DNA: Structure

- Chromosomes
- Chromatin
- Histones
Chromosomes

<table>
<thead>
<tr>
<th>Table 10.4 Haploid DNA Content, or C Value, of Selected Species</th>
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<tbody>
<tr>
<td><strong>Species</strong></td>
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<tr>
<td><strong>Viruses and Phages</strong></td>
</tr>
<tr>
<td>λ (bacteriophage)</td>
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<tr>
<td>T4 (bacteriophage)</td>
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<tr>
<td>Feline leukemia virus (cat virus)</td>
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<tr>
<td>Simian virus 40 (SV40)</td>
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<tr>
<td>Human immunodeficiency virus-1 (HIV-1, causative agent of AIDS)</td>
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<tr>
<td>Measles virus (human virus)</td>
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<tr>
<td><strong>Bacteria</strong></td>
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<tr>
<td>Bacillus subtilis</td>
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<tr>
<td>Borrelia burgdorferi (Lyme disease spirochete)</td>
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<tr>
<td>Escherichia coli</td>
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<tr>
<td>Helicobacter pylori (bacterium that causes stomach ulcers)</td>
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<tr>
<td>Neisseria meningitides</td>
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<tr>
<td><strong>Archaea</strong></td>
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<tr>
<td>Methanococcus jannaschii</td>
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<tr>
<td><strong>Eukarya</strong></td>
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<tr>
<td>Saccharomyces cerevisiae (budding yeast; Brewer's yeast)</td>
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<tr>
<td>Schizosaccharomyces pombe (fission yeast)</td>
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<td>Lilium formosanum (lily)</td>
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<td>Zea mays (maize, corn)</td>
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<td>Amoeba proteus (amoeba)</td>
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<td>Drosophila melanogaster (fruit fly)</td>
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<td>Caenorhabditis elegans (nematode)</td>
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<td>Danio rerio (zebrafish)</td>
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<td>Xenopus laevis (African clawed frog)</td>
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<td>Mus musculus (mouse)</td>
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<td>Rattus rattus (rat)</td>
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<td>Canis familiaris (dog)</td>
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<td>Equus caballus (horse)</td>
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<tr>
<td>Homo sapiens (humans)</td>
</tr>
</tbody>
</table>

*These C values derive from the complete genome sequence, all others are estimates based on other measurements.
Eukaryotic Chromosomes

- DNA and Histone Proteins
- packaging of DNA
- nucleosomes
Chromatin Structure
Histones

- Composed of proteins
- rich in lysine and arginine
- conserved
Structure of Nucleosomes

- H2a, H2b, H3, H4 octamer
- H1 linker
Figure 9–28  The way histone H1 (220 amino acids) is thought to help pack adjacent nucleosomes together. The globular core of H1 binds to each nucleosome near the site where the DNA helix enters and leaves the histone octamer. When H1 is present, two full turns of the DNA (166 nucleotide pairs) are protected from micrococcal nuclease digestion (an extra 20 nucleotide pairs—see Figure 9–23). Neither the three-dimensional structure of histone H1 nor the precise sites of interaction of its extended amino-terminal and carboxyl-terminal arms with the nucleosome are known.
Replication of histones

Requires histone chaperone proteins
DNA structure II

• DNA
• Composition of DNA
• Evidence for genetic material
• Structure
• Implications of the structure
DNA & Nucleotides

(a) Purine nucleotides

- Adenosine 5'-monophosphate (dAMP)
- Guanine 5'-monophosphate (dGMP)

(b) Pyrimidine nucleotides

- Cytosine 5'-monophosphate (dCMP)
- Thymine 5'-monophosphate (dTMP)

Table 11-4. Chemical structure of the four nucleotides (two with purine bases and two with pyrimidine bases) that are the fundamental building blocks of DNA. The sugar is called deoxyribose because it is a variation of a common sugar, ribose, that has one more oxygen atom.