# 10 Figures from Introduction and from Experimental Approaches to DNA structure and dynamics

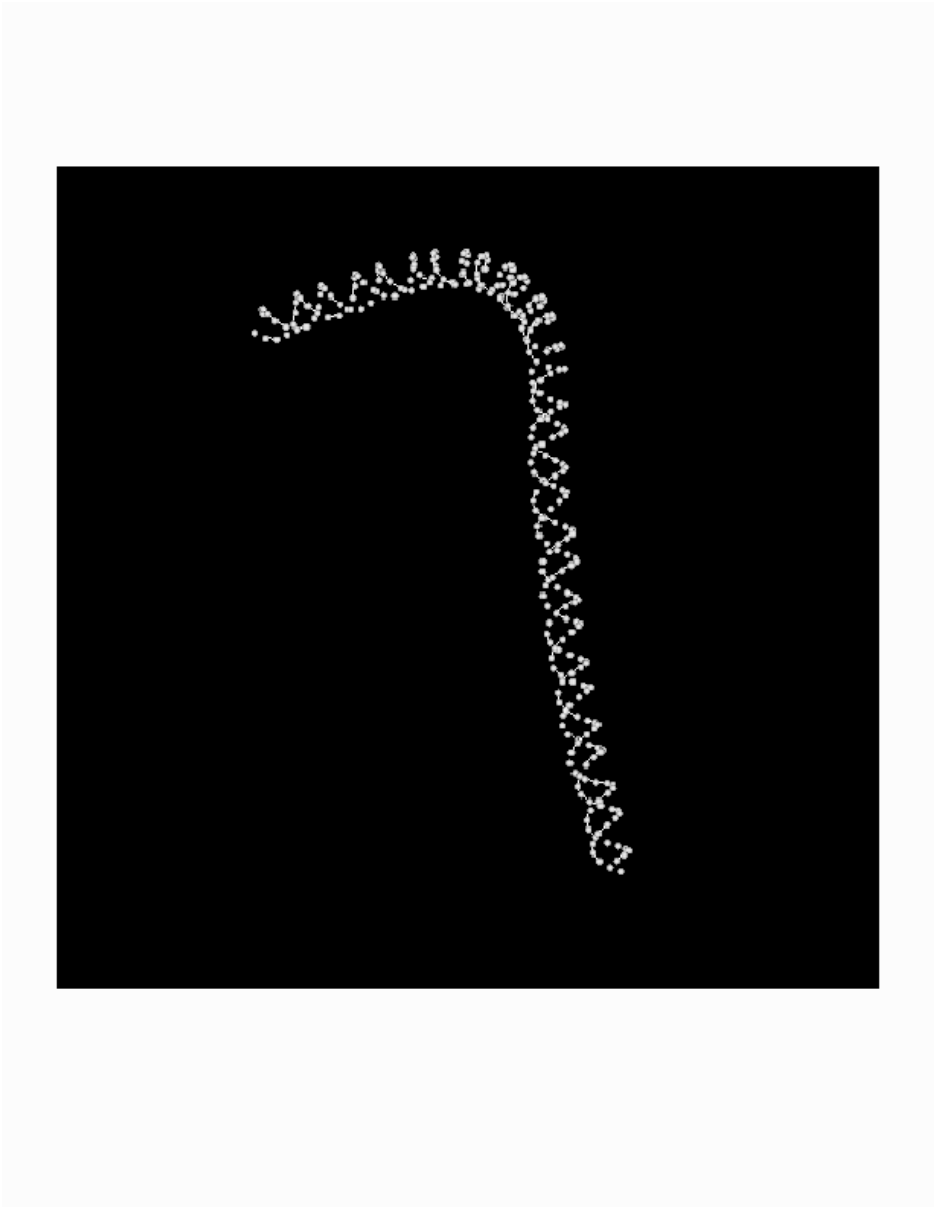


Figure 1:

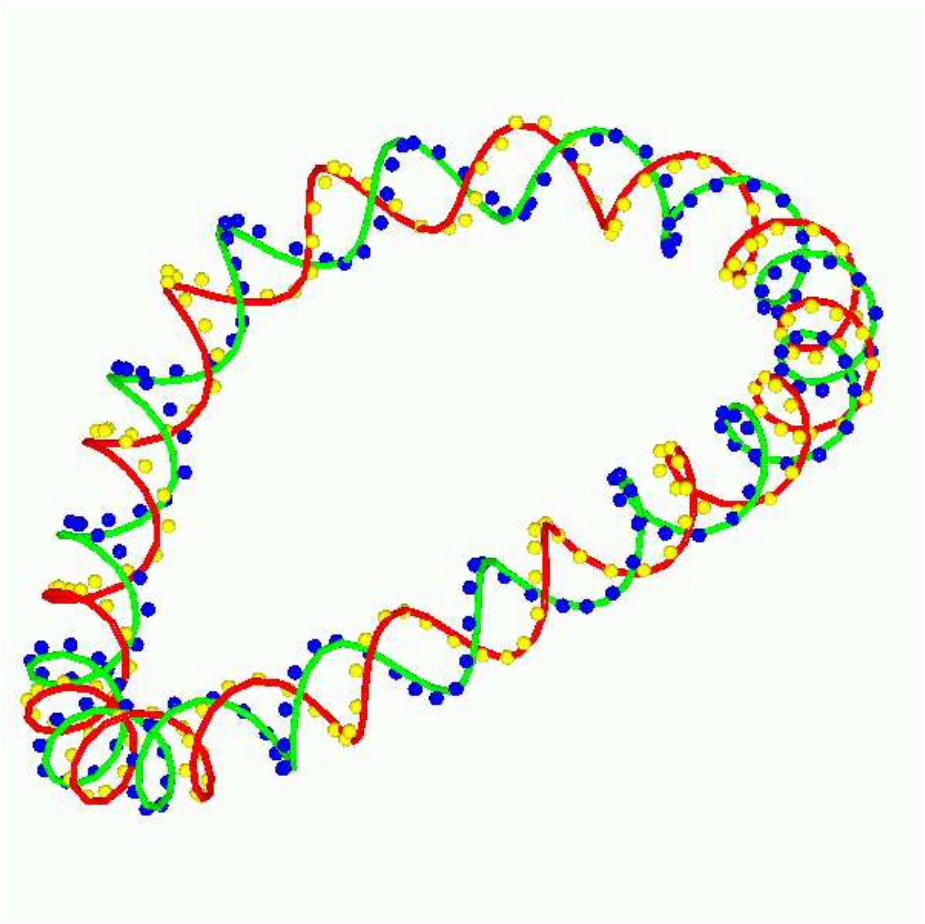
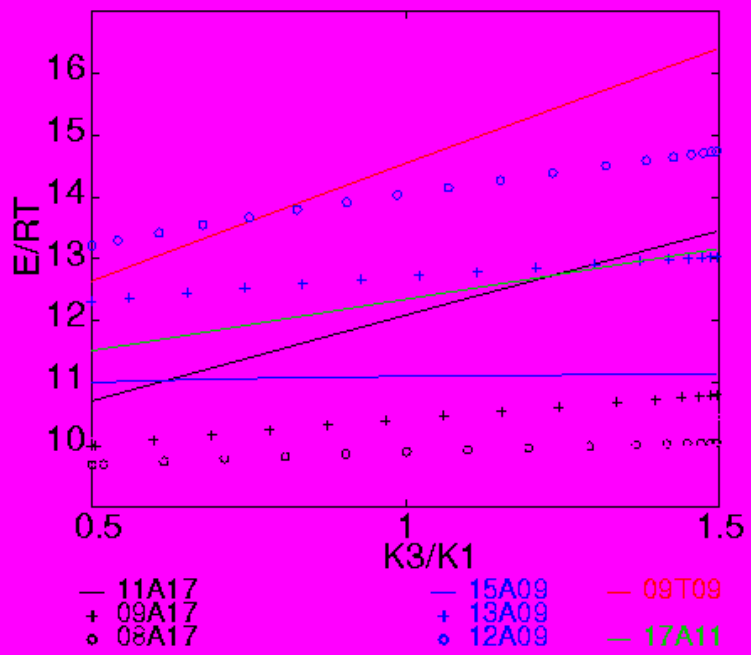


