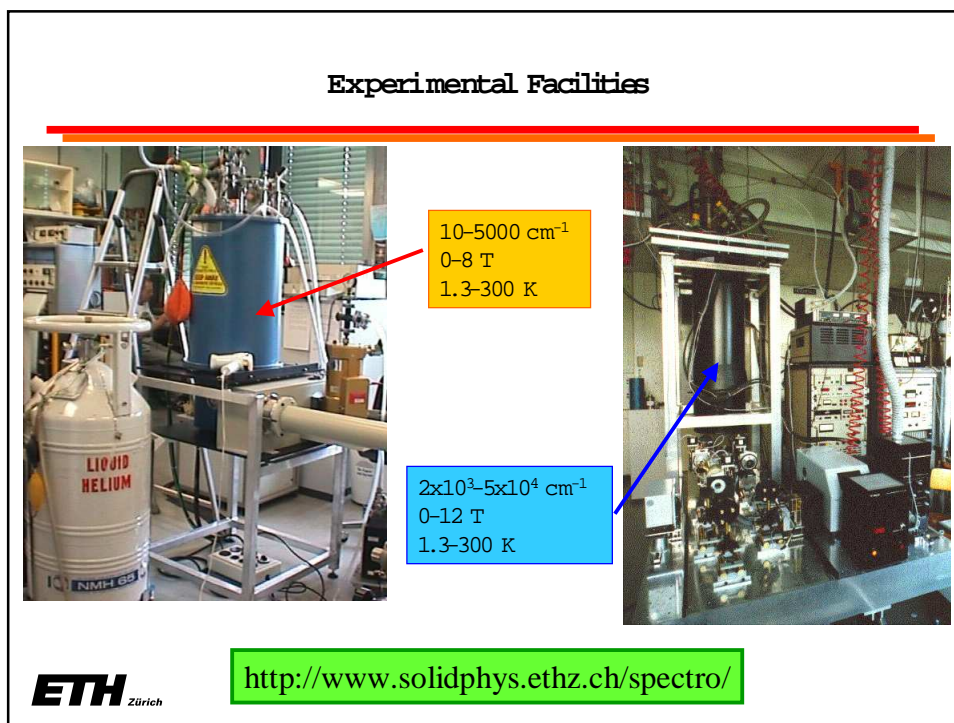
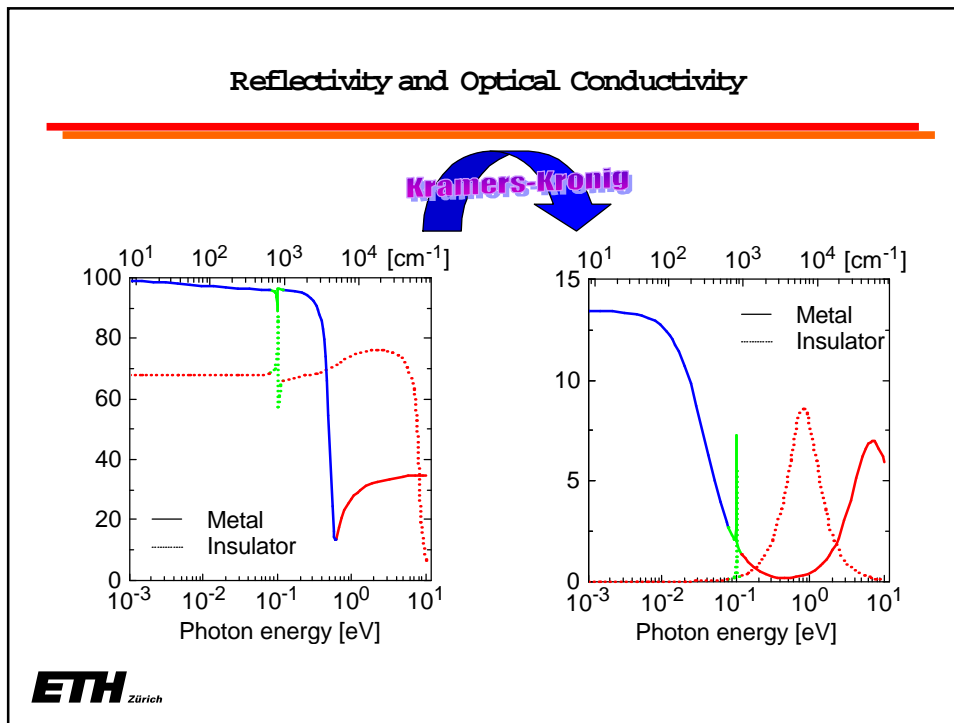
Low-dimensional effects
Dimensionality crossover
Non-Fermi liquid normal states
Broken symmetry ground states

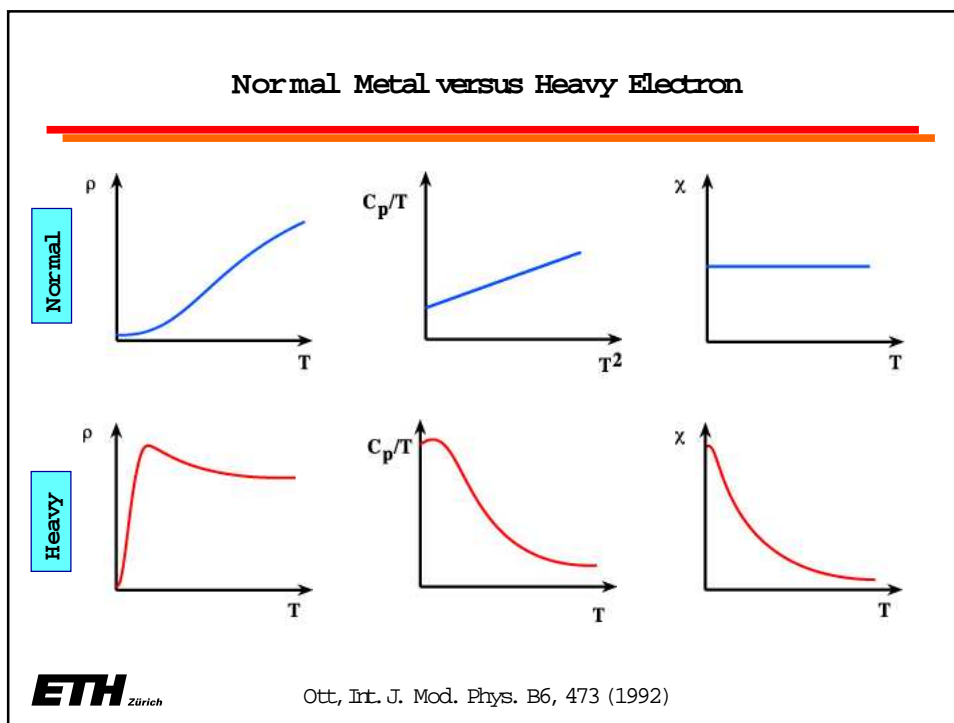
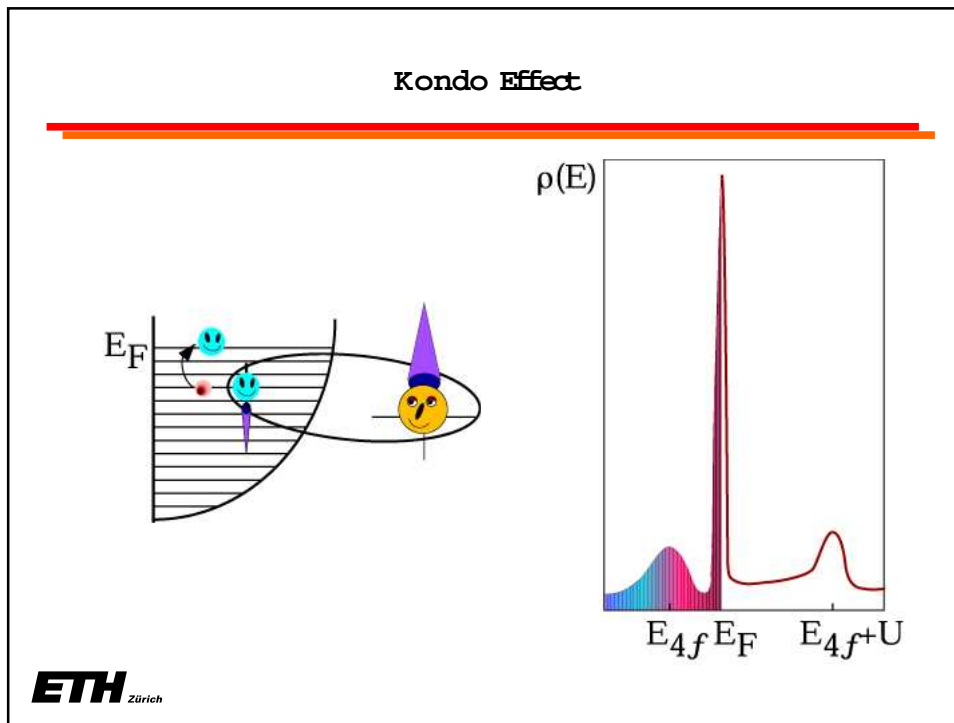
Strongly correlated electrons
Kondo problem
Heavy electrons

