



Simulation: The “CGI” of Science

Louisiana Tech University
Engineering & Science Day
4-10-13





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KEY INDUSTRIES

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Key Industries

ADVANCED MANUFACTURING

AGRIBUSINESS

AVIATION AND AEROSPACE

CLEAN-TECH

DIGITAL MEDIA AND SOFTWARE

ENERGY

ENTERTAINMENT

SPECIALTY HEALTH CARE

WATER MANAGEMENT

JOBS = MONEY!!

... but it's not just about the money.

**Scientists MAKE A
DIFFERENCE!**

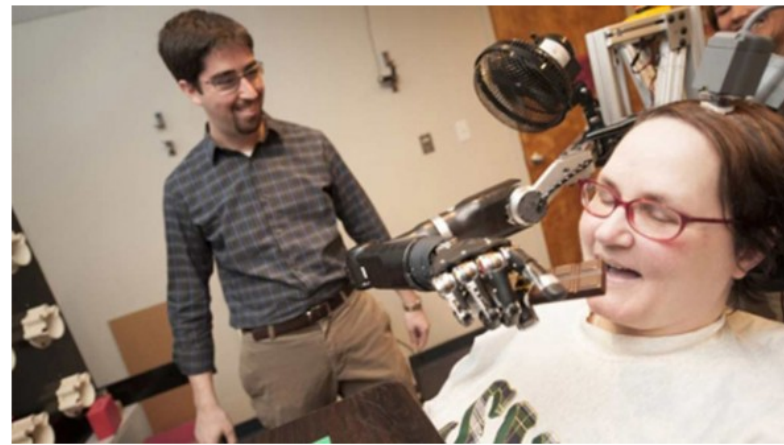
Home » Articles » 27 Science Fictions That Became Science Facts In 2012

27 SCIENCE FICTIONS THAT BECAME SCIENCE FACTS IN 2012

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We may never have our flying cars, but the future is here. From creating fully functioning artificial leaves to hacking the human brain, science made a lot of breakthroughs this year.

1. QUADRIPLLEGIC USES HER MIND TO CONTROL HER ROBOTIC ARM





When you think of SCIENCE,
which do you picture?

