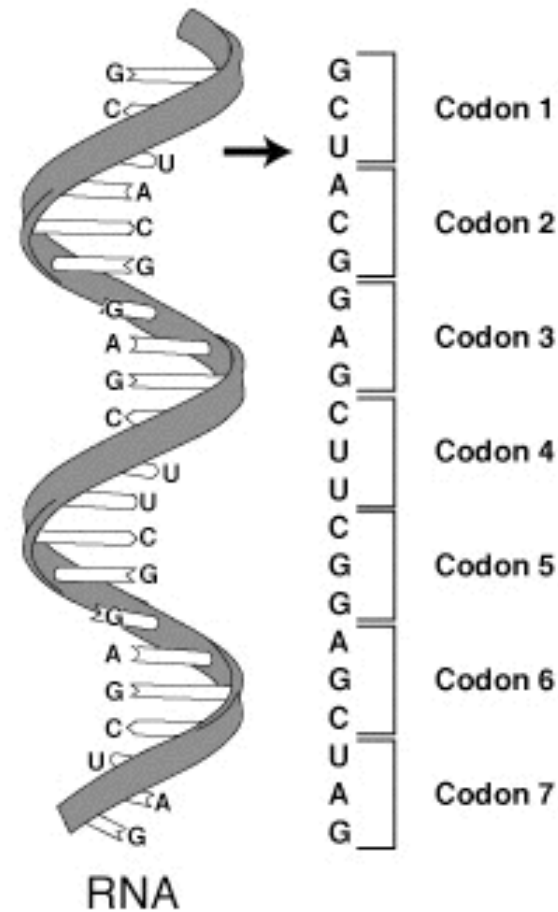


# Coding Theory and Protein Sequences

# Genetic Code



Ribonucleic acid

- The **genetic code** is the set of rules by which information encoded in genetic material (DNA or RNA sequences) is translated into proteins (amino acid sequences) by living cells.
- Specifically, the code defines a mapping between tri-nucleotide sequences called **codons** and amino acids; every triplet of nucleotides in a nucleic acid sequence specifies a single amino acid.

# RNA codon table

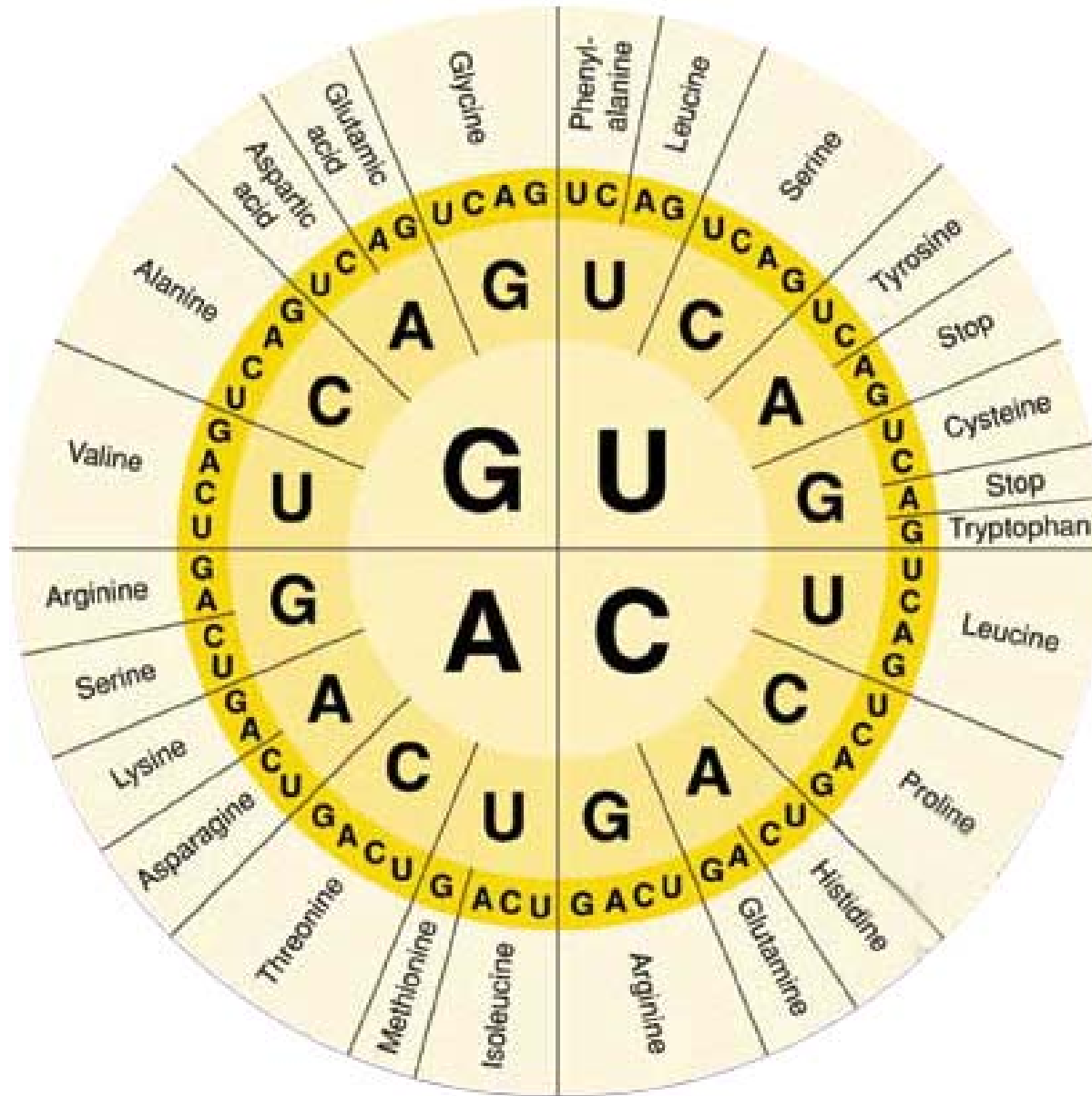
This table shows the 64 codons and the amino acid each codon codes for. The direction is 5' to 3'.

		2nd base			
		U	C	A	G
1st base	U	UUU (Phe/F) <a href="#">Phenylalanine</a> UUC (Phe/F) <a href="#">Phenylalanine</a> UUA (Leu/L) <a href="#">Leucine</a> UUG (Leu/L) <a href="#">Leucine</a>	UCU (Ser/S) <a href="#">Serine</a> UCC (Ser/S) <a href="#">Serine</a> UCA (Ser/S) <a href="#">Serine</a> UCG (Ser/S) <a href="#">Serine</a>	UAU (Tyr/Y) <a href="#">Tyrosine</a> UAC (Tyr/Y) <a href="#">Tyrosine</a> UAA Ochre ( <i>Stop</i> ) UAG Amber ( <i>Stop</i> )	UGU (Cys/C) <a href="#">Cysteine</a> UGC (Cys/C) <a href="#">Cysteine</a> UGA Opal ( <i>Stop</i> ) UGG (Trp/W) <a href="#">Tryptophan</a>
	C	CUU (Leu/L) <a href="#">Leucine</a> CUC (Leu/L) <a href="#">Leucine</a> CUA (Leu/L) <a href="#">Leucine</a> CUG (Leu/L) <a href="#">Leucine</a>	CCU (Pro/P) <a href="#">Proline</a> CCC (Pro/P) <a href="#">Proline</a> CCA (Pro/P) <a href="#">Proline</a> CCG (Pro/P) <a href="#">Proline</a>	CAU (His/H) <a href="#">Histidine</a> CAC (His/H) <a href="#">Histidine</a> CAA (Gln/Q) <a href="#">Glutamine</a> CAG (Gln/Q) <a href="#">Glutamine</a>	CGU (Arg/R) <a href="#">Arginine</a> CGC (Arg/R) <a href="#">Arginine</a> CGA (Arg/R) <a href="#">Arginine</a> CGG (Arg/R) <a href="#">Arginine</a>
	A	AUU (Ile/I) <a href="#">Isoleucine</a> AUC (Ile/I) <a href="#">Isoleucine</a> AUA (Ile/I) <a href="#">Isoleucine</a> AUG (Met/M) <a href="#">Methionine</a> , <i>Start</i> <sup>11</sup>	ACU (Thr/T) <a href="#">Threonine</a> ACC (Thr/T) <a href="#">Threonine</a> ACA (Thr/T) <a href="#">Threonine</a> ACG (Thr/T) <a href="#">Threonine</a>	AAU (Asn/N) <a href="#">Asparagine</a> AAC (Asn/N) <a href="#">Asparagine</a> AAA (Lys/K) <a href="#">Lysine</a> AAG (Lys/K) <a href="#">Lysine</a>	AGU (Ser/S) <a href="#">Serine</a> AGC (Ser/S) <a href="#">Serine</a> AGA (Arg/R) <a href="#">Arginine</a> AGG (Arg/R) <a href="#">Arginine</a>
	G	GUU (Val/V) <a href="#">Valine</a> GUC (Val/V) <a href="#">Valine</a> GUA (Val/V) <a href="#">Valine</a> GUG (Val/V) <a href="#">Valine</a>	GCU (Ala/A) <a href="#">Alanine</a> GCC (Ala/A) <a href="#">Alanine</a> GCA (Ala/A) <a href="#">Alanine</a> GCG (Ala/A) <a href="#">Alanine</a>	GAU (Asp/D) <a href="#">Aspartic acid</a> GAC (Asp/D) <a href="#">Aspartic acid</a> GAA (Glu/E) <a href="#">Glutamic acid</a> GAG (Glu/E) <a href="#">Glutamic acid</a>	GGU (Gly/G) <a href="#">Glycine</a> GGC (Gly/G) <a href="#">Glycine</a> GGA (Gly/G) <a href="#">Glycine</a> GGG (Gly/G) <a href="#">Glycine</a>

# Inverse table

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

<b>3 Letter Code</b>	<b>1 Letter Code</b>	<b>Full name</b>	<b>mRNA nucleotide triplets (codons)</b>
Ala	A	Alanine	GCA, GCC, GCG, GCU
Arg	R	Arginine	AGA, AGG, CGA, CGC, CGG, CGU
Asn	N	Asparagine	AAC, AAU
Asp	D	Aspartic acid	GAC, GAU
Cys	C	Cysteine	UGC, UGU
Glu	E	Glutamic acid	GAA, GAG
Gln	Q	Glutamine	CAA, CAG
Gly	G	Glycine	GGA, GGC, GGG, GGU
His	H	Histidine	CAC, CAU
Ile	I	Isoleucine	AUA, AUC, AUU
Leu	L	Leucine	UUA, UUG, CUA, CUC, CUG, CUU
Lys	K	Lysine	AAA, AAG
Met	M	Methiodine	AUG
Phe	F	Phenylalanine	UUC, UUU
Pro	P	Proline	CCA, CCC, CCG, CCU
Ser	S	Serine	AGC, AGU, UCA, UCC, UCG, UCU
Thr	T	Threonine	ACA, ACC, ACG, ACU
Trp	W	Tryptophan	UGG
Tyr	Y	Tyrosine	UAC, UAU
Val	V	Valine	GUA, GUC, GUG, GUU
STOP		UAA, UAG, UGA	

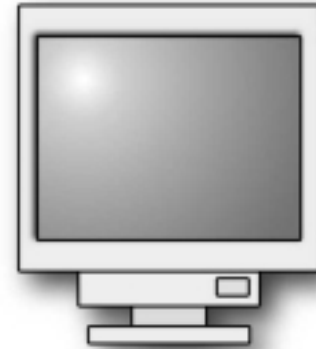
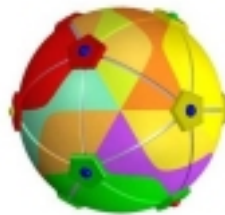




**DNA**



**Genetic Code**



**Protein**



