940: Monitoring DNA Damage

The topics for the four days are:

* A Molecular Biology Primer for the Uninitiated
  1. Replication, Recombination and Repair
  2. Central Dogma of Molecular Biology (DNA -> RNA -> Protein)
  3. Gene Expression and its Control
* Endpoint Tests (colony formation): The First Tests (cell death) to the Ames Test
  1. Mutagen detection (Hypothesis; most carcinogens are also mutagens)
     + Reversion assays to prototrophy
  2. Gaining chemical access to the genetic material-crossing cell walls and membranes
  3. Preventing repair of DNA damage
  4. Mammalian activation of carcinogens to mutagens
  5. Time frame: one-two days
* More sensitive tests based upon knowledge that specific patterns of gene expression are induced by sublethal levels of stressful chemicals
  1. Cells have specific means to induce different patterns of gene expression to survive insults
  2. These patterns of gene expression are induced at lower levels of insult than those causing prevention of cell growth (more sensitivity)
  3. Metabolism is not effected by this low level of insult
  4. Easily detectable genes can be fused to the stress responsive genetic elements allowing real time monitoring of stress responses
  5. Time frame: about one hr.
* Monitoring DNA damage by sequencing entire genomes and mRNA populations