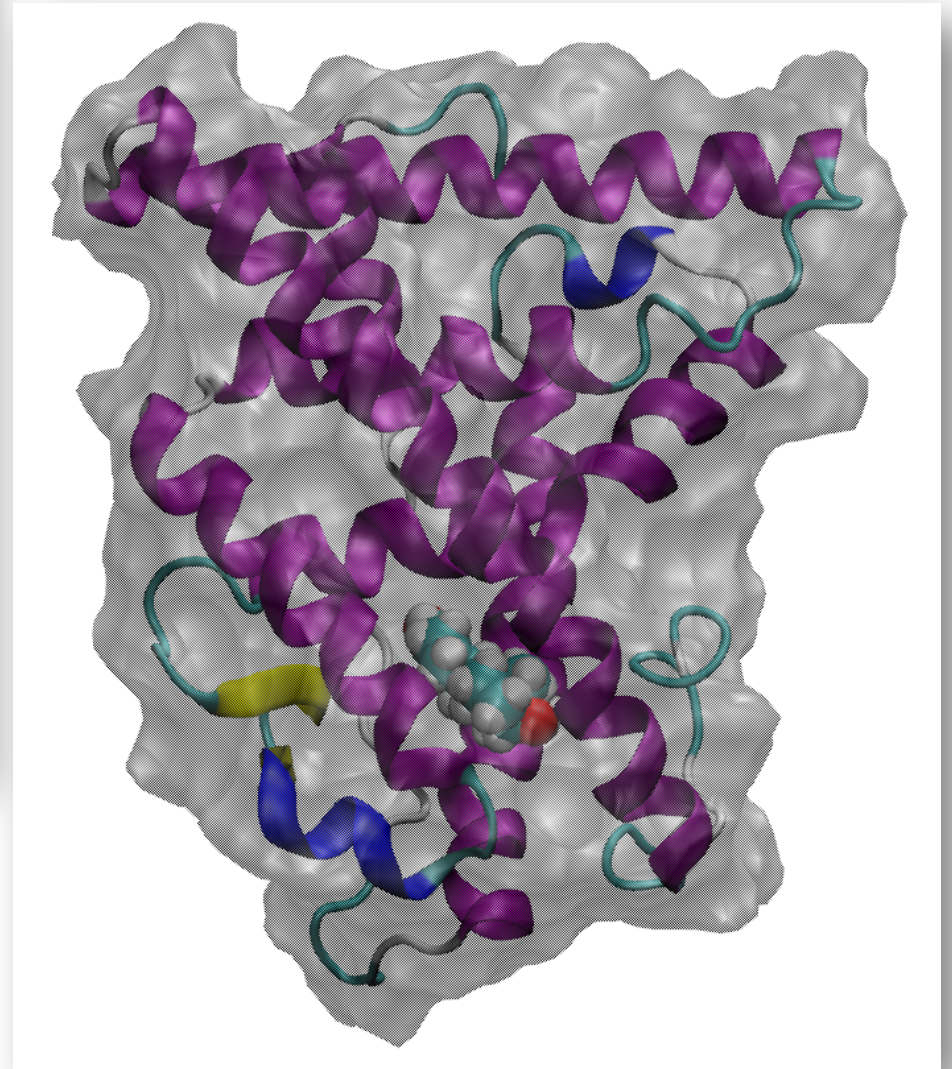
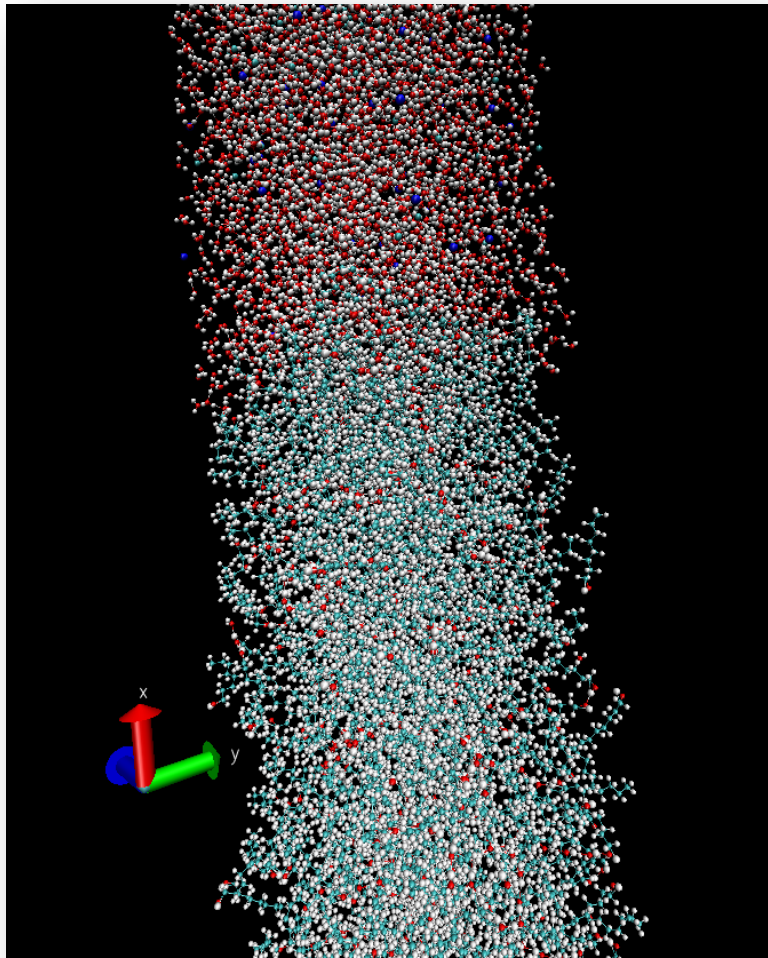


philipmartin.info



BOTH can be science!





Victoria Bamburg

Freshman at LA Tech
Chemical Engineering Major

Research on
Nucleosome Exclusion Sequences



A picture is worth a 1000 words



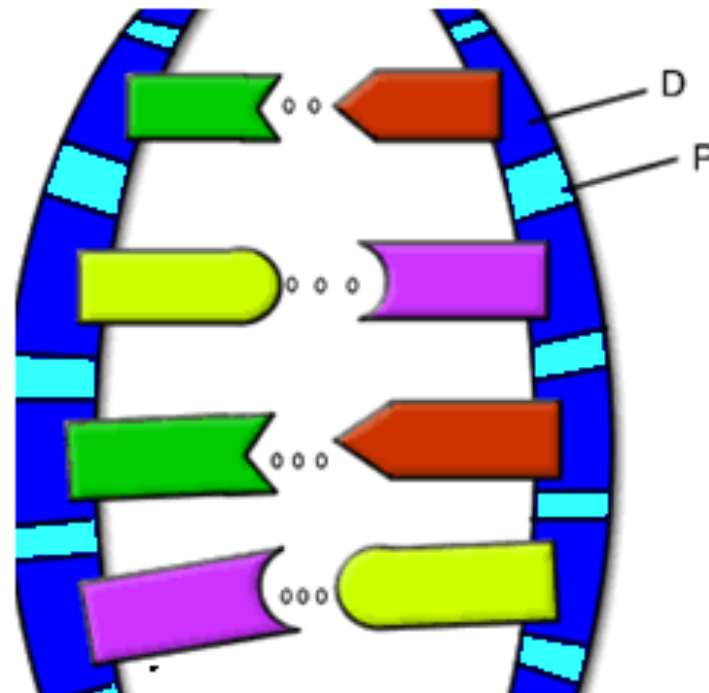
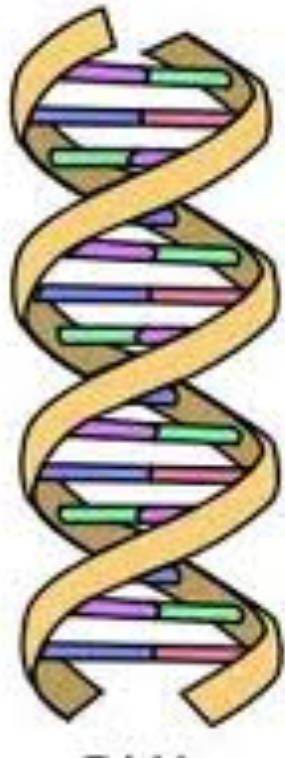
Do you see a musician or a girl's face?

