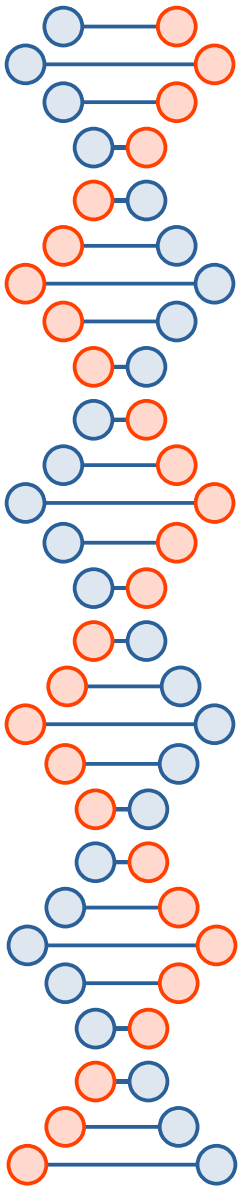
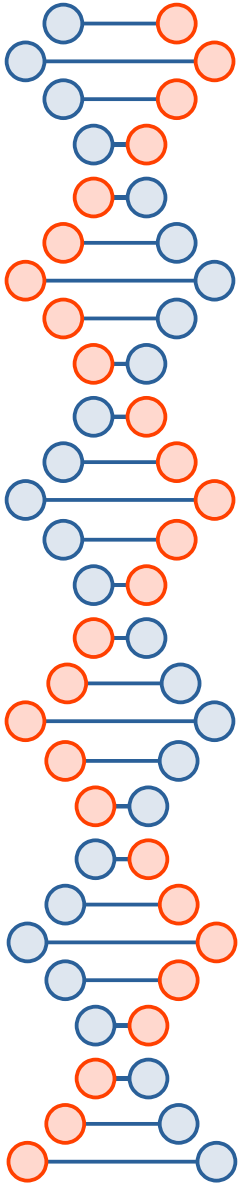


Computer Science and Medical Research

Session 1

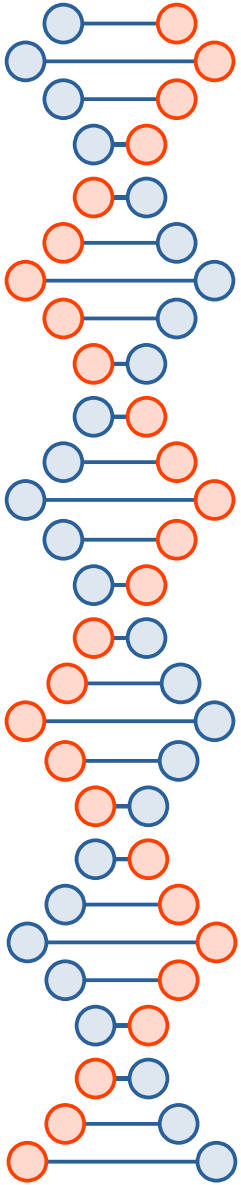
Introduction to Bioinformatics

github.com/Yoyomanzoor/CSMR



Me

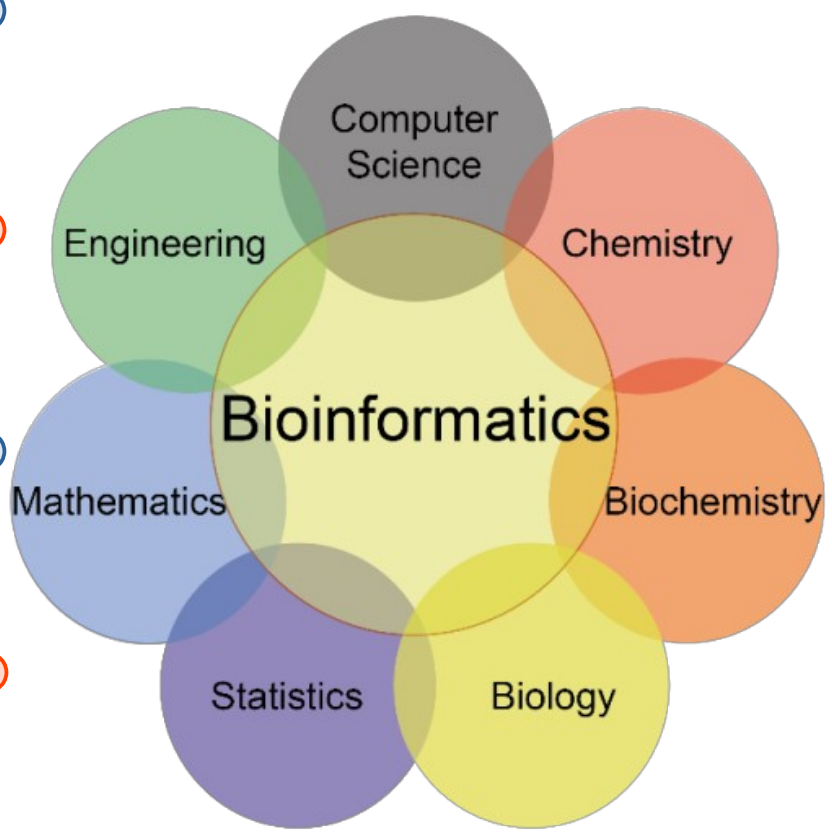
- Sumeed Manzoor
- smanzoor@umich.edu
- 2nd year grad student at the University of Michigan

