Essay

Mathematics Is Biology’s Next Microscope, Only Better; Biology Is Mathematics’ Next Physics, Only Better

Joel E. Cohen
Fig. 64. Scheme to illustrate a method of crossing over the chromosomes.
Chromosome Geography: Genomic vs. physical position

Cremer and Cremer

Lucy Shapiro
Fluorescence In-Situ Hybridization (FISH)

http://www.microscopyu.com/articles/fluorescence/insitu/brennerinsitu.html
Schemes for Mapping Chromosome Geography

Gitai et al, 2005
Fluorescent Proteins

http://www.tsienlab.ucsd.edu/Images/General/IMAGE%20-%20Wreath%202002.jpg
Quantifying the Geography

Gasser, Science 2002
Yokota et al, 1995
Quantifying the Geography

Sachs et al.
The Immune System

HEAVY CHAIN:

Germ line configuration

V_{Hj}-D_{Hj} joining product plus N region untemplated nucleotides

D_{Hj}-J_{H2} joining product
The Immune System

Kees Murre, UCSD
The Chromosome as a Polymer Blob

\[ b = 2P \]
Higher Order Structure

NET RESULT: EACH DNA MOLECULE HAS BEEN PACKAGED INTO A MITOTIC CHROMOSOME THAT IS 10,000-FOLD SHORTER THAN ITS EXTENDED LENGTH

Figure 5-24  Essential Cell Biology, 2/e. (© 2004 Garland Science)
Atomic-Level Structure of the Nucleosome

Figure 4–25. Molecular Biology of the Cell, 4th Edition.
Replication origins are confined!
Vibrio Distributions: theory and experiment

Model:

0.8 µm

oriCI  oriCII

Long axis

Perpendicular direction

Graphs showing distribution along the long and perpendicular axes.