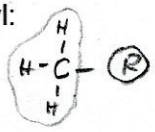
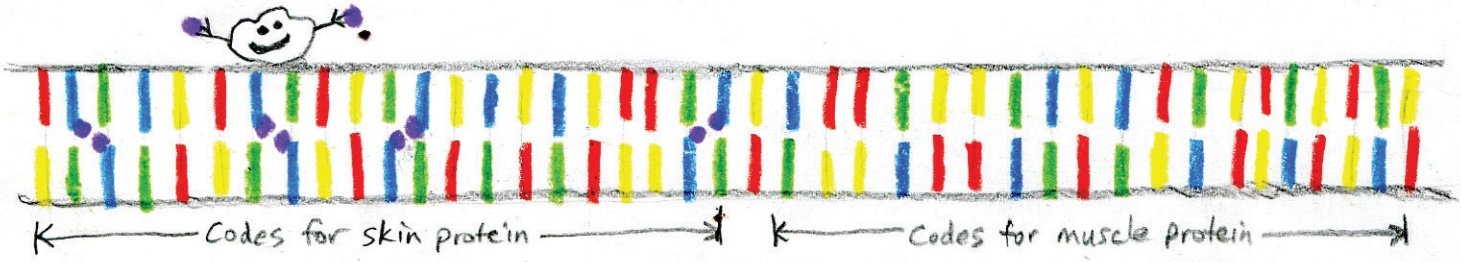
EPIGENETIC MECHANISMS

The zygote is a human cell but it is not any particular cell. To become a specific type of cell, such as a skin cell or a muscle cell, all the non-skin or non-muscle DNA must be permanently zippered shut. There are three main ways that DNA can be silenced.

1) DNA methylation

This is the most permanent form of locking away information.
Enzymes put methyl tags (CH3) on cytosines in the areas that are to be locked.

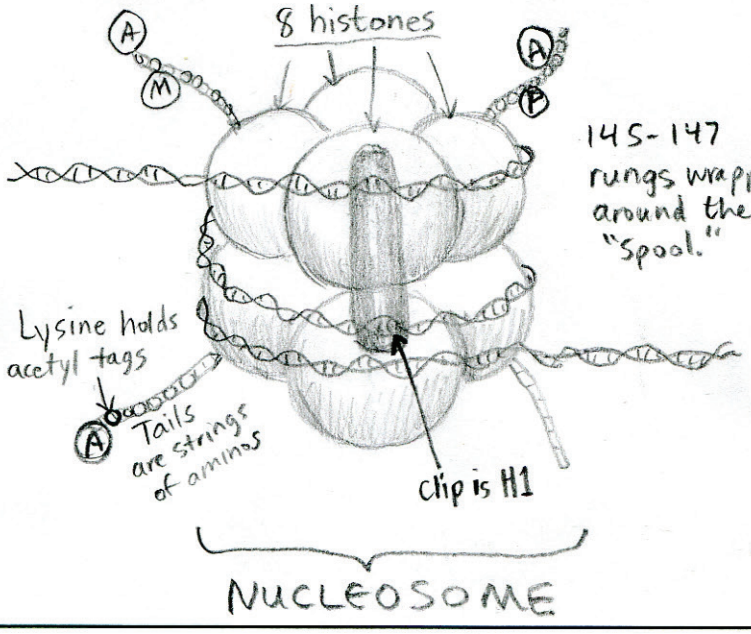
Methyl: ● = CH_3 = 



If this cell wants to be a muscle cell, it must lock away all other information, including skin info.

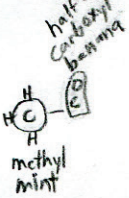
2) Histone modification

The histone spools on which DNA is wound can control whether a gene is expressed or not.
("Expressed" means that the information is being used and proteins are being made.)



TAGS can be:

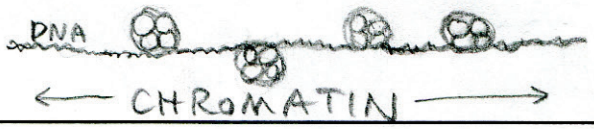
① methyl - CH_3 (methylation)



★ primary "opener"

② acetyl - $COCH_3$ (acetylation)

③ phosphate - PO_4 (phosphorylation)



3) Micro RNAs (miRNA)

Micro RNAs are non-coding RNAs whose sole purpose is to mess up RNA. When a miRNA attaches, that portion of the RNA becomes unusable. Thus, gene expression is blocked.