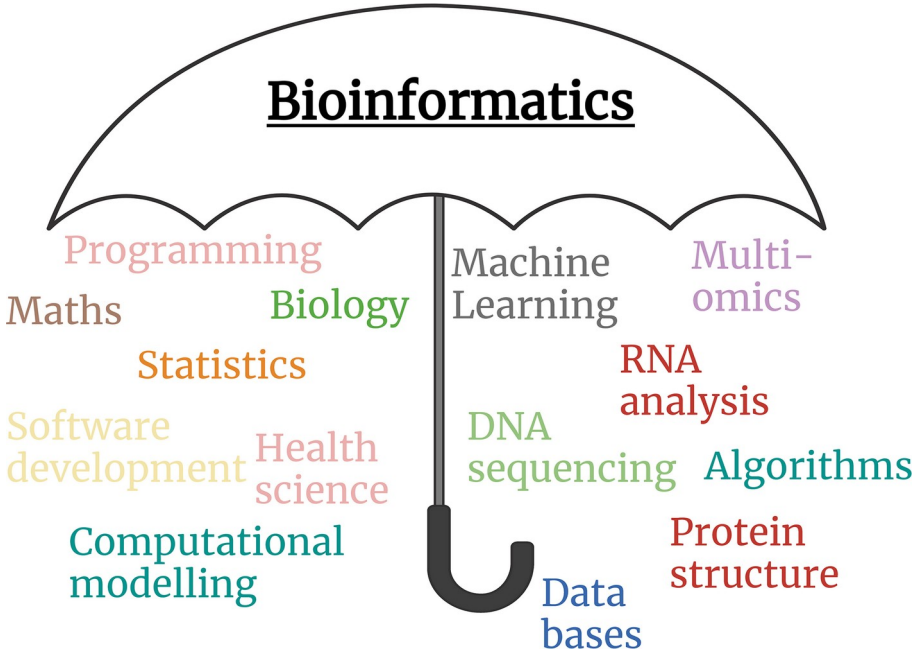


You?

- School?
- Year?
- What brought you here?

