Plan for lectures by Prof. D. Phillips (Ohio University)

"Chiral Effective Theory for Electomagnetic Interactions with Light Nuclei"

Day 1: Introduction to Effective Field Theory (EFT)
Discussion of EFT as a general principle.
Examples from Classical Electrodynamics (Multipole expansion, Thomson scattering).
Examples from Quantum Field Theory (Fermi electroweak theory, phi^4 theory in six dimesions).

Day 2: Chiral Symmetry and hadron-hadron interactions
Chiral symmetry of QCD and the hidden nature of chiral symmetry in low-energy hadron-hadron interactions.
Goldstone bosons.
Chiral perturbation theory (ChiPT) as the low-energy EFT of QCD.
ChiPT with baryons.
ChiPT predictions for nucleon-nucleon (NN) interactions.

Day 3: Why and how we iterate
The problem with perturbative calculations of the NN amplitude.
The Lippmann-Schwinger equation and how to solve it.
ChiPT calculation of the leading-order NN potential.
Renormalization of the leading-order potential.
Sub-leading potentials.
Predictions for NN and NNN scattering.
Issues regarding renormalization.

Day 4: Electron scattering from light nuclei
ChiPT predictions for nucleon electromagnetic form factors.
Introduction to electron-deuteron scattering.
Predictions for deuteron electromagnetic form factors in chiral effective theory.
Form factors for the trinucleons and electron-induced breakup of the deuterium nucleus.

Day 5: Compton scattering from light nuclei
Introduction to Compton scattering on the proton and neutron; overview of proton Compton experiments.
ChiPT predictions for Compton scattering from the proton.
ChiPT predictions for Compton scattering from the deuteron.
Comparison with data.
Issue associated with the nuclear bound state.
ChiPT predictions for Compton scattering from Helium-3.
Compton scattering outlook.