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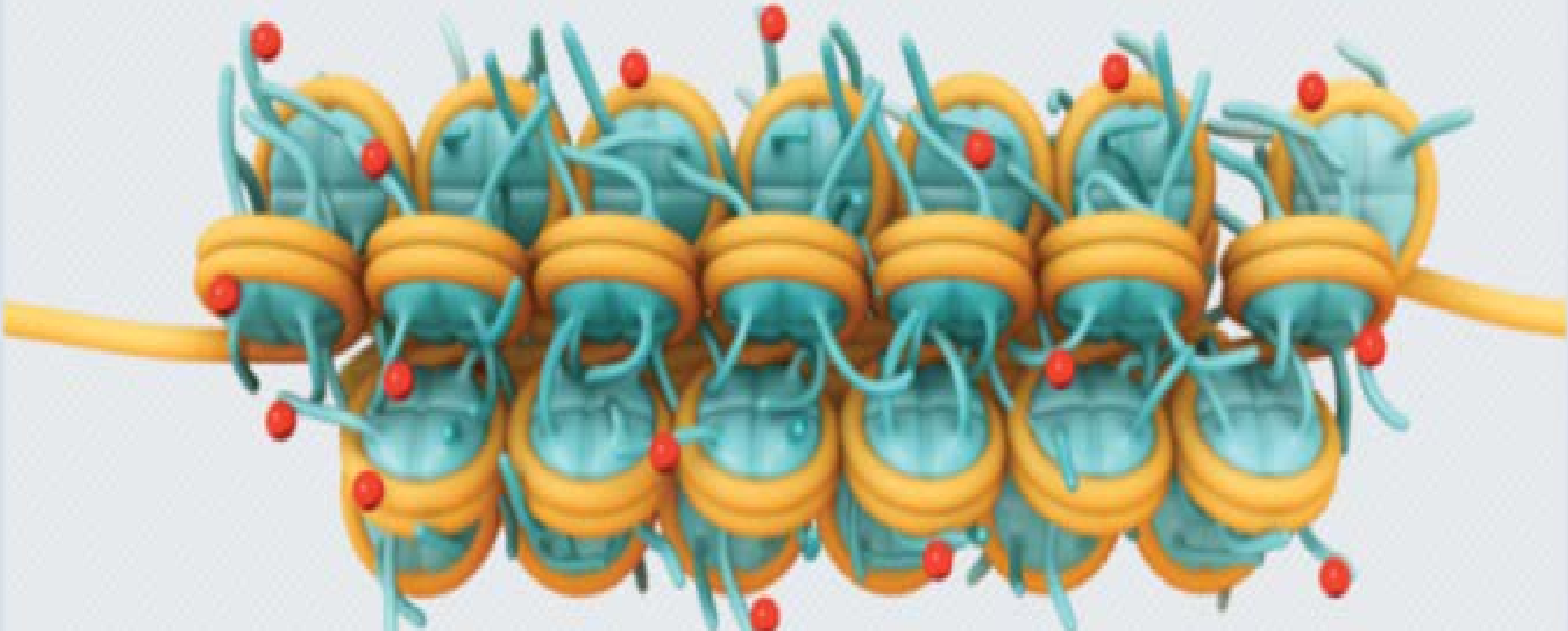
HEALTH

Epigenetics Explained [Animation]