... or maybe a lot of arguments.



DeoxyriboNucleicAcid

DNA : The Genetic Stuff



-  Thymine
-  Adenine
-  Guanine
-  Cytosine

D = Deoxyribose (sugar)

P = Phosphate

ooo Hydrogen Bond

How much DNA in a human cell?

Answer:

3,000,000,000 base pair in EVERY cell !

How long is the DNA?

Hint: Each base pair is

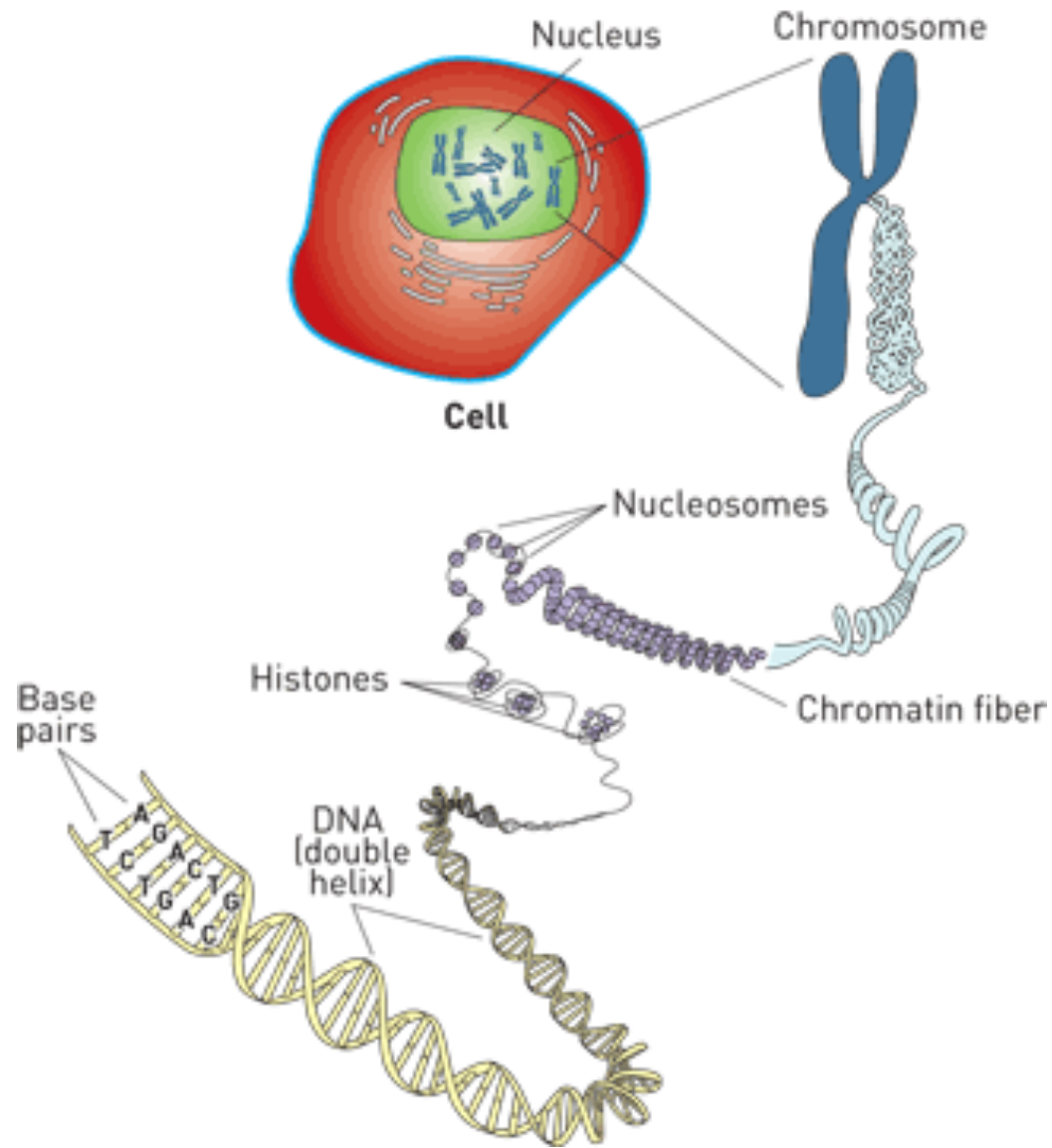
$\frac{1}{3,000,000,000}$ meters long

$$\frac{1\text{m}}{3,000,000,000} = \frac{1}{3} \text{ nm}$$

How long is the DNA?

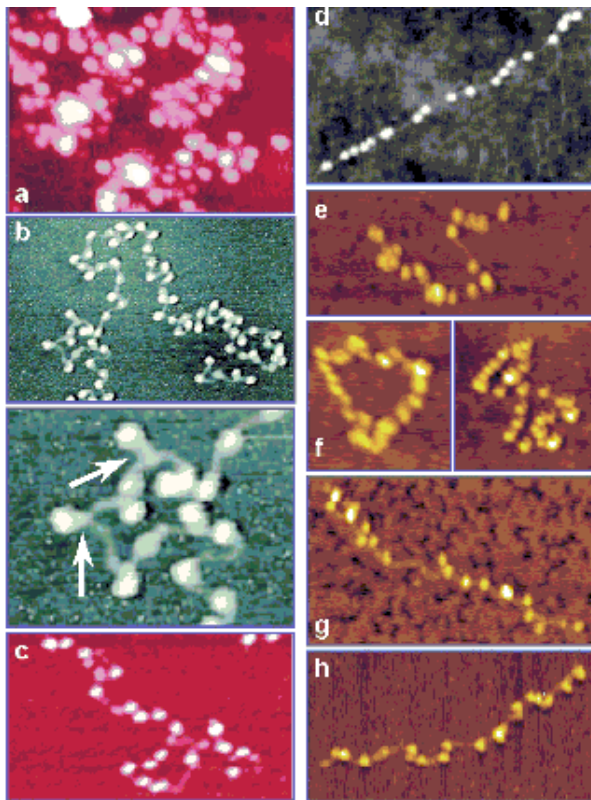
Answer:

$$3,000,000,000bp \times \frac{1 \text{ } m}{3,000,000,000bp} = 1m$$

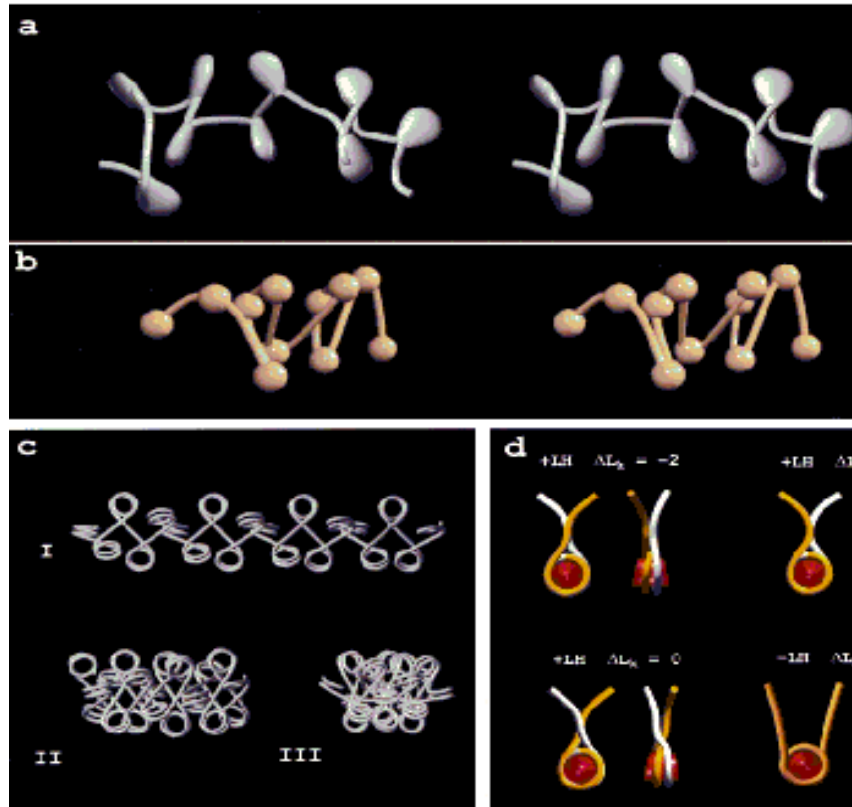


Biology 101

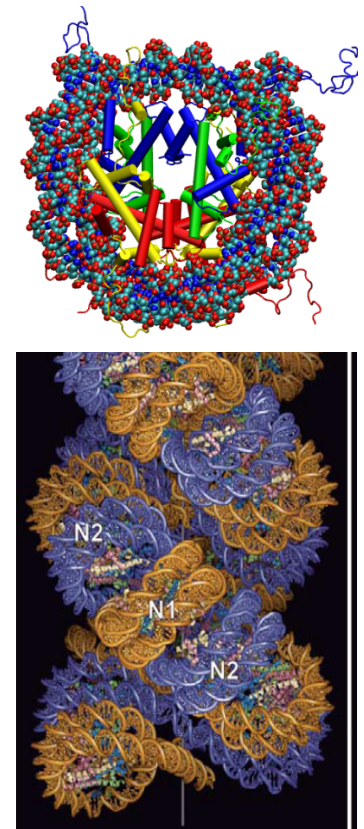
Nucleosomes and Chromatin



Zlatanova and Leuba
JMB 2003



Bednar, PNAS 1998



Luger, 1997
Schalch Nature 2005

a

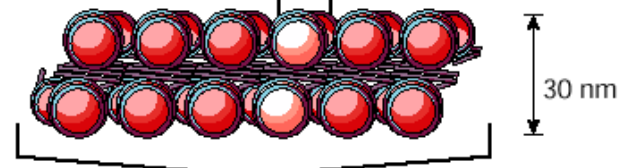
Short region of DNA double helix



"Beads on a string" form of chromatin



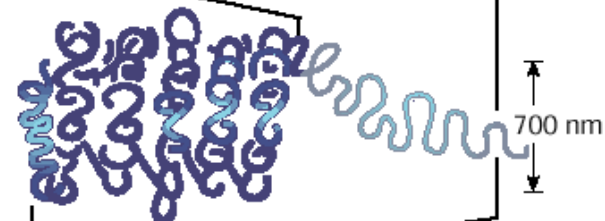
30-nm chromatin fibre of packed nucleosomes



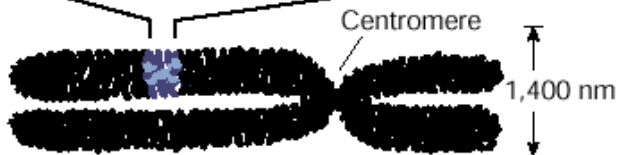
Section of chromosome in an extended form



Condensed section of chromosome

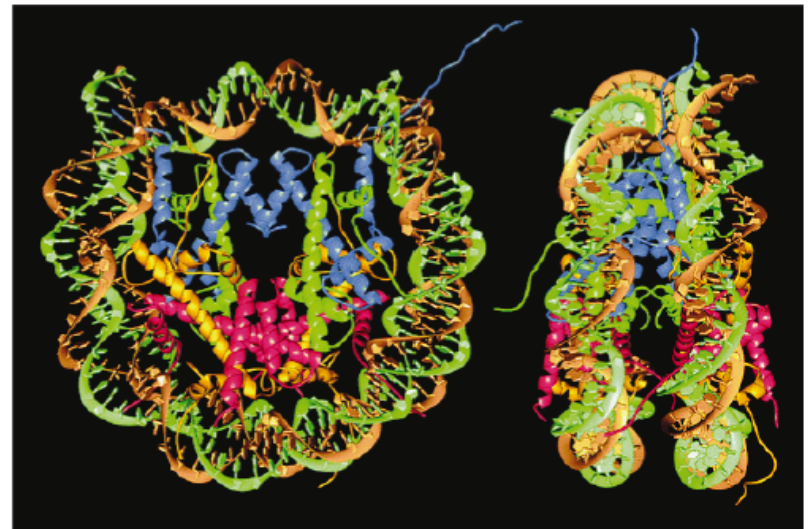


Entire mitotic chromosome



DNA Folding

b



Felsenfeld, Nat.
2003
Luger Nat. 1997

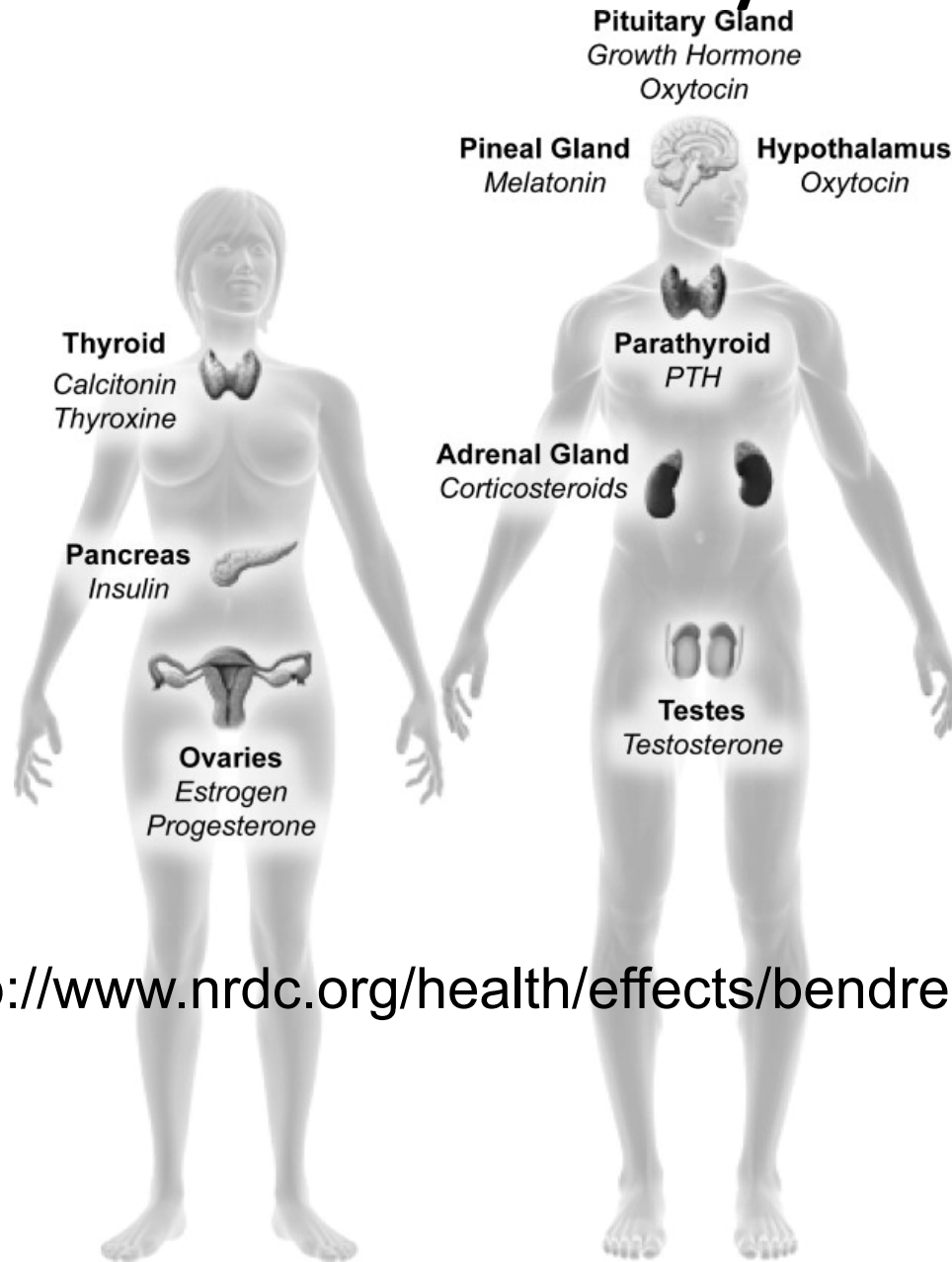
Today's Assignment

Make a model of the

Mouse Mammary Tumor Virus
Promoter Complex



The Endocrine System

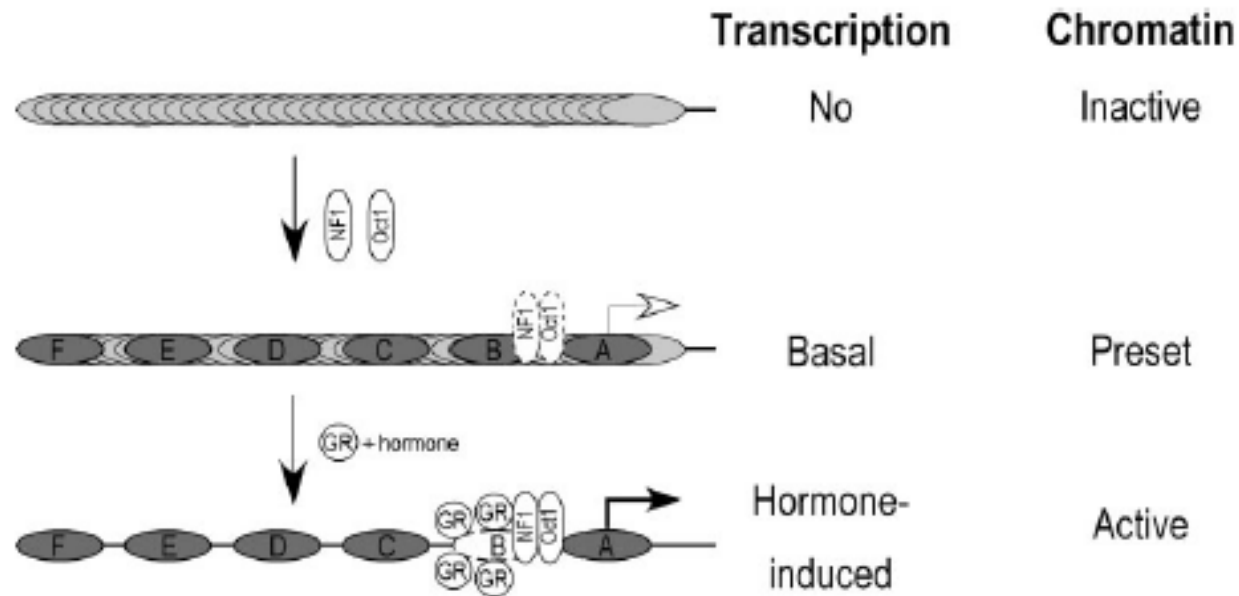


<http://www.nrdc.org/health/effects/bendrep.asp>

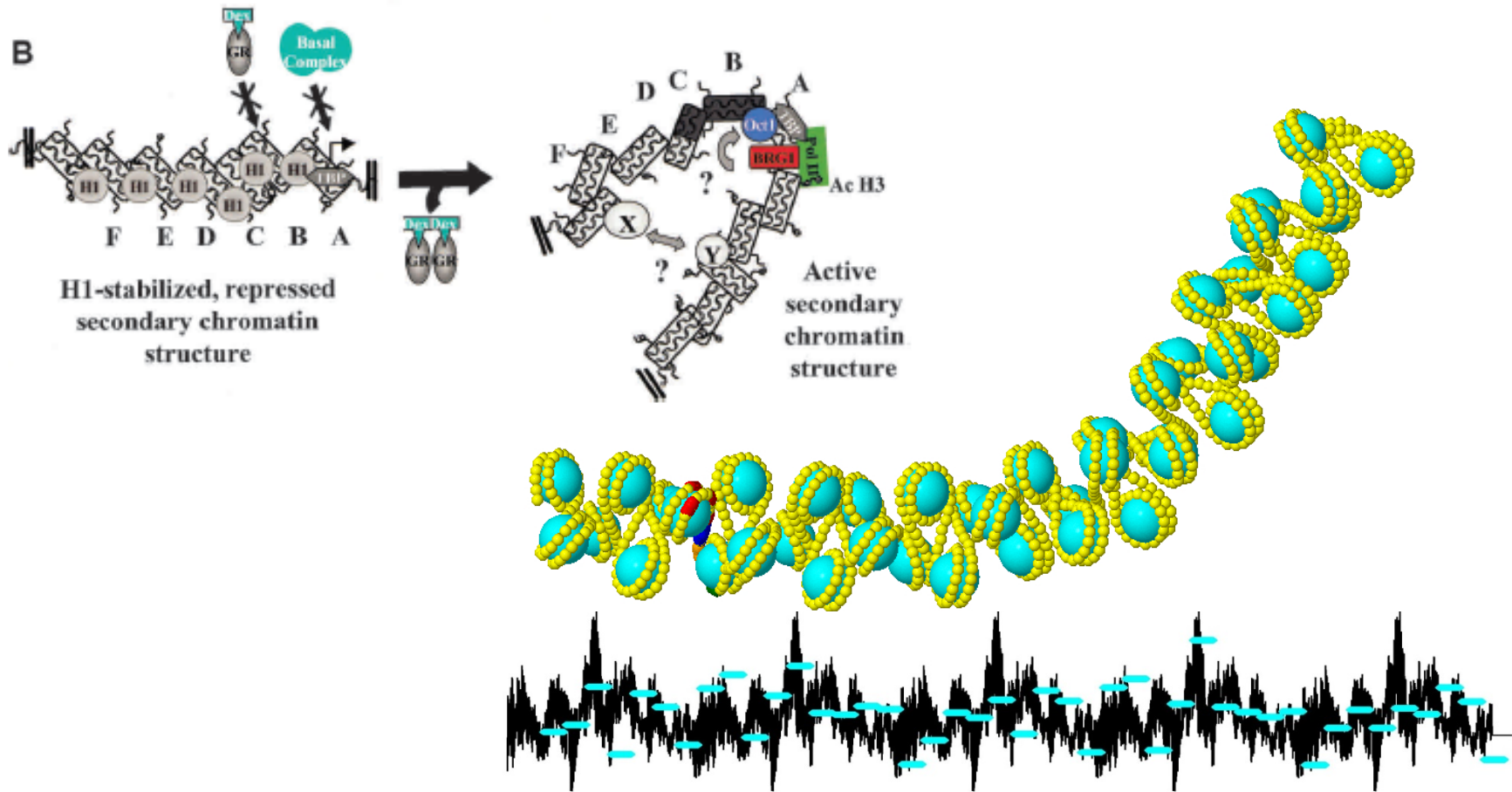
Hormone Receptor Mechanism: MMTV

NF1 and Oct1 Preset Chromatin in MMTV LTR

4986



Tandem Repeats of MMTV Yields Bent Chromatin



MMTV Sequence Bioinformatics

GRE
NF1
OCT

TATA

TGCTTCTTTTAAAAAAGAAAAAGGGGAAATGCCGCGCCTGCAGCAGAAATGGTTGAAC
TCCCGAGAGTGTCTACACTTAGGGGAGAAGCAGCCAAGGGTTGTTTCCCACCAAGGAC
GACCCGTCTGCGCACAAACGGATGAGCCCATCAGACAAAGACATACTCATTCTCTGCTGC
AACTTGGCATAGCTCTGCTTTCCTAGGGCTATTGGGGGAAGTTGCGGTTTCGTGCTCGC
