**Starter**

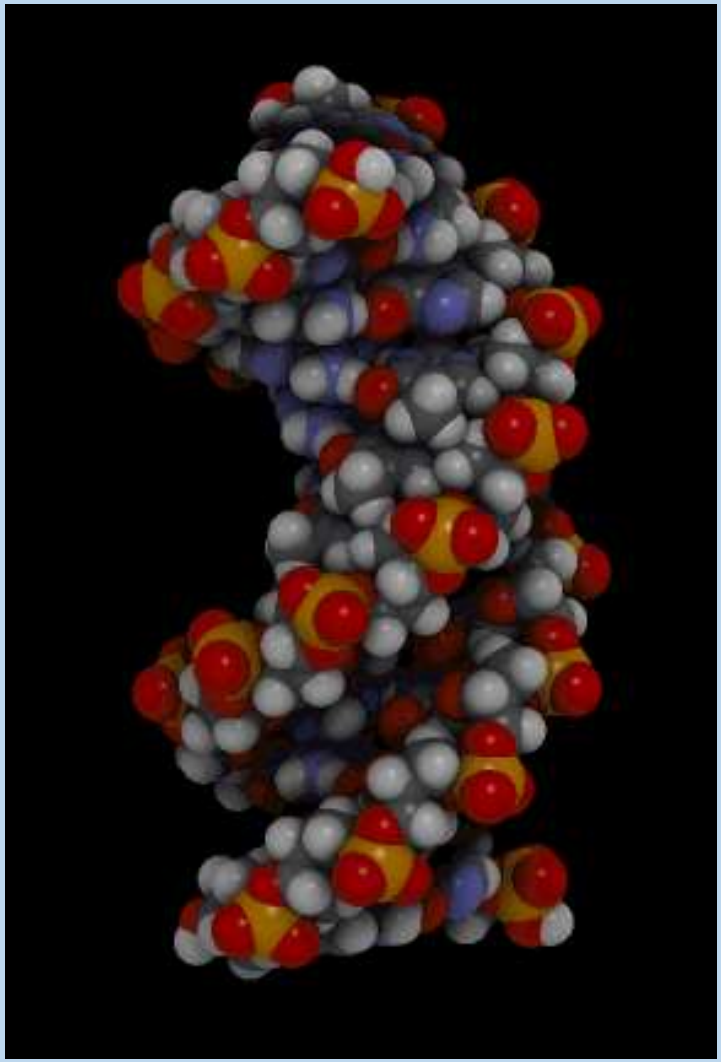
**True or False…**

1. A ribosome has three binding sites.
2. tRNA contains an anticodon which is complimentary to the codon on mRNA.
3. DNA polymerase is the enzyme used in transcription.
4. An intron is an area of DNA which codes for production of a protein.

# Unit 1: DNA & the Genome

## Topic 5:

## The Structure of the Genome



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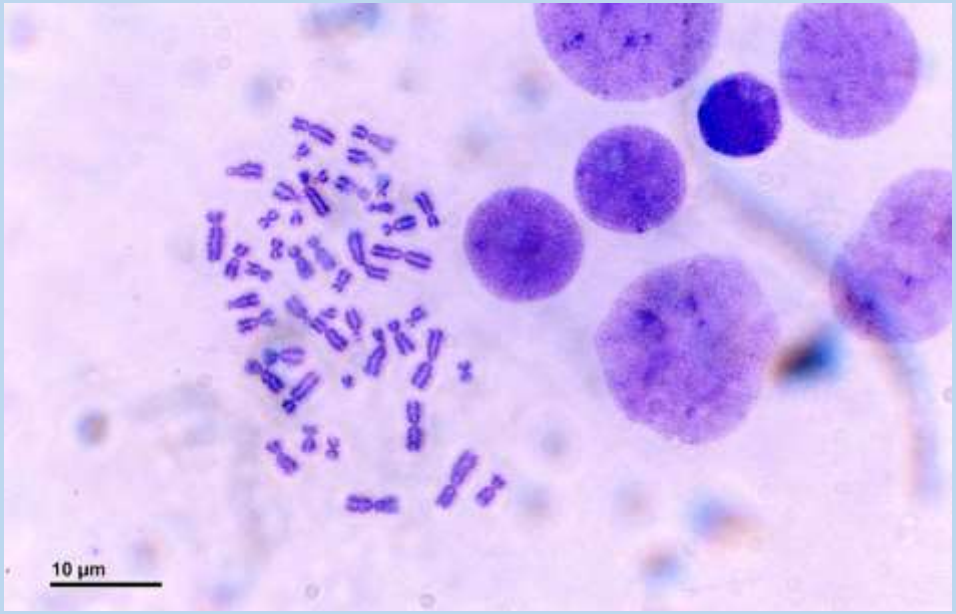
## Learning Outcomes