By Ricki Rusting on November 22, 2011

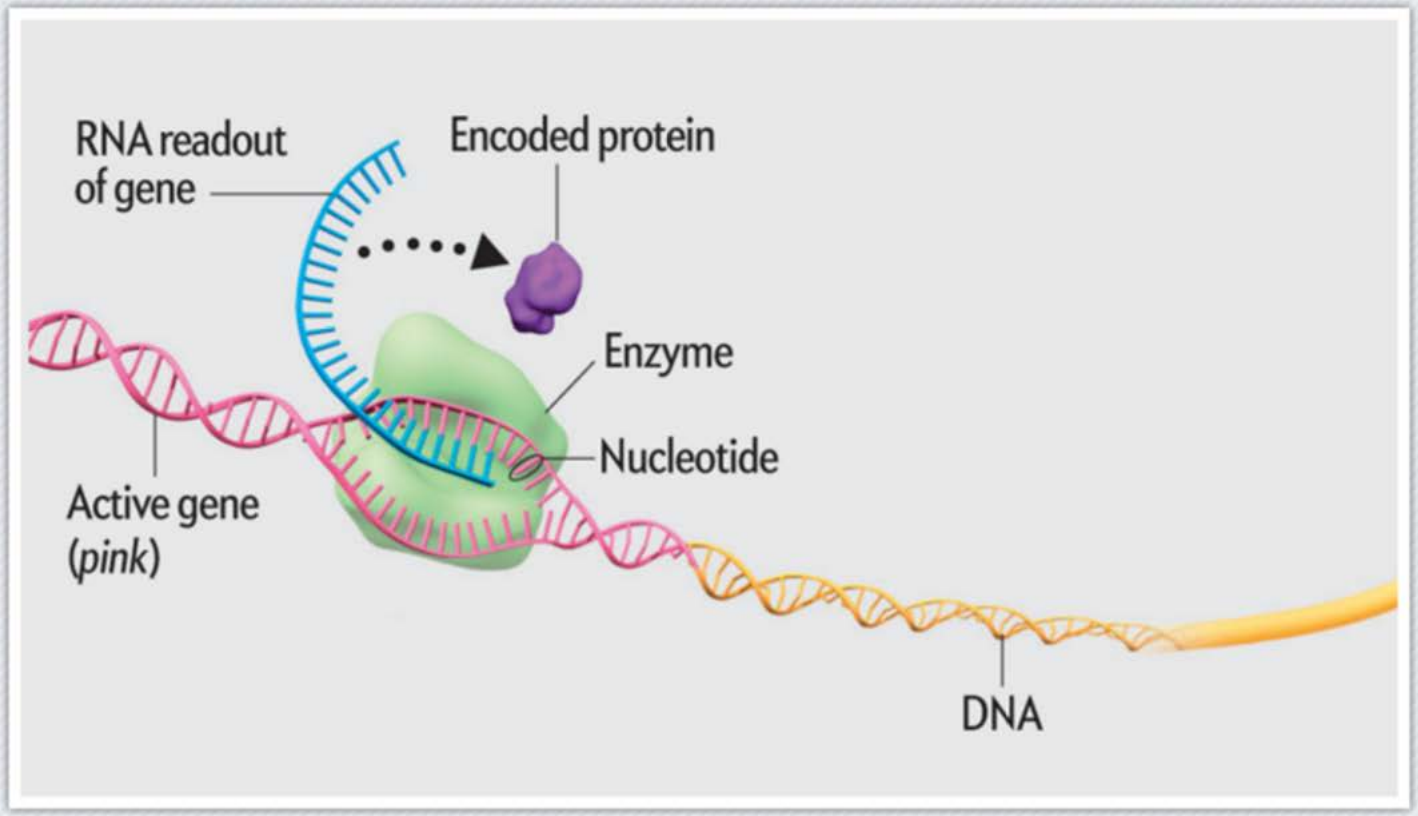
SCIENTIFIC AMERICAN™

Epigenetics Explained



1. How a Normal Gene Functions

Genes serve as blueprints for proteins. When a cell needs a protein, it activates the corresponding gene: An enzyme (an RNA polymerase) transcribes the gene's DNA nucleotides, or code letters, into a strand of messenger RNA, which is subsequently used as a template for constructing the encoded protein.



