



# **GENETIC CODE**

**Dr. Mahesha H B**

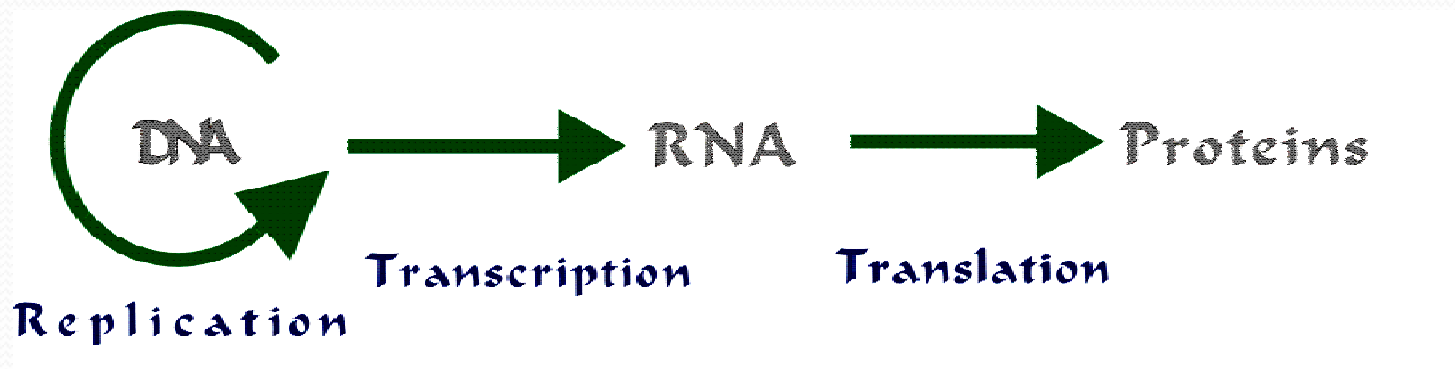
**Professor and Head**

**Department of Sericulture**

**Yuvaraja's College**

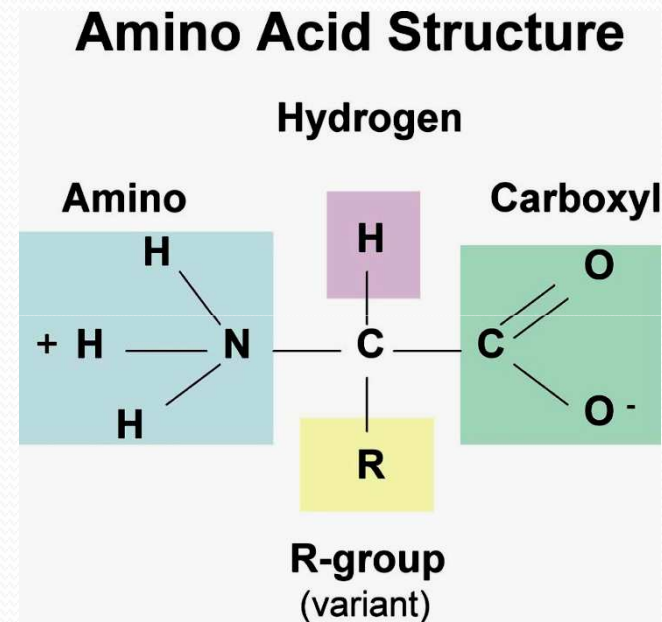
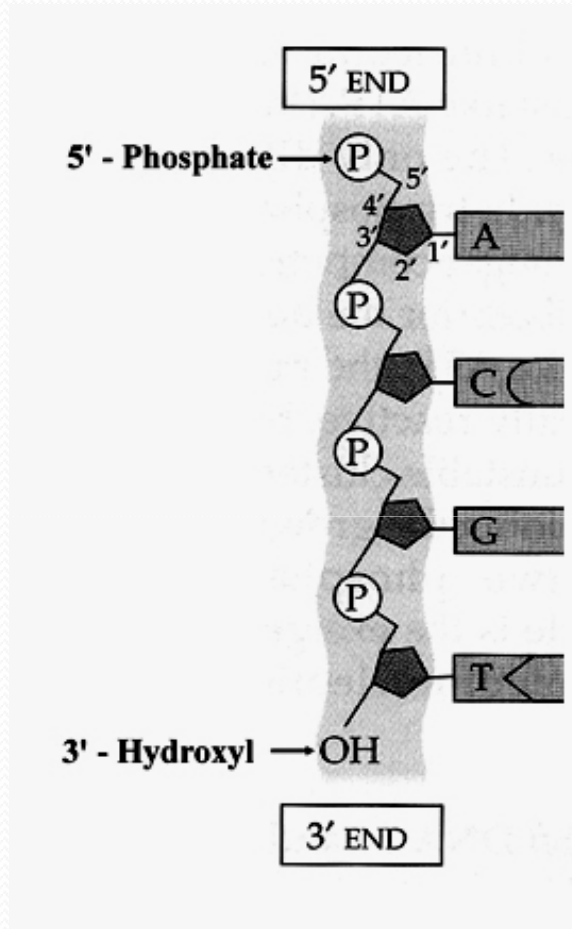
**University of Mysore, Mysuru, India**

