

The background of the slide is a soft-focus photograph of a garden. In the foreground, a white butterfly with orange and black markings is perched on a light pink cosmos flower. To its left, another butterfly with black and white spots is visible. In the upper left, a third butterfly is captured in flight. The background is filled with more out-of-focus pink and purple flowers and green foliage.

WRITE AN RNA TRANSLATOR

WEEKS 2-6

Objectives of Today's class

Weeks 2-6:

- Learn basics of programming in python.
- Write an RNA translator.

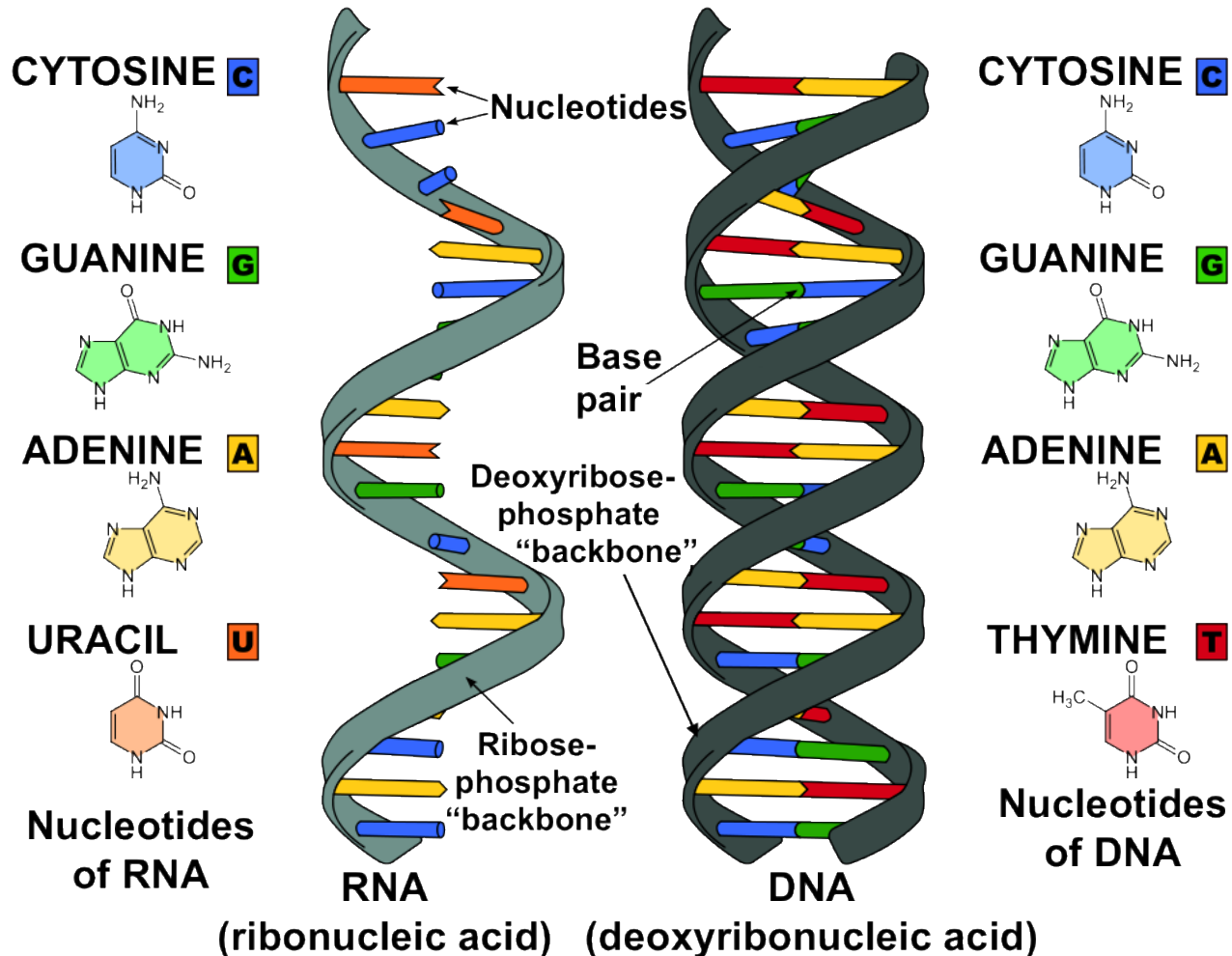
Today:

- Review of Biological Concepts (DNA, RNA, Codons)
- Learn fundamental programming tools:
 - **Indexing**
 - **Slicing/Subsetting** data
 - Reading Files
 - **List** data
 - **Loop** data to automatize processes