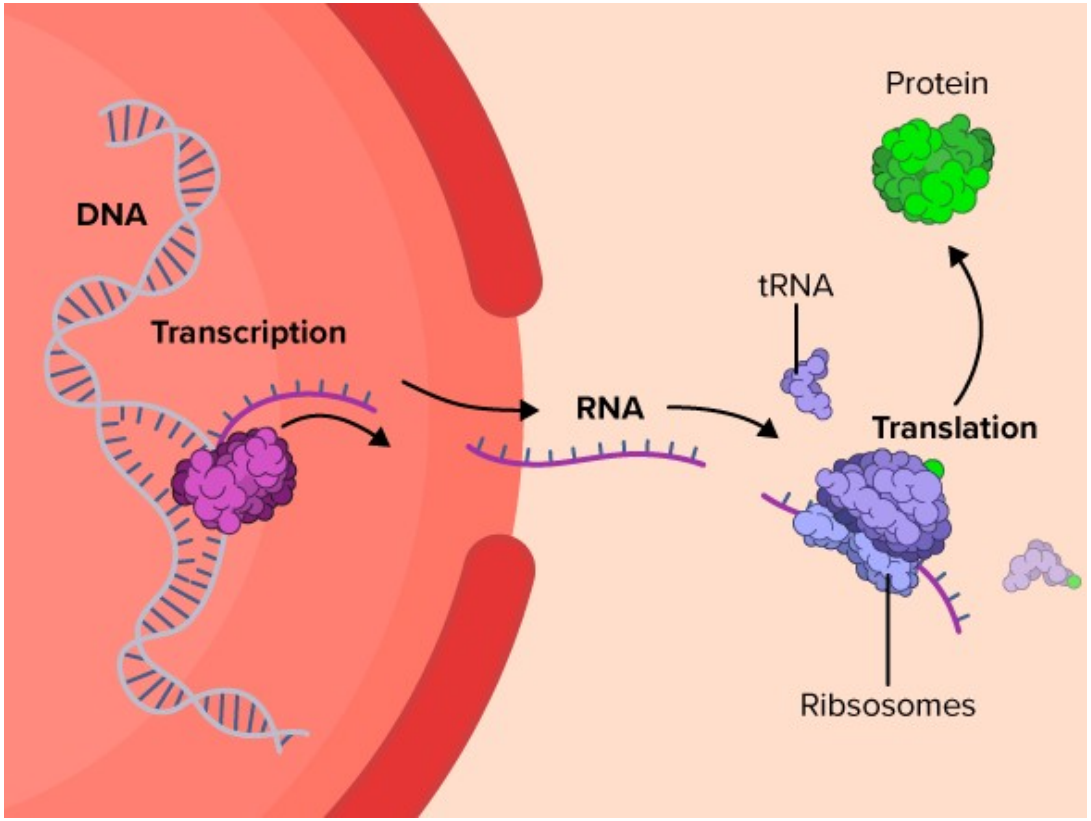
Bioinformatics



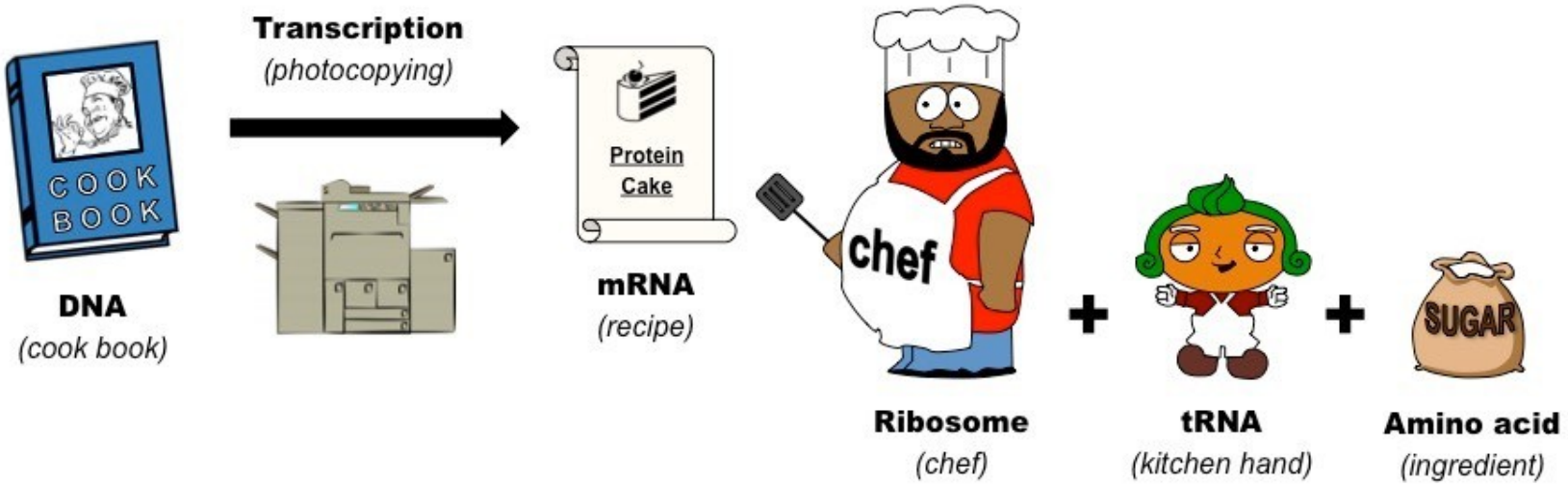


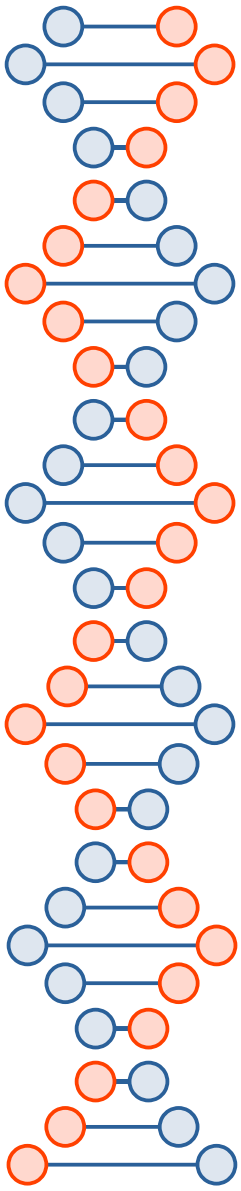
