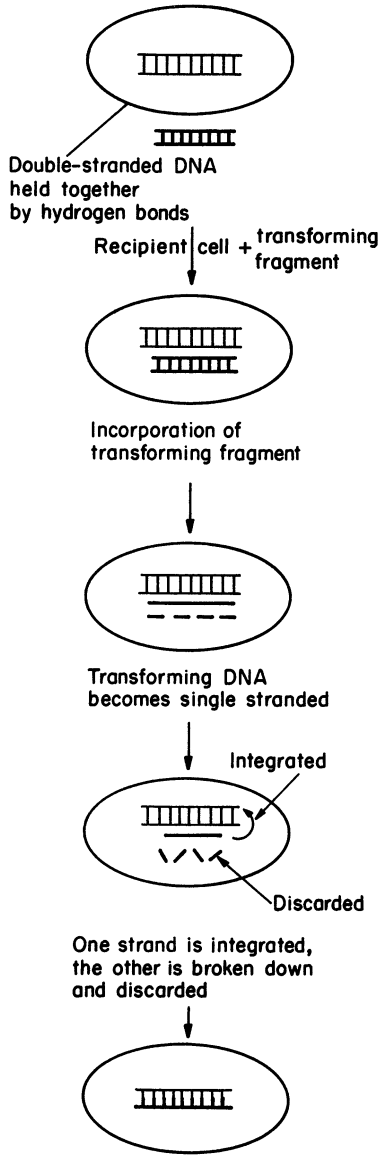

Figure 8.4. Integration of transforming DNA into a recipient cell. (With permission, from T. D. Brock, D. W. Smith, and M. T. Madigan, *Biology of Microorganisms*, 4th ed., Pearson Education, Upper Saddle River, NJ, 1984, p. 353.)

cut out the homologous section of recipient DNA, allow insertion of the donor DNA, and then ligate or join the ends of the donor DNA to the recipient DNA. Pieces of donor DNA that a cell recognizes as foreign are usually degraded by enzymes called *restriction endonucleases* (these enzymes are essential in genetic engineering). A cell marks its own DNA (e.g., through methylation of certain purine or pyrimidine bases) to distinguish it from foreign DNA. These modifications block the action of a cell's own restriction endonucleases on its own DNA. Under natural conditions, gene transfer is effective only if the donor DNA is from the same or closely related species.

Let us now consider some details of how donor DNA can enter a cell.