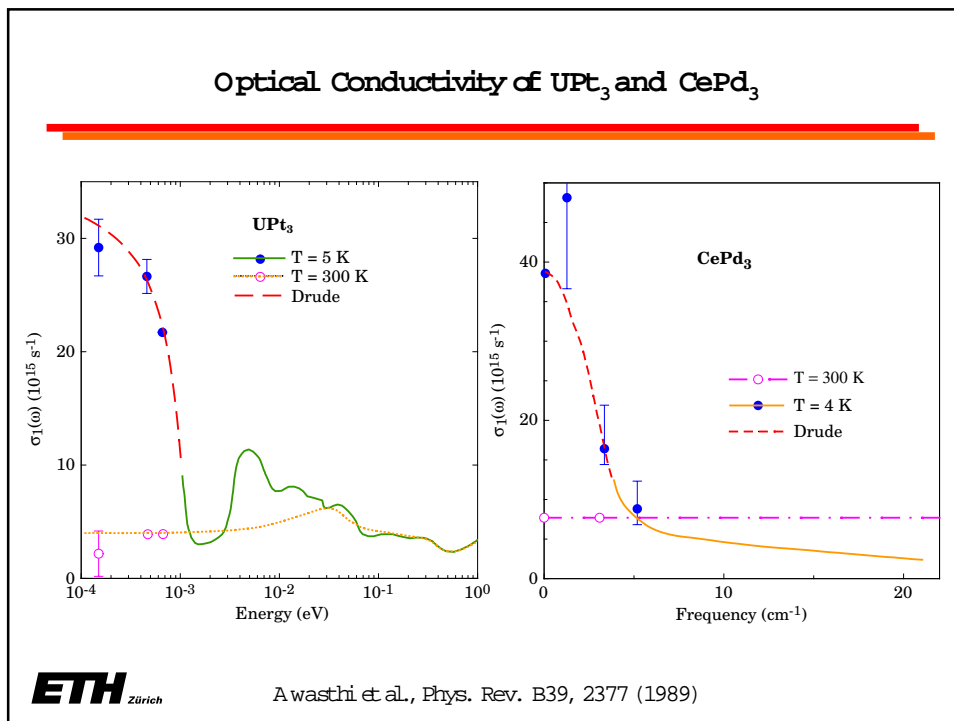
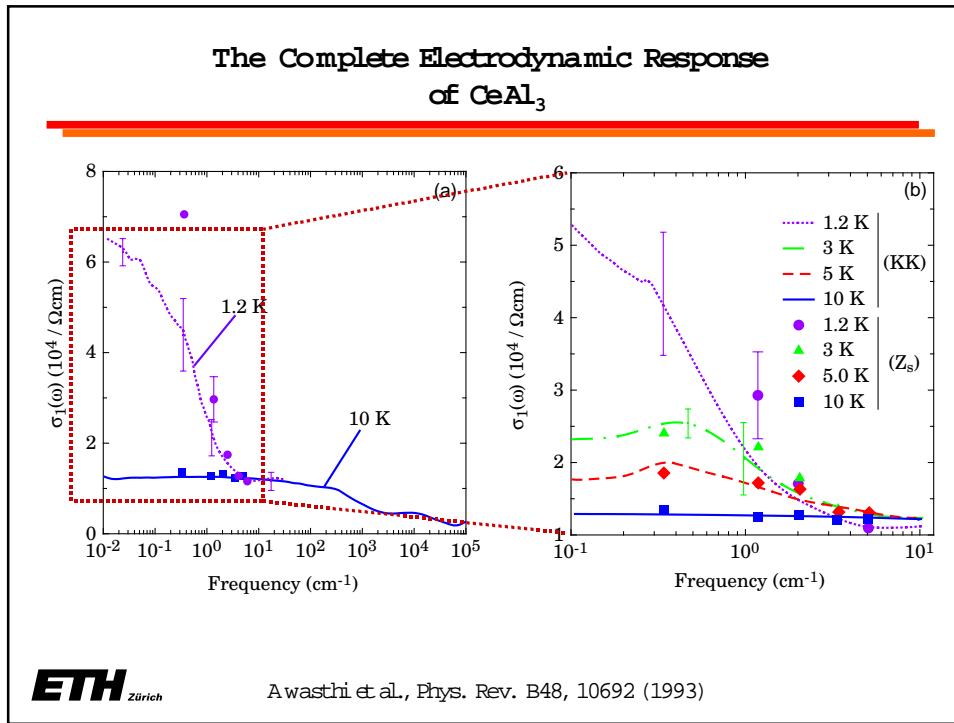
Biophysics
Imaging techniques
Tissues analysis

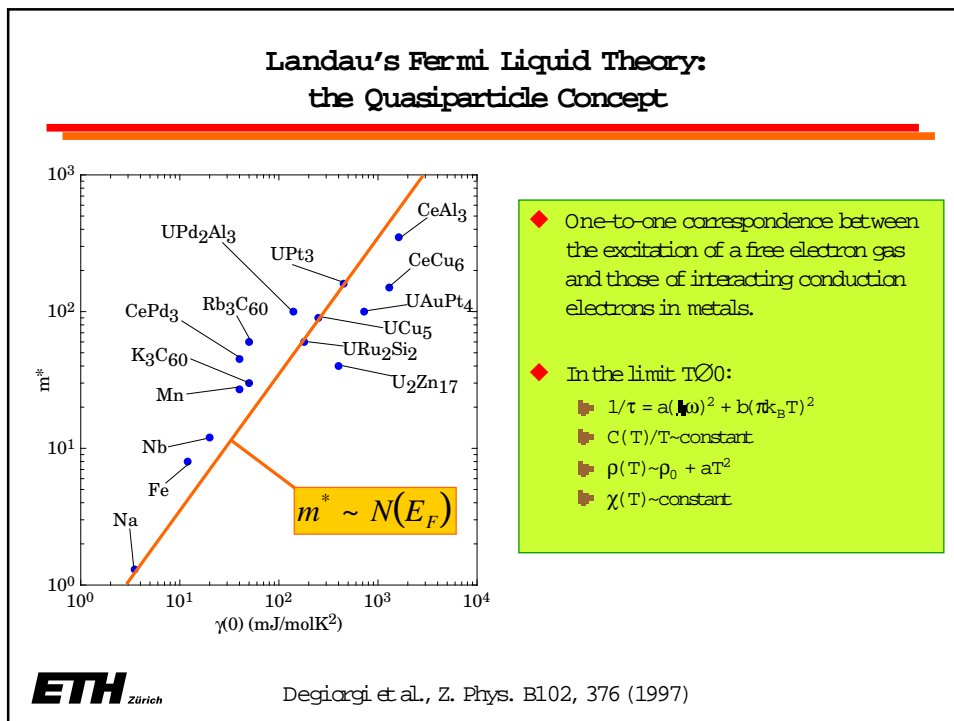
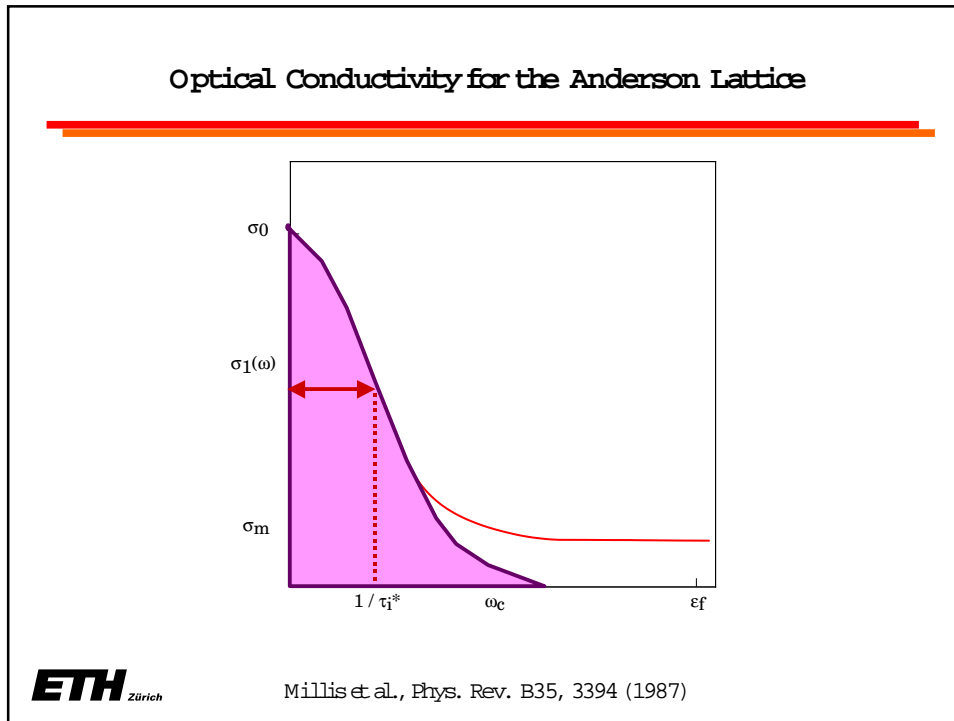
Magnetism
Interplay magnetism
and superconductivity
Itinerant versus localized
moments

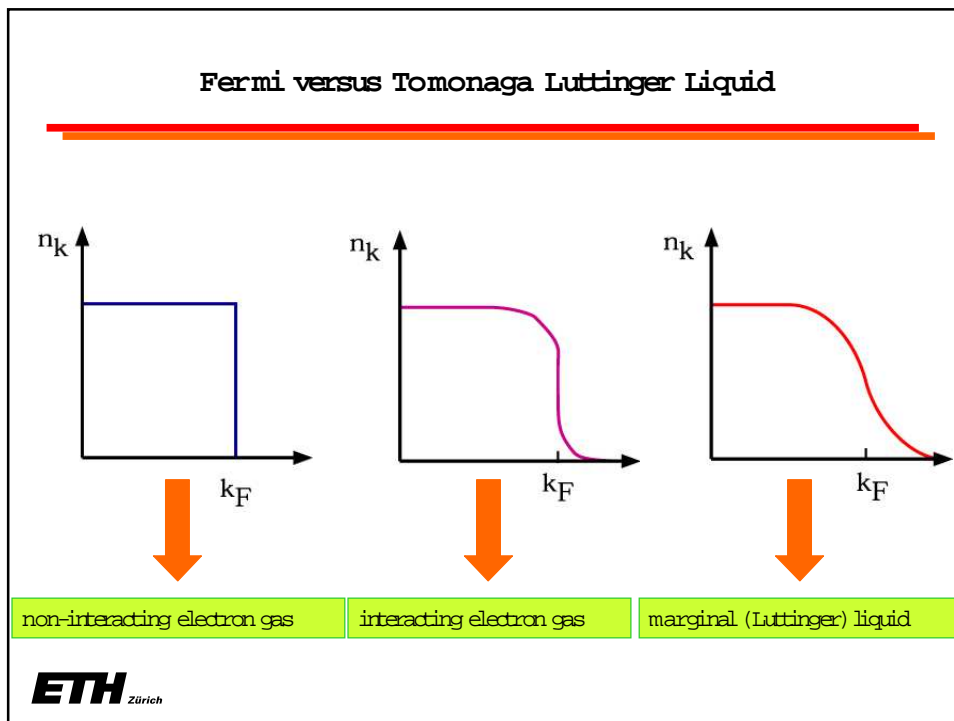