# Central Dogma of Molecular Biology



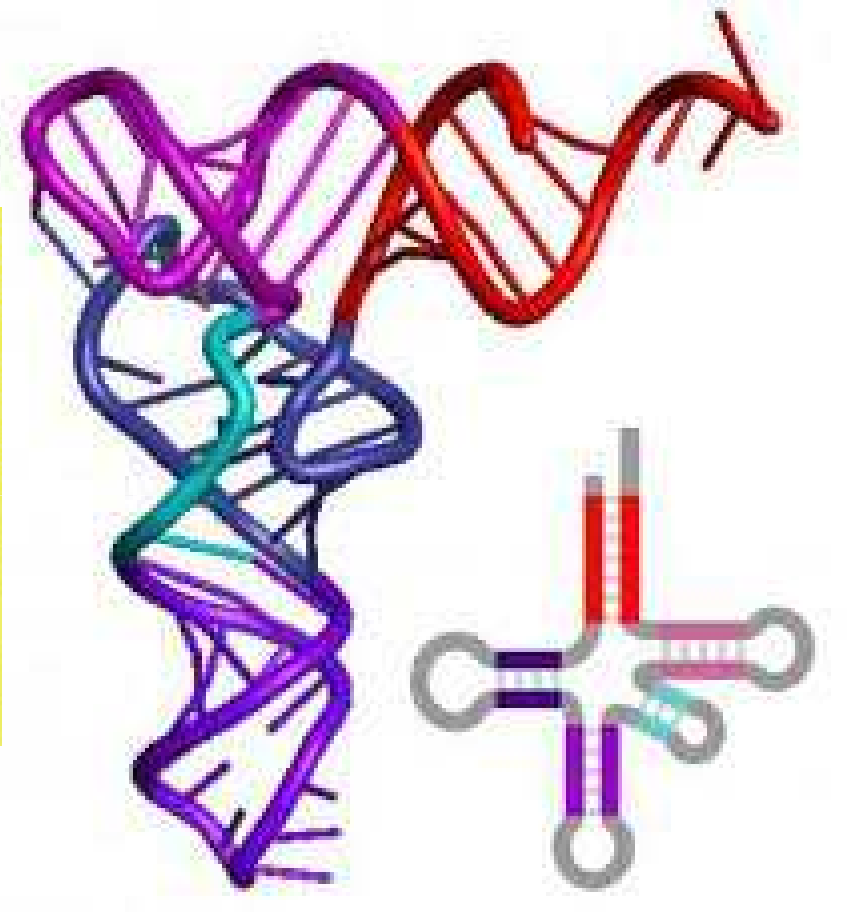
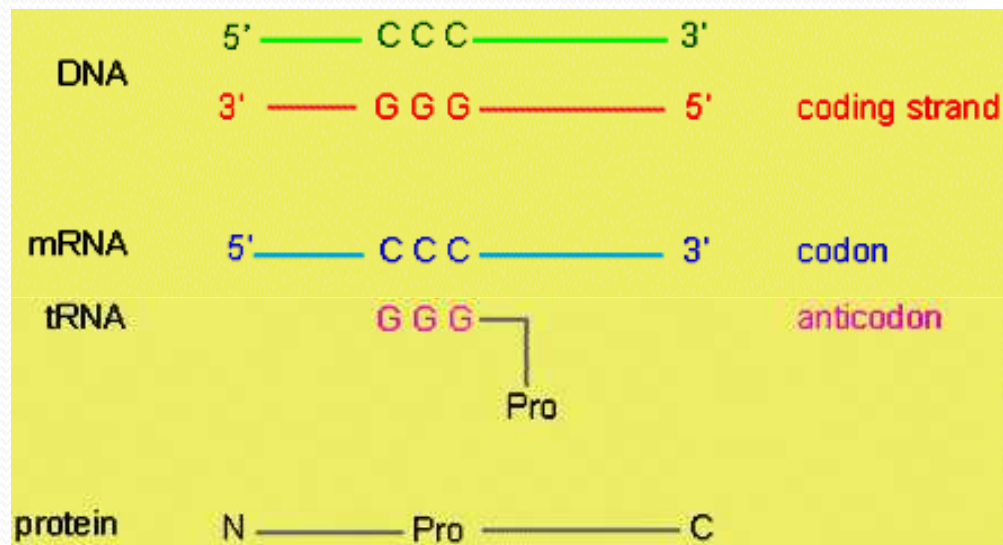
# DNA

