Lecture 1

- Introduction
  - who am I?
    - http://www.cbcb.umd.edu/~mpop
    - came from JHU via TIGR
    - last year at UMD as research faculty
    - Research interests: genome assembly, new sequencing technologies, metagenomics (e.g. bacteria in the gut)
  - class policies
    - homework, 2 exams, 2 projects
    - first project - write a suffix tree program
    - second project - your choice - go meet a biologist. There will be a proposal defense.
    - Check website regularly. I'll post homeworks & class notes.
    - Grading policy - homeworks primarily to gauge how things are working
    - late policy...2 days max. lose 10 pts/ late day
    - attendance policy - let me know if you'll miss class. Extra credit for participation - ask questions, point out mistakes, volunteer answers when I ask questions.
    - Office hours usually mondays - not next week (Labor day)
    - Honor code - shouldn't really mention this to graduate students but I strongly believe in it.
- Molecular biology primer
  - Domains of life: Viruses, Bacteria, Archaea, Eukarya
  - DNA is a string, hence this course
  - DNA is double-stranded, used in replication
    - the four bases Adenine, Thymine, Guanine, Cytosine

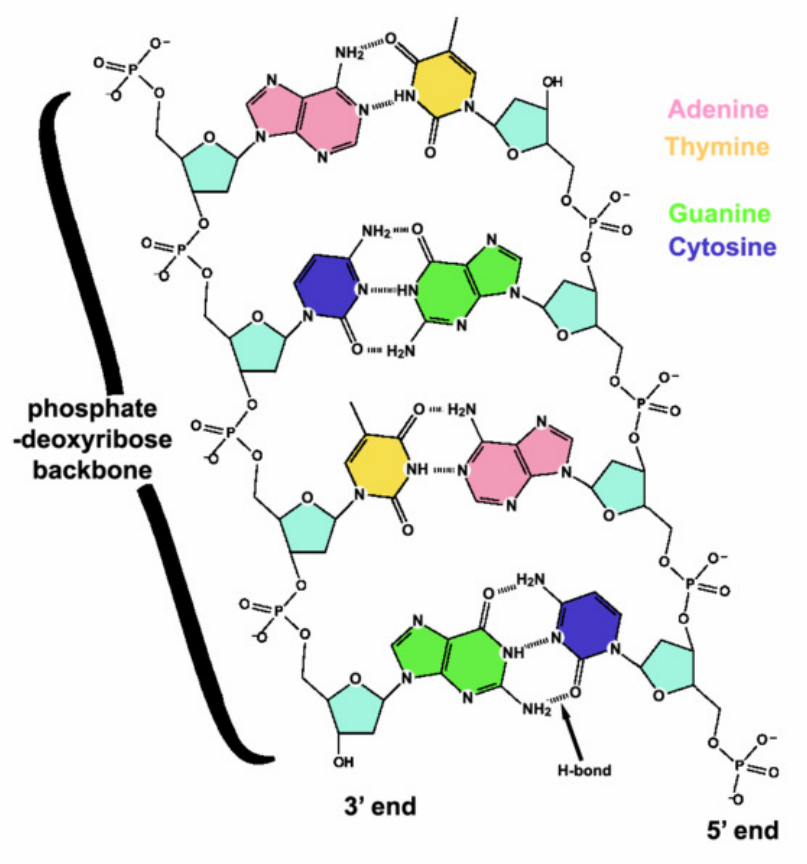

Figure 1 DNA backbone (picture from Wikipedia entry on DNA)

- bases complementarity A-T, C-G
- purines (AG) - 2 cycles , pyrimidines (TCU) - 1 cycle
- 5', 3' - why? - count the carbons in the sugar rings
- how replication works goes from 5' to 3' conferring orientation to DNA strand (written left to right)
- DNA polymerase - enzyme that extends the DNA strand
- cell cycle - bacteria vs. eukarya?

- Central dogma - DNA is the template/code that creates life
- Transcription/translation
  - proteins do all the work (enzymes)
  - DNA -> mRNA (transcription) - (Thymine is replaced by Uracil in RNA), RNA polymerase unwinds double-stranded DNA and uses it as a template for making RNA
  - mRNA -> amino acids (translation)
  - Genetic code - from 3-mers of DNA (4^3 = 64) to 20 AA (sometimes 21/22 depending on organism).
  - translation starts at a start (ATG), stops at a stop (TAA, TAG, TGA). Ribosome (complex of proteins & RNA) is the enzyme that does the translation
  - transfer RNA brings amino acids (one for each of the 20) to the ribosome.