- The genome of an organism is its entire hereditary information encoded in DNA.
- DNA sequences that code for protein are defined as genes.
- A genome is made up of genes and other DNA sequences that do not code for proteins.
- Non-coding sequences include those that regulate transcription and those that are transcribed to RNA but are never translated.
- Some non-coding sequences have no known function.

A **genome** is the code within an organism's DNA which contains all the genetic information required to make a new organism.

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A **gene** is a sequence of DNA bases within the genome which codes for protein.

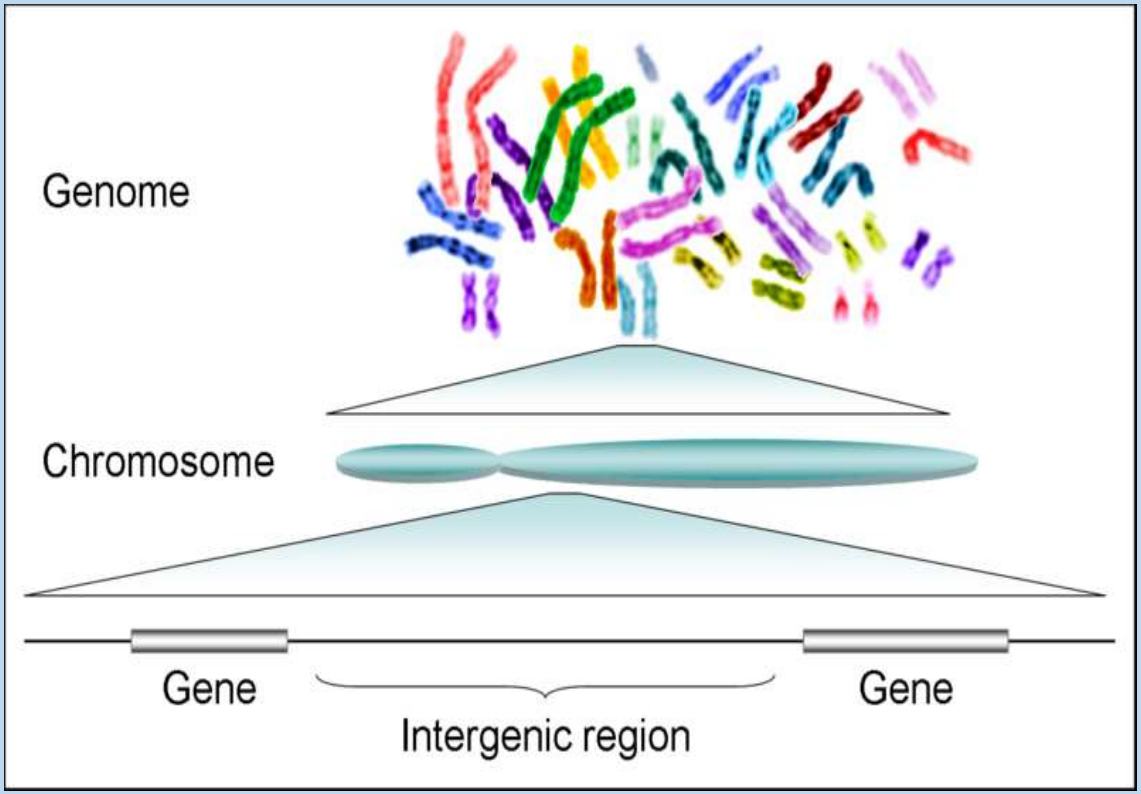
**But…**

# The Role of Non-Coding DNA

In eukaryotes there are many long sequences of DNA which do not actually code for a protein.

Only a tiny proportion of eukaryotic genomes contain genes!

Research scientists have worked out the roles for some of these sequences of DNA but the function of many of these regions is still unknown.

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We are going to look at three roles for this non-coding DNA…

1. Regulation of transcription
2. Protection
3. Transcription of non-translated RNA

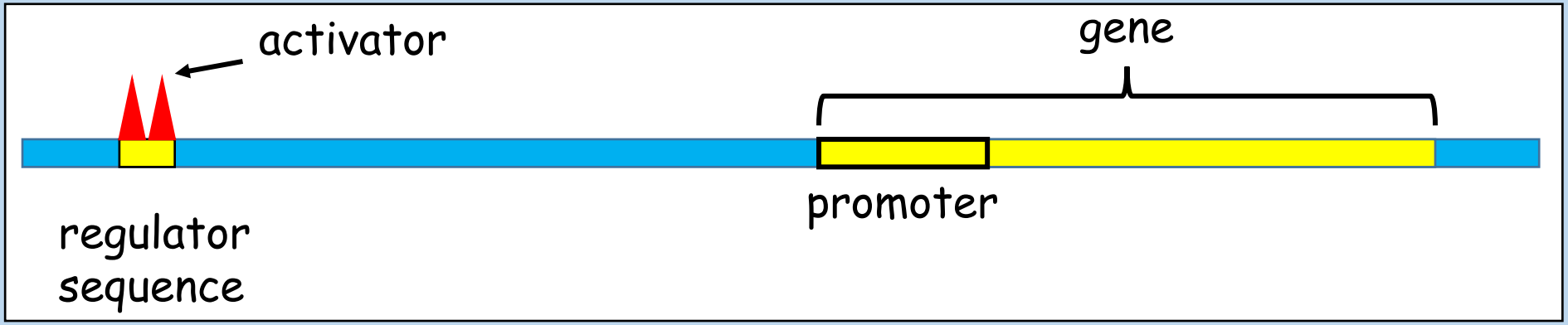
# Non-Coding DNA and the Regulation of Transcription

RNA polymerase is not able to bind to the promoter region of the DNA by itself.

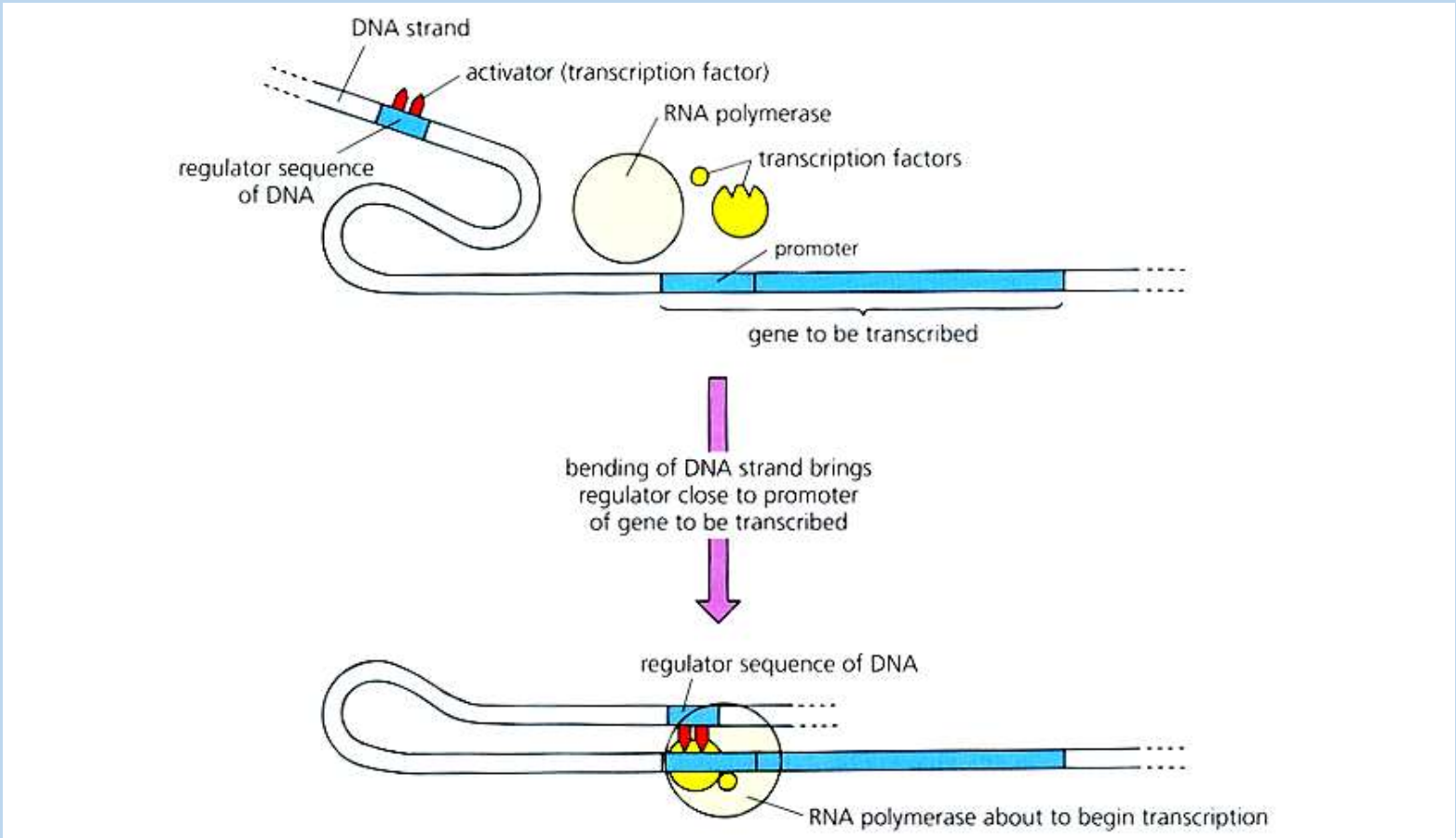
It needs the help of transcription factors (sometimes several at once).

Some transcription factors are known as activators which can bind to a section of DNA called the regulator sequence.

The regulator sequence is usually some distance from the coding gene.