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Review of Biological Concepts

DNA and RNA Nucleotides



RNA and codon translator

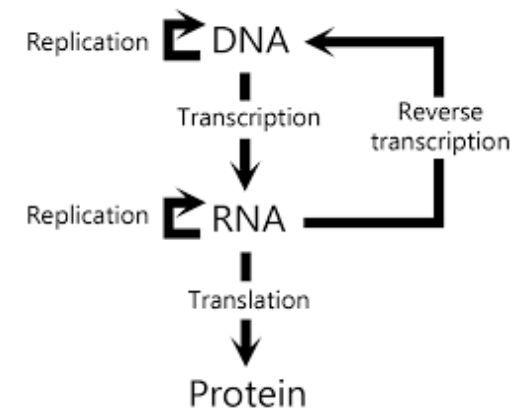
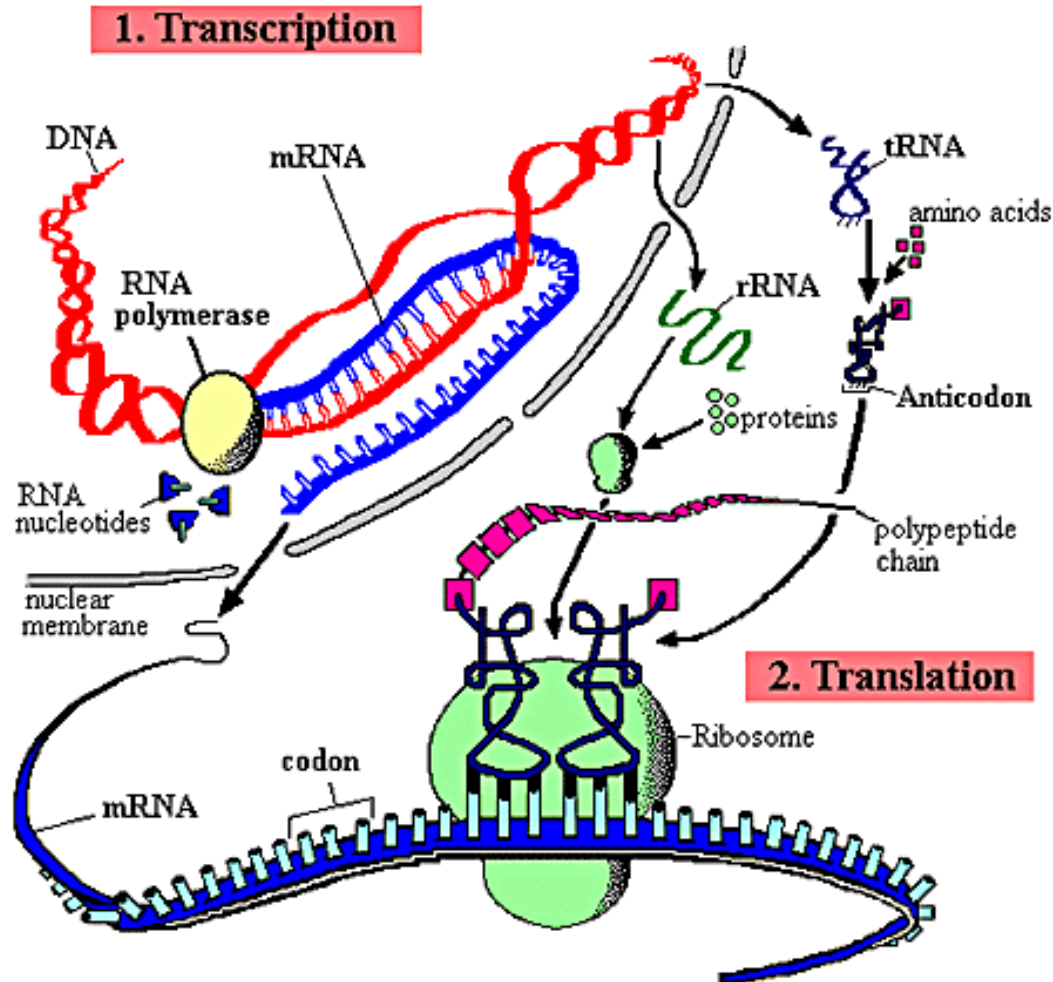
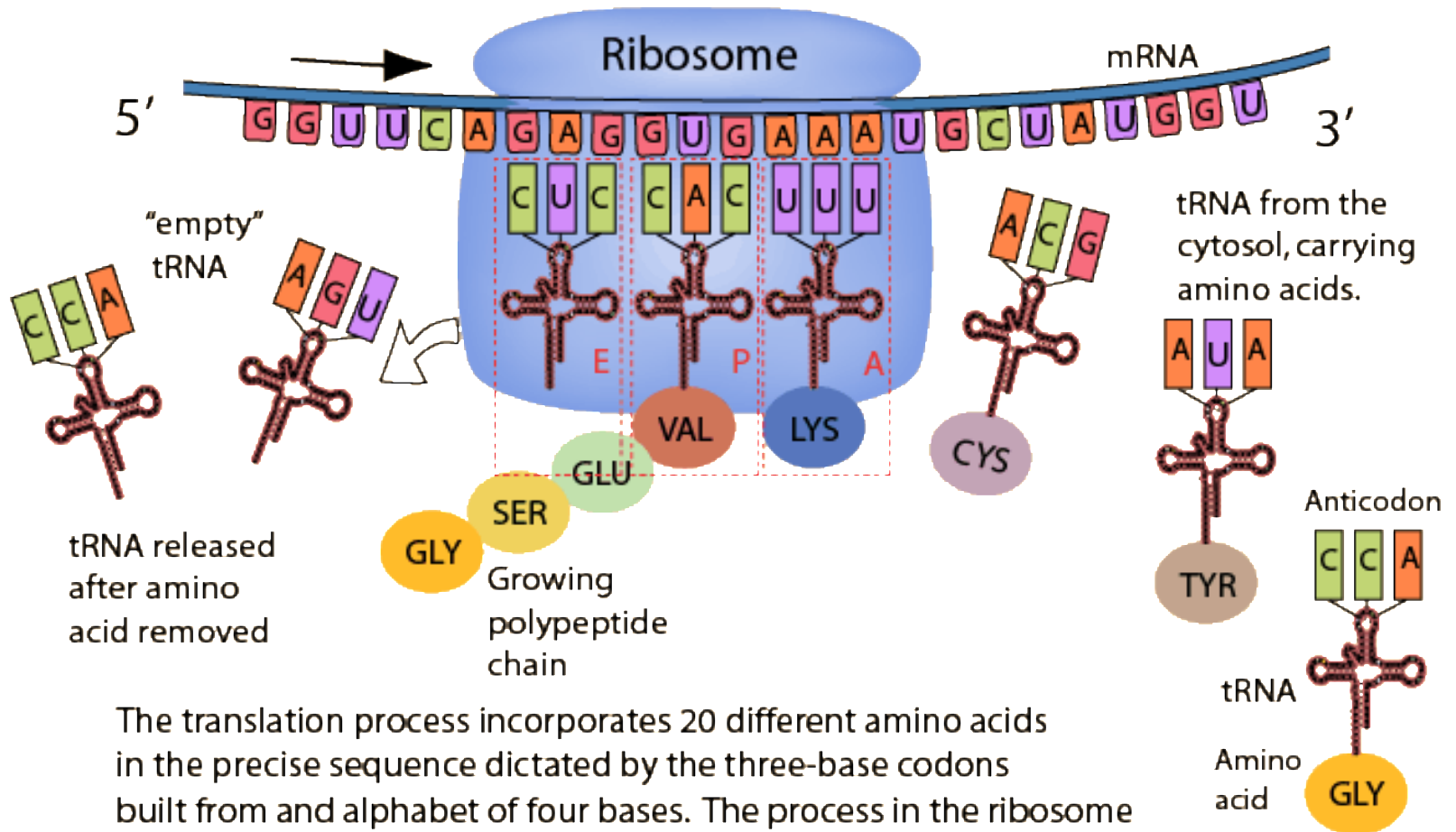