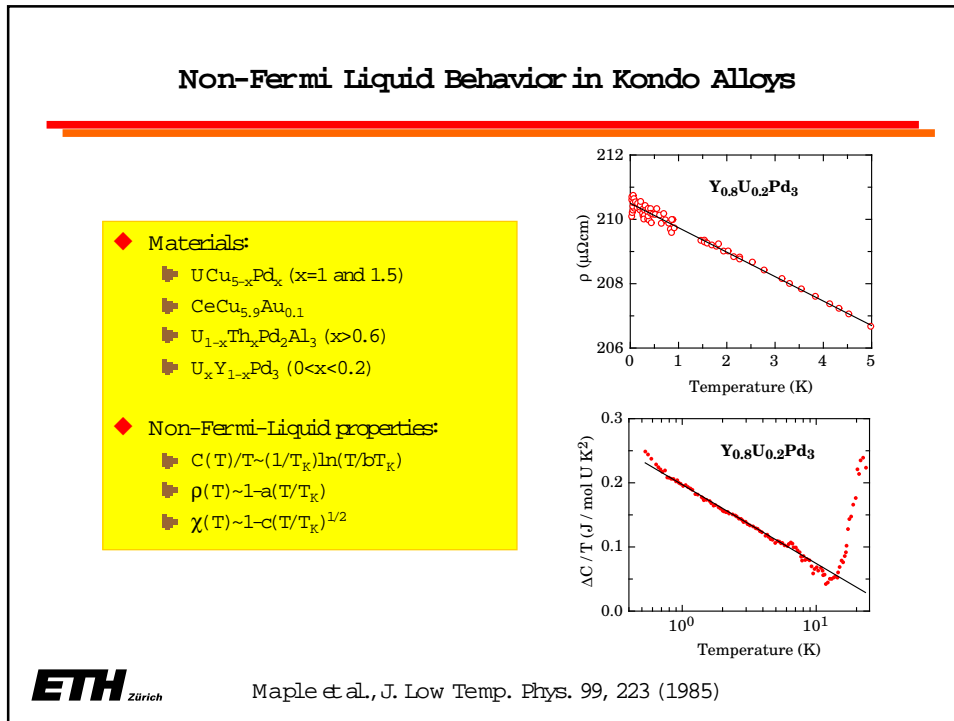
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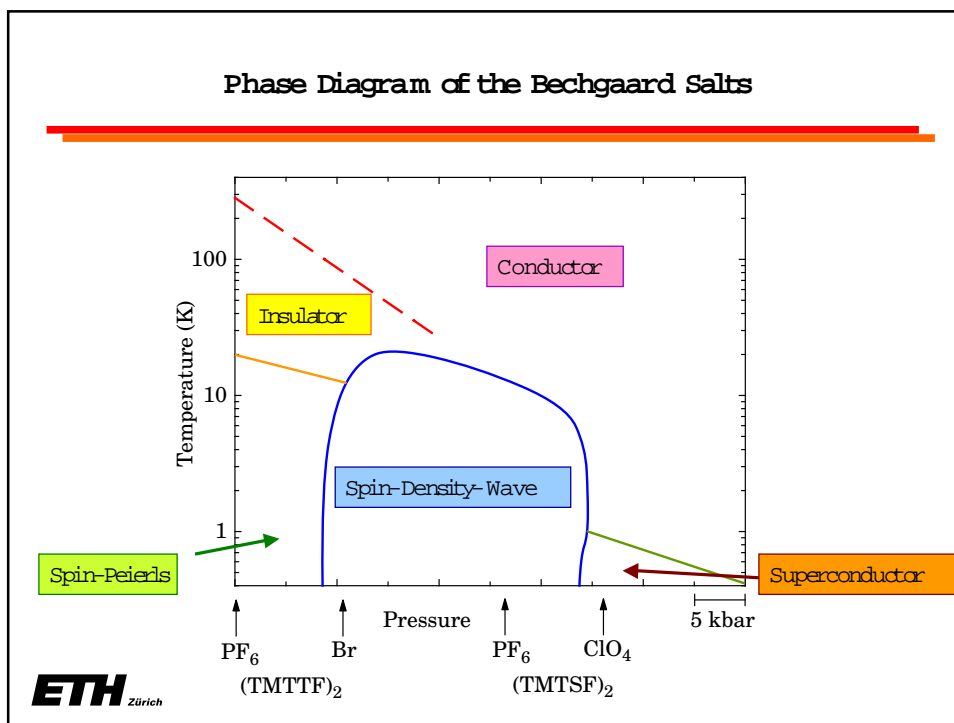
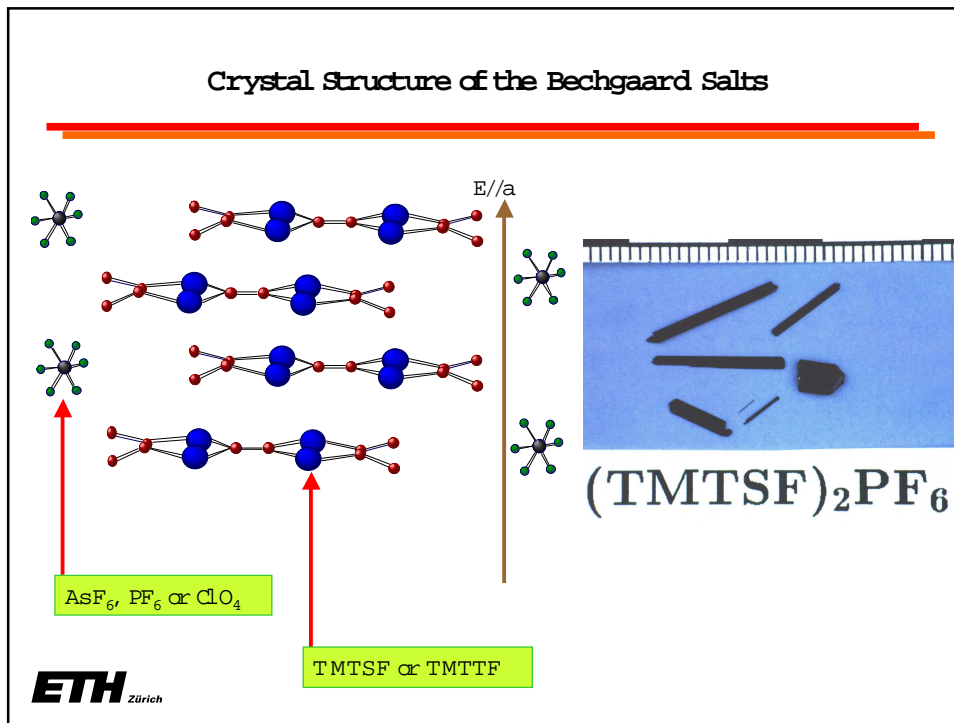


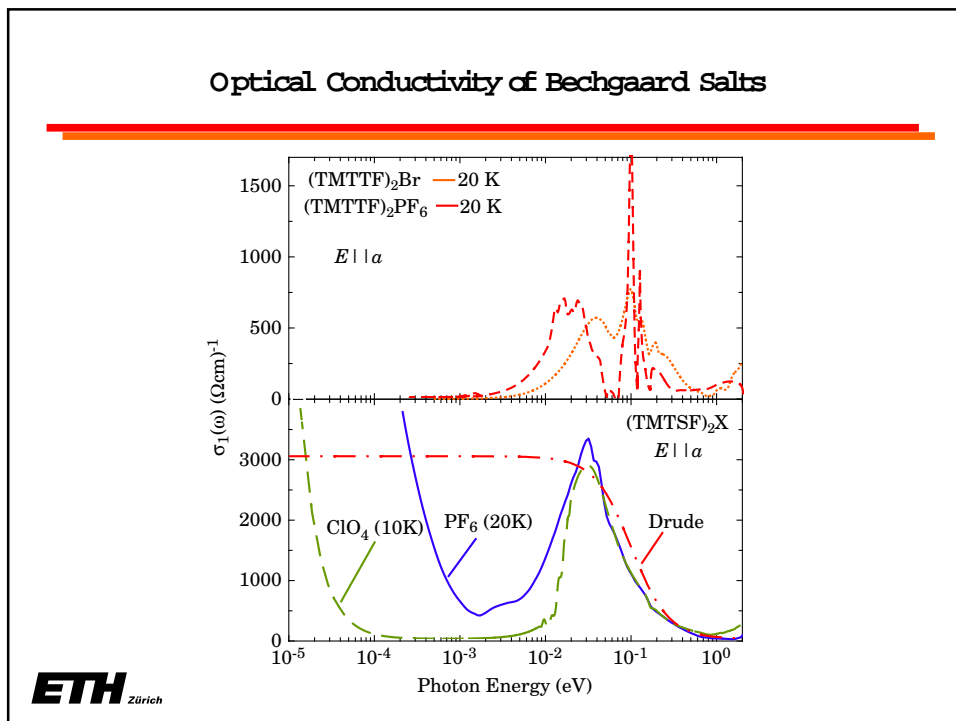
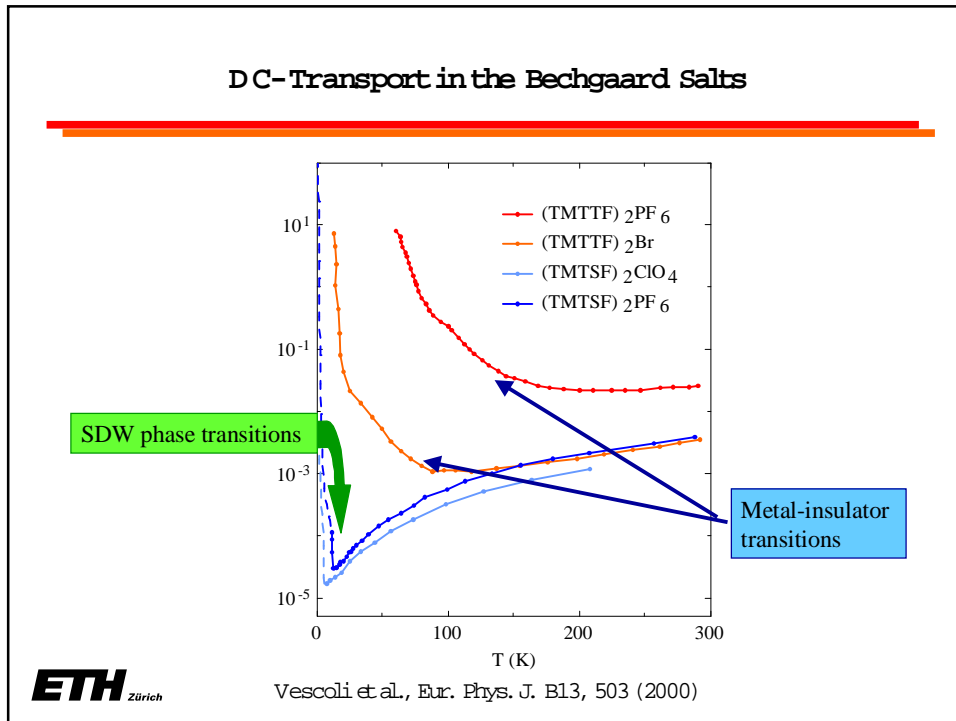


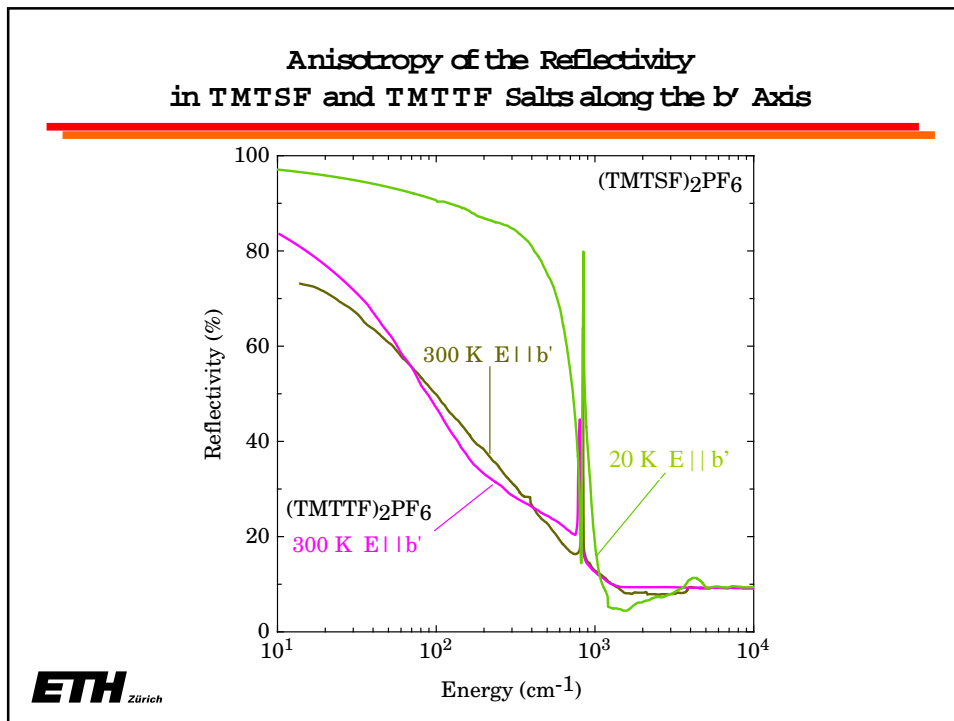




