Genetics Glossary

A

Acrocentric chromosome A chromosome whose centromere is located very close to one end.

Active site The region of a protein (usually an enzyme) whose structural integrity is required for proper function of the protein (for example, the substrate-binding site of an enzyme).

Albinism A condition resulting from the lack of production of the pigment melanin in the skin, hair, iris. An individual suffering from albinism is called an **albino**. In humans, albinism is inherited as a homozygous recessive condition.

Allele One of the mutational forms of a gene, distinguished from other alleles by its phenotypic effects.

Allele frequency The proportion of total alleles within a population comprised of a specific allele.

Allosteric effect A conformational change in the active site of a protein, caused by the interaction of the protein with an effector molecule.

Ames test An assay developed by Bruce Ames to test for the mutagenicity (and probable carcinogenicity) of compounds.

Amino acid Any of a family of subunits that are joined covalently to produce polypeptides.

Amino terminus (N terminus) The end of a polypeptide containing a free amino group; the end of the polypeptide where protein synthesis began.

Aminoacyl (A) site The site of a ribosome that contains the incoming aminoacyl tRNA.

Aminoacyl tRNA A molecule consisting of an amino acid linked to one of its specific tRNA molecules, in preparation for protein synthesis.

Anaphase The stage of cell division during which chromosomes begin moving to opposite poles of the cell.

Aneuploidy The condition where the chromosome number is not an exact multiple of the normal haploid number.

Anticodon The triplet nucleotide sequence of a tRNA molecule that is complementary to, and binds to the triplet nucleotide codon sequence of an mRNA molecule during translation.

Antiparallel Parallel, but oriented in opposite directions, as in the two strands of a DNA molecule.

Assortative mating Nonrandom mating between males and females of a species.

Autosome Any chromosome other than the sex chromosomes. In humans, there are 22 pairs of autosomes.

Auxotroph A mutant organism or cell that requires growth supplements that could normally be synthesized by wild-type strains.

Avirulent Unable to overcome the host's defenses; therefore, unable to sustain an infection.

B

Backcross A cross between an F_1 heterozygote and an individual with the parental genotype.

Bacteriophage A virus that infects bacteria (synonym: phage).

Barr body A dense mass of chromatin in nuclei of placental mammals, believed to be the inactivated X chromosome.

Base analogue Unnatural purine or pyrimidine nucleotide differing slightly from normal bases that can be incorporated into DNA, often causing a mutation.

Base pair Two complementary nucleotides joined by hydrogen bonding.

Base substitution A single base change in a DNA molecule that causes a mutation.

Biotechnology Commercial or industrial processes that utilize biological systems or products.

Bivalent A pair of synapsed homologous chromosomes in prophase of meiosis I. Also called a tetrad.

Blastomere Any one of the cells formed by the first few cleavages of an animal embryo.

Blastula An early animal embryo formed by the first few cleavages after fertilization. Often a thin sheet or hollow ball of cells.

BrdU (5-bromodeoxyuridine) A mutagenic analogue of thymidine in which the 5' methyl group is replaced by bromine.

C

CAAT box A conserved nucleotide sequence of eukaryotic promoters, involved in the initiation of transcription.

cAMP (cyclic AMP) An important regulatory molecule in prokaryotic and eukaryotic organisms.

Carboxyl terminus (C terminus) The end of a polypeptide containing a free carboxyl group; the end of the polypeptide where protein synthesis terminated.

Carrier An individual (heterozygotic) who carries a recessive allele, but does not express it.

Catabolite activator protein (CAP) A protein that binds cAMP and regulates the activation of inducible operons in prokaryotes.

Catabolite repression The selective repression of a prokaryotic operon by the metabolic product of the enzymes encoded by the operon.

cDNA (complementary DNA) DNA synthesized from RNA using the enzyme reverse transcriptase.

Cell cycle The cyclical events that occur during mitotic cell division. Cells oscillate between mitosis and interphase, which is made up of G_1, S, and G_2 phases.

Centriole An organelle in many animal cells made of microtubules, involved in the formation of spindles during cell division.

Centromere The specialized region of a chromosome to which spindle fibers attach during cell division.

Character (or characteristic) One of the many details of structure, form, or function that make up an individual. A phenotypic attribute.

Chiasma (plural: chiasmata) Crossed-over strands of chromatin between homologous chromosomes as seen during diplonema of meiosis I.

Chromatid In mitosis or meiosis, one of the two identical subunits, joined at the centromere, resulting from replication of a chromosome.

Chromatin The organized mixture of nucelic acid and protein (histone and non-histone) that makes up chromosomes.

Chromosomal aberration Any change in chromosomal material caused by deletion, duplication, or rearrangement.

Chromosome In prokaryotes, the intact DNA molecule containing the genome. In eukaryotes, a DNA molecule complexed with RNA and protein into a threadlike structure containing a linear array of genes.

Chromosome map A map showing the locations of genes on a chromosome.

Clone Organisms or cells that are genetically identical.

Codominance A condition in which the phenotypic effects of two alleles are equally and fully expressed in a heterozygote.

Codon A triplet of nucleotides in a DNA or mRNA molecule that encodes the information for a specific amino acid.

Complementarity Chemical affinity between nitrogenous bases as a result of hydrogen bonding. Adenine is complementary to thymine, and cytosine is complementary to guanine. Complementarity is necessary for base pairing in double-stranded DNA.

Conjugation Temporary fusion of two single-celled organisms for the purposes of exchanging genetic information.

Constitutive expression Continuous transcription of a gene in an organism.

Continuous variation Phenotypic variation not represented by distinct classes. Such quantitative traits are distributed in an overlapping or continuous fashion between two phenotypic extremes. Multiple genes are usually involved in such variation.

Cri-du-chat syndrome A clinical syndrome in humans caused by the deletion of part of the short arm of chromosome 5. Afflicted infants have a distinctive cry, resembling that of a cat.

Crossing over The exchange of genetic material between homologous chromosomes.

Cytokinesis The separation of cytoplasmic contents during mitosis or meiosis.

Cytosine A pyrimidine base found in the nucleotides of RNA and DNA.

D

Dalton A unit of mass equal to that of the hydrogen atom.

Degeneracy The specification of one amino acid by more than one codon.

Deletion Loss of a segment of DNA from a chromosome.

Denaturation The loss of native structure by a macromolecule, usually accompanied by a loss of biological activity. Denatured DNA becomes single-stranded, whereas denatured proteins unfold.

Deoxyribonuclease (DNase) Any of a family of enzymes that digests (hydrolyzes) DNA.

Diakinesis The final stage of prophase I in meiosis, just prior to metaphase I.

Differentiation A process by which unspecialized cells acquire specific structures and functions.

Dihybrid An individual that is heterozygous for two pairs of alleles.

Diploid The condition of having two of each chromosome. Somatic cells of higher plants and animals are normally diploid.

Diplonema (adjective: diplotene) The stage of prophase I between pachynema and diakinesis, during which the chromosomes of a bivalent separate at and around their centromeres, allowing chiasmata to become visible.

Discontinuous variation Phenotypic variation in which the phenotypes fall into distinct classes, such as tall vs. short, yellow vs. green, etc.

Disjunction The separation of chromosomes at anaphase.

DNA (deoxyribonucleic acid) The macromolecule that contains genetic information and comprises the genes. DNA consists of a chain of deoxyribonucleotides joined by phosphodiester linkages. Each deoxyribonucleotide consists of a nitrogenous base attached to the sugar deoxyribose, which in turn has a phosphate group attached at its 5' position.

DNA ligase An enzyme that joins the 5' end of one polynucleotide chain to the 3' end of another (or the same) polynucleotide chain.

DNA polymerase An enzyme that catalyzes the synthesis of DNA using a template DNA molecule, a primer, and free deoxyribonucleotides.

Dominance A condition where one member of an allele pair is expressed in exclusion to the other.

Dosage compensation A mechanism by which the activity of a gene is increased or decreased depending on the number of copies of that gene present in the cell. Most commonly seen in genes found on the X chromosome, which must be regulated so that males and females have the same amount of gene product.

Double crossover Two separate crossover events occurring within the same tetrad.

Double helix The structure of DNA proposed by Watson and Crick, consisting of two antiparallel polynucleotide chains wound into a right-handed helix with approximately 10 base pairs per full turn of the double helix.

E

Effector molecule A small molecule that regulates the activity of a protein (such as a repressor protein) by binding to a receptor site on the protein.

Electrophoresis A technique used to separate macromolecules by their differential migration through a semi-solid matrix in an electrical field.

Elongation factors Proteins required for polypeptide elongation during protein synthesis.

Endonuclease An enzyme that cleaves a nucleic acid molecule at internal positions.

Enhancer A DNA sequence that influences the transcription of a nearby gene. Enhancers are differentiated from promoters by their ability to act over thousands of base pairs, and either upstream or downstream of a gene.

Enzyme A protein that accelerates a biochemical reaction.

Episome A circular piece of DNA that can replicate independently of the bacterial chromosome or integrate and replicate as part of the chromosome.

Epistasis Interaction between non-allelic genes, such that one gene masks or interferes with expression of the other gene.

Euchromatin Regions of chromatin that are relatively uncoiled during interphase. Euchromatin is thought to contain actively transcribed genes.

Eukaryote An organism whose cells have true nuclei and membranous organelles, and whose cells undergo mitosis and meiosis.

Euploid Containing a chromosome number that is an exact multiple of the haploid chromosome number.

Evolution The origin of organisms by modification of previously existing organisms.

Excision repair Repair of damaged DNA by removal of the damaged segment of DNA and its replacement with a newly synthesized correct segment.

Exon The segments of a gene that are transcribed and included in the final processed transcript.

Exonuclease An enzyme that cleaves a nucleic acid molecule only at its ends.

F

F+ cell A bacterial cell possessing the fertility factor. Acts as a donor in conjugation.

F- cell A bacterial cell that does not contain a fertility factor. Acts as a recipient in conjugation.

F' cell A bacterial cell in which an integrated fertility factor spontaneously excises itself, taking part of the chromosome with it. The resulting episome therefore contains chromosomal material.

F factor An episome in bacterial cells that confers the ability to act as a genetic donor during conjugation.

F_1 generation The first filial generation; the first generation of offspring from a given mating.

F_2 generation The second filial generation; the progeny of a cross of the F_1 generation.

formylmethionine (^{f}met) A molecule created by the addition of a formyl group to the amino acid methionine. The first amino acid inserted in all bacterial polypeptides.

Frameshift mutation A mutation caused by the deletion or insertion of one or more nucleotides (but not a multiple of three), such that the translational reading frame is shifted for all codons following the mutation.

G

Gamete A cell specialized for reproduction, containing a haploid set of chromosomes, such as sperm or egg.

Gametogenesis The formation of gametes.

Gastrula An early embryonic stage in which the embryo consists of multiple layers of cells; the developmental stage following blastula.

Gene The fundamental unit of heredity; a segment of DNA found at a fixed location on a chromosome that codes for a single polypeptide.

Gene cloning The directed incorporation of a gene of interest into a self-replicating DNA vector, and the amplification of the resulting recombinant DNA molecule in the appropriate host cell.

Gene conversion The conversion of one allelic form of a gene to another, usually involving recombination.

Gene expression The process of RNA and protein production by which genes exert their phenotypic effects on an organism.

Gene pool The total set of all alleles in members of a breeding population at a given time.

Genetic code The set of 64 triplet codons that specify the 20 amino acids as well as translation initiation and termination.

Genetic drift Random fluctuation in allele frequency from generation to generation. Usually observed in small populations.

Genetic equilibrium The maintenance of allele frequencies from generation to generation.

Genome The complete set of genetic material in an individual.

Genotype The specific allelic constution of an individual; often, the allelic composition of the limited number of genes under consideration.

Germ cell A reproductive cell, which, when mature, is capable of contributing to the genesis of a new organism. Opposite of somatic cell.

Guanine A purine base found in DNA and RNA.

H

Haploid Having a single set of unpaired chromosomes; the gametic chromosome number.

Hardy-Weinberg law A principle stating that allele frequencies will remain in equilibrium in an infinitely large population in the absence of mutation, selection, migration, and nonrandom mating.

Helix-turn-helix motif The structure of the DNA-binding region of one family of DNA binding protein.

Hemizygous The condition of having only one allele of a pair, as seen for genes on the X chromosome in males.

Heterochromatin Regions of chromosomes that remain highly condensed during interphase. Heterochromatic regions do not contain active genes.

Heteroduplex A double-stranded nucleic acid whose strands have different origins. This may result from a recombination event, or by the reannealing of single-stranded molecules *in vitro*.

Heterozygote An individual with different alleles at the gene locus or loci under consideration.

Hfr A strain of bacteria exhibiting a high frequency of recombination, due to a chromosomally-integrated fertility factor. This strain is able to transfer all or part of the chromosome to recipient strains.

Histones Proteins complexed with DNA in the nucleus. Histones function to coil the DNA into nucleosomes.

Homeobox A sequence of 180 nucleotides that encodes a 60 amino acid homeodomain, which serves as a DNA-binding domain in one family of transcription factors.

Homologous chromosomes Chromosomes that synapse during meiosis. Such chromosomes are identical with regard to their genetic loci and centromere placement.

Homozygote An individual with identical alleles at one or more gene loci.

Hydrogen bond Weak interaction between an electronegative atom and a hydrogen atom covalently bonded to a strongly electronegative atom such as oxygen or nitrogen.

I

Inbreeding Mating between two closely related organisms.

Incomplete dominance Expression of a heteozygous phenotype that is distinct from, and often intermediate to, the homozygous phenotypes.

Independent assortment The random distribution of chromosomes to gametes during meiosis. The distribution of one pair of alleles is independent of other genes on non-homologous chromosomes.

Inducer An effector molecule (such as lactose in the lac operon) that activates transcription.

Inducible enzyme system An enzyme system in which an inducer molecule inactivates a repressor, allowing transcription of the gene(s) encoding the enzyme(s).

Initiation codon The triplet nucleotide code, AUG, in an mRNA that signals the start of translation and codes for the insertion of methionine as the first amino acid in a polypeptide.

Initiation factor Any of a group of proteins required for the initiation of translation.

Intercalating agent A compound that inserts between adjacent base pairs in a DNA molecule, disrupting base pairing in complementary strands.

Interphase The stage of the cell cycle between cell divisions. It is during interphase that DNA replication and gene expression occur.

Intron A portion of DNA found between exons. Introns are transcribed, but are not present in the final processed transcript.

Inversion A chromosomal aberration in which a portion of a chromosome has been reversed relative to the rest of the chromosome.

in vitro Latin meaning "in glass"; refers to things that occur in an artificial environment such as a test tube.

in vivo Latin meaning "in life"; refers to things occurring in a living organism.

K

Karyokinesis The process of nuclear division.

Karyotype The chromosomal set of a cell or individual; metaphase chromosomes arranged in order of length and according to centromere position.

Kilobase (kb) A unit of length consisting of 1000 nucleotides.

Klinefelter syndrome A genetic disorder in human males caused by the presence of an extra X chromosome, making the males XXY instead of XY. Associated with the syndrome are enlarged breasts, small testes, sterility, and occasionally, mental retardation.

L

Lagging strand In DNA replication, the strand that is synthesized in a discontinuous manner. This strand is made as a series of short pieces of DNA known as Okazaki fragments.

Leader sequence The portion of an mRNA molecule 5' to the initiation codon. This sequence is not translated into protein, but probably contains regulatory sequences. Also known as the 5' untranslated region (5'-UTR).

Leading strand In DNA replication, the strand that is synthesized in a continuous manner toward the replication fork.

Leptonema (adjective: leptotene) The stage of meiotic prophase I that precedes synapsis. Chromosomes are not yet fully condensed, and are seeking their homologues.

Lethal mutation A mutation that renders the organism or cell possessing it inviable.

Leucine zipper A structural motif found in members of one family of transcription factor, characterized by leucine residues occurring in the polypeptide every seventh amino acid. Leucine zippers on two polypeptides appear to interact to form a dimer that binds to DNA.

Ligand A molecule that binds to a receptor.

Ligation The joining of DNA molecules by the enzyme DNA ligase.

Linkage A condition in which two non-allelic genes tend to be inherited together. Linked genes are found on the same chromosome and do not assort independently, but can be separated by crossing over.

Linkage group A group of genes that have their loci on the same chromosome.

Locus The place on a chromosome where a particular gene is located (plural: loci).

Lysis The destruction of a cell caused by the rupture of its membrane.

M

Map unit A measure of distance between two genes on a chromosome, corresponding to a crossover frequency of one per cent.

Meiosis A cell division process (in gametogenesis or sporogenesis) in which one replication of the chromosomes is followed by two nuclear divisions to produce four haploid cells.

Melanin A brown or black pigment.

Merozygote A partially diploid bacterial cell produced by partial genetic exchange, such as conjugation involving an F'strain.

Messenger RNA (mRNA) RNA that contains information for the synthesis of a polypeptide.

Metaphase A stage of cell division in which condensed chromosomes line up along a central plane between the two poles of the cell.

Microtubules Hollow protein filaments used to make up part of the cytoskeleton, various locomotory structures, and the mitotic spindle.

Minimal medium A growth medium that will support the growth and reproduction of only wild-type organisms.

Mismatch repair Postreplicative DNA repair in which base mismatches are recognized, the region surrounding the mismatch is excised, and new DNA is synthesized using the other strand as a template.

Mitosis A form of cell division resulting in the production of two cells, each of which has the same chromosomal complement as the original parent cell.

Monohybrid cross A genetic cross between two individuals differing in only one character, or in which only one character is under consideration (eg. AA x aa).

Monosomy A condition in which one member of a chromosome pair is missing.

Morphogen A substance that induces the development of form or structure in an embryo.

Mutagen Any agent that causes an increase in mutation rate.

Mutant A cell or organism carrying an altered or mutated gene.

Mutation A change in DNA or chromosome structure; the source of most alleles.

N

Natural selection Differential survival and reproduction of some mebers of a species due to genotypic differences.

Nondisjunction Aberrant cell division in which homologous chromosomes during meiosis or sister chromatids during mitosis fail to separate and migrate to opposite poles. Nondisjunction results in monosomy and/or trisomy.

Nuclease Any enzyme that cleaves nucleic acids.

Nucleolus A nuclear organelle that is involved in ribosome biosynthesis.

Nucleoside A purine or pyrimidine base covalently attached to a ribose or deoxyribose sugar molecule.

Nucleosome A complex of eight histones (two each of H2A, H2B, H3, and H4) wrapped by two turns of a DNA molecule. A basic unit of chromatin structure.

Nucleotide A nucleoside attached covalently to a phosphate group. The basic building block of nucleic acid.

Nucleus The membrane-bound organelle found in eukaryotes that contains the chromosomes and nucleolus.

O

Okazaki fragment A small, discontinuous strand of DNA produced by DNA synthesis.

Oligonucleotide A short linear chain of nucleotides (usually up to about 40).

Oocyte A cell that undergoes two meiotic divisions to produce an ovum (egg). An oocyte prior to completion of meiosis I is a primary oocyte; and oocyte prior to completion of meiosis II is a secondary oocyte.

Oogenesis The process of formation of an egg or ovum.

Open reading frame (ORF) The sequence of nucleotides between a start (initiation) codon and an in-frame stop (termination) codon that codes for amino acids to be incorporated into a polypeptide.

Operator A region of DNA in a prokaryotic operon that interacts with a repressor proteinto control the transcription of an adjacent gene or gene set.

Operon A genetic unit in prokaryotes that consists of one or more structural genes (polypeptide-encoding) adjacent to an operator region that controls their transcription.

P

Pachynema (adjective: pachytene) The stage of meiosis I between zygonema and diplonema. Chromosomes become condensed during this stage.

Palindrome A sequence of DNA that reads the same in both directions from a central point of symmetry.

Paternal Pertaining to the father.

Pedigree A diagram showing the ancestral relationships and transmission of genetic traits over several generations in a family.

Peptide A compound containing amino acids.

Peptide bond A chemical bond joining amino acids together in a polypeptide.

Peptidyl (P) site The ribosome site that contains the tRNA to which the growing polypeptide is attached.

Peptidyl transferase An enzyme (built into the large ribosomal subunit) that catalyzes the formation of peptide bonds between amino acids during translation.

Phenotype The observable characteristics of an organism that are genetically controlled.

Phosphodiester bond The covalent bond between the 5' phosphate group on one nucleotide and the 3' hydroxyl group on an adjacent nucleotide; the bond that forms the backbone of the DNA molecule.

Photoreactivation A light-dependent process for the repair of thymine dimers in DNA.

Pilus (plural: pili) A proteinaceous filamentlike projection from the surface of a bacterial cell.

Plasmid An extrachromosomal circular DNA element that replicates independently of the host chromosome and may contain other genetic information.

Ploidy A term referring to the basic set of chromosomes or multiples of that set.

Point mutation A mutation that results in the substitution of one nucleotide for another, or the insertion or deletion of one or a few nucleotides.

Polar body In oogenesis, a cell produced by either the first or second meiotic division that has almost no cytoplasm due to unequal cytokinesis.

Polyadenylation The addition of a stretch of adenine nucleotides to the 3' end of a eukaryotic mRNA.

Polygenic inheritance The transmission of a phenotypic trait that depends on the additive effects of two or more genes.

Polylinker A segment of DNA that has been engineered to include multiple sites for restriction enzyme digestion. Polylinkers are usually found in engineered vectors such as plasmids.

Polymerase chain reaction (PCR) A method for amplifying DNA segments using a heat-stable DNA polymerase, sequence-specific primers, and cycles of denaturation, annealing, and synthesis.

Polymorphism The existence of two or more discontinuous, segregating phenotypes in a population.

Polypeptide A molecule made of two or more amino acids joined by peptide bonds.

Polyploid An individual or cell having more than two sets of chromosomes.

Polysome A structure composed of two or more ribosomes associated with an mRNA, engaged in translation.

Population A group of individuals of the same species that are potentially or actually interbreeding.

Primary protein structure The linear sequence of amino acids in a polypeptide.

Primary transcript The RNA molecule produced by transcription, prior to any processing (such as intron removal, 5' capping, or polyadenylation).

Primer A short length of RNA or single-stranded DNA that is necessary for the initiation of DNA synthesis.

Product law A law that states that the probability of two independent events occurring simultaneously is equal to the product of the probabilities of each event occurring alone.

Progeny The offspring of a mating.

Prokaryotes Organisms that lack true nuclei, such as bacteria and cyanobacteria.

Promoter A DNA sequence having a regulatory function over the transcription of an adjacent gene, and to which RNA polymerase binds prior to transcription.

Proofreading A molecular mechanism for detecting and correcting errors in replication.

Prophase The first stage of cell division (meiotic or mitotic). During this stage, chromosomes begin to condense, the nuclear envelope breaks down, and centrioles replicate. In meiosis, the first prophase is divided into five substages: leptonema, zygonema, pachynema, diplonema, and diakinesis.

Protease Any enzyme that digests protein.

Protein A molecule composed of one or more polypeptides.

Prototroph An organsim (usually a microorganism) that is capable of growing on minimal medium. Wild-type strais are usually regarded as prototrophs.

Q

Quarternary protein structure The structural relationship between two or more polypetides in a protein consisting of multiple subunits.

R

Random mating Mating between individuals without regard to genotype.

Reannealing Reformation of double-stranded DNA from dissociated single strands.

Receptor A molecule that can bind to, or receive, a ligand.

Recessive A term applied to one member of an allele pair that is not expressed when the other, dominant, member of the pair is present.

Reciprocal cross Two crosses, in which the genotype of the female in the first cross is the same as the genotype of the male in the second cross, and vice versa.

Recombinant DNA A DNA molecule formed by the joining of two heterologous DNA molecules. Usually applied to DNA molecules from different organisms.

Recombination A process of DNA strand exchange between homologous molecules that leads to new combinations of alleles on chromosomes.

Release factors Soluble proteins that recognize termination codons and terminate translation in response.

Renaturation The reacquisition of proper three-dimensional structure by denatured proteins or nucleic acids.

Repetitive DNA DNA sequences present in multiple copies in the haploid genome.

Replication The process of DNA synthesis.

Replication fork The Y-shaped region of a piece of DNA associated with the site of replication.

Replicon The amount of DNA that is replicated beginning at a single origin of replication.

Repressible enzyme system An enzyme or group of enzymes whose synthesis is regulated by a product of enzyme action.

Repressor A protein that binds to a regulatory region adjacent to a gene and prevents transcription.

Restriction endonuclease A nuclease, derived frommicroorganisms, that recognizes a specific DNA sequence (usually a sequence of four to ten nucleotides) and nicks or cleaves the DNA at or near that site.

Restriction fragment A fragment of DNA produced by cleavage of a larger DNA molecule with one or more restriction enzymes.

Restriction Fragment Length Polymorphism (RFLP) A genetic difference between individuals in a population detected by observing differences in restriction fragment lengths .

Restriction site A DNA sequence recognized by a restriction endonuclease.

Ribonuclease Any enzyme that hydrolyzes RNA.

Ribosomal RNA (rRNA) The RNA molecules that are the structural components of the ribosomal subunits. In prokaryotes, the rRNA molecules are 23S, 16S, and 5S; in eukaryotes they are 28S, 18S, 5.8S, and 5S.

Ribosome A cytoplasmic organelle composed of RNA and protein that is the site of protein synthesis.

RNA (ribonucleic acid) nucleic acid characterized by the presence of the base uracil instead of thymine, and by the sugar ribose instead of deoxyribose. RNA is usually single-stranded, and is generated by transcription from DNA. There are several types: messenger RNA, ribosomal RNA, and transfer RNA.

RNA Polymerase An enzyme that catalyzes the synthesis of an RNA molecule using single-stranded DNA as a template.

S

Satellite DNA DNA that consists of short sequences repeated many times in the genome.

Secondary protein structure The folding of polypeptides into regular structures stabilized by hydrogen bonds, such as alpha helices and beta sheets. Most proteins have one or both of these types of secondary structure.

Segregation The separation of homologous chromosomes into different gametes during meiosis.

Selection The force that brings about changes in allele and genotype frequency due to differential reproductive success.

Selfing In plants, reproduction by self-fertilization; fertilization of an ovule by pollen from the same plant.

Semiconservative replication A model of DNA replication in which each daughter DNA molecule consists of one parental strand and one newly-synthesized strand.

Sex chromosome A chromosome involved in sex determination. An example of this are the X and Y chromosomes of humans.

Sex-influenced inheritance Phenotypic expression that is dependent on the sex of the individual. A heterozygote would express one phenotype in females and a different phenotype in males. An example of this is human male-pattern baldness.

Shine-Delgarno sequence A nucleotide sequence (AGGAGG) that is present in the 5'-untranslated region of prokaryotic mRNAs. This sequence serves as a binding site for ribosomes.

Sickle-cell anemia A genetic disease in humans, caused by a single amino acid change in the beta chain of globin. Affected erythrocytes have a sickle shape instead of the typical biconcave disk shape. The trait is autosomal recessive, and is often fatal in the homozygous condition.

Sigma factor A polypeptide subunit of prokaryotic RNA polymerase that recognizes the binding site for the initiation of transcription.

Small nuclear RNA (snRNA) Small, abundant RNA molecules found in the nucleus of eukaryotic cells. These RNAs associate with proteins to form small nuclear ribonucleoproteins (snRNPs or snurps) that are involved in intron removal and exon splicing.

Solenoid structure A structure of eukaryotic chromatin structure resulting from supercoiling of nucleosomes.

Somatic cell A "body" cell - any cell of an organism that isn't a germ cell or gamete.

Somatic mutation A mutation that occurs in a somatic cell. Such mutations are not heritable.

Species A group of potentially interbreeding individuals that is reproductively isolated from other individuals or groups.

Spliceosome A nuclear complex of RNA and protein that acts to remove introns from pre-RNA molecules.

Spontaneous mutation A mutation that does not arise as a result of the action of a mutagenic agent.

SRY The "sex-determining region of Y" - a gene on the Y chromosome that is believed to direct the differentiation of male gonads in mammals.

Strain A group of individuals with common ancestry who share characteristics of interest for genetic study.

Sum law A law that states that the probability of one or the other of two mutually exclusive events occurring is equal to the sum of the probability of each event occurring alone.

Svedberg coefficient unit (S unit) A measure for the rate at which particles sediment in a centrigugal field. S units are a measure of the relative size of a particle, rather than the absolute size.

Synapsis The pairing of homologous chromosomes in meiosis.

T

TATA box A short nucleotide sequence found within many eukaryotic promoters, 20 to 30 base pairs upstream of the transcription start site. RNA polymerase binds to the TATA box. The actual consensus sequence of the TATA box is TATAAA.

Telocentric chromosome A chromosome in which the centromere is found at the end of the chromosome.

Telomerase An enzyme that adds short repeated nucleotide sequences to the ends of eukaryotic chromosomes.

Telomere The end of a eukaryotic chromosome.

Telophase The stage of cell division in which the recently separated chromosomes reach opposite poles of the cell. Nuclei reform and cytokinesis occurs.

Template The single-stranded nucleic acid molecule that specifies the sequence for another nucleic acid molecule synthesized by a polymerase.

Tertiary protein structure The three-dimensional structure of a polypeptide chain, resulting from specific folding of the chain upon itself.

Test cross A cross btween an individual whose genotype at one or more loci is unknown, and an individual homozygous recessive for the same loci.

Tetrad The structure made by four sibling chromatids when homologous chromosomes pair during prophase I of meiosis.

Thymine dimer A DNA lesion caused by the formation of covalent bonds between adjacent thymines, usually as a result of exposure to ultraviolet radiation.

Totipotent When a cell retains the ability to direct the development of an entire adult organism.

Trait A detectable phenotypic variation of an inherited characteristic.

Transcription The synthesis of an RNA molecule from a DNA template.

Transcription factor A protein that regulates the transcription of genes in eukaryotes.

Transcription unit A segment of DNA that contains transcription initiation and termination sites, and is transcribed into a single RNA molecule.

Transduction Transfer of genetic material between bacteria, with bacteriophage acting as an intermediary.

Transfer RNA (tRNA) Small RNA molecules that act as adaptor molecules during protein synthesis. Each tRNA molecule contains a specific three-base segment called an anticodon, which binds to the complementary codon in mRNA, and a binding site for a specific amino acid.

Transformation (bacteria) Genetic alteration of bacteria as a result of uptake of foreign DNA by the bacteria.

Transgenic A term applied to organisms that have been genetically modified to incorporate foreign DNA into their genomes.

Turner syndrome A genetic condition in which an individual is XO (i.e. has only one sex chromosome, an X). Such individuals are phenotypically female, but are sterile because of undeveloped ovaries.

U

Unequal crossing over Recombination that occurs between two homologues that are improperly aligned. Exchange of DNA is unequal, such that one homologue winds up with three copies of a region of the chromosome, while the other homologue has only one.

Unique DNA DNA sequences that exist in only one copy per haploid genome.

V

Vector A plasmid or viral chromosome that is used to construct recombinant DNA molecules for introduction into living cells.

Viability The ability of an organism to live, grow, and reproduce.

Virulent Infectious; able to overcome the host's defense system.

W

Wild type The most commonly observed phenotype, which is designated as the standard for comparison.

Wobble hypothesis The idea that the third base in an anticodon can align several ways to allow it to recognize more than one codon in mRNA.

X

X inactivation The random cessation of transcription from one X chromosome in mammalian females. This compensates for the difference in X chromosome dosage between males and females.

X linkage The pattern of inheritance of genes located on the X chromosome.

Y

Y chromosome A sex chromosome in organsims (such as mammals) in which males are heterogametic (XY).

Z

Zinc finger A type of DNA-binding domain found in some transcription factors. Zinc fingers are characterized by a pattern of cysteine and histidine residues that complex with zinc ions to form a polypeptide loop or finger.

Zygote The diploid cell (anew individual) formed by fusion of two haploid gametes.

Zygonema (adjective: zygotene) A stage of meiotic prophase I, in which the homologous chromosomes synapse along their entire length, forming bivalents. The stage between leptonema and pachynema.