AGGGCTCTCACCCCTTGATTCTTTCAATAATAACTCTTCTGTGCAAGATTACAATCTAAAC
GATTTCGGAGAACTCGACCTTCCCTTTGGGGCAAGGACCACAGCCAACCTTCCCTTTACAAG
CCGCATCGAATTTGTCCTTTAGAAATAGAAATAAGAATGCTTGCTAAAAAGTATATTTTT
ACCAATAAGACCAATCCAATAGGTCGATTATTAGTCACTATGTTAAGAAATGAATCATT
TCTTTTAGTACTATTTTTACTCAAATTCAGAAGTTAGAAATGGGAATAGAAAATAGAAAG
AGACGCTCAAATCAATTGAAGAGCAGGTACAAGGACTATTGGCCTCAGGCTAGAAGTA
AAAAAGGGAAAAAGAGTGTGTTTGTCAAATAGGAGACAGGTGGTGGCAACCAAGGACT
TATAGGGGACCTTACATCTACAGACCAACAGATGCCCCCTTACCATATACAGGAAGATAT
GACTTAAATTGGGATAGGTGGGTACAATCAACGGCTATAAAGTGTATACAGATCCCTC
CCCTTTCGTGAAAGACTCGCCAGAGCTAGACCTCCTTGGTGTATGCTAACTGAGAAAGAG
AAAGACGACATGAAACAACAGGTACATGATTATATTTATCTAGGAACAGGAATGCACTTT
TGGGGAAAGTTTTCCATACCAAGGAAGGGCAGTGGCTGGACTGATAGAACATTATTCT
GCAAAAACCTTATGGTATGAGTTATTATGATTAGCCTTTATTTGCCAACCTTGC GGTTCC
