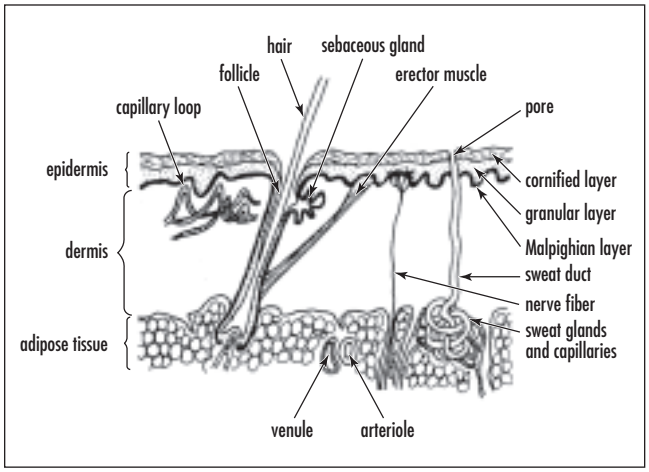


The epidermis serves as a protective layer against invasion of foreign substances, both chemical and animal (parasites).

of a secondary plant body, a periderm consisting of cork that serves as a protective packed-cell arrangement for woody stems.

desferal *See* DESFERRIOXAMINE.

desferrioxamine (**dfo**) Chelating agent used worldwide in the treatment of iron overload conditions, such as HEMOCHROMATOSIS and THALASSEMIA.

See also CHELATION.

desmosome At certain points along adjacent surfaces of cells there are intercellular attachments: *zonula occluden* (tight junction), *zonula adherens* (belt desmosome), and *macula adherens* (spot desmosome). Belt desmosomes are a specialized lateral cell-to-cell adhesion, or anchoring junction, that anchors cells, usually epithelial cells, to each other or to extracellular matter. Consisting of dense protein plaques, they form tight attachments to other cells with intermediate filaments consisting of cytoskeleton material that serves as support and structure between adjacent cells, between cells, and as an extracellular matrix. Found in tissues that have been stretched or are subjected to friction, e.g., heart muscle. "Spot" desmosomes are found in all epithelial cells and other tissues such as smooth muscle and are buttonlike contact points between cells and "spot welds" between cells and adjacent plasma membranes.

determinate cleavage (**mosaic cleavage**) A type of cleavage in protostomes, usually spiral, in which the fates of the cells (blastomeres) are fixed and cannot be changed very early in development. Determinate cleavage was first discovered in nematodes.

determinate growth A growth characteristic of specific duration in which an organism stops growing after it reaches a certain size or achieves a specific goal. As examples: a crop that stops growing and dries after producing grain; a human adult that stops growing after achieving final height; a plant that ripens all of its seeds at the same time; or an apical meristem that differentiates into flowers, terminating the production of additional leaves and stems.

determination In many organisms, the fates of the earliest embryonic cells are not determined and have the potential to develop into many different cell types. Determination is the process whereby cells are committed to a particular development fate as the embryo grows. Portions of the gene are selected for expression in different embryonic cells, which gradually restricts cell fate. Cells can progress from being capable of forming any cell type (totipotent), such as the zygote; to being capable of forming most tissues of an organism (pluripotent); to being fully determined.

As an embryo develops, its cells become determined and committed to developing into particular parts of the embryo and later adult structures. Following determination, cells eventually differentiate into their final, and often specialized, forms.

Determination is a slow process in which a cell's potency is progressively restricted as it develops, and the determined state is heritable (a type of cell memory) via somatic cell division. It is irreversible most of the time, but there have been examples of a cell reverting back to an undetermined state.

detritus Accumulated organic debris from dead organisms, often an important source of nutrients in a

food web. A detrivore is any organism that obtains most of its nutrients from detritus.

deuterostomes One of the two groups of coelomates, animals that have a coelom or body cavity lined with mesoderm. The deuterostomes, which includes echinoderms and chordates, are animals where the first opening in the embryo during gastrulation becomes the anus, while the mouth appears at the other end of the digestive system; opposite of the protostomes (mollusks, annelids, arthropods), where the mouth forms first during gastrulation and before the future anus. The blastopore, which is the opening of the archenteron in the gastrula, is the site of both mouth or anus development in both groups.

Devonian period A geological period that existed during the middle of the Paleozoic era. The Devonian period existed between 406 and 360 million years ago and is separated into the Early Devonian period (406 to 387 million years ago), the Middle Devonian period (387 to 374 million years ago), and the Late Devonian period (374 to 360 million years ago). It is also called the age of fishes.

See also GEOLOGICAL TIME.

dfo *See* DESFERRIOXAMINE.

diabetes mellitus An ailment characterized by hyperglycemia resulting from the body's inability to use blood glucose for energy. There are two types. In type 1 diabetes, the pancreas ceases to make insulin, and blood glucose does not enter the cells to be used for energy. In type 2 diabetes, the pancreas fails to make sufficient insulin, or the body is unable to use insulin correctly. It is estimated to affect some 17 million people in the United States and is the sixth leading cause of death.

diamagnetic Substances having a negative MAGNETIC SUSCEPTIBILITY are diamagnetic. They are repelled by a magnetic field.

diaphragm A dome-shaped sheet of thin skeletal muscle that separates the lungs and heart from the abdomen and assists in breathing. With inspiration, the diaphragm contracts and flattens downward, while the volume of the thoracic cavity increases, allowing air to enter the respiratory tract. After expiration, the diaphragm relaxes back to its dome shape until the next inspiration.

A diaphragm is also a modern contraceptive devices that prevents sperm from reaching and entering the egg.

diastereoisomers STEREOISOMERS not related as mirror images.

diastole One of two phases of the beating heart. Diastole is the three-step phase when the heart muscle (ventricles) relaxes, causing blood to fill the heart chambers. SYSTOLE is when the ventricles contract. Diastolic blood pressure is the blood pressure measured during diastole, when the chambers fill with blood. It is the force exerted by blood on arterial walls. The lowest blood pressure measured in the large arteries is about 80 mm Hg under normal conditions for a young adult male.

The three phases—early, mid, and late diastole—deal with the conditions of the ventricle, semilunar valve, and atrioventricula valve, while filling, and the reactions of the SA (sinoatrial) node (the heart's "pacemaker") and AV (atrioventricular) node, which regulate contractions.

See also BLOOD PRESSURE.

The Bacillariophyceae or diatoms are unicellar algae that are found in single, colonial, or filamentous states. *(Courtesy of Hideki Horikami)*

diatoms *See* ALGAE; CHROMISTA.

dichotomous Either halving or branching by pairs.

dicot (dicotyledon) A member of a subclass of the angiosperms (division Anthophyta) characterized by the presence of two cotyledons in the seed, a reticulated netlike system of veins in the leaves, flower petals in fours or fives, vascular system arranged in a ring in the cortex, root development from the radicle with a fibrous root, and a three-pore pollen structure.

There are about 250,000 species of angiosperms around the world. They make up the largest classification of plants. It is the development of flowers for reproduction that sets them apart from other plant types.

Many of our food and economic staples are from angiosperms, e.g., peanuts, flax, spinach, rice, corn, cotton.

The class Angiospermae (division Anthophyta) is the largest classification of plants. Its distinctive characteristic is the development of flowers, which are used for reproduction. The oldest angiosperm fossils came from the Cretaceous period of the Mesozoic era.

The other angiosperm class is the monocotyledons (monocots), which evolved from dicot ancestors early in the development of flowering plants. There are many more dicots than monocots, and the two groups differ radically in many ways. Dicots are woody or herbaceous; monocots are only herbaceous. The monocots's pollen (single pore), vascular arrangement in stems and roots (scattered bundles), seed leaf (one), flower parts (multiples of three), and root structure (adventitious with taproot) are also different.

See also MONOCOT.

differentiation A process in embryonic development where unspecialized cells take on their individual traits, reach mature form, and progressively become specialized for specific functions such as tissues and organs.

diffusion The random dispersion or spreading out of molecules from a region of high concentration to one of low concentration, stopping when the concentration is equally dispersed.

digestion The process by which living organisms break down ingested food in the alimentary tract into more easily absorbed and assimilated products using enzymes and other chemicals. Digestion can occur in aerobic conditions, where waste is decomposed by microbial action in the presence of oxygen, or under anaerobic conditions when waste is decomposed under microbial action in the absence of oxygen. In anaerobic conditions such as in a large animal facility (e.g., a dairy farm), the by-product, a low-energy biogas that is made with the combination of methane and carbon dioxide, can be used as an energy source.

dihybrid cross The inheritance of two characteristics from two parents at the same time (e.g., leaf shape and stem color). If one trait inherited does not affect the other, the dihybrid cross is two monohybrid crosses operating concurrently. Traits that do not influence the inheritance of each other are said to assort independently. Demonstrates that Mendel's Principle of Independent Assortment allows each trait to be considered separately, since each trait is inherited independently of the other.

dihydrofolate An oxidation product of TETRAHYDROFOLATE that appears during DNA synthesis and other reactions. It must be reduced to tetrahydrofolate to be of further use.

See also FOLATE COENZYMES.

dikaryon The occurrence of two separate haploid nuclei in each cell in the mycelium of some forms of fungi such as basidiomycetes. If the nuclei are both the same genotype, it is said to be homokaryotic; if nuclei are of different genotypes, it is said to be heterokaryotic.

dikaryotic Mycelium or spores containing two sexually compatible nuclei per cell. Common in the BASIDIOMYCETES.

dimorphism The ability of a species to have more than one color or body form, such as differences between sexes.

See also SEXUAL DIMORPHISM.

dinoflagellates *See* ALGAE.

dinosaurs Animals that arose from a common reptilian ancestor that had developed a hole in the bone of its hip socket, was erect, was bipedal or quadrupedal, lived on land, and only lived during the Mesozoic era between 245–144 million years ago. Birds are the direct descendents of dinosaurs.

dinuclear *See* NUCLEARITY.

dioecious A term describing individual organisms that produce only one type of gamete. Asparagus is a dioecious plant species, having a male (staminate) and female (pistillate) flowers on separate plants. The term applies to species where sexes are always separate, e.g., humans. It is the opposite of MONOECIOUS.

dioxygenase An ENZYME that catalyzes the INSERTION of two oxygen atoms into a SUBSTRATE, both oxygens being derived from O_2.

diploid cell A cell with two sets of chromosomes, with one set inherited from one parent and the other set inherited from the other parent.

diplopods A subclass of Myriapoda, the common millipede