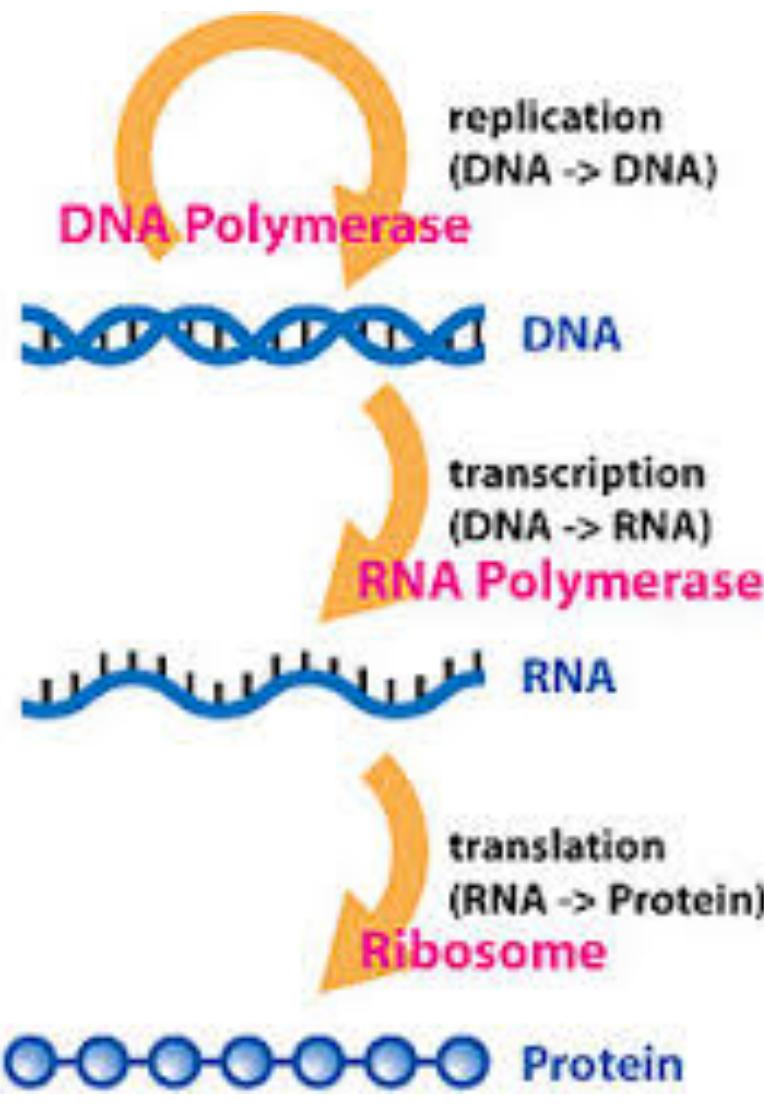


PROTEINS AND TRANSLATION

The Central Dogma



Amino Acids Form Peptides

<http://www.nature.com/scitable/topicpage/protein-structure-14122136>

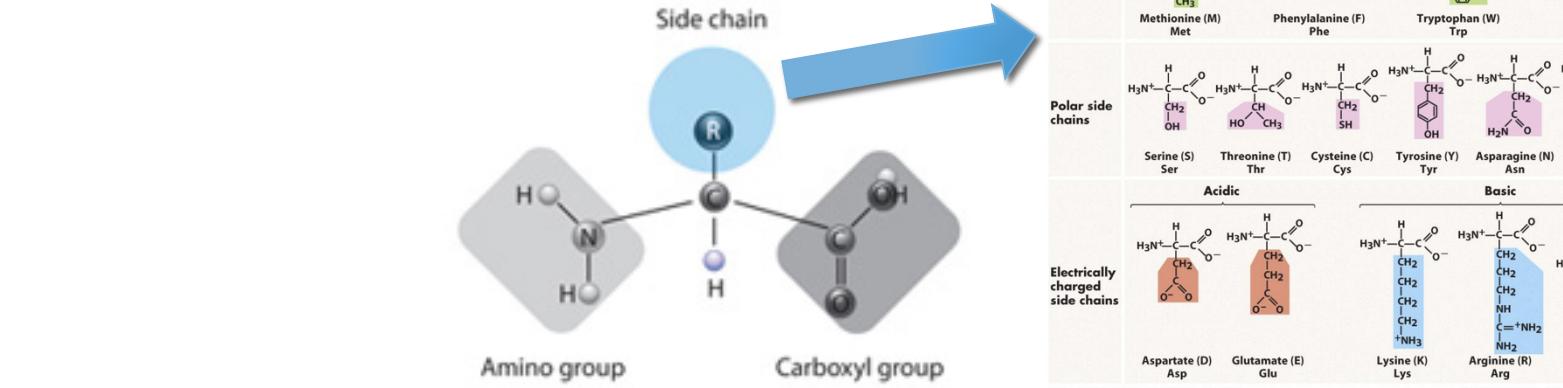
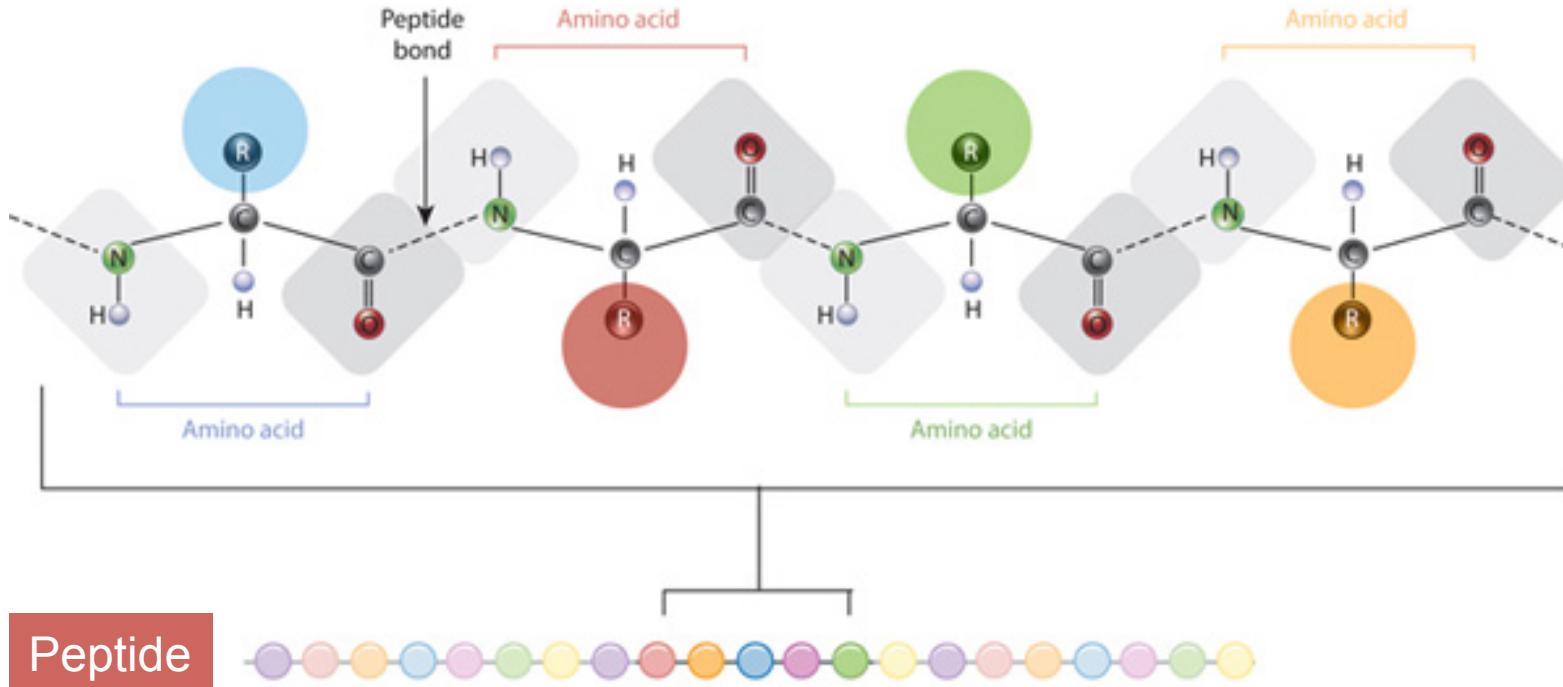


Figure 3-5 Biological Science, 2/e

© 2005 Pearson Prentice Hall, Inc.



Amino Acids Form Peptides

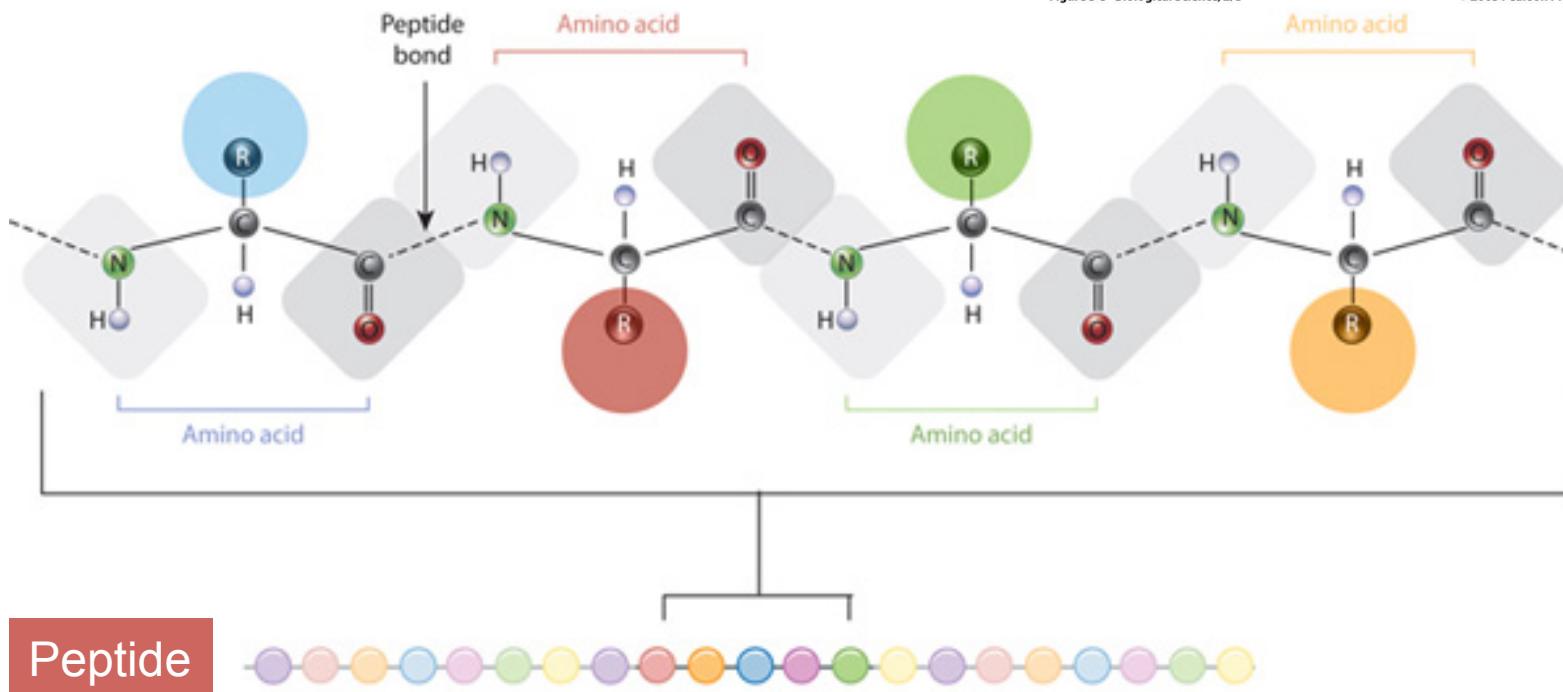
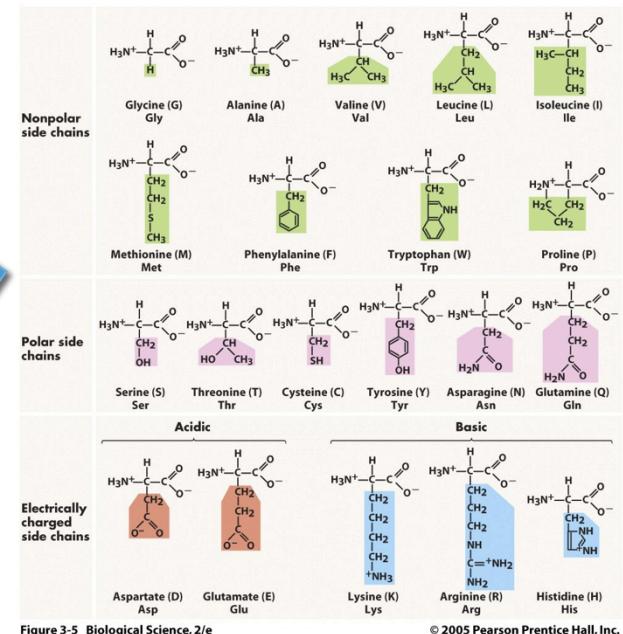
<http://www.nature.com/scitable/topicpage/protein-structure-14122136>

Number of Amino Acids:
Over 500 amino acids known
23 protein-building amino acids:
- 20 encoded in genes ("standard")
- 3 "non-standard"

Side chain

Amino group

Carboxyl group



Amino Acids have Different Properties

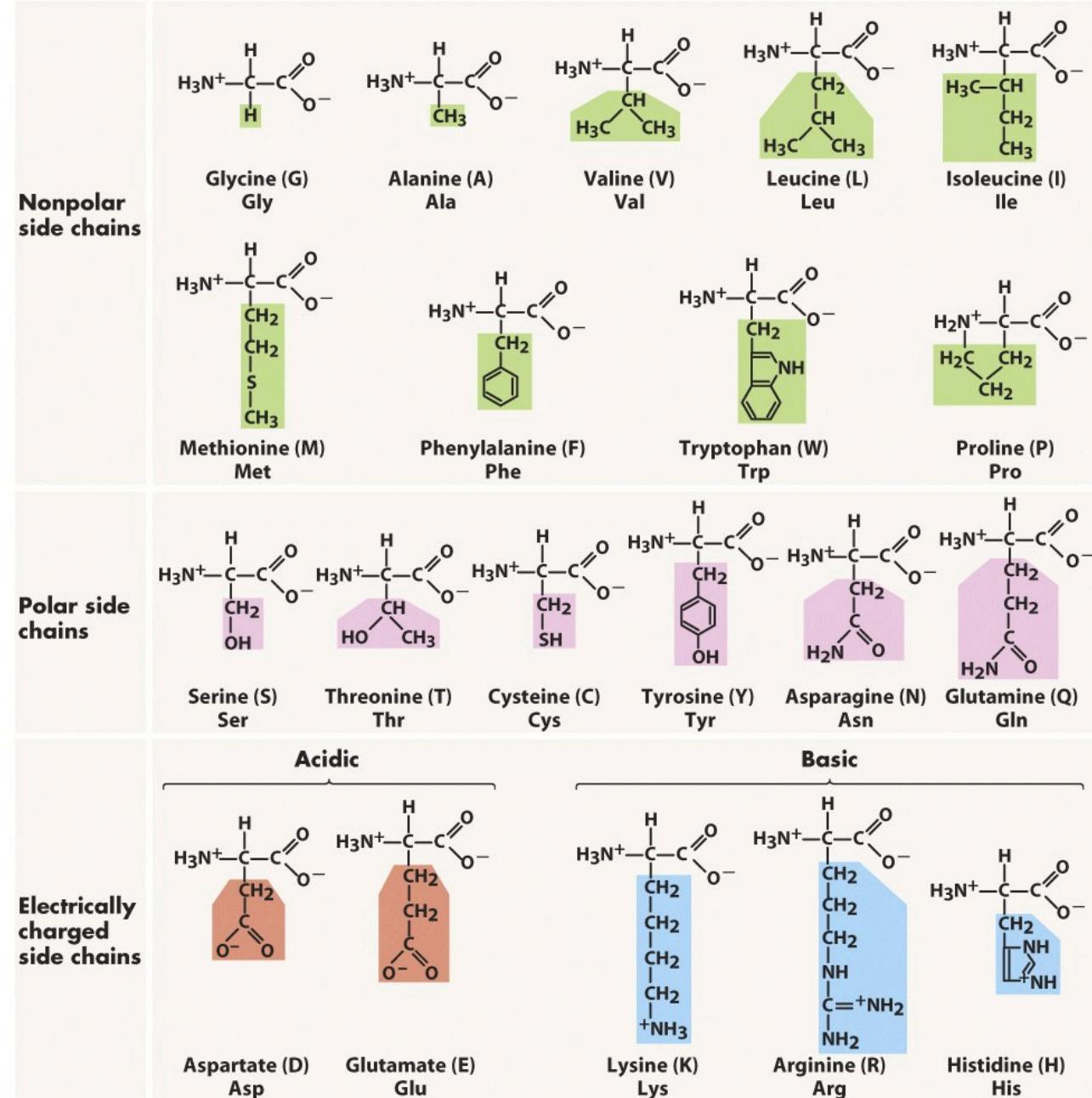
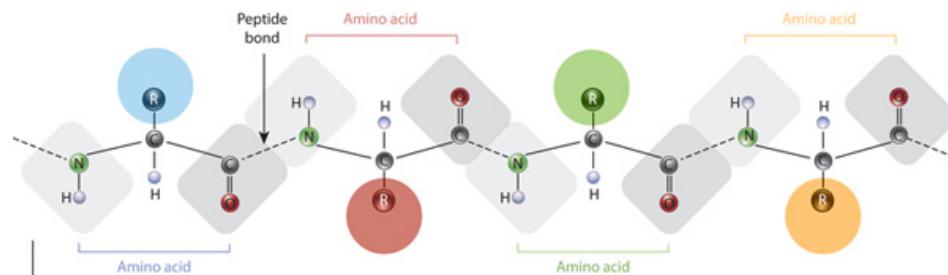
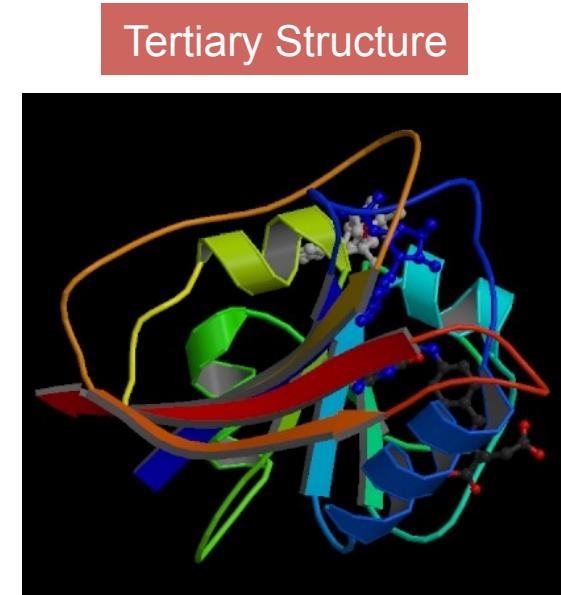
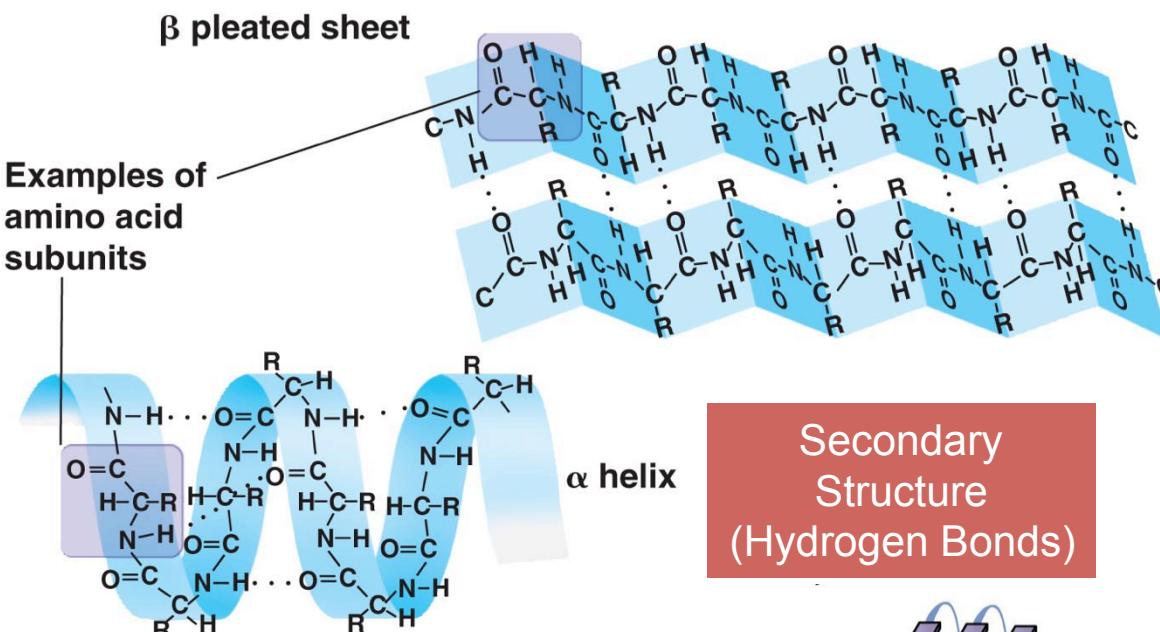


Figure 3-5 Biological Science, 2/e

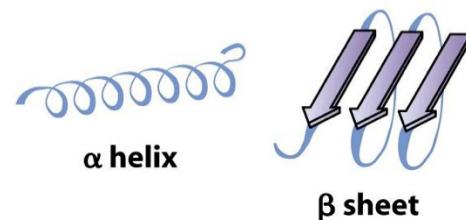
Peptides Fold to Form Proteins



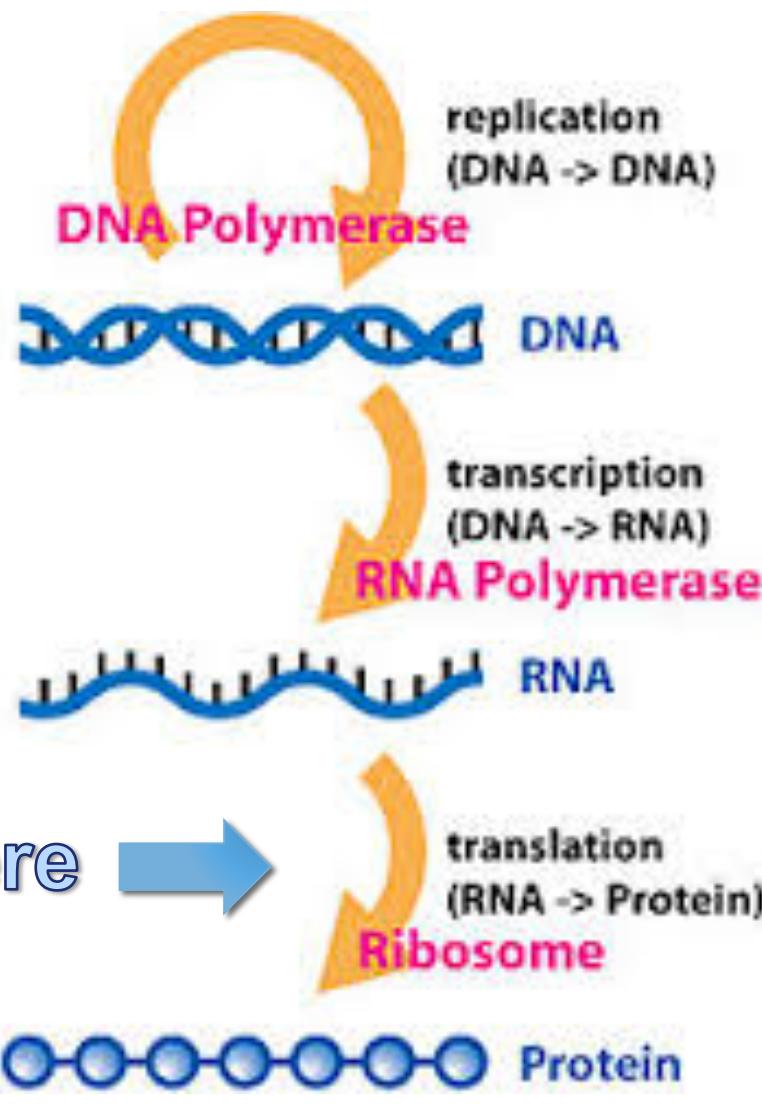
Primary Structure
(Peptide)



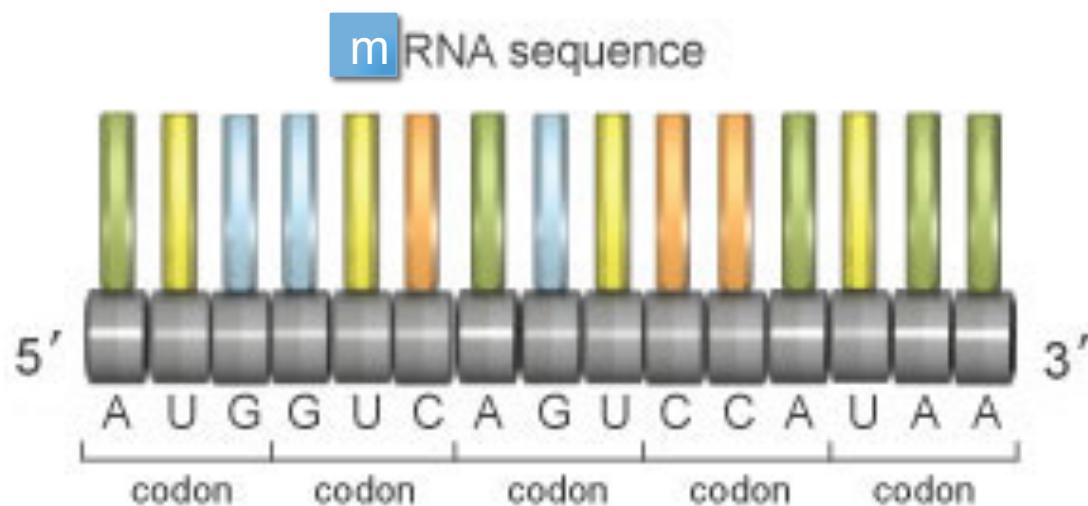
Dihydrofolate reductase enzyme (7DFR)
<http://www.rcsb.org/pdb/home/home.do>



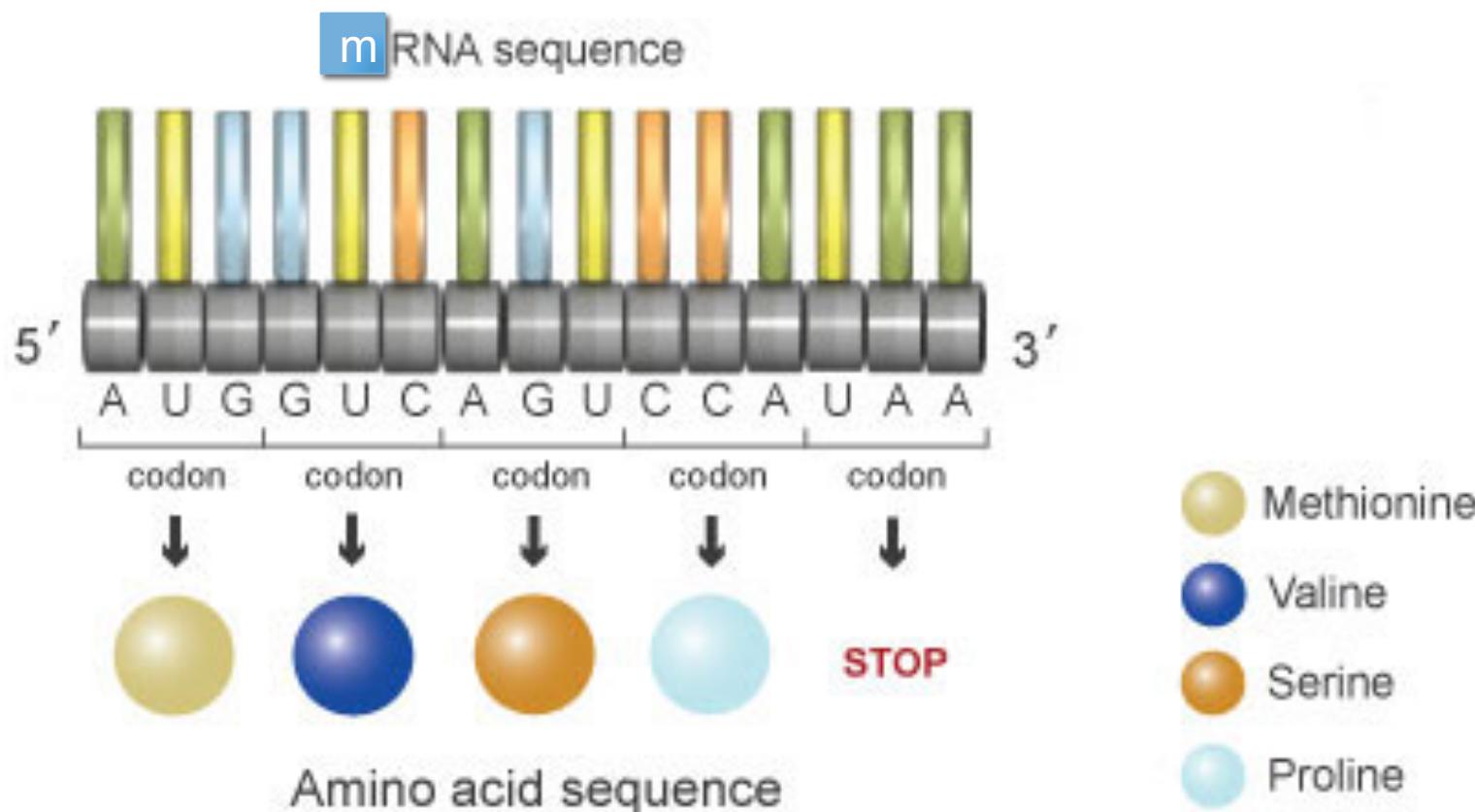
The Central Dogma



Goal: Convert Instructions in mRNA to a Peptide



Goal: Convert Instructions in mRNA to a Peptide



Goal: Convert Instructions in mRNA to a Peptide

20 Amino Acids.
How Many Codons?

$$\begin{array}{ccc} \hline 4 & 4 & 4 \\ \hline 4 \times 4 \times 4 = 4^3 = 64 \end{array}$$

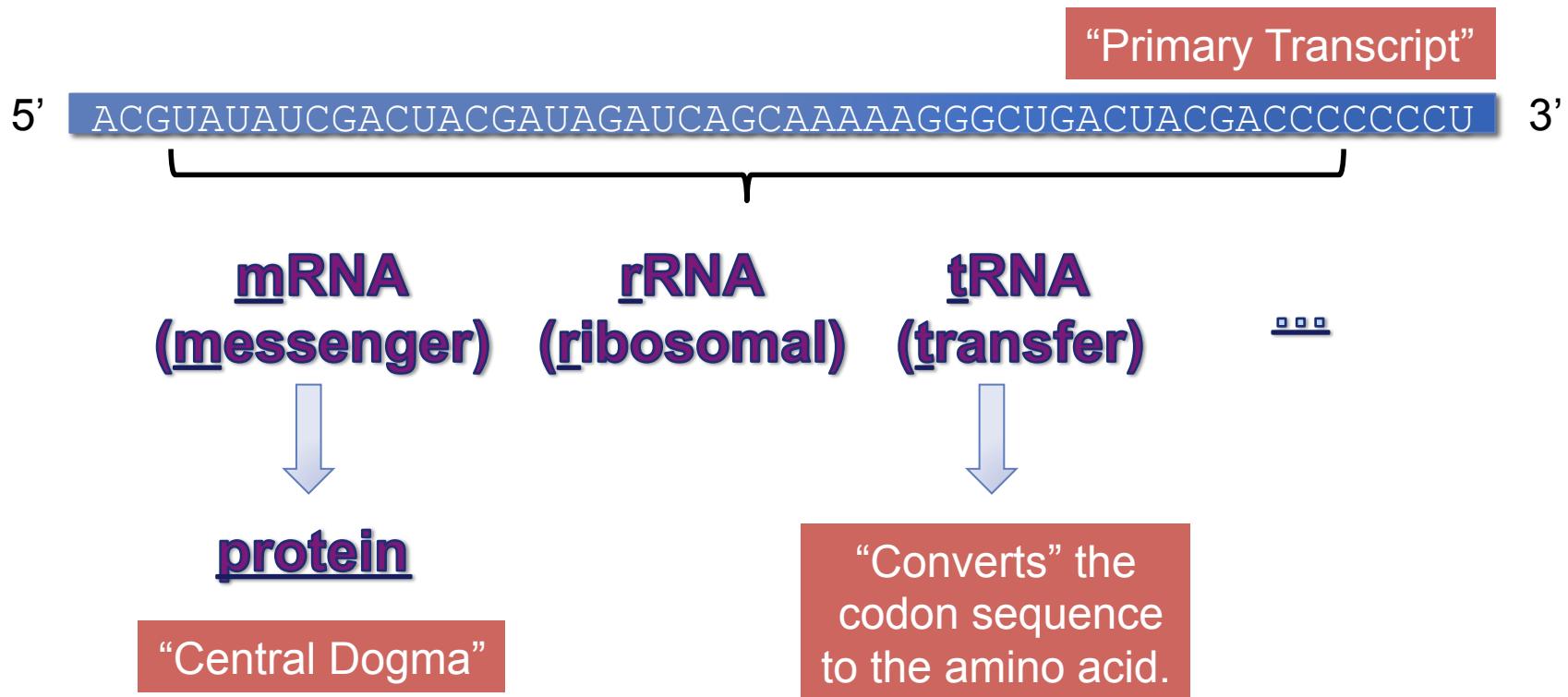
Codons do not overlap. What would happen if they did?

Different mRNA transcripts may code for the **same** peptide.

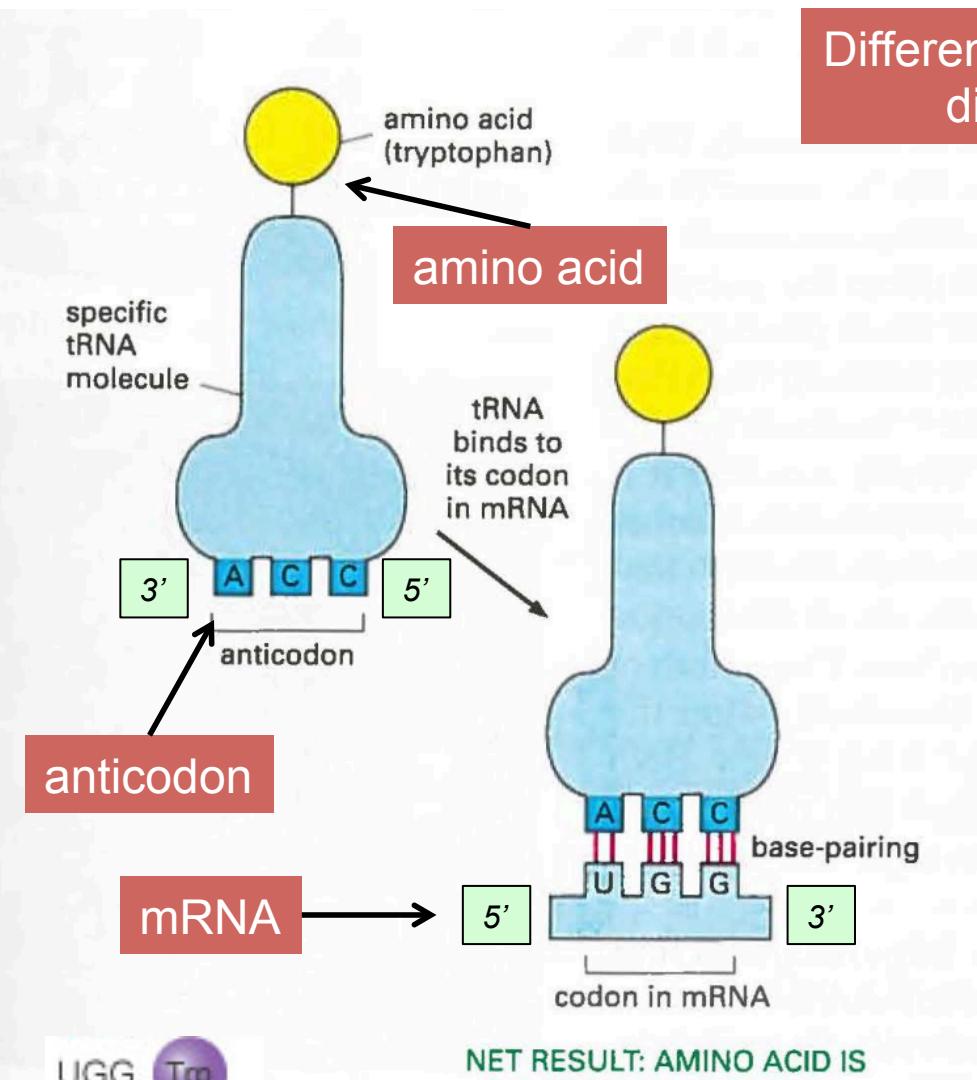
				Second nucleotide			
				U	C	A	G
First nucleotide	U	UUU Phe UUC UUA Leu UUG	UCU UCC UCA Ser UCG	UAU Tyr UAC UAA STOP UAG STOP	UGU Cys UGC UGA STOP	UGU Cys UGC UGA STOP	UGU Cys UGC UGG Trp
	C	CUU CUC Leu CUA CUG	CCU CCC CCA Pro CCG	CAU His CAC CAA Gln CAG	CGU CGC CGA Arg CGG	CGU CGC CGA Arg CGG	CGU CGC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

Transfer Mechanism: tRNA

RNA



Transfer Mechanism: tRNA

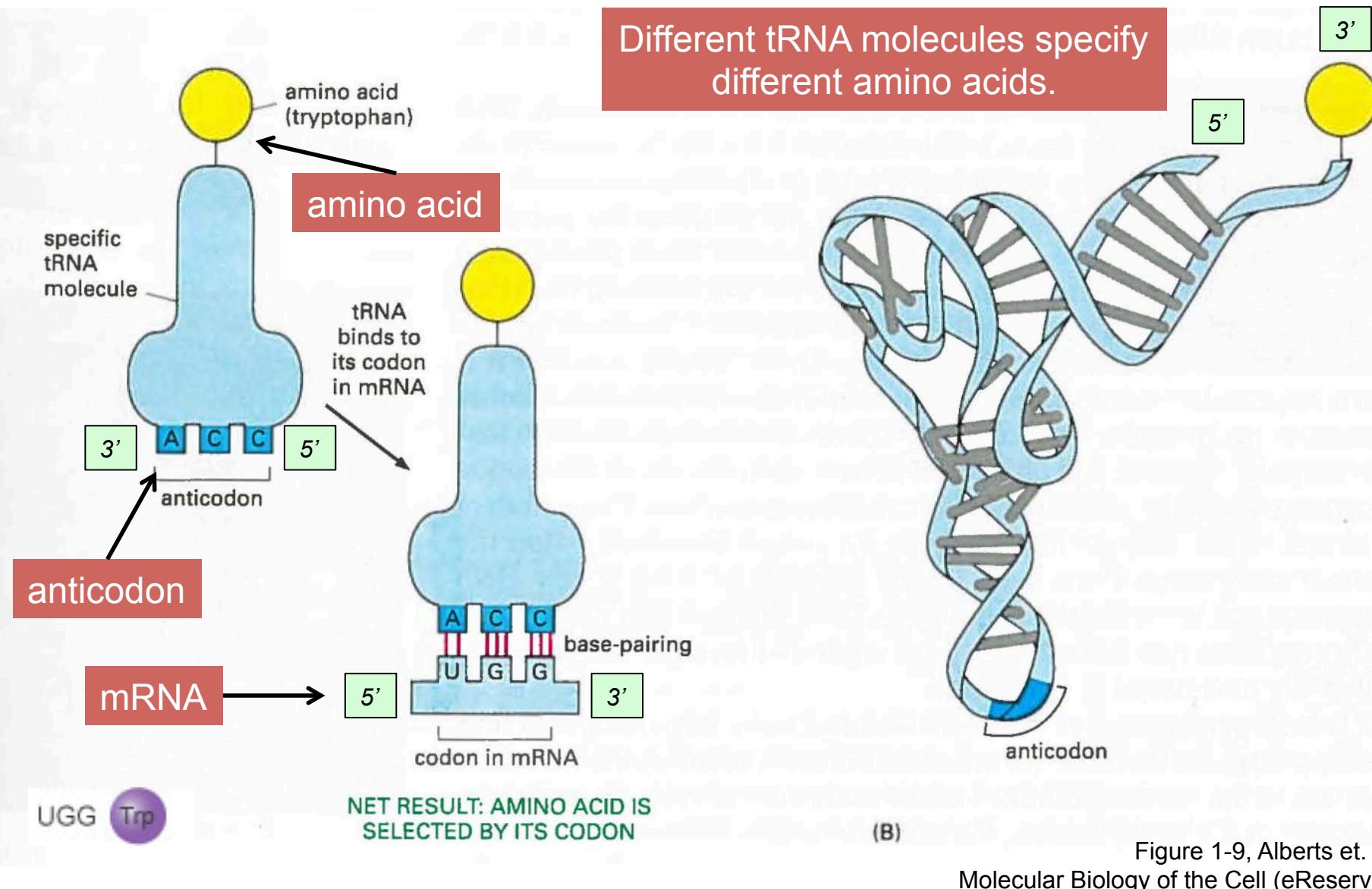


UGG Trp

(B)

Figure 1-9, Alberts et. al.,
Molecular Biology of the Cell (eReserves)

Transfer Mechanism: tRNA



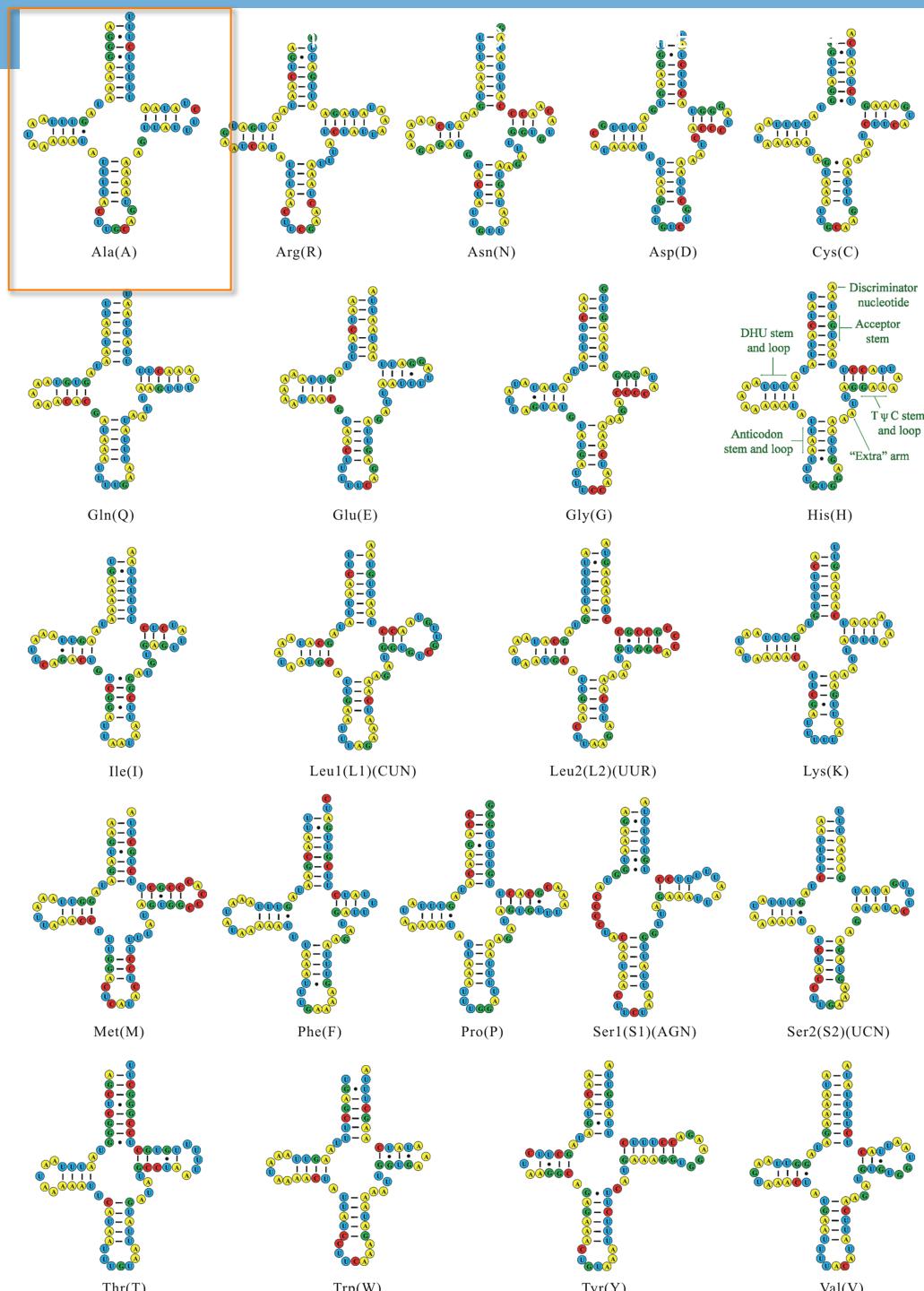
tRNA Structures are Similar



The booklouse.