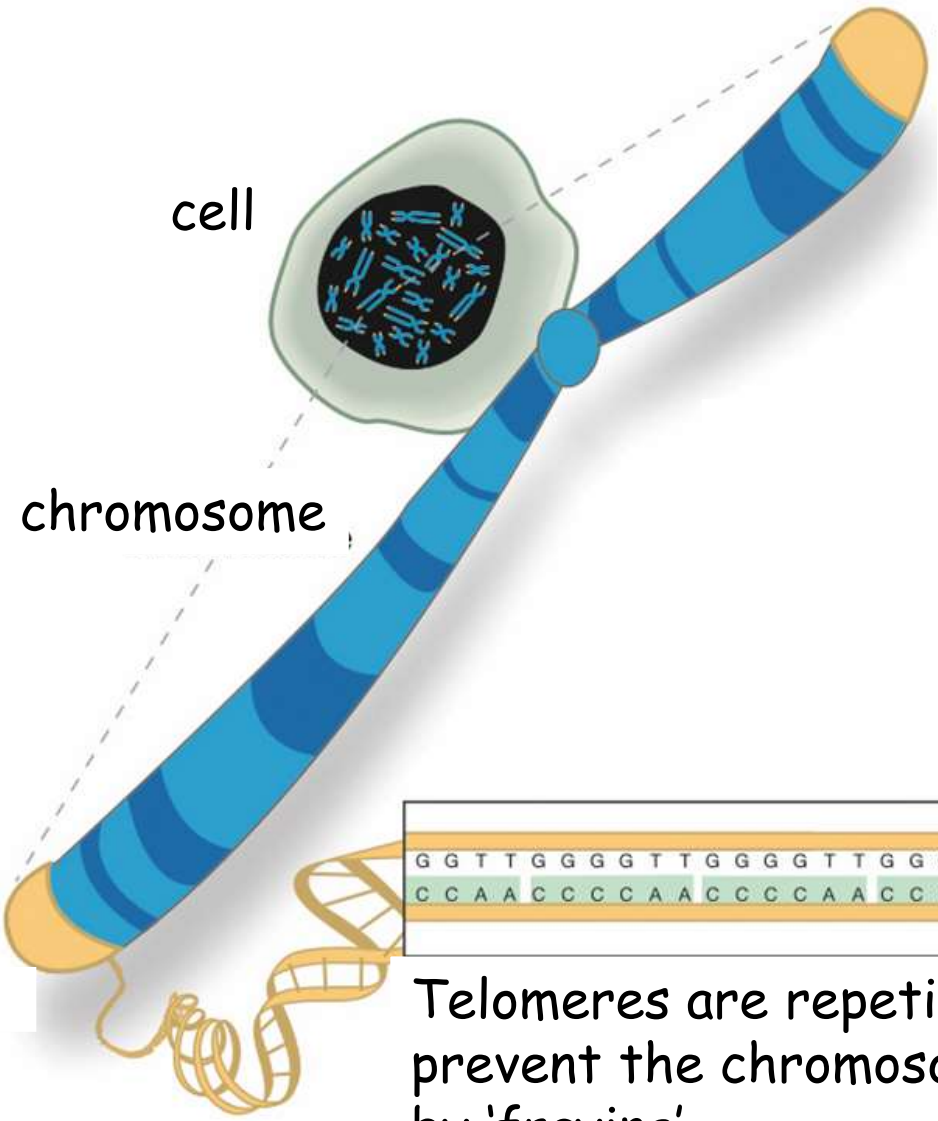


The DNA strand bends so that all of the transcription factors (including the bound activator) which are needed for the RNA polymerase to bind to the promoter region come together to form a molecular complex.




Regulation of transcription

# Non-Coding DNA and Protection




Telomeres form protective caps at the ends of chromosomes.




Telomeres are repetitive DNA sequences which prevent the chromosome from becoming damaged by 'fraying'.