# Amino Acids

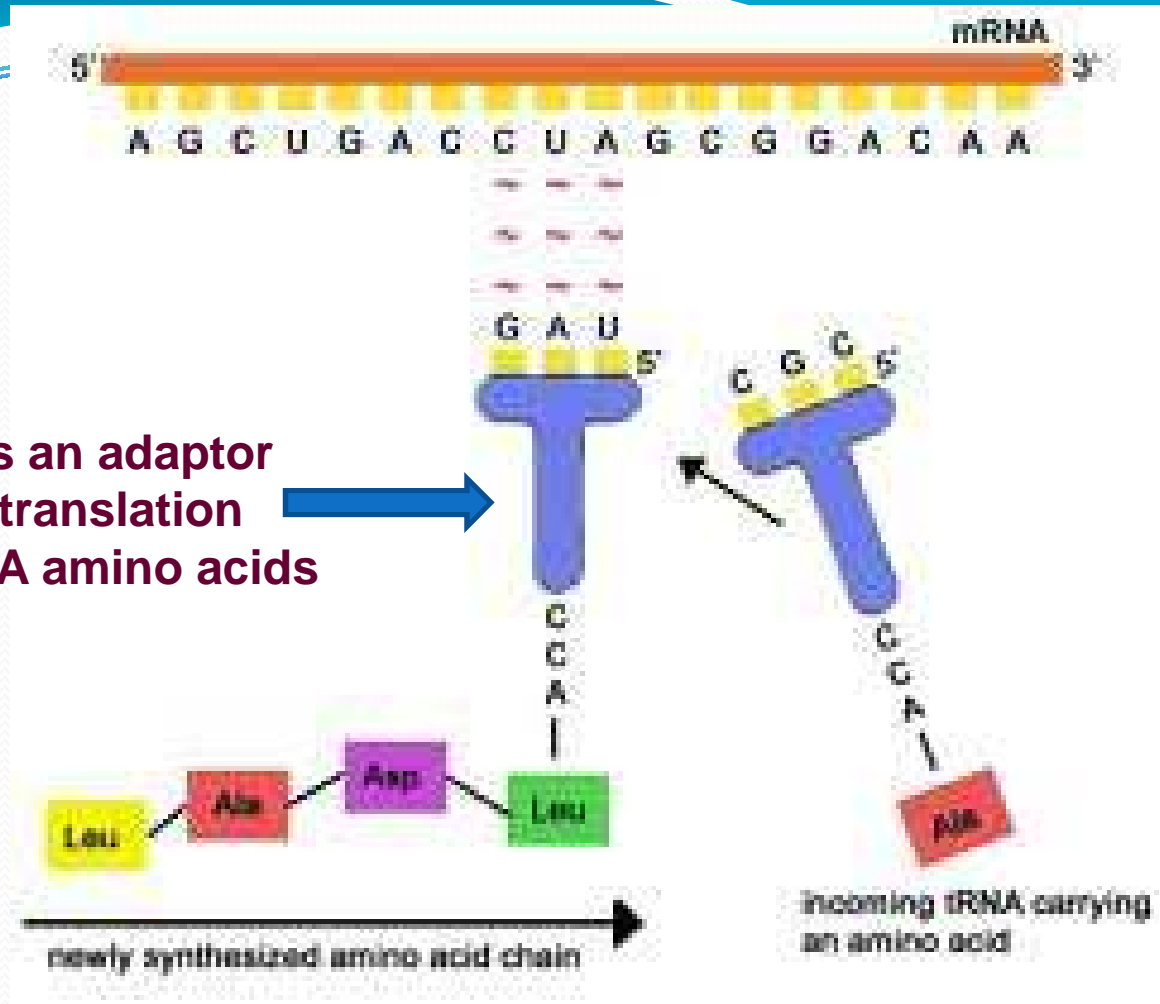


**General Structure of DNA and Amino Acids showing no specific recognition sites  
Hence needs an adaptor molecule i.e., tRNA**

# tRNA structure and role in translation



tRNA acts as an adaptor molecule in translation between DNA amino acids





**Genetic code: The sequence of nucleotides that determines the specific amino acid sequence in the synthesis of proteins.**

**Codon: A section of DNA (three nucleotide pairs in length) or RNA (three nucleotide in length) that codes for a single amino acid.**

**Or**

**A sequence of three RNA or DNA nucleotides that specifies (codes for) either an amino acid or the termination of translation.**

**Or**

**A base sequence corresponding to a particular amino acid is called codon.**

# Genetic Code

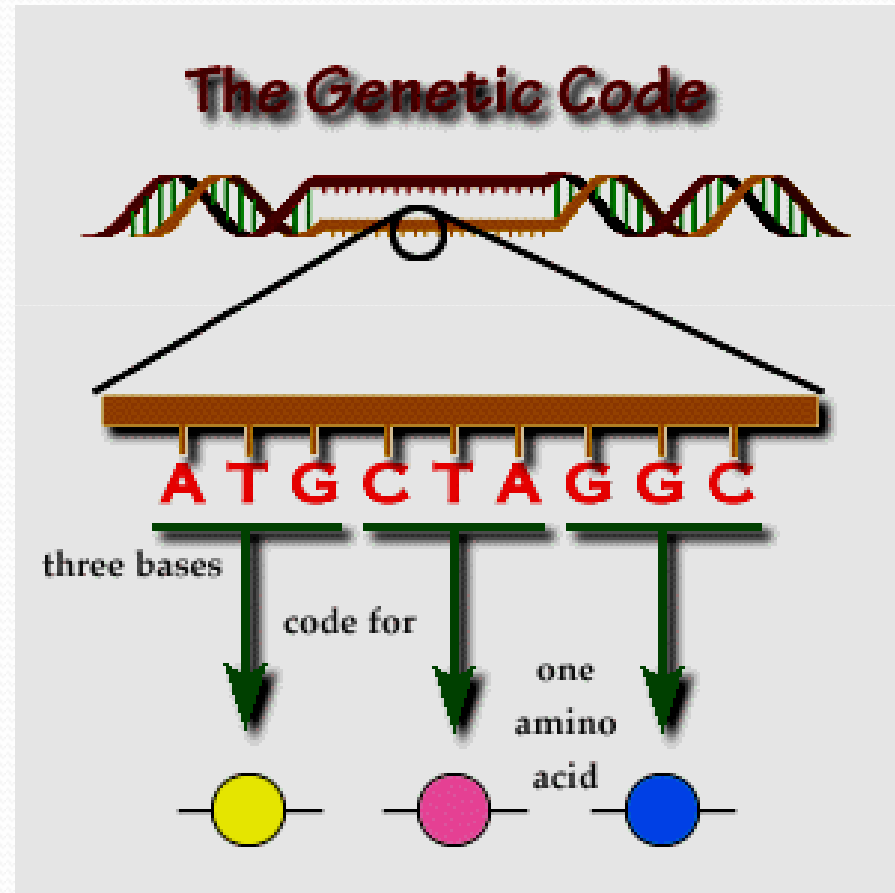
		Second base					
		U	C	A	G		
First base 5'	U	UUU } Phenyl- UUC } alanine UUA } Leucine UUG }	UCU } Serine UCC } UCA } UCG }	UAU } Tyrosine UAC } UAA } Stop codon UAG } Stop codon	UGU } Cysteine UGC } UGA } Stop codon UGG } Tryptophan	Third base 3'	U C A G
	C	CUU } Leucine CUC } CUA } CUG }	CCU } Proline CCC } CCA } CCG }	CAU } Histidine CAC } CAA } Glutamine CAG }	CGU } Arginine CGC } CGA } CGG }		U C A G
	A	AUU } Isoleucine AUC } AUA } AUG } Methionine start codon	ACU } Threonine ACC } ACA } ACG }	AAU } Asparagine AAC } AAA } Lysine AAG }	AGU } Serine AGC } AGA } Arginine AGG }		U C A G
	G	GUU } Valine GUC } GUA } GUG }	GCU } Alanine GCC } GCA } GCG }	GAU } Aspartic acid GAC } GAA } Glutamic acid GAG }	GGU } Glycine GGC } GGA } GGG }		U C A G

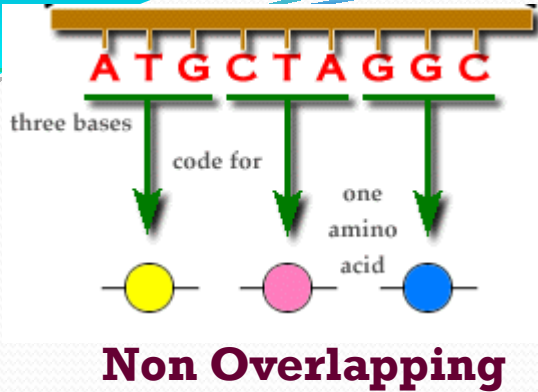


# Major Properties

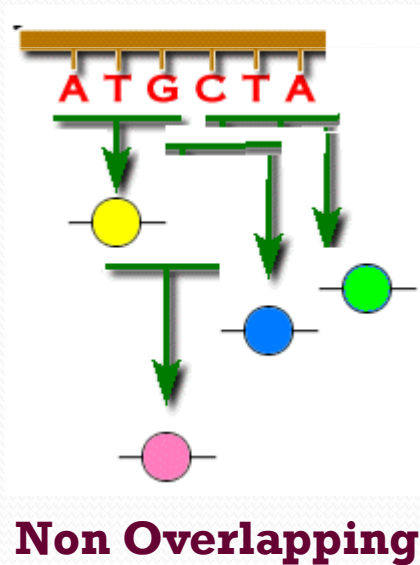
## 1. Triplet:

Gamow 1954 suggested 3 letter code



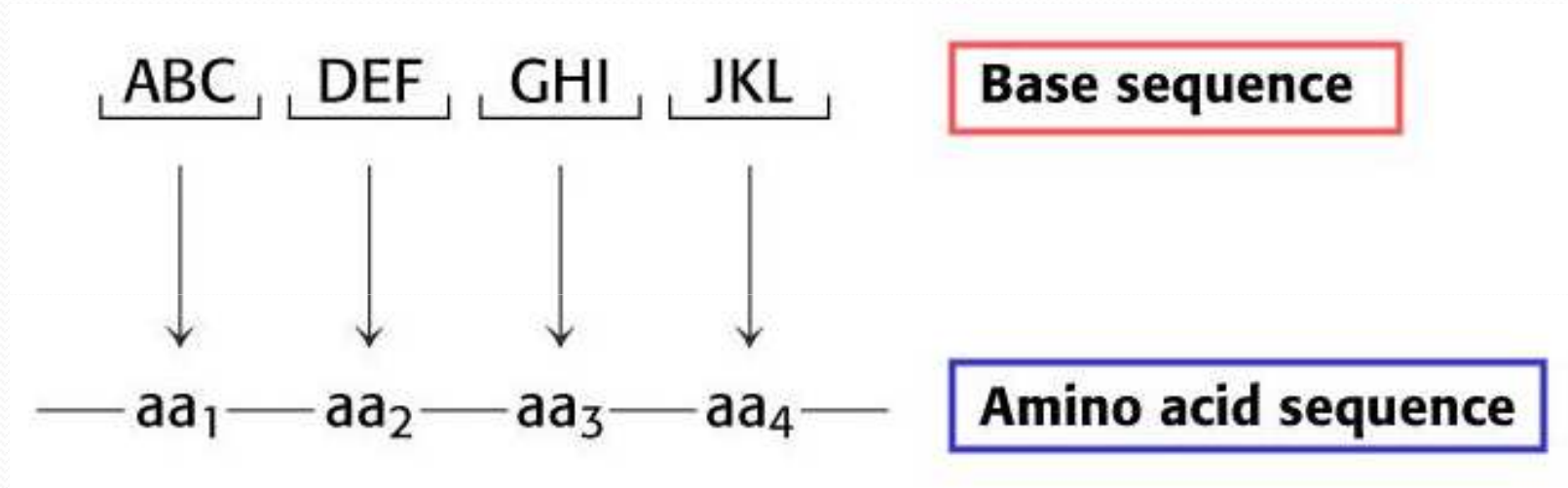


**Genetic code is Non-Overlapping,  
if it is overlapping three amino acids  
Should have been changed in sickle cell  
anemia**



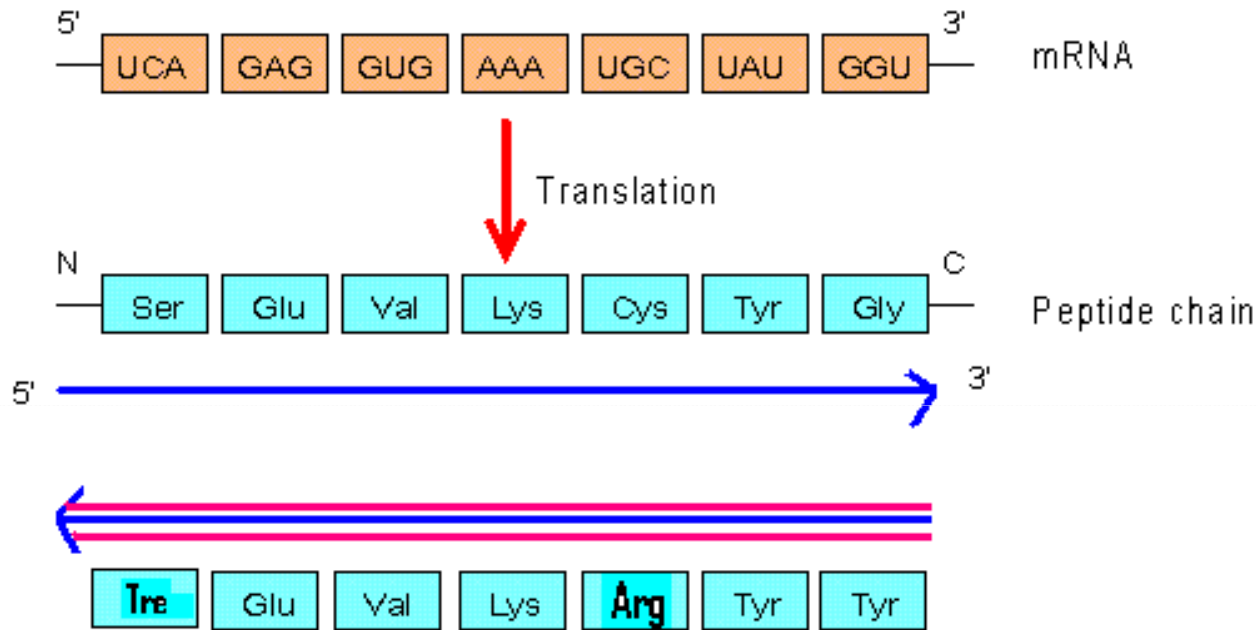
Normal Cells							
CAA	GTA	AAC	ATA	GGA	CTT	CTT	DNA
GUU	CAU	UUG	UAU	CCU	GAA	GAA	mRNA
val	his	leu	thr	pro	glu	glu	Protein
Sickle Cells							
CAA	GTA	AAC	ATA	GGA	CAT	CTT	DNA
GUU	CAU	UUG	UAU	CCU	GUA	GAA	mRNA
val	his	leu	thr	pro	val	glu	Protein