https://doi.org/10.1042/bio_2022_136

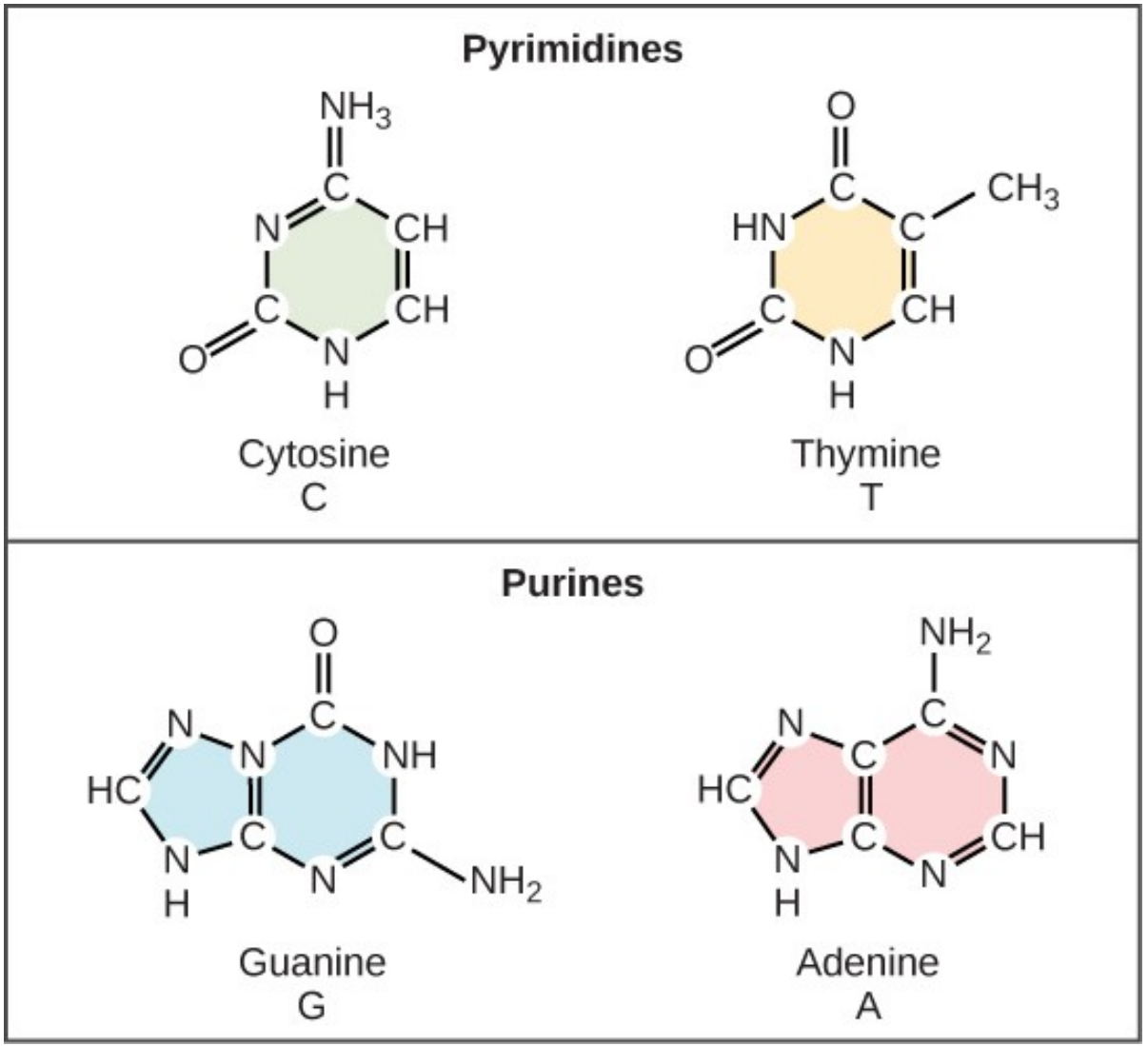
Central dogma



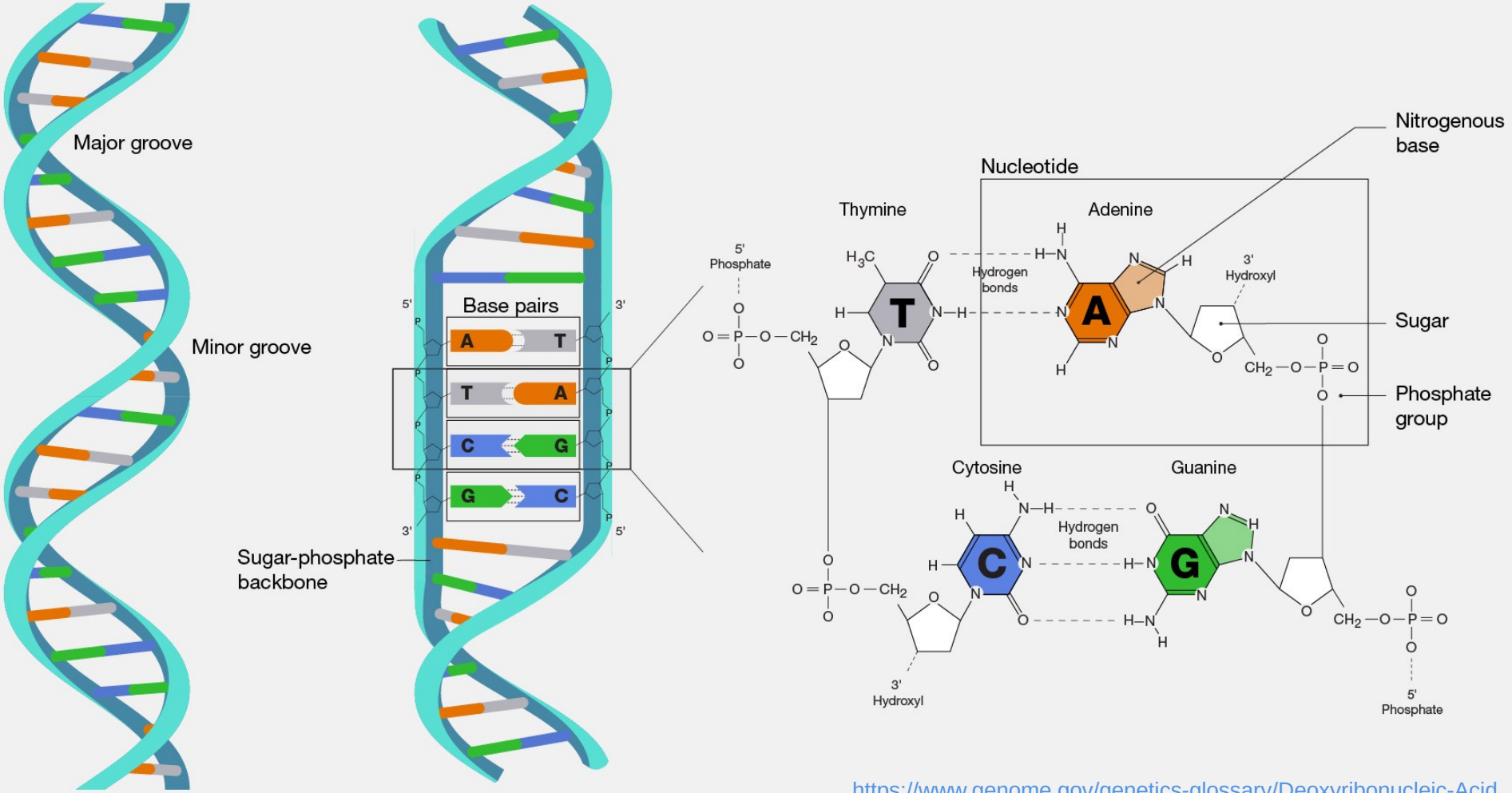