# Transcription of Non-Translated forms of RNA

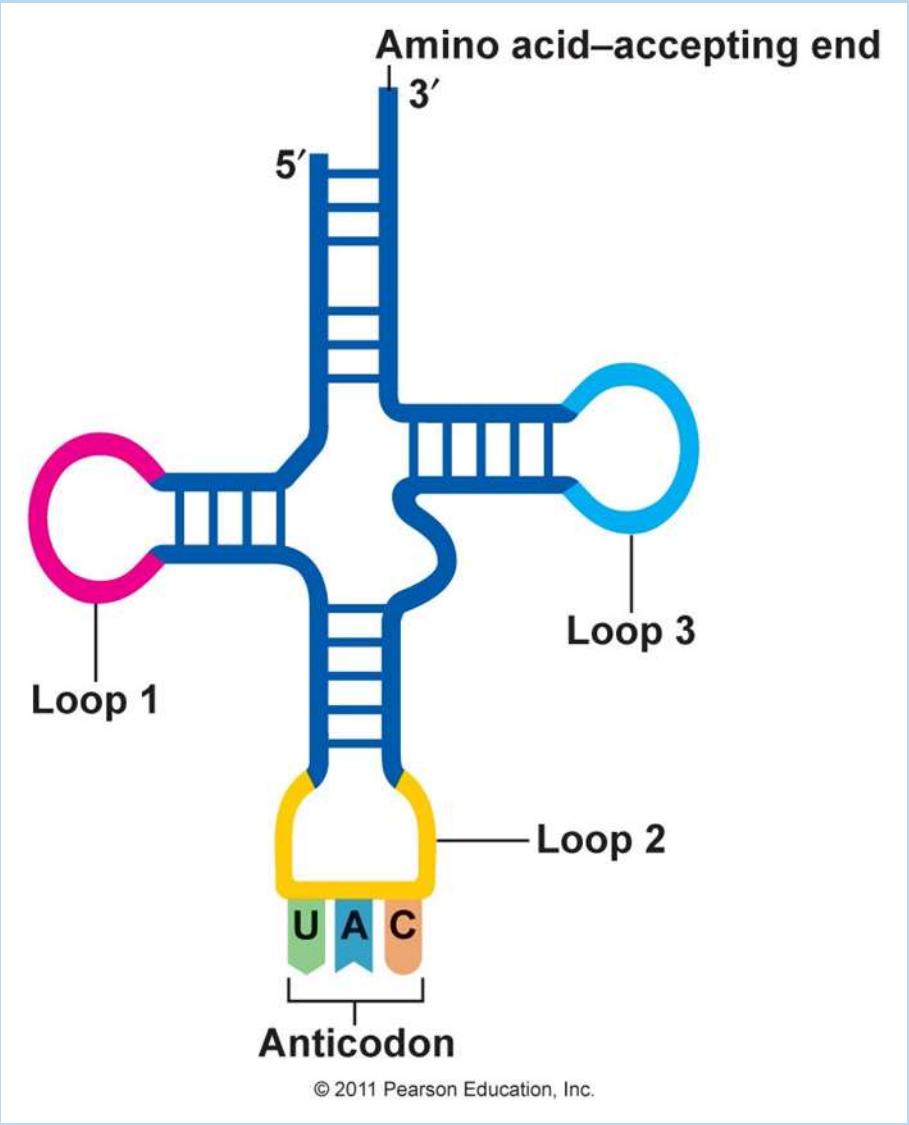
There are 3 types of RNA transcribed from DNA but are not translated into proteins.

1. tRNA (transfer RNA)

2. rRNA (ribosomal RNA)

3. RNA fragments