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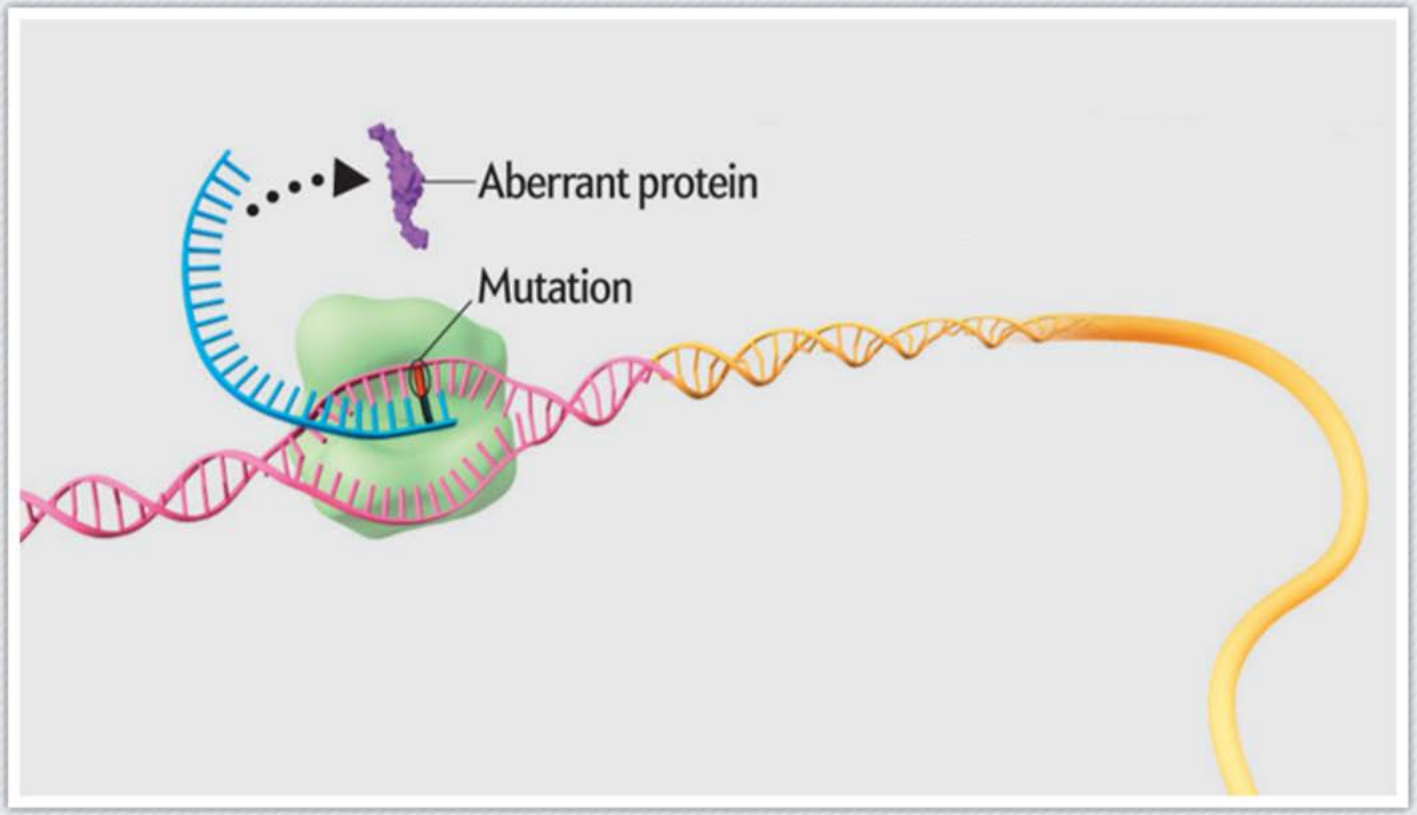
2. What a Mutation Does

Genetic mutations can take various forms. Often the wrong nucleotides appear in one or more positions in the DNA (shown). Such mutations can result either in the production of a structurally aberrant protein, which behaves abnormally if it functions at all, or in the over- or under-production of the protein.