Central dogma





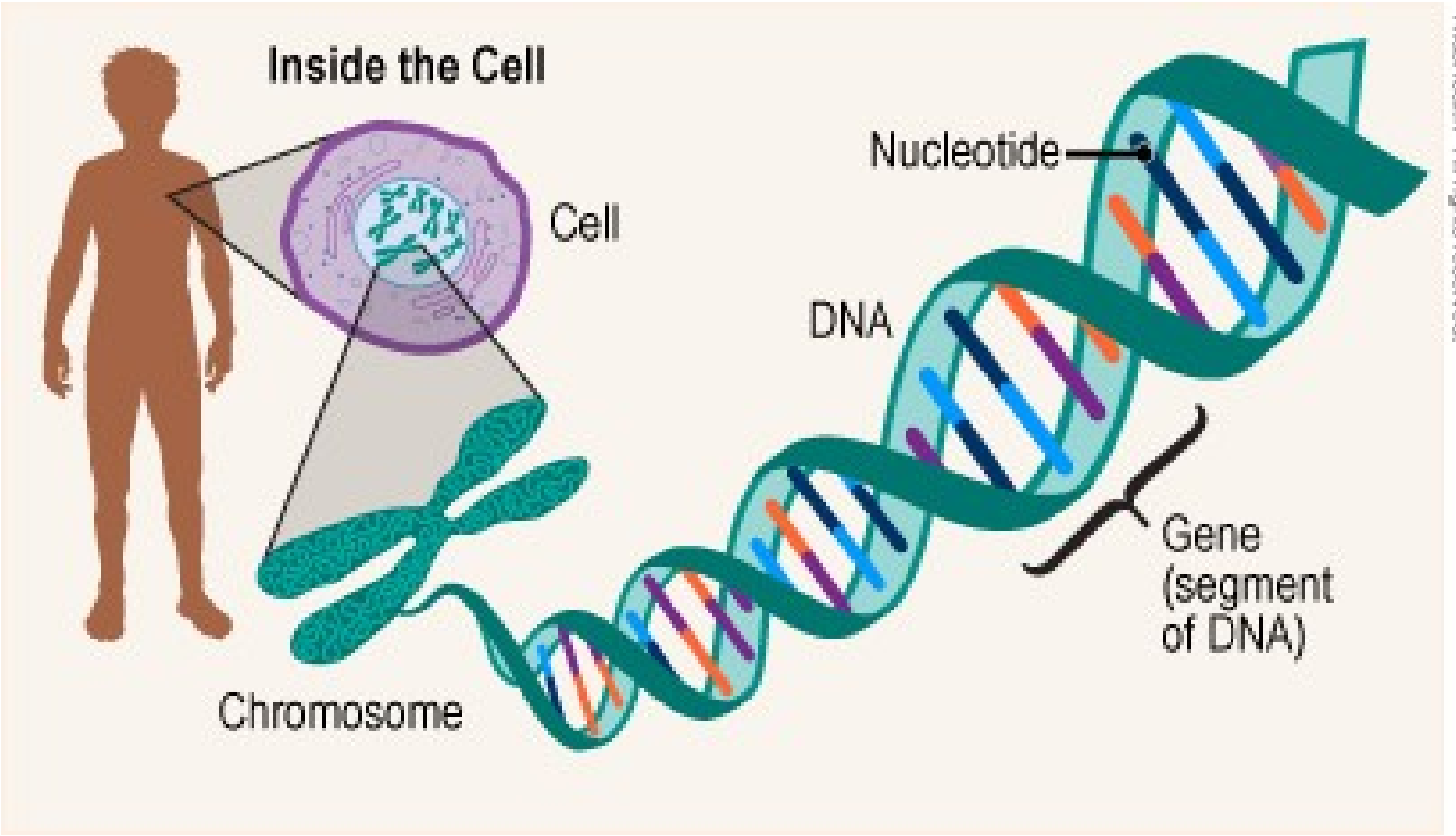

Pyrimidines
NH3
C
N
CH
C
CH
O
N
H
Cytosine
C
O
C
CH3
HN
C
C
CH
O
N
H
Thymine
T
Purines
O
C
N
N
NH
HC
C
C
N
NH2
N
H
Guanine
G
NH2
C
N
C
HC
N
C
CH
N
H
Adenine
A

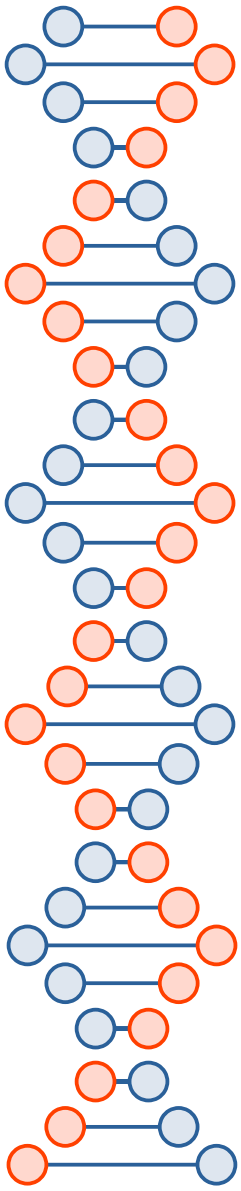
Deoxyribonucleic acid (DNA)



