

LECTURE #1: **NUCLEOCYTOPLASMIC TRAFFICKING**

1. Architecture of the nuclear pore complex (NPC)
  - Nucleoporins
  - FxFG, GLFG, and FG repeat proteins
  - Nuclear fibrils and other features
  - NPC assembly
  
2. Nucleocytoplasmic transport
  - Types of cargo
  - Signals for transport
    - Nuclear localization signals (NLS's)
    - Nuclear export signals (NES's)
  
3. Mechanisms of nucleocytoplasmic trafficking
  - Cytosolic/soluble transport factors
    - Ran GTPase and its regulatory factors
    - Karyopherins (importins and exportins)
  - Interaction of transport factors with nucleoporins
  - Nuclear protein import
  - Nuclear protein export
  - Export of certain classes of RNA (e.g. tRNAs, pre-miRNAs, rRNAs)
  - Export of mRNA as ribonucleoprotein particles (RNP's)
  - Surveillance / "quality control" mechanisms (coupling of mRNA export to gene transcription, pre-mRNA splicing, and nonsense-mediated mRNA decay)
  
4. Regulation of nucleocytoplasmic trafficking
  - Roles of protein phosphorylation
    - Control of localization (e.g. Swi5, NFAT<sub>c</sub>)
    - Control of sequestration (e.g. NF- $\kappa$ B, Rb)
    - Control of stability (e.g. APC = *adenomatous polyposis coli* gene product &  $\beta$ -catenin)
  - Calcium regulation of NPC permeability