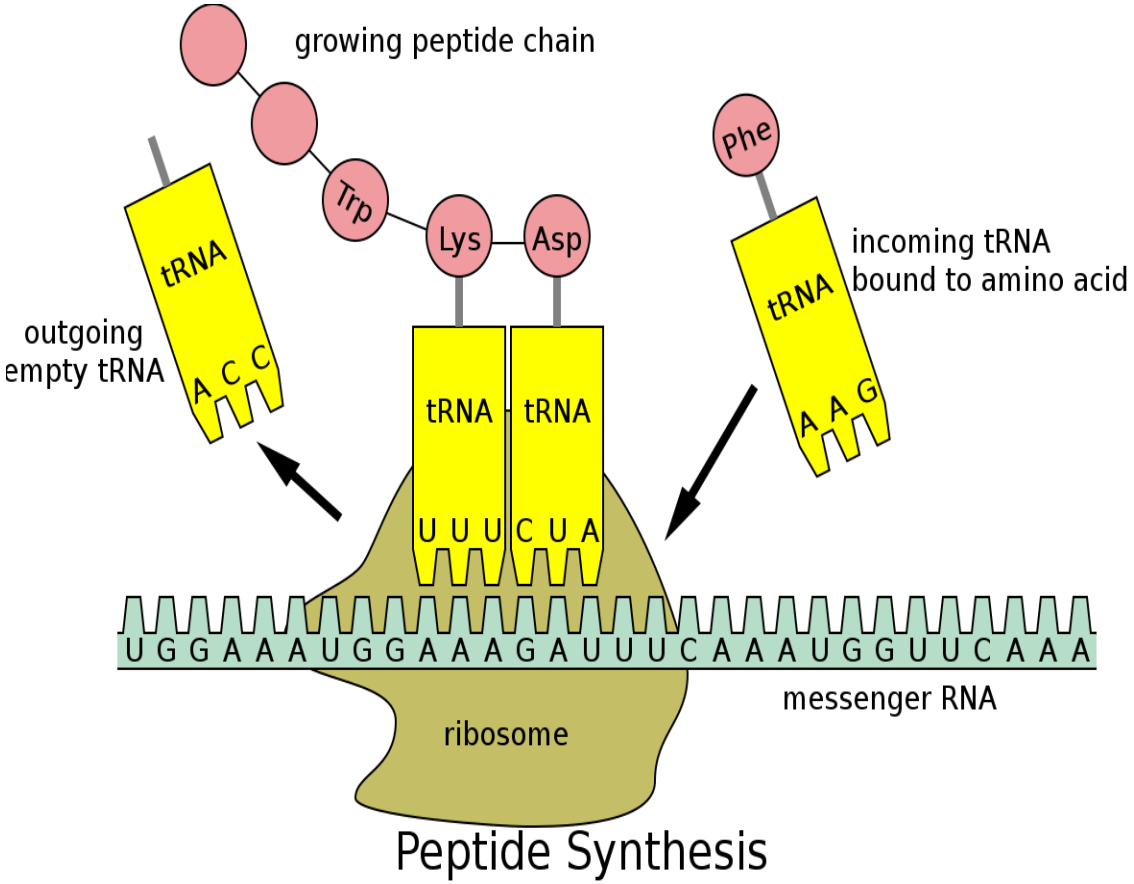
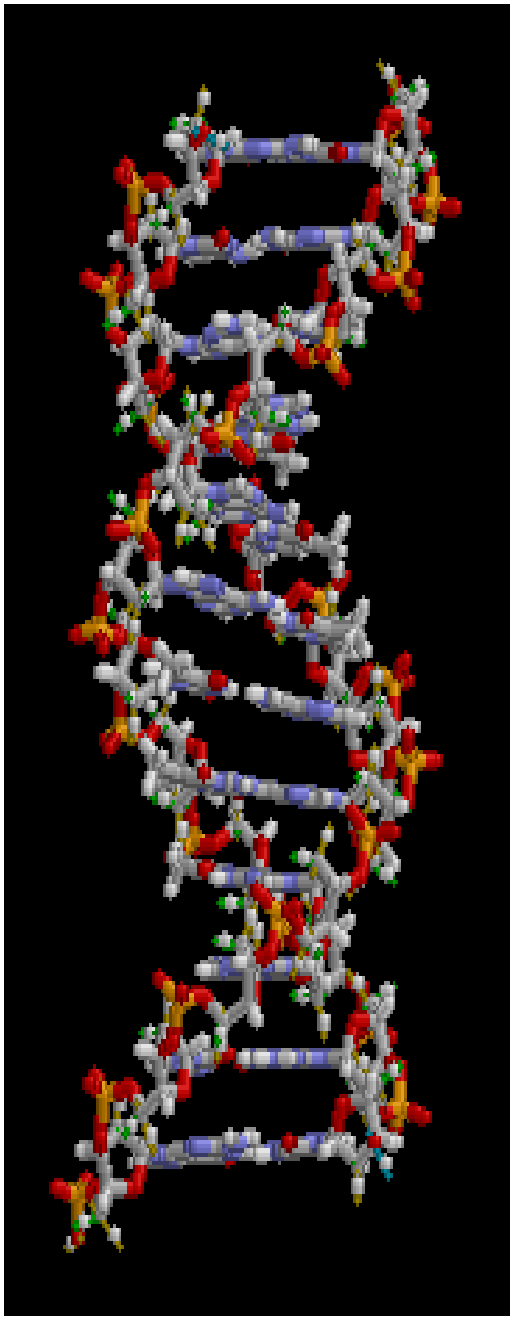
The central dogma of molecular biology





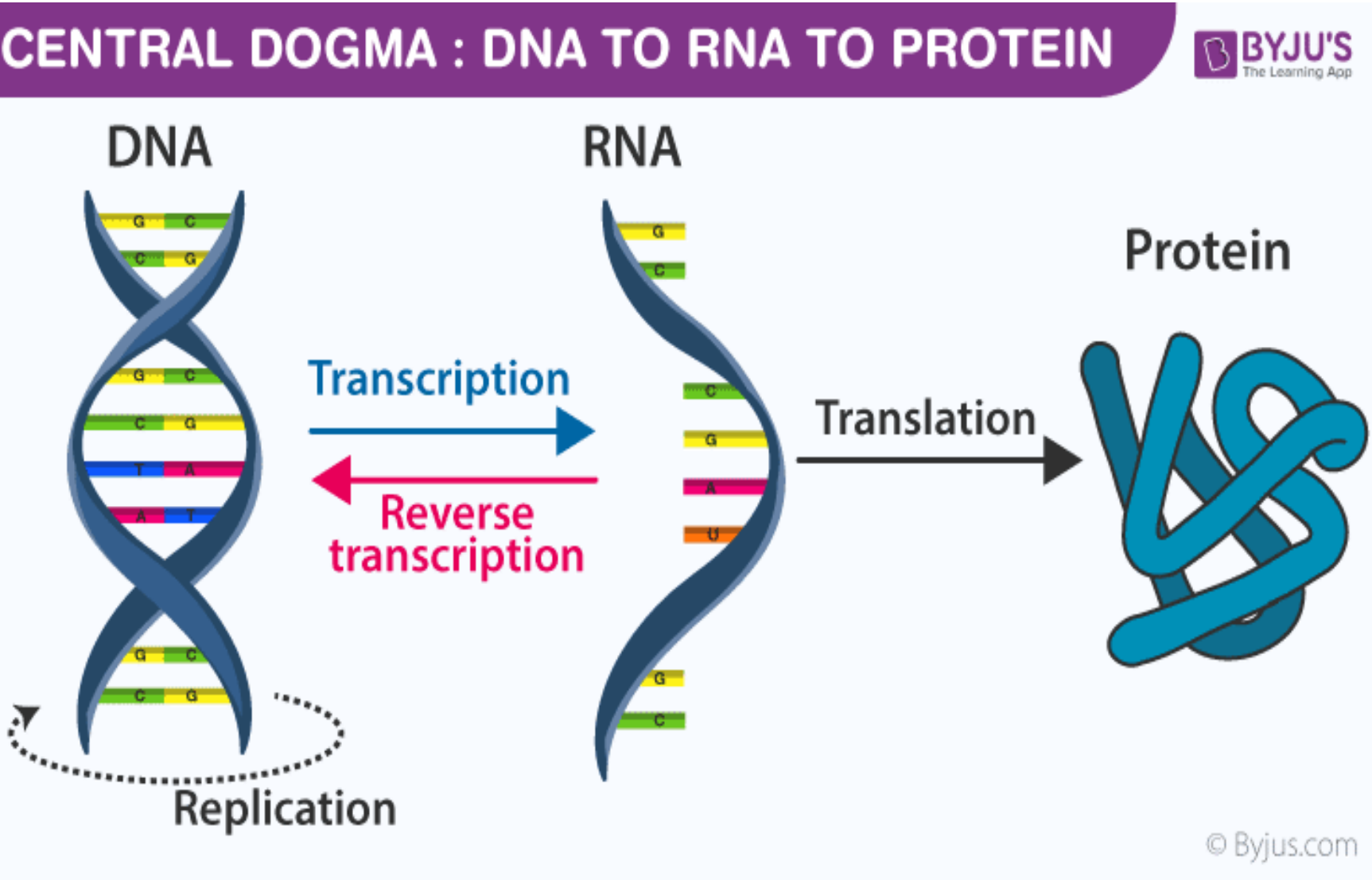
The central dogma of molecular biology

is an explanation of the flow of genetic information within a biological system. It is often stated as "DNA makes RNA, and RNA makes protein",

It was first stated by Francis Crick in 1957,

The Central Dogma. This states that once "information" has passed into protein it cannot get out again. In more detail, the transfer of information from nucleic acid to nucleic acid, or from nucleic acid to protein may be possible, but transfer from protein to protein, or from protein to nucleic acid is impossible. Information means here the precise determination of sequence, either of bases in the nucleic acid or of amino acid residues in the protein.

CENTRAL DOGMA : DNA TO RNA TO PROTEIN



What is the backbone of molecular biology?

Central dogma is the backbone of molecular biology all the basic concept revolves around it. It's the step by step transfer of information within the cell at molecular level.

What are the four steps of central dogma?

The central dogma states that the pattern of information that occurs most frequently in our cells is: **From existing DNA to make new DNA (DNA replication?) From DNA to make new RNA (transcription) From RNA to make new proteins (translation)**.

What is reverse dogma of molecular biology?

During the reverse flow of information in the central dogma of molecular biology, the information flows from RNA to DNA which then forms RNA again which is translated to form proteins. This process is known as reverse transcription.

How do genes direct the production of proteins?

Most genes contain the information needed to make functional molecules called proteins. (A few genes produce regulatory molecules that help the cell assemble proteins.) The process that convert gene to protein is complex and tightly controlled within each cell. It consists of two major steps: transcription and translation. Together, transcription and translation are known as gene expression.

During the process of transcription, the information stored in a gene's DNA is passed to a similar molecule called RNA (ribonucleic acid) in the cell nucleus. Both RNA and DNA are made up of a chain of building blocks called nucleotides, but they have slightly different chemical properties. The type of RNA that contains the information for making a protein is called messenger RNA (mRNA) because it carries the information, or message, from the DNA out of the nucleus into the cytoplasm.

Translation, the second step in getting from a gene to a protein, takes place in the cytoplasm. The mRNA interacts with a specialized complex called a ribosome, which "reads" the sequence of mRNA nucleotides. Each sequence of three nucleotides, called a codon, usually codes for one particular amino acid. (Amino acids are the building blocks of proteins.) A type of RNA called transfer RNA (tRNA) assembles the protein, one amino acid at a time.

Protein assembly continues until the ribosome arrives to a “stop” codon (a sequence of three nucleotides that does not code for an amino acid UAA, UGA, UAG).

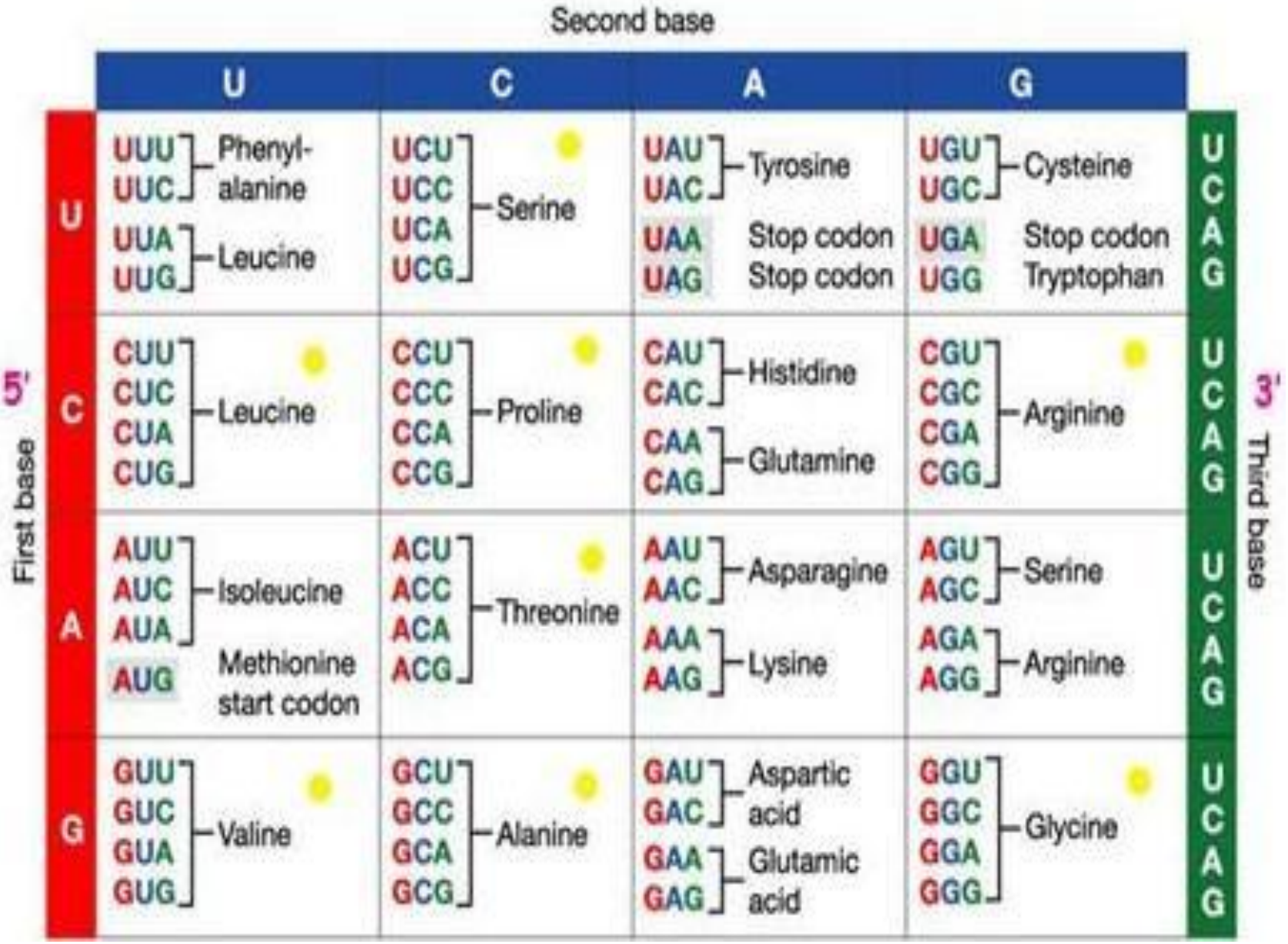
The flow of information from DNA to RNA to proteins is one of the fundamental principles of molecular biology. Through the processes of transcription and translation, information from genes is used to make proteins.

What are proteins and what do they do?

Proteins are large, complex molecules that play many critical roles in the plant. They do most of the work in cells and are required for the structure, function, and regulation of the plant tissues and organs.

Proteins are made up of hundreds or thousands of smaller units called amino acids, which are attached to one another in long chains.

There are 20 different types of amino acids that can be combined to make a protein. The sequence of amino acids determines each protein's unique 3-dimensional structure and its specific function. Amino acids are coded by combinations of three DNA building blocks (nucleotides), determined by the sequence of genes. Proteins can be described according to their large range of functions in the body, listed in alphabetical order:


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

Examples of protein functions

Function	Description	Example
Antibody	Antibodies bind to specific foreign particles, such as viruses and bacteria, to help protect the body.	Immunoglobulin G (IgG)
Enzyme	Enzymes carry out almost all of the thousands of chemical reactions that take place in cells. They also assist with the formation of new molecules by reading the genetic information stored in DNA.	Phenylalanine hydroxylase
Messenger	Messenger proteins, such as some types of hormones, transmit signals to coordinate biological processes between different cells, tissues, and organs.	Growth hormone
Structural component	These proteins provide structure and support for cells. On a larger scale, they also allow the body to move.	Actin
Transport /storage	These proteins bind and carry atoms and small molecules within cells and throughout the body.	Ferritin

Can genes be turned on and off in cells?

Each cell expresses, or turns on, only a part of its genes at any given time. The rest of the genes are repressed, or turned off. The process of turning genes on and off is known as gene regulation. Gene regulation is an important part of normal development. Genes are turned on and off in different patterns during development to make a storage cell look and act different from a parenchyma cell,