https://www.genome.gov/genetics-glossary/Deoxyribonucleic-Acid

Genes are made of DNA

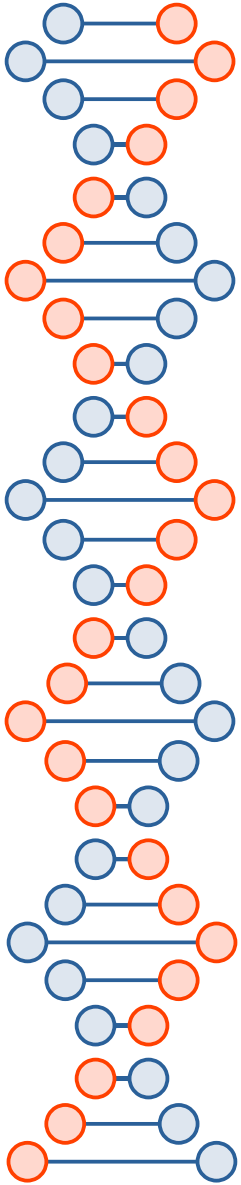


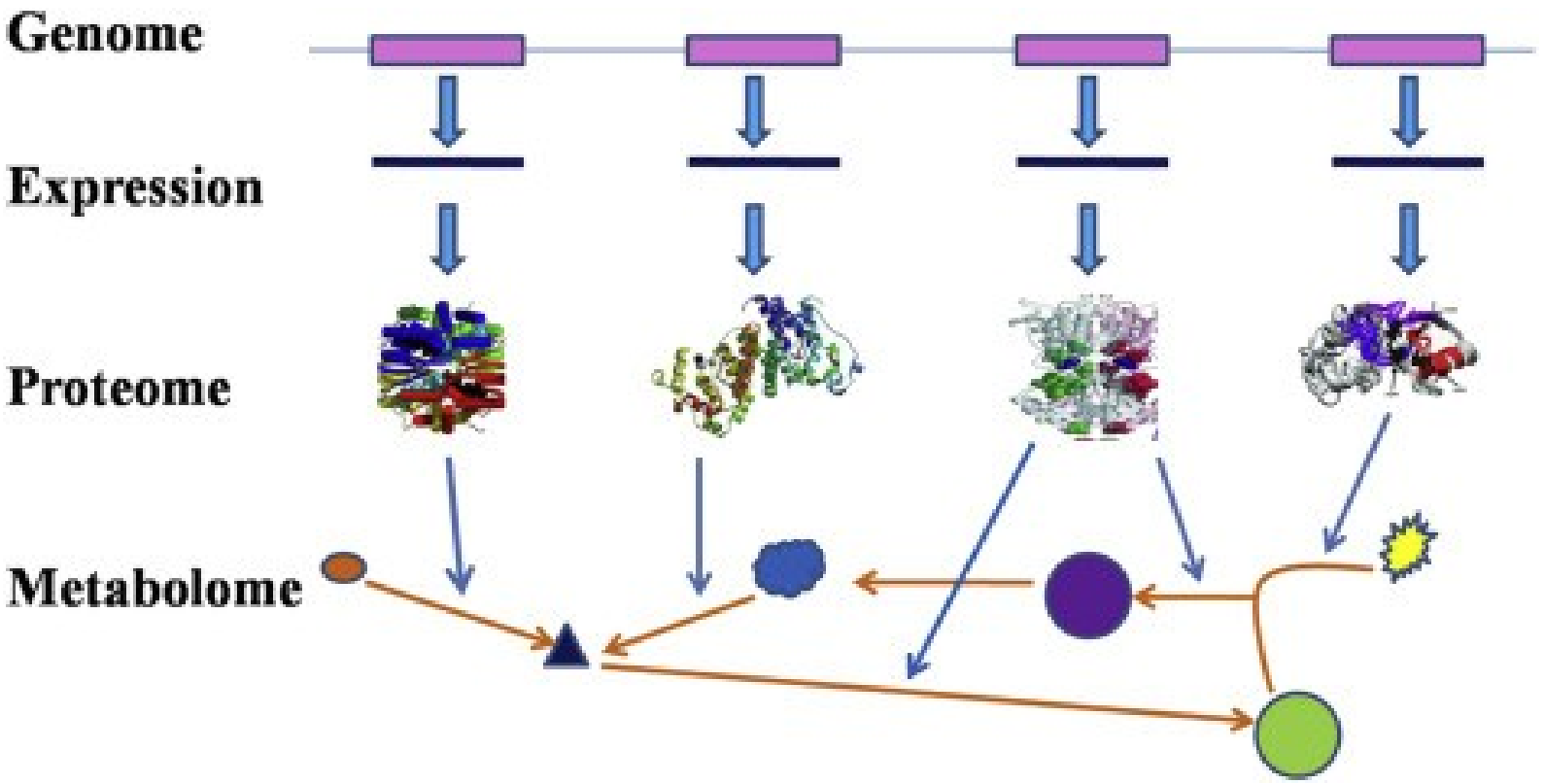


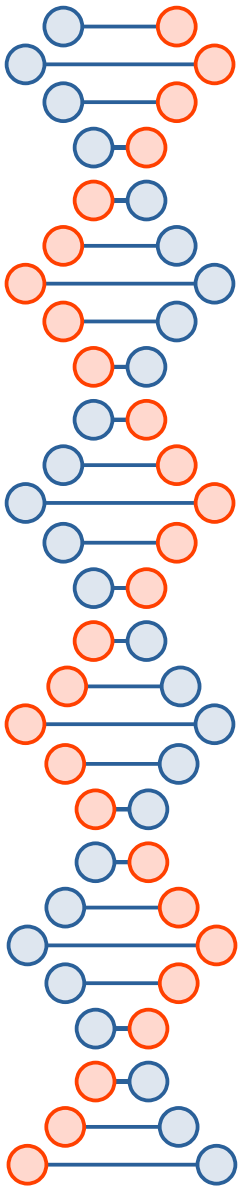
Genomics vs Genetics

- The study of an organism's complete set of genetic information.
- The genome includes both genes (coding) and non-coding DNA.
- 'Genome': the complete genetic information of an organism.

- The study of heredity
- The study of the function and composition of single genes.
- 'Gene': specific sequence of DNA that codes for a functional molecule.




Genome
Expression
Proteome
Metabolome

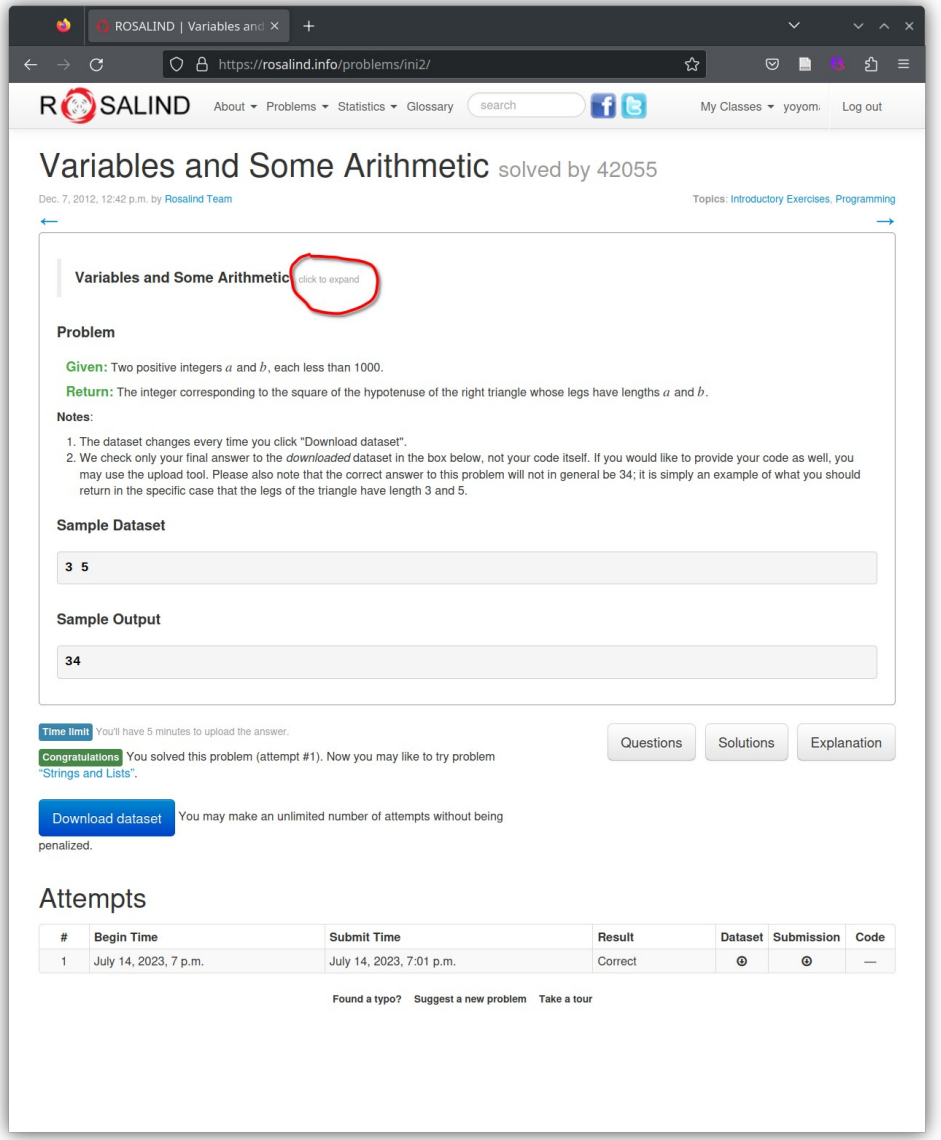


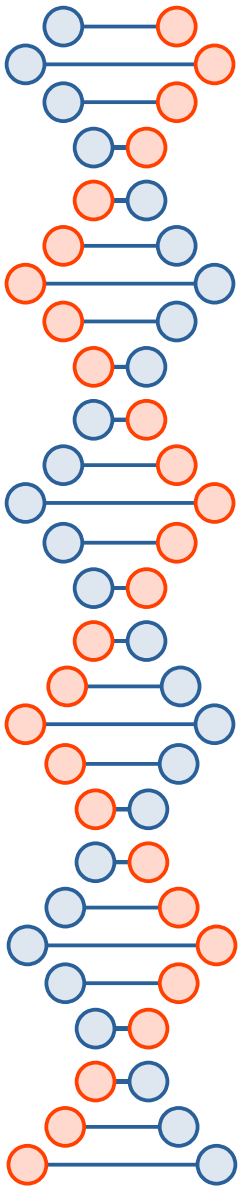
Big Data!

- The genome consists of ~3 billion base pairs! That's a 3.5 gigabyte text file.
- There are >45k genes, and ~20k protein coding genes

- Enter bioinformatics! We can use computational methods to analyze this data and develop hypotheses, form predictions, and make discoveries

- We will use Rosalind to learn the basics of Python





Expectations

- Be excited! We will first start with learning the tools of bioinformatics and analyzing data, but soon you will be working with real-world data and making scientific discoveries!
- I will challenge you to think deeply and broadly to learn this topic. Programming is learned though practice, not lectures!
- By the end of this course, I hope that you will be exposed to scientific literature, medical research, and computer science in the context of biology. You will get out what you put in.