# 1. tRNA




tRNA is made from regions of (non-coding) DNA in a similar way to that of mRNA.

However, tRNA itself is not translated into protein.

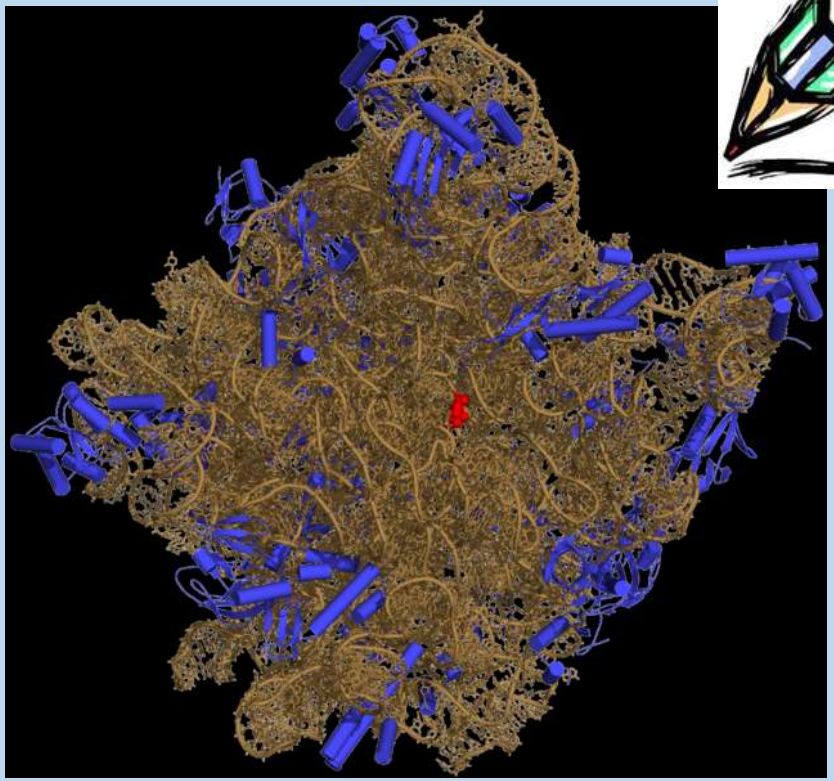
The function of tRNA is to transport a specific amino acid to a ribosome.