### 3. Comma less:



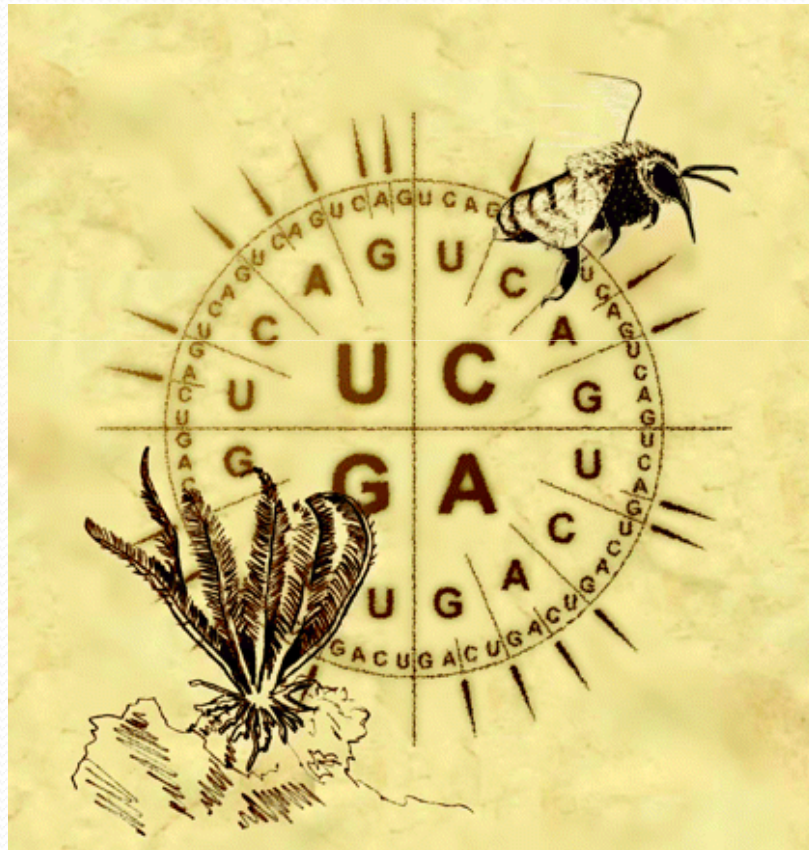
**Genetic code is comma less**

## 4. Has Polarity:



**Genetic code has polarity i.e., 5' to 3' direction.  
If it reads in opposite direction it yields a different protein**

## 5. Universal: Marshal *et al.*, 1967

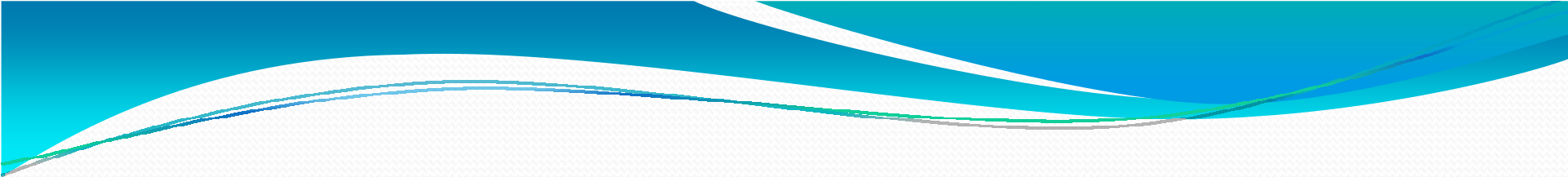


- In Yeast **mitochondria** **UGA** codes for **tryptophan**, although in the nuclear genes UGA is a termination codon.
- In the ciliate protozoa UAA & UAG codes for glutamine instead of **stop** signal



## **6. Degenerate/Redundant:**

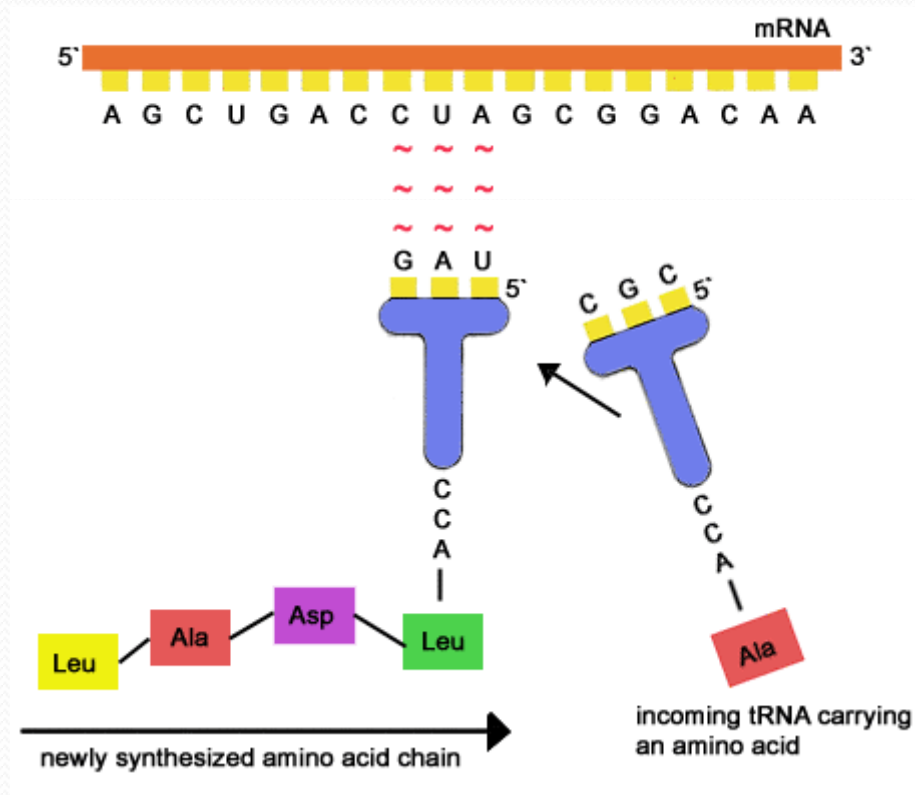
**Provision or existence of more than one Codon to perform an activity or function.**



**7. Non-ambiguous/unambiguous:**  
**Having or exhibiting no ambiguity or uncertainty; clear**

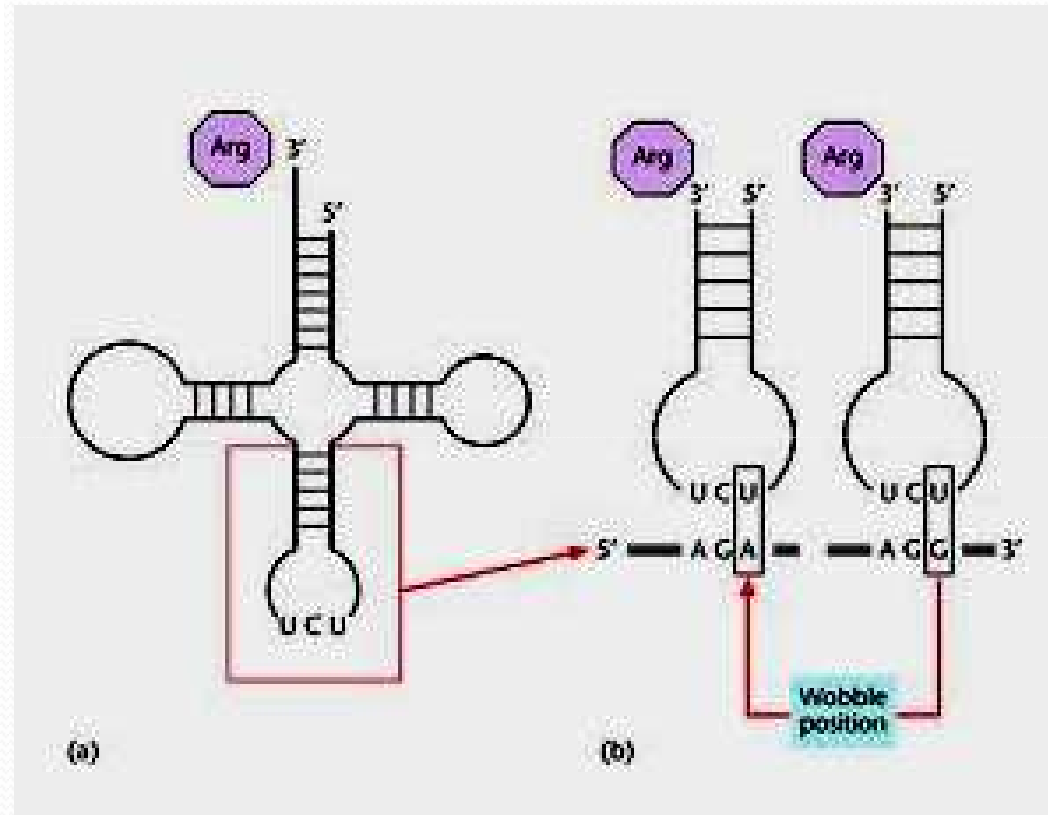
# Wobble Hypothesis

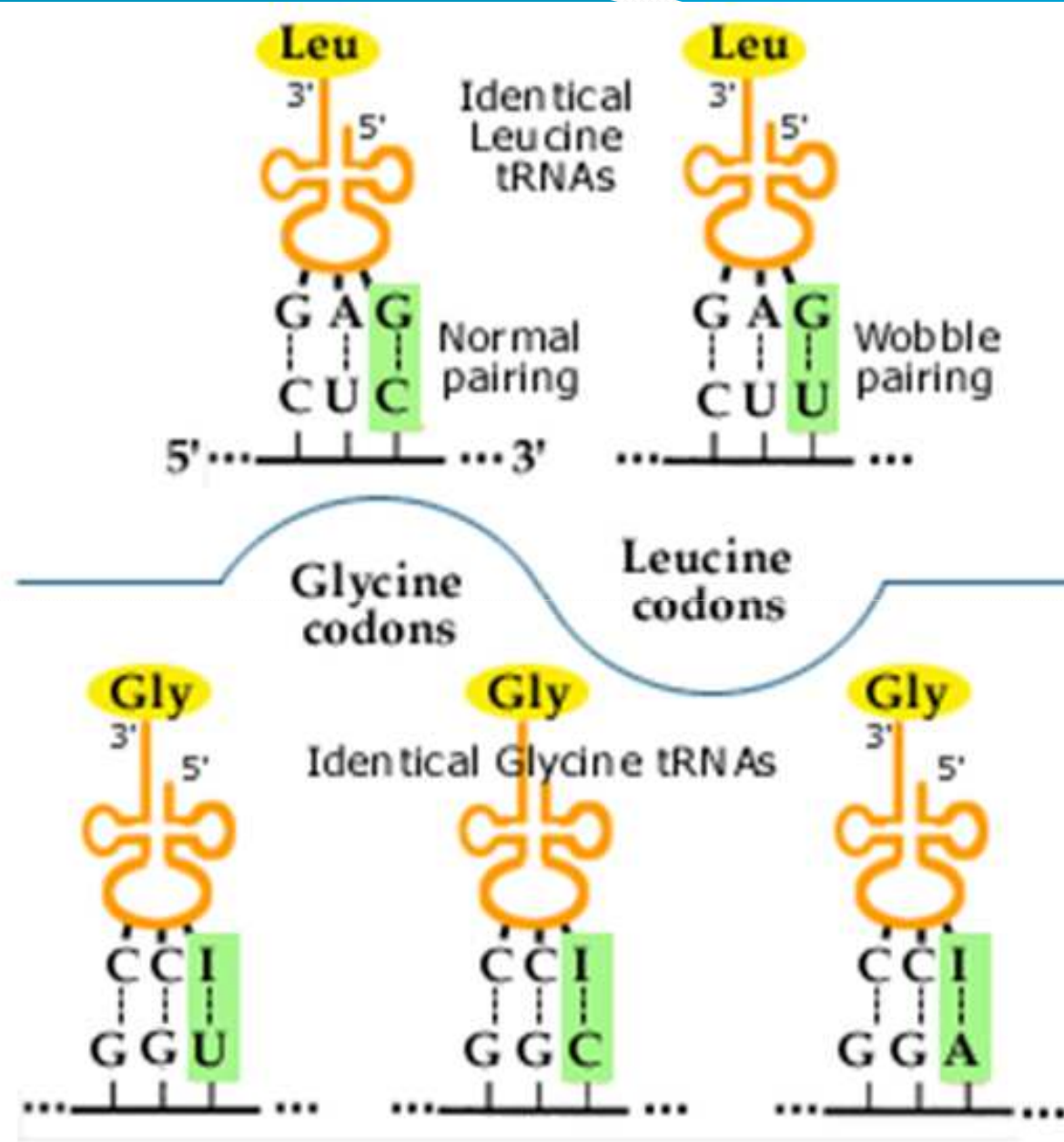
Crick – 1966 proposed hypothesis





Codon	Anti-Codon
A	U or I
G	C or U or I
C	G or I
U	A or G or I







# Animation on Genetic Code





**Acknowledgements  
to**

**INTERNET**

**FOR  
PICTURES**