- RNA also folds using base-pairing

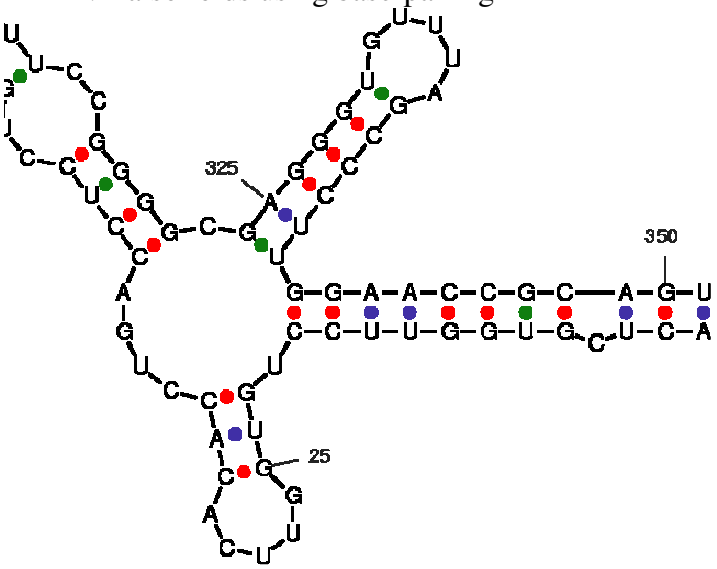

Figure 2 Section of folded RNA molecule. From http://www.bioinfo.rpi.edu/~zukerm/lectures/RNAfold-html

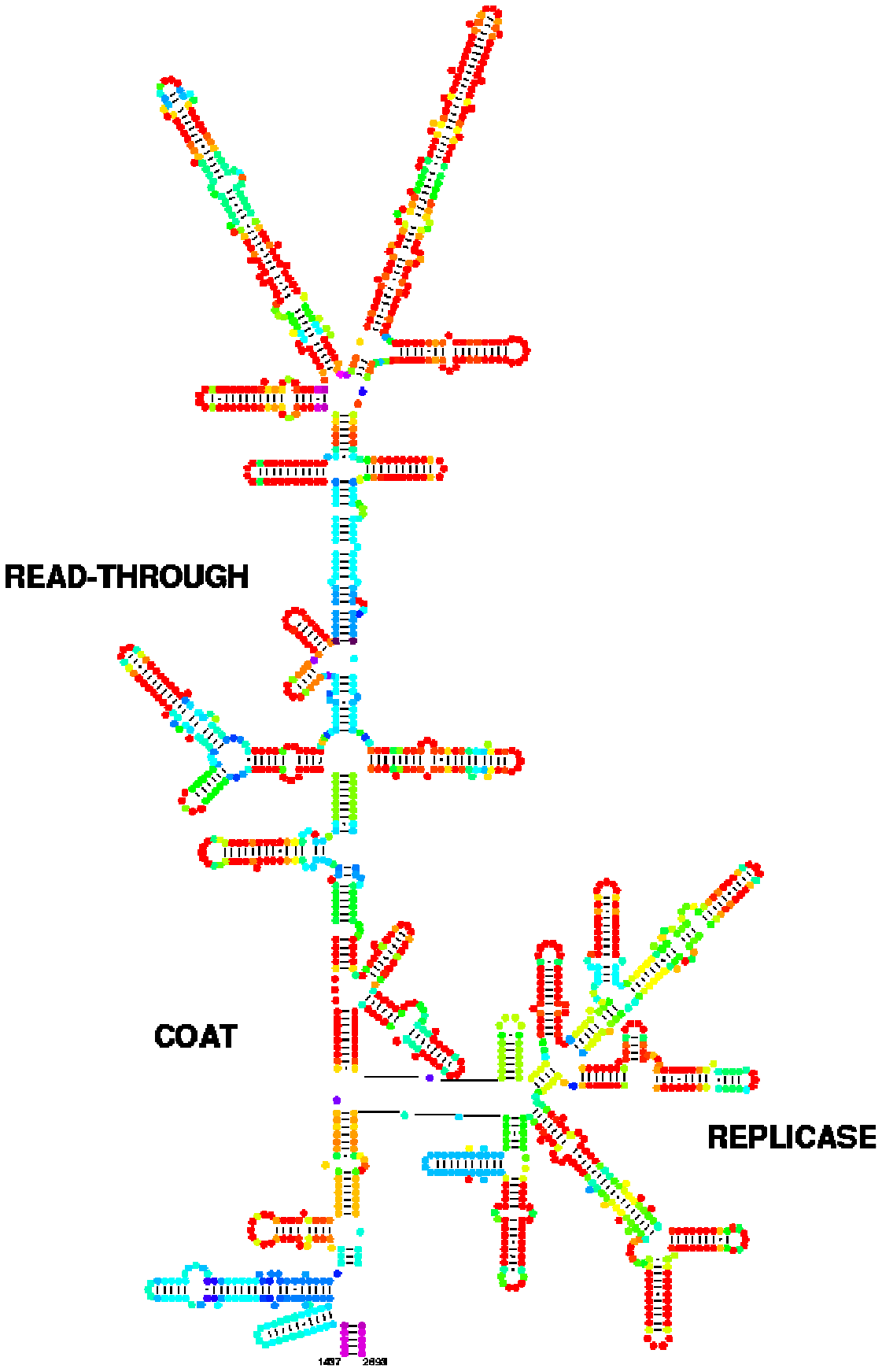
READ-THROUGH
COAT
REPLICASE

Figure 3 RNA fold of coliphage (an RNA virus that infects bacteria). From http://www.bioinfo.rpi.edu/~zukerm/lectures/RNAfold-html

- gene regulation, microRNAs, DNA folding (one chromosome is about 5cm in length but fits in one cell)