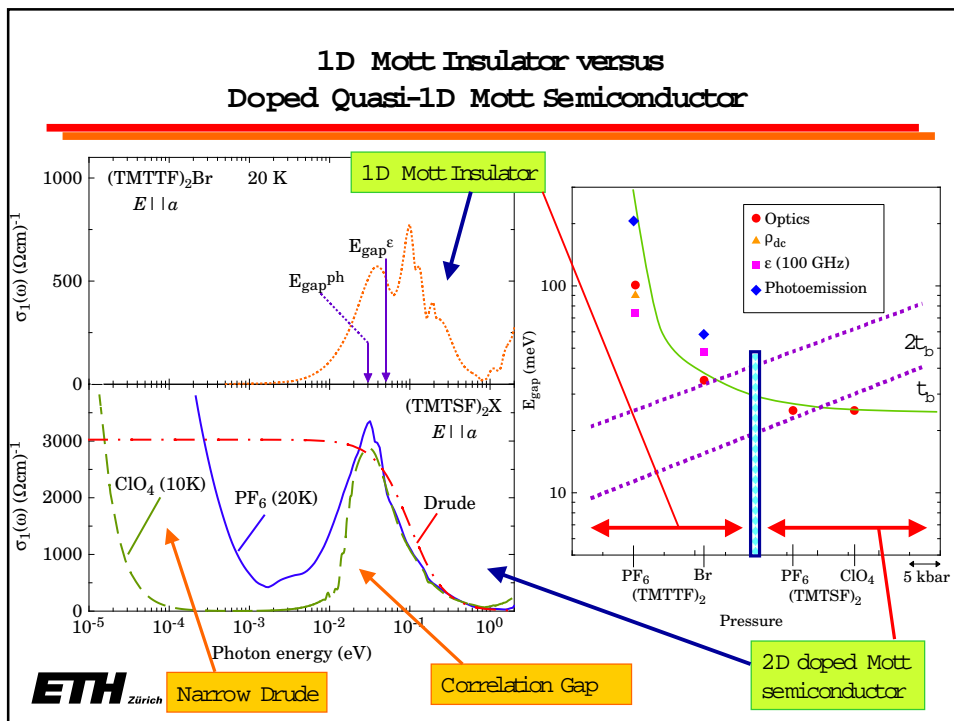
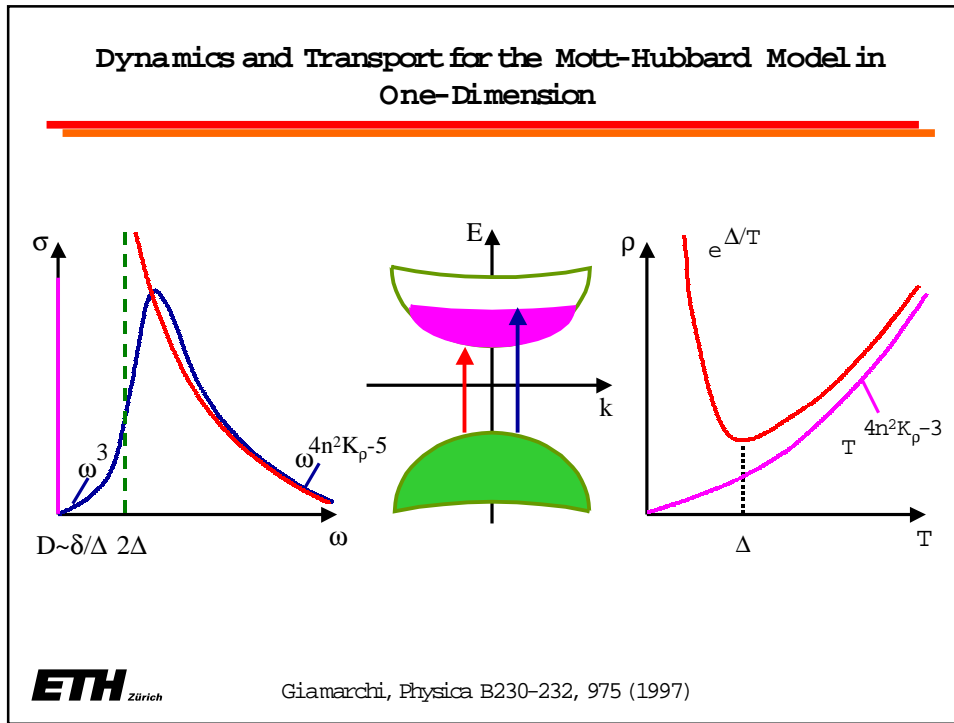


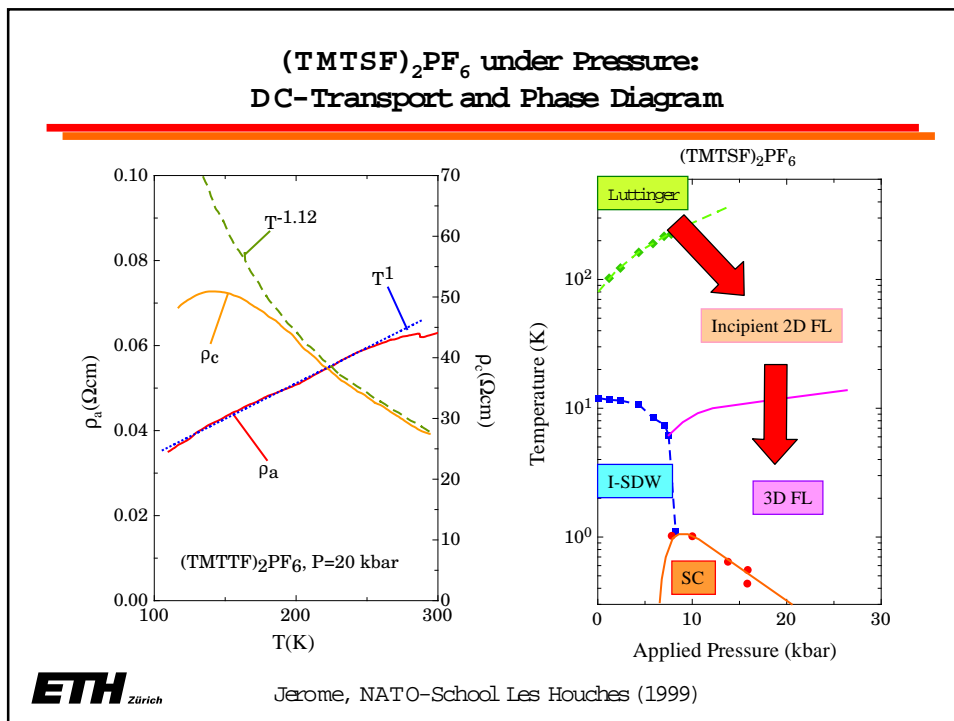
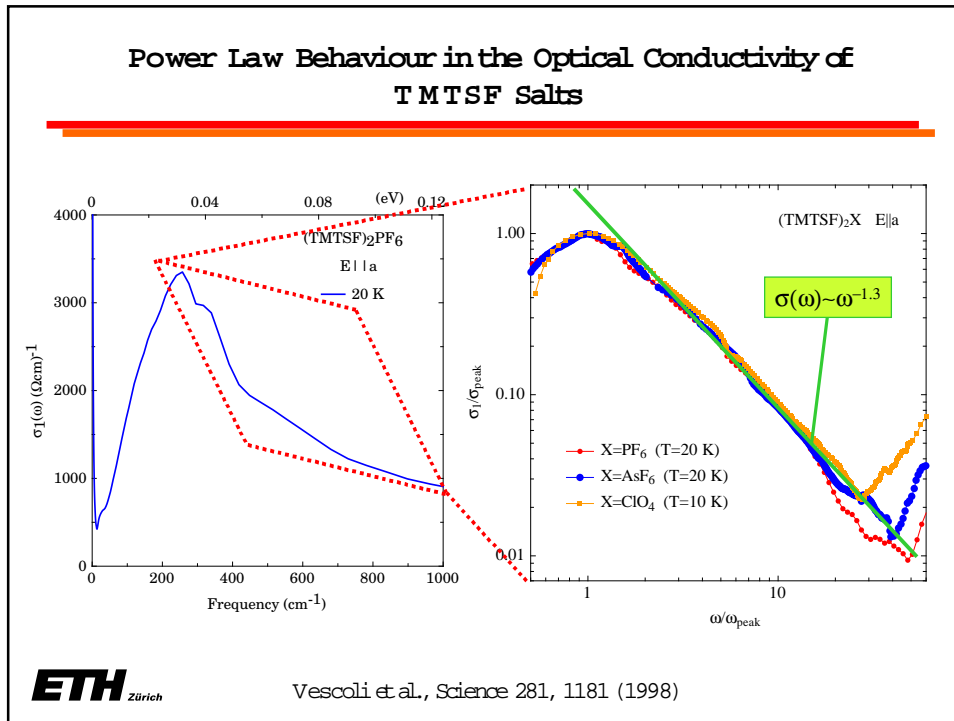


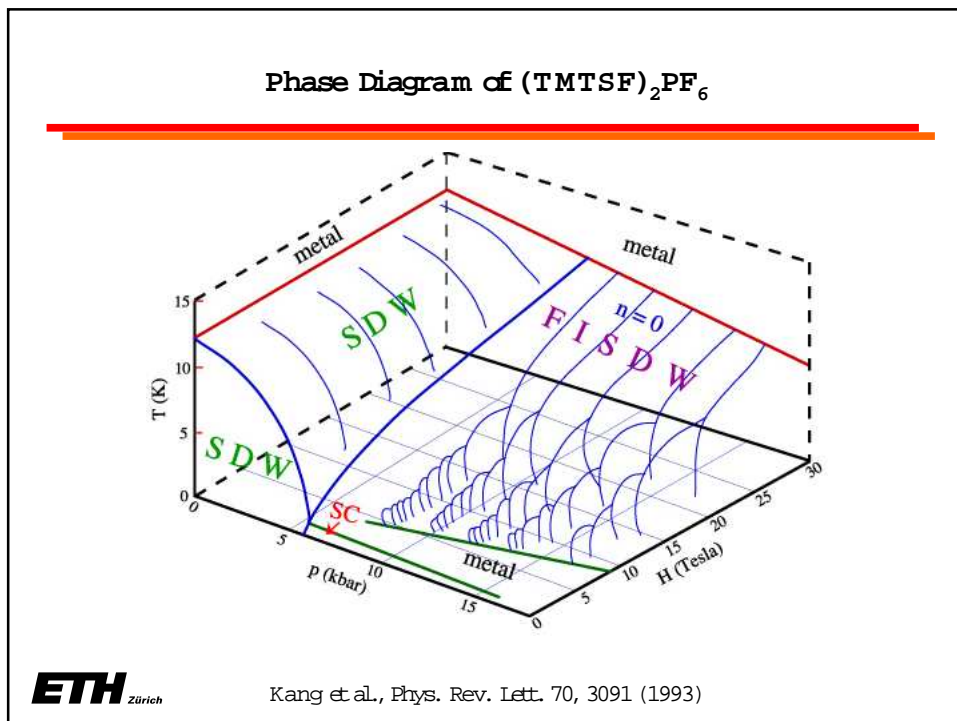


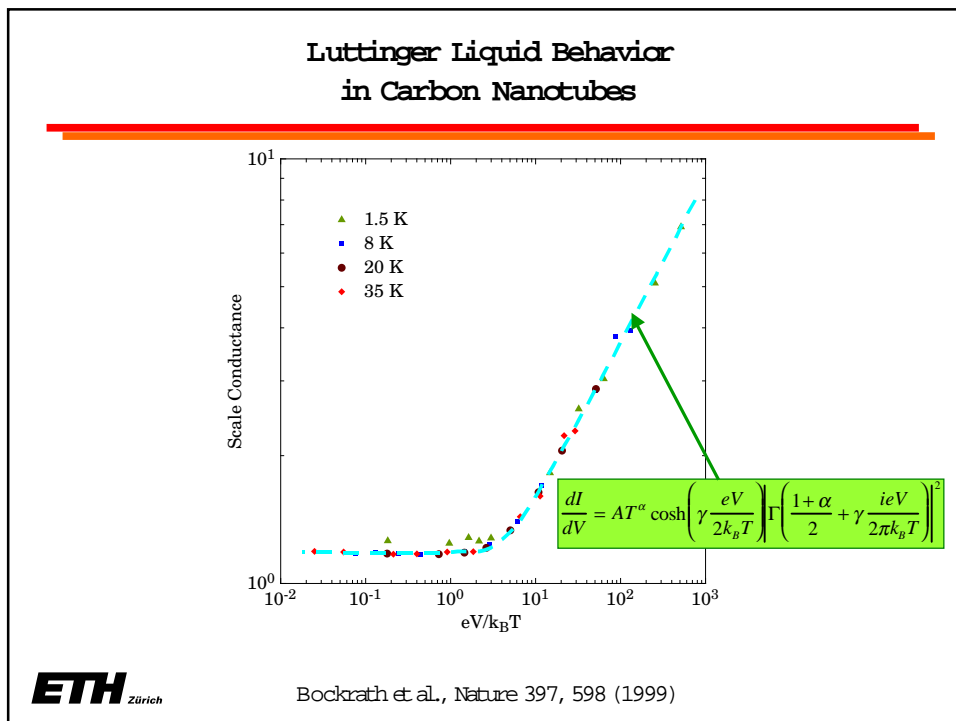
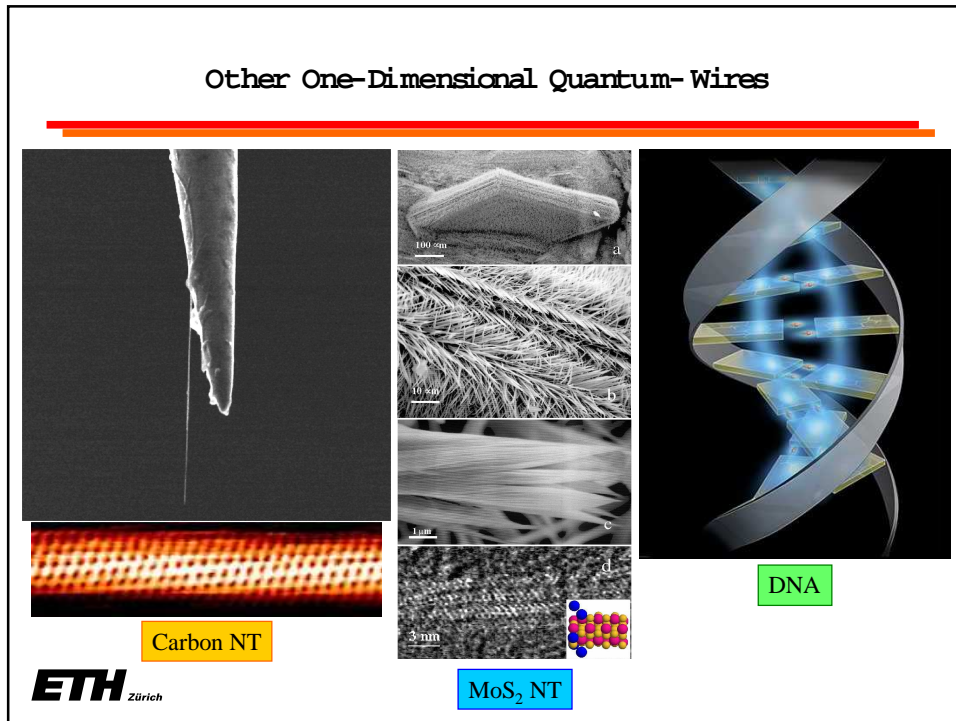


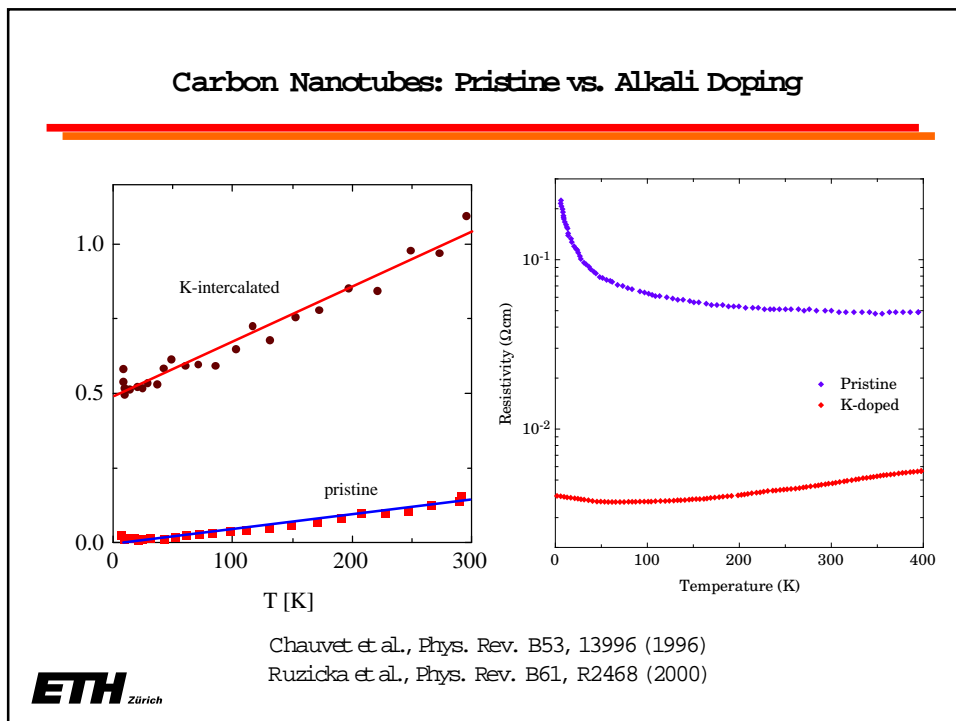
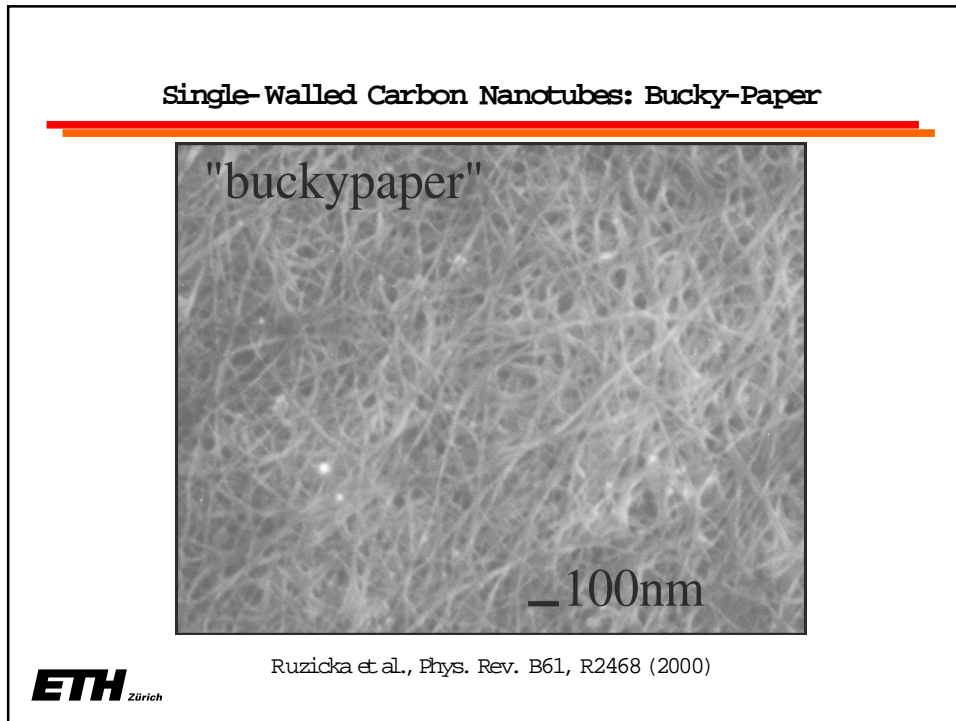
- ### Theoretical Impact of the "Infrared Puzzle" in the Metallic Organic Compounds
- ◆ Charge and dimerization gap in the Hubbard model at quarter filling
 - K. Penc et al., Phys. Rev. B50, 11429 (1994)
 - S. Nishimoto et al., J. Phys. Soc. Jap. 69, 1594 (2000)
 - ◆ Charge excitation in doped Mott insulator in one dimension
 - M. Mori et al., J. Phys. Soc. Jap. 65, 3604 (1996)
 - ➔ T. Giamarchi, Physica B230-232, 975 (1997)
 - S. Biermann et al., cond-mat/0201542
 - M. Tsuchiizu et al., J. Phys. Soc. Jap. 68, 1809 (1999)
 - A. Georges et al., cond-mat/0001063
 - E. Jeckelmann et al., cond-mat/9911281
 - D. Controzzi et al., Phys. Rev. Lett. 86, 680 (2001)
 - J.M.P. Carmelo et al., Phys. Rev. Lett. 84, 4673 (2000)
 - ◆ and more will come
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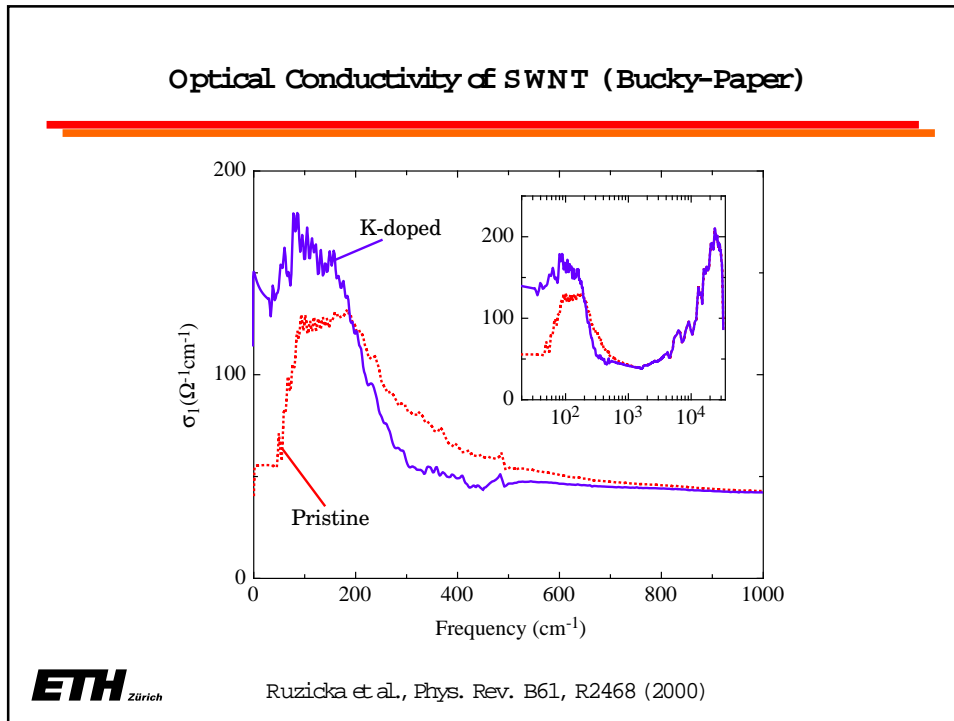












- ### What Did We Learn?
- ◆ Characteristic energy scales
 - ▶ Plasma frequency and scattering rate
 - ▶ Correlation gaps and collective modes
 - ◆ Intrinsic parameters about the strength of interactions
 - ▶ Electron-electron and/or electron-phonon interaction
 - ▶ Characteristic power-law behaviours
 - ◆ Electronic interband transitions and phonon modes spectrum
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