

Week 2: 04.10.16

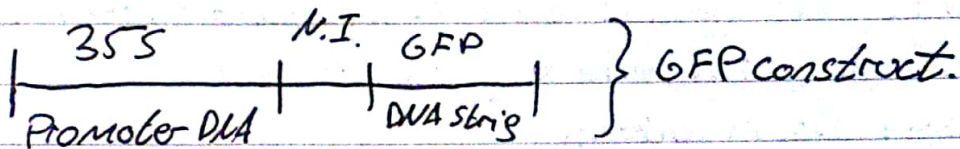
HN

Molecular Biology and the dynamic cell

The eukaryotic cell and its Nucleus

Confocal laser scanning

- GFP = Green fluorescent protein
- Most use GFP as part of genetic engineering to find nucleus.



To add it to plants, wait for some of the seeds to express.

Nuclear matrix:

- consists of two parts: nuclear lamina (L), and a network of intricately structured fibres connected to lamina and well distributed through nuclear volume.

Chromosomes

During inter-phase chromosomes are not easily imaged by light microscopy and only become visible when they condense in early stages of mitosis.

Genes and transcripts can be observed using a technique called FISH.

- DNA molecule complementary to gene sequence used as probes, tagged with fluorescent molecule → visualized.

Chromosomes stained with specific probe ⇒ 2 stains as pairs. Detects linear organization.

*See diagram, nuclei = blue stain & chromosome stained red or green. Different pairs stained at different images.

Chromosome painting allows positioning of each chromosome in an inter-phase nucleus to be imaged.

Week 2 06.10.16

HN

Molecular Biology and the dynamic cell
Chromosome packaging.

Bacteria transformation provided the first evidence that DNA is the genetic material of bacteria.

Bacteriophage infection showed that DNA is the genetic material of viruses.

Griffith's experiment -

- ~~living strain~~ of living S strain of *S. pneumoniae*
⇒ mouse dies
- living R strain of *S. pneumoniae*
⇒ mouse lives
- S strain heat killed
⇒ mouse lives
- living R strain + S-strain (killed)
⇒ mouse dies + living S strain recovered

⇒ S-strain cells undergoes fractionation → into classes of molecules
DNA carried the S-strain, not RNA/Protein etc
⇒ DNA carries heritable information

Hershey and chase experiment.

- Again used to differentiate DNA/Protein
→ checker: radioactivity within cell.

Virus inserts genetic material: Protein or DNA? into *E. coli* cell
DNA labelled with ^{32}P and protein labelled with ^{35}S added to
E. coli + virus and infection starts. Blended to shear off viral
heads off bacteria → centrifuged and seen that bacteria have
 ^{32}P but no ^{35}S .

Specialized DNA sequences are required for DNA replication and
chromosome segregation.

Week 3 10.10.2016
Molecular Biology and the dynamic cell
Translation.

HN

mRNA decoded in sets of three nucleotides.

tRNA molecules match amino acids to codons in mRNA.

mRNA message decoded by ribosomes.

Specific codons in mRNA, signal the Ribosome where to start and stop protein synthesis.

Proteins made of polyribosomes.

Inhibitors of prokaryotic protein synthesis = antibiotics

Controlled protein breakdown = regulate amount of each protein in cell

RNA molecule translated in 3 possible reading frames

CUGAGCGUUACCAC
└─┘└─┘└─┘└─┘
└─┘└─┘└─┘└─┘
└─┘└─┘└─┘└─┘

Genetic code is degenerate.

tRNA molecules match amino acids to codons in mRNA.
anticodon + codon.

Aminoacyl-tRNA synthetase couple each amino acid to appropriate set of tRNA molecules. (charging) aka.

Linkage of amino acid to tRNA turns ATP to AMP + 2P_i.

Now this complex can bind to codon on RNA

→ amino acid selected by codon.

Ribosomes = large complex of RNA and proteins (not Proteins)

large subunit + small subunit = complete ribosome

Mw = 2'800'000

Mw = 1'400'000

Prokaryotic = 70S

Eukaryotic = 80S

Ribosome = one binding site for mRNA (small ribosomal subunit)

3 binding sites for tRNA (A, P, + E)

During protein synthesis → two sites occupied