Primer on Molecular Genetics

mRNA is moved from the nucleus to the cellular cytoplasm, where it serves as the template for protein synthesis. The cell's protein-synthesizing machinery then translates the codons into a string of amino acids that will constitute the protein molecule for which it codes (Fig. 5). In the laboratory, the mRNA molecule can be isolated and used as a template to synthesize a complementary DNA (cDNA) strand, which can then be used to locate the corresponding genes on a chromosome map. The utility of this strategy is described in the section on physical mapping, p. 11.

Chromosomes

The 3 billion bp in the human genome are organized into 24 distinct, physically separate microscopic units called chromosomes. All genes are arranged linearly along the chromosomes. The nucleus of most human cells contains 2 sets of chromosomes, 1 set given by each parent. Each set has 23 single chromosomes—22 autosomes and an X or Y sex chromosome. (A normal female will have a pair of X chromosomes; a male will have an X

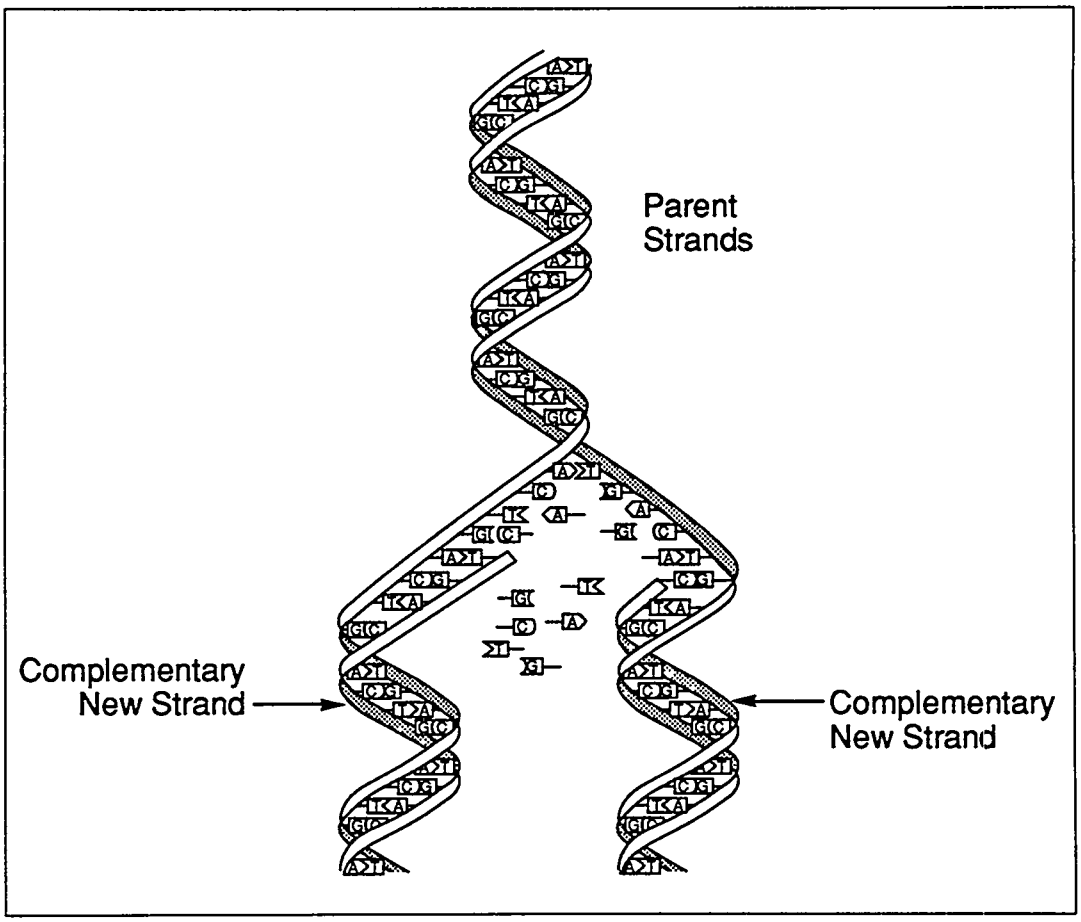

Fig. 4. DNA Replication. *During replication the DNA molecule unwinds, with each single strand becoming a template for synthesis of a new, complementary strand. Each daughter molecule, consisting of one old and one new DNA strand, is an exact copy of the parent molecule. [Source: adapted from* Mapping Our Genes—The Genome Projects: How Big, How Fast? *U.S. Congress, Office of Technology Assessment, OTA-BA-373 (Washington, D.C.: U.S. Government Printing Office, 1988).]*