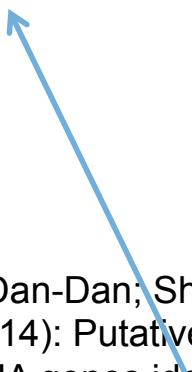
Chen, Shi-Chun; Wei, Dan-Dan; Shao, Renfu; Dou, Wei; Wang, Jin-Jun (2014): Putative secondary structures of the 22 tRNA genes identified in the mitochondrial genome of *Liposcelis decolor*.
Figure_3.tif. PLOS ONE. 10.1371/journal.pone.0091902.g003.



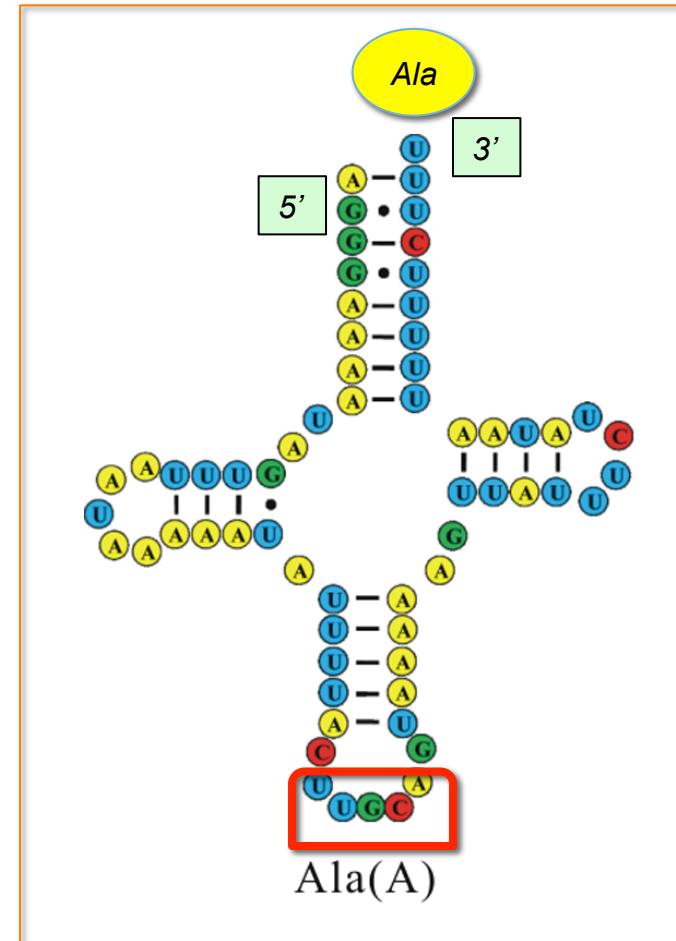
tRNA Structures are Similar



The booklouse.



Chen, Shi-Chun; Wei, Dan-Dan; Shao, Renfu; Dou, Wei; Wang, Jin-Jun (2014): Putative secondary structures of the 22 tRNA genes identified in the mitochondrial genome of *Liposcelis decolor*. Figure_3.tif. PLOS ONE. 10.1371/journal.pone.0091902.g003.



Anticodon: 5' UGC 3'
Codon: 3' ACG 5'
= 5' GCA 3'

GCU
GCC
GCA
GCG

Ala

Upcoming Schedule

Week 3	
Mon 2/6	Lecture, HW2 Due, HW3 Out
Mon/Tues	Lab: Reverse Complement Function
<i>Tues 2/7 12p-1p: ES-Bio Faculty Candidate Talk</i>	
Wed 2/8	Lecture
<i>Thurs 2/9 12p-1p: ES-Bio Faculty Candidate Talk</i>	
Fri 2/10	Lecture, Internal HW3.1 Deadline
Week 4	
Mon 2/13	Lecture, Internal HW3.2 Deadline
Mon/Tues	Lab: Rosalind Tutorial
Wed 2/15	Lecture
Fri 2/17	Lecture, HW3 Due

HW1 Back
(Moodle)

Obtain
Textbook

Environmental Studies – Biology Job Candidate Talk

Tuesday February 7th
12:10 – 1:00 in B19



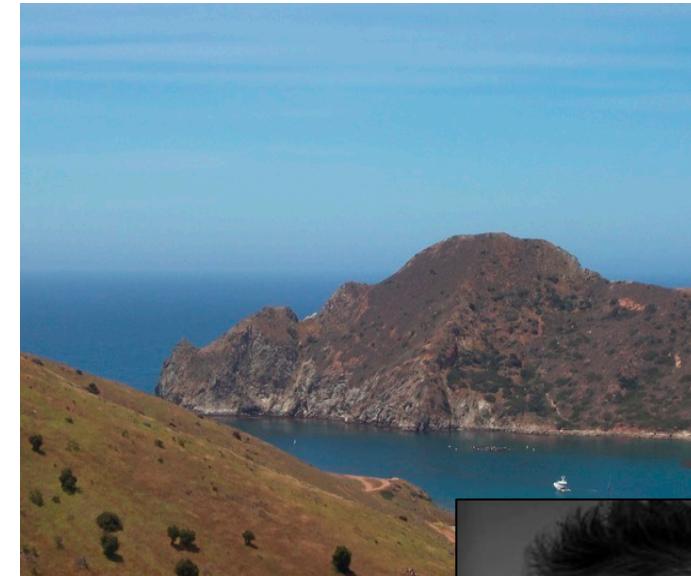
Dr. Seeta Sistla

“Ecological feedbacks to global change: A terrestrial ecosystems perspective.”



Environmental Studies – Biology Job Candidate Talk

Thursday February 9th
12:10 – 1:00 in B19



Dr. Aaron Ramirez

*“The impacts of deer browsing
on an island ecosystem:
A lesson in translational ecology”*



Upcoming Schedule

Week 3	
Mon 2/6	Lecture, HW2 Due, HW3 Out
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HW1 Back
(Moodle)

Obtain
Textbook