CAGGGTTTTAAATAAGTTTATGGTTACAAACGTTCTTAAAACGAGGATGTGAGACAAGTG
GTTTCCCTGACTTGGTTTGGTATCAAATGTTCTGATCTGAGCTCTTAGTGTCTTTTTCC
TATGTTCTTTTGGAACTATCCAAGTCTTATGTAATGCTTATGTAACCATATAAATTTT
AGAGTGCTGATTTTTTGGAGTAAACTTGCAACAGTCCTAACATTCTTCTCTCGTGTGTTTG
TGTCTGTTCCCATCCCCTCCTCGCTCGTCACTTATCCTTCACTTTTCAGAGGGTCCCC
CGCAGATCCCAGTCAACCTCAGGTCGGCCGACTGCGGCAGCTGGCGCCCGAACAGGGACC
CTCGGATAAGTGACCCTTGTCTTTATTTCTACTATTTTGTGTTTCTTGTGTTTGTCTCT
ATCTTGTCTGGCTATCATCACAAGAGCGGAACGGACTCACCTCAGGGAA

I Interactive Chromatin Modeling

ICM ~ I see 'em

<http://localhost/icm/>

<http://www.latech.edu/~bishop>

Thank You!



This material is based upon work supported by the National Science Foundation under the NSF EPSCoR Cooperative Agreement No. EPS-1003897 with additional support from the Louisiana Board of Regents.”

References:

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