BIOL 2030, Fall '09, Lecture #12
Problems, Ch. 8: 4, 6, 7-13, 15, 19, 25, 26, 38

How is the sense of a gene encoded by the arrangement of four bases?

I. The nonsense hypothesis
- A. reverting and non-reverting mutations
- B. suppressible mutations
- C. Benzer & Champe test of nonsense hypothesis
  1. mutation that fuses rIIA & rIIB ($A^- B^+$)
  2. suppressible mutation in A kills B
  3. suppression by generalized nonsense suppressor

II. Co-linearity of gene and protein
- A. T4 gene 23 makes >50% of protein late in infection
- B. linear correspondence between map position of nonsense mutation and length of protein

III. How is information transferred from DNA?
- A. DNA in nucleus, protein synthesis in cytoplasm
- B. RNA intermediate (mRNA)
  1. DNA transcribed into complementary RNA by RNA pol II (for protein-coding genes), also polymerizes 5'→3'
     - note – RNA uses U in place of T
  2. RNA processed and transported from nucleus to cytoplasm
  3. Ribosome recognizes mRNAs and translates into protein

IV. How can variation in the sequence of 4 bases encode complex information?
- A. combinatorial code, requires at least triplet to encode 20 aa
- B. Crick's frameshift experiments show triplet nature of code
  - 4^3 = 64 possibilities, code is redundant
- C. Nirenberg and Khorana, synthetic RNAs to deduce code
  - codon table
- D. Four codons are "punctuation"
  1. AUG = start (encodes methionine)
  2. UAG, UGA, UAA = stop (no aa), also known as nonsense codons