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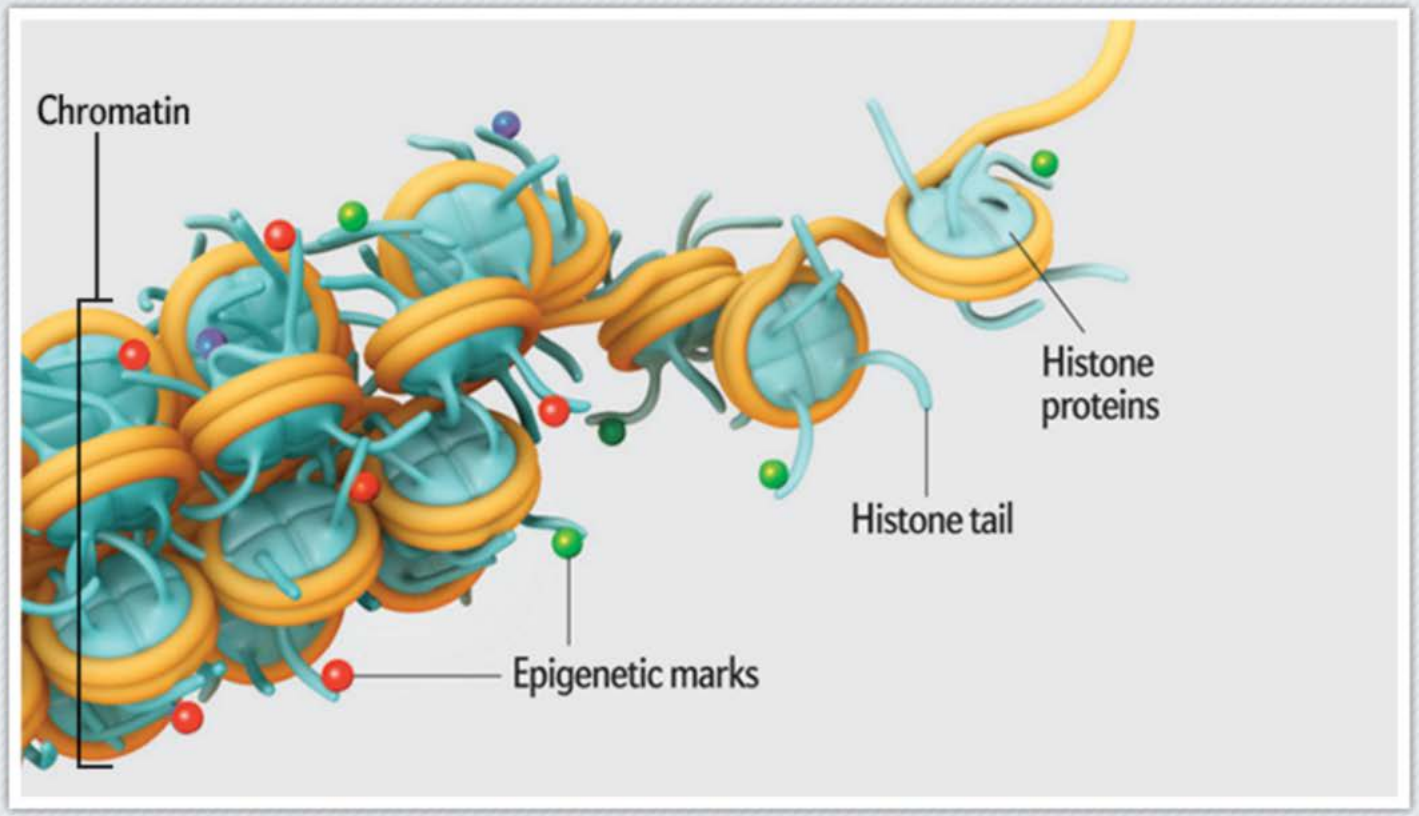
3. What Epigenetic Marks Are

The DNA in our cells is wrapped around complexes of proteins called histones, like thread around a spool; the combination of DNA and histone protein is known as chromatin. Epigenetic marks are chemical groups of various sorts that decorate the histones and DNA; they can be added or subtracted in response to environmental factors and experience.



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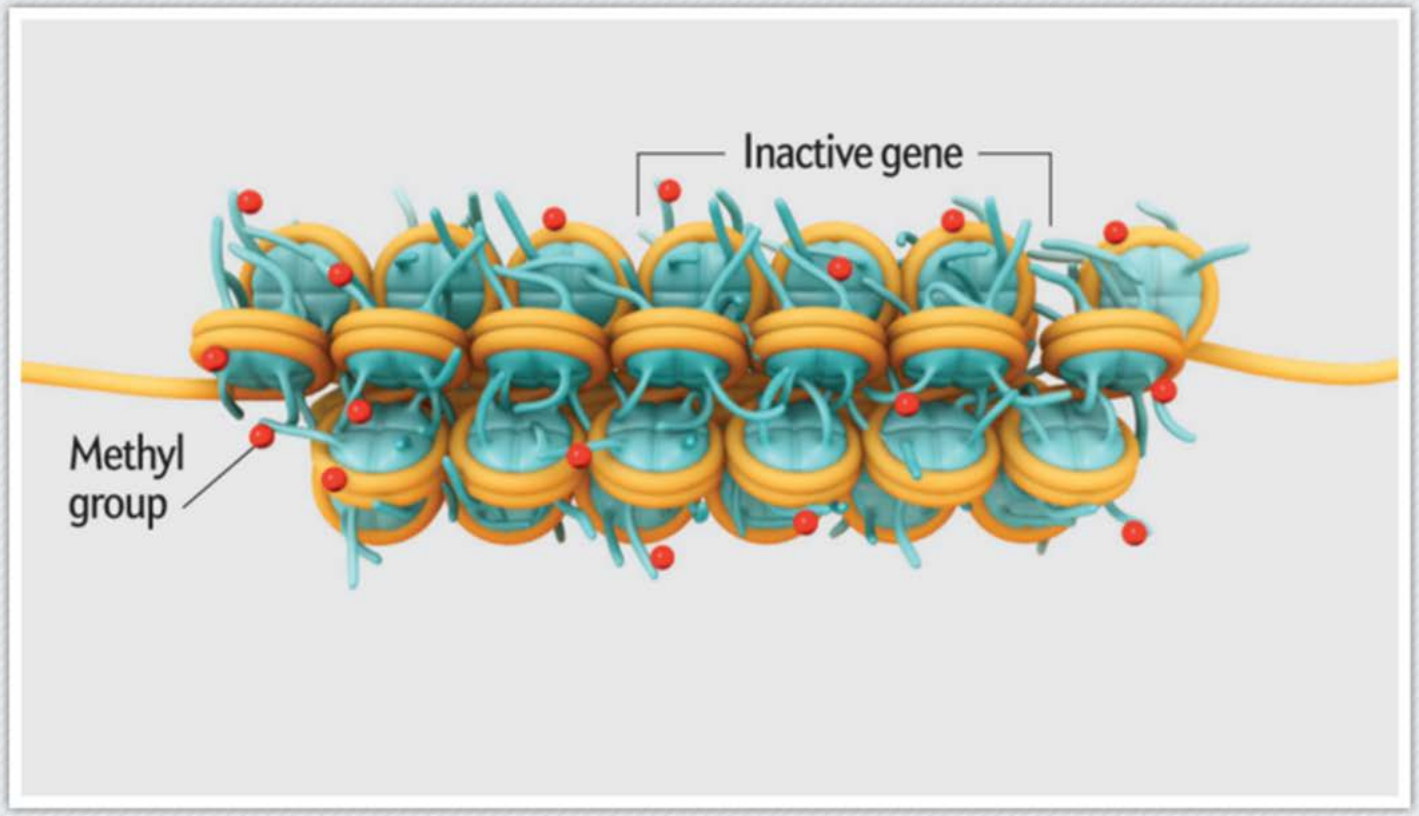
4. What Epigenetic Marks Do

Epigenetic marks influence how tightly the spools are packed in any given region of chromatin and, in so doing, affect the activity level of the genes within that region.

GENE OFF: Some epigenetic marks lead to tight packing; methyl groups often play that role. A tight configuration can block the gene-transcription machinery from interacting with the DNA and thus tends to inhibit gene transcription.



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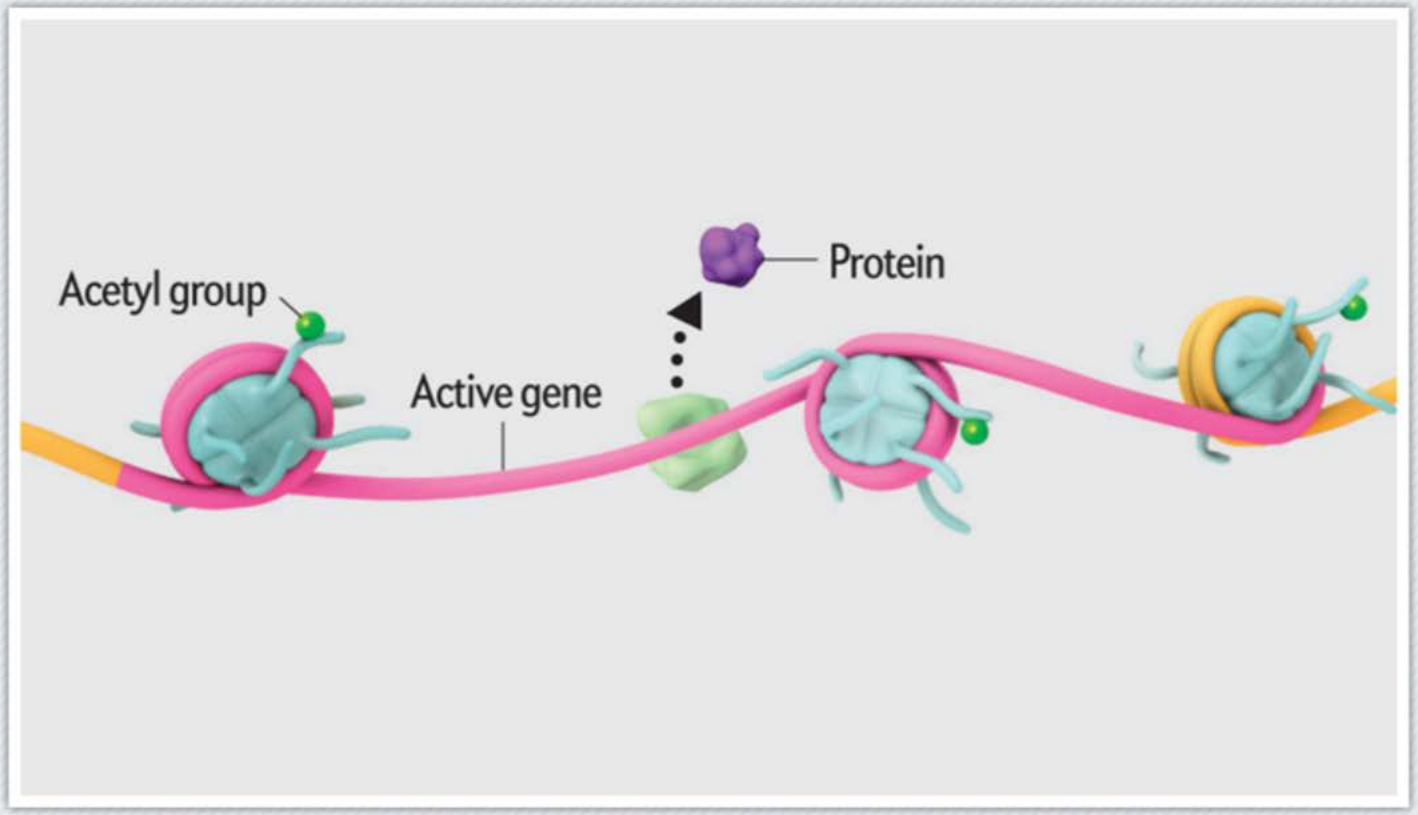
GENE ON: Other marks, such as acetyl groups, tend to unfurl the chromatin and thereby foster gene transcription.



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