## 2. rRNA

Ribosomes consist of a complex of protein and rRNA.

The rRNA is transcribed from (non-protein coding) DNA.

Ribosomes contain one large subunit and one smaller one.



http://commons.wikimedia.org/wiki/File:50S-subunit_of_the_ribosome_3CC2.png?uselang=en-gb

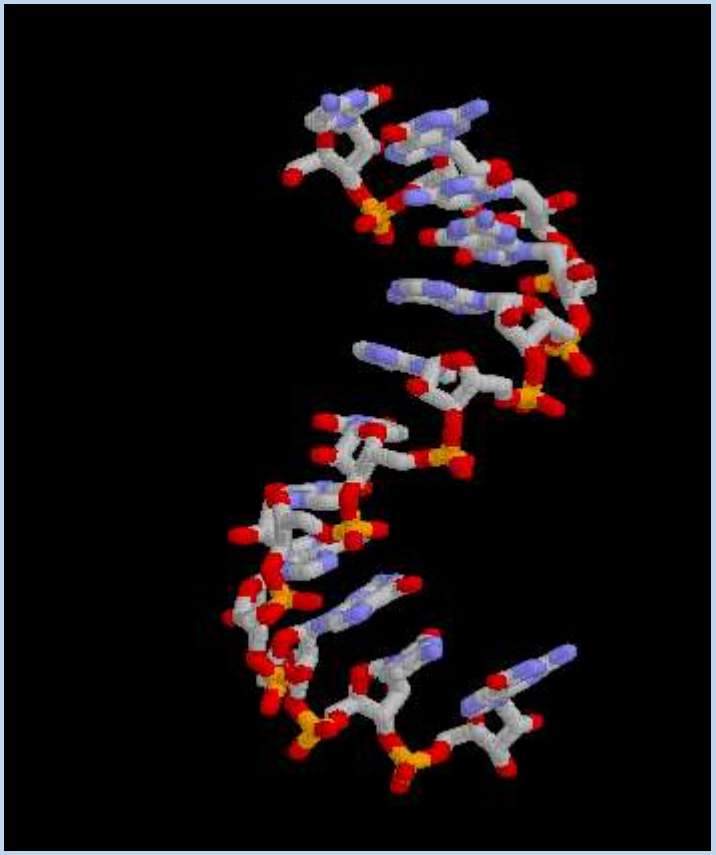
The individual subunits containing the protein and rRNA are assembled in the nucleus.

The subunits leave the nucleus via the nuclear pore before combining in the cytoplasm.

# RNA Fragments

RNA fragments are also made from non- protein coding regions of DNA.

When RNA fragments, called small nuclear RNA (snRNA), combine with proteins they are involved in removing introns from the primary transcript mRNA.



Other RNA fragments, called micro RNA (miRNA), play an important part in silencing genes.

# Structure of the Genome in Eukaryotes