Image by Patrick R. Wright

Protein synthesis

RNA and codon translator



RNA and codon translator

Chart of the Genetic code

		Second letter				
		U	C	A	G	
First letter	U	UUU } Phe UUC } UUA } Leu UUG }	UCU } UCC } Ser UCA } UCG }	UAU } Tyr UAC } UAA Stop UAG Stop	UGU } Cys UGC } UGA Stop UGG Trp	U C A G
	C	CUU } CUC } Leu CUA } CUG }	CCU } CCC } Pro CCA } CCG }	CAU } His CAC } CAA } Gln CAG }	CGU } CGC } Arg CGA } CGG }	U C A G
	A	AUU } AUC } Ile AUA } AUG Met	ACU } ACC } Thr ACA } ACG }	AAU } Asn AAC } AAA } Lys AAG }	AGU } Ser AGC } AGA } Arg AGG }	U C A G
	G	GUU } GUC } Val GUA } GUG }	GCU } GCC } Ala GCA } GCG }	GAU } Asp GAC } GAA } Glu GAG }	GGU } GGC } Gly GGA } GGG }	U C A G

Image by Chegg.com/study

Amino Acids

Full Name	Abbreviation (3 Letter)
Alanine	Ala
Arginine	Arg
Asparagine	Asn
Aspartate	Asp
Aspartate or Asparagine	Asx
Cysteine	Cys
Glutamate	Glu
Glutamine	Gln
Glutamate or Glutamine	Glx
Glycine	Gly
Histidine	His
Isoleucine	Ile
Leucine	Leu
Lysine	Lys
Methionine	Met
Phenylalanine	Phe
Proline	Pro
Serine	Ser
Threonine	Thr
Tryptophan	Trp
Tyrosine	Tyr
Valine	Val

RNA and codon translator

Use the codon table to translate the mRNA into an Amino acid sequence

RNA: CAGGAGUUUGUGCGUGGCCAUUUUUUAU

RNA: CAG GAG UUU GUG CGU GGC CAU UUU UAU



Protein: Gln Glu Phe R G H F Y

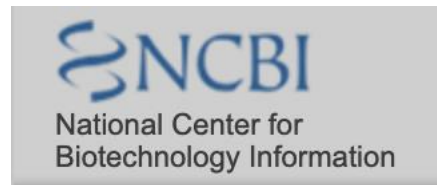
RNA and codon translator - Exercise

RNA: UAGUUUGUGCGUGGCCAGGUUAAU

Find the correct protein sequence by using the
Chart of the genetic Code

What happen with long sequences?

How can we speed the process?



Translation Tools



Translate tool

Translate is a tool which allows the translation of a nucleotide (DNA/RNA) sequence to a protein sequence.


Please enter a DNA or RNA sequence in the box below (numbers and blanks are ignored).

```
3601 AAGATACTAG TTTTGTGAA AATGACATTA AGGAAAGTTC TGCTGTTTT AGCAAAAGCG
3661 TCCAGAAAGG AGAGCTTAGC AGGAGTCCTA GGCCTTTCAC CCATACACAT TTGGCTCAGG
3721 GTTACCGAAG AGGGGCCAAG AAATTAGAGT CCTCAGAAGA GAACCTATCT AGTGAGGATG
3781 AAGAGCTTCC CTGCTTCCAA CACTTGTTAT TTGGTAAAGT AAACAATATA CTTTCTCAGT
3841 CTACTAGGCA TAGCACCGTT GCTACCGAGT GTCTGTCTAA GAACACAGAG GAGAATTTAT
3901 TATCAITGAA GAATAGCTTA AATGACTGCA GTAAACAGGT AATATTGGCA AAGSCATCTC
3961 AGGAACATCA CCTTAGTSAG GAAACAAAT GTTCTGCTAG CTGTGTTTCT TCACAGTGCA
4021 GTGAATTGGA AGACTTGACT GCAAAATACAA ACACCCAGGA TCCTTTCTTG ATTGGTTCIT
4081 CCAACAAAT GAGSCATCAG TCTGAAAGCC AGGGAGTTGG TCTGAGTGAC AAGGAATTGG
4141 TTTCAAGTGA TGAAGAAAGA GGAACGGGCT TGGAAAGAAA TAATCAAGAA GAGCAAAAGCA
4201 TGGATTCAAA CTTAGGTGAA GCAGCATCTG GGTGTGAGAG TGAACCAAGC GTCTCTGAAG
4261 ACTGCTCAGG GCTATCCTCT CAGAGTGACA TTTTACACAC TCAGCAGAGG GATACCATGC
4321 AACATAACCT GATTAAGCTC CAGCAGGAAA TGGCTGAACT AGAAGCTGTG TTAGAACAGC
4381 ATGGGAGCCA GCGTTCTTAC AGCTACCGTT CCATCATAGG TGACTCTTCT GCGCTTGAGG
4441 ACCTGCGAAA TCCAGAACAA AGCACATCAG AAAAAACAGT ATTAACCTCA CAGAAAAGTA
```

Output format:

or

Uses programming as a tool

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Steep and tools to build the RNA translator

RNA Translator in Python

Steps:

What do you think should be the steps to program an RNA translator in Python?