Figure 2:




| DNA | Symbol | $-\ln J = \Delta G/RT$ |
|---|---|---|
| 12A09 | ○ | 20.9 |
| 09T09 | — | 20.9 |
| 13A09 | + | 20.1 |
| 17A11 | — | 19.1 |
| 11A17 | — | 17.8 |
| 15A09 | — | 17.2 |
| 11T15 | | 16.2 |
| 09A17 | + | 15.7 |
| 08A17 | ○ | 15.0 |
| 08T15 | | 14.8 |
| 09T15 | | 14.7 |

Figure 3:

Figure 4:

Figure 5:

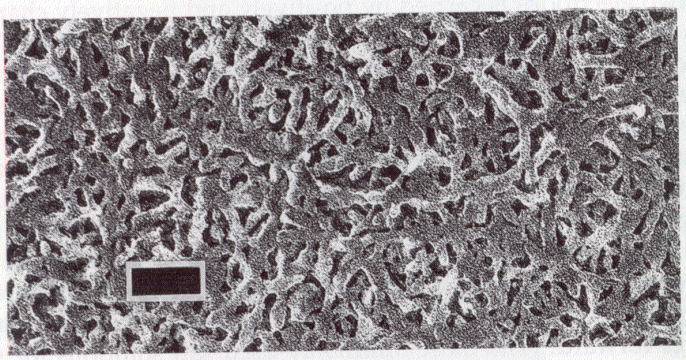


*Figure 9.10* Electron micrograph of a portion of a 2% agarose gel, 1 mm × 0.5 mm overall: the small black rectangle is 1000 Å × 500 Å. Individual gel fibers are about 100 Å wide. Courtesy of Sue Whytock and John Finch.

Figure 6:

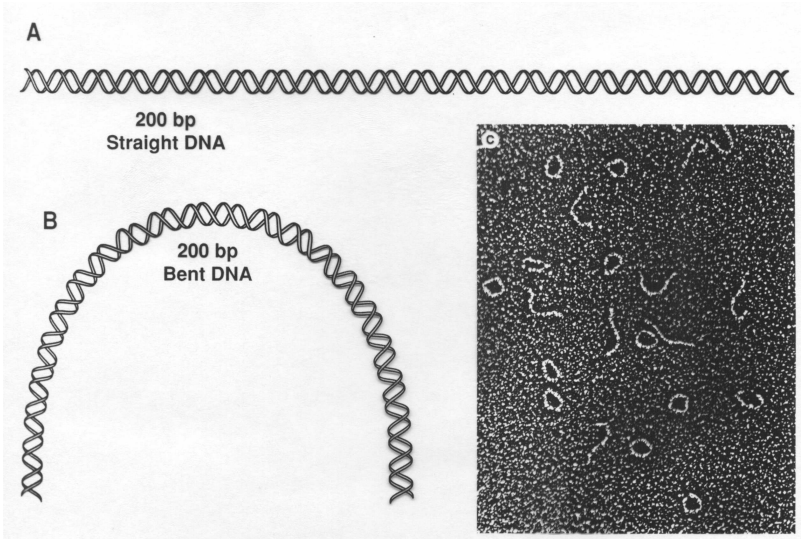



**Figure 2.1 Straight DNA and bent DNA.** (A) A representation of a 200-bp straight DNA molecule. The persistence length of DNA is 150–200 base pairs. Persistence length is the length of DNA that resists easy deformation, or a length that is not considered very flexible. DNA smaller than its persistence length cannot be easily bent into a circle. (B) A 200-bp piece of bent DNA is shown. Some DNAs, because of their primary base sequence, will adopt a stable bent or curved configuration. (C) The electron micrograph shows a 223-bp fragment of *Crithidia fasciculata* DNA containing 18 phased $A_4$ to $A_6$ tracts. Although the fragment is linear and is blunt ended, many molecules appear to be intact circles. Without the phased A tracts, the DNA would appear as linear, relatively straight molecules. Courtesy of Jack D. Griffith.

Figure 7:

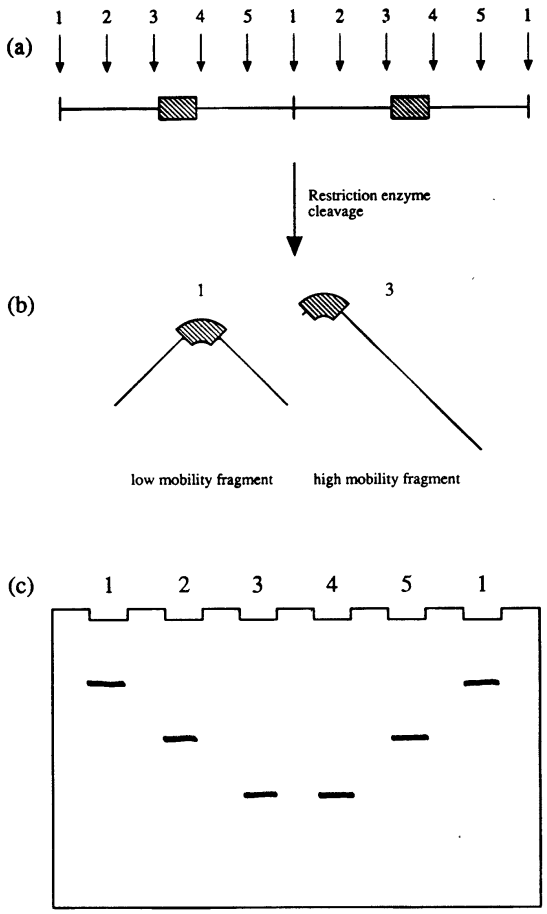



**Figure 1.7.** Demonstration of the effect of A-tracts in DNA curvature. DNA molecules containing phased A-tract sequences (orange boxes) are cut with a series of restriction enzymes (1–5 in **(a)**). When analysed by polyacrylamide gel electrophoresis **(c)**, the fragments show varying mobility depending on the position of the A-tract sequences **(b)**.

Figure 8:

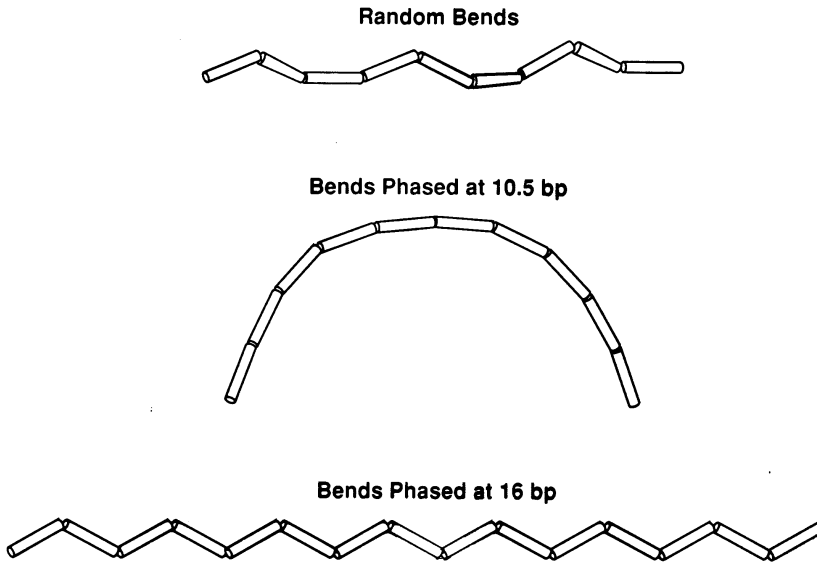



**Figure 2.6 The significance of phasing in DNA bending.** An A tract will introduce a small bend or deflection of the helix axis in DNA. However, the phenomenon of "bent DNA" or "stably curved DNA" that exhibits anomalous migration on polyacrylamide gel electrophoresis requires a number of small individual bends that are in phase. If bends are random, as shown in the top molecule, the DNA will migrate true to its length in an acrylamide gel. Only when bends are phased by 10.5 bp is the stable curvature shown in the middle structure observed. This DNA migrates anomalously slowly on electrophoresis in an acrylamide gel. If, as shown in the bottom structure, bends are phased by 16 bp, successive bends will be directed alternatively up and down. This creates a zig-zag molecule, which is unusually straight and migrates slightly more rapidly than unbent DNA (or DNA containing random bends) in an acrylamide gel.

Figure 9:

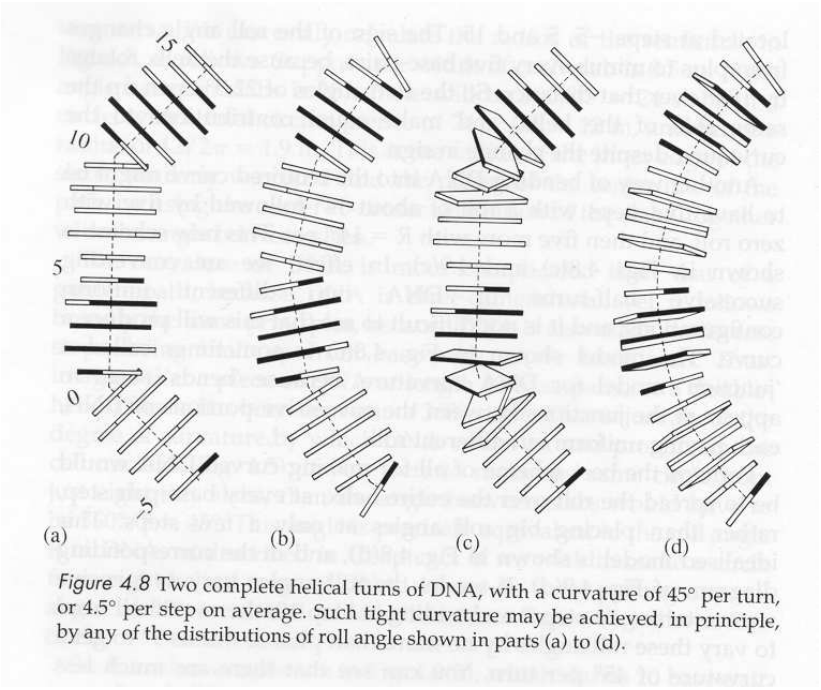



*Figure 4.8* Two complete helical turns of DNA, with a curvature of 45° per turn, or 4.5° per step on average. Such tight curvature may be achieved, in principle, by any of the distributions of roll angle shown in parts (a) to (d).

Figure 10:

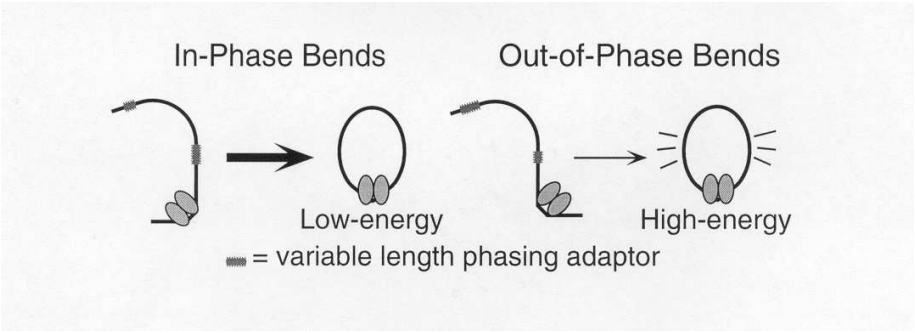



Figure 11:

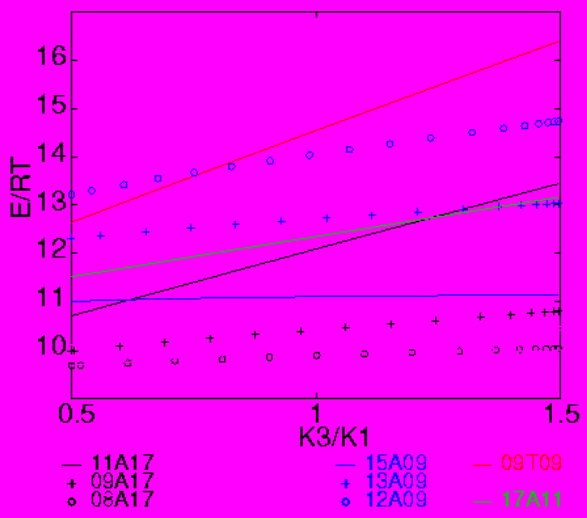



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Figure 12:

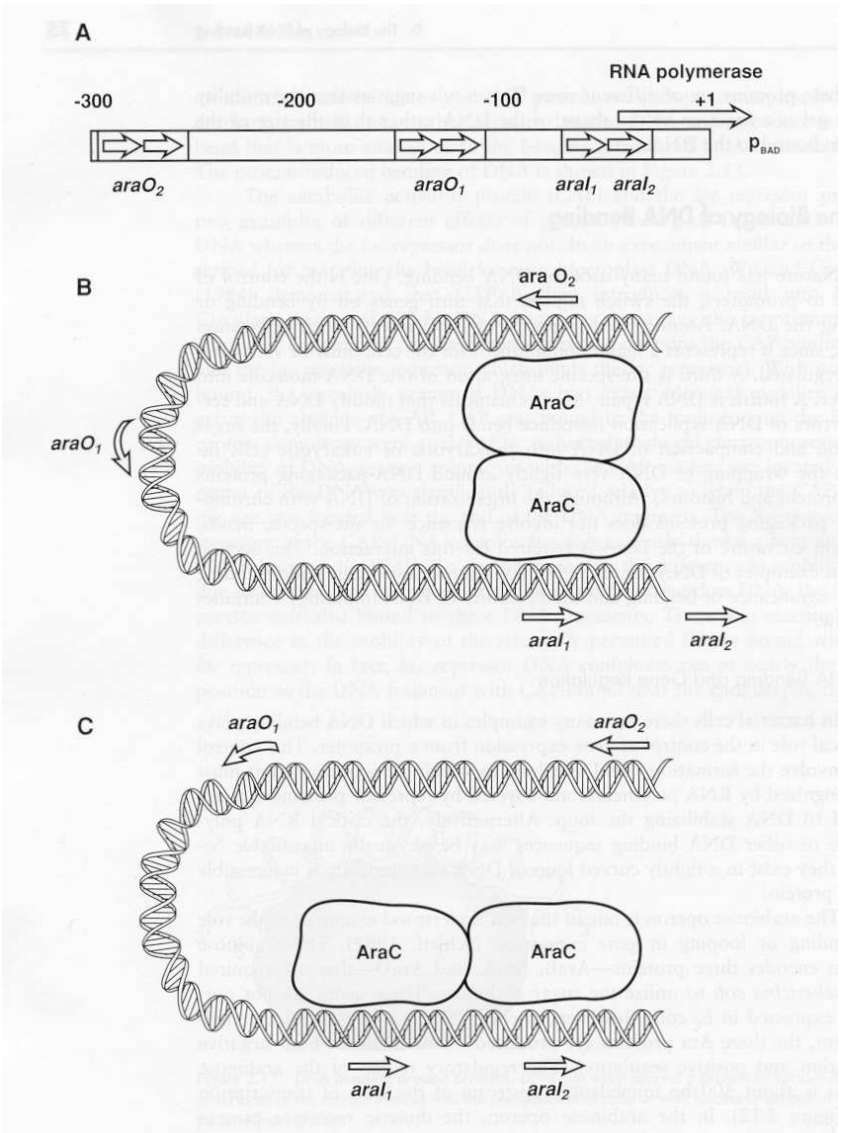
A
RNA polymerase
-300
-200
-100
+1
$p_{BAD}$
$araO_2$
$araO_1$
$araI_1$
$araI_2$
B
ara $O_2$
AraC
AraC
$araO_1$
$araI_1$
$araI_2$
C
$araO_1$
$araO_2$
AraC
AraC
$araI_1$
$araI_2$

Figure 13: