

# LECTURES ON ANDERSON LOCALISATION

## Lecture 1.

*Introduction* . . . . .

Qualitative discussion: Quantum Mechanics of a single particle in a random potential; Spectrum, Density of states, wave functions, Rate of Tunneling, Diffusion and Localisation, Hopping Conductivity. Level Statistics. Integer Quantum Hall Effect.

Elements of Theoretical Technology (very qualitatively): To average or not to average. Green's Functions, Conductivity.

## Lecture 2.

*Band Tail* . . . . .

Density of states at the energy  $E \rightarrow -\infty$ .

## Lecture 3.

*Supersymmetric Non-linear  $\sigma$ -Model.*

*Level Statistics* . . . . .

## Lecture 4.

*Weak Localisation* . . . . .

Quantum Correction to Conductivity in the Extended states. Effect of Magnetic Field, Magnetic Impurities and Spin-Orbit Interaction.

## Lecture 5.

*Scaling Theory for Localisation* . . . . .

“Gang of Four” (E. Abrahams, P.W. Anderson, D.C. Liccardello and T.V. Ramakrishnan) Theory

**Lecture 6.**

*Dirty Superconductors* . . . . .

A.A. Abrikosov and L.P. Gorkov theory. Effect of Magnetic Impurities.

**Lecture 7.**

*Pre-Localisation and Gapless Superconductivity* .

**Lecture 8.**

*Integer Quantum Hall Effect* . . . . .

**Appendix 1**

*Rate of Phase Breaking*

*due to Electron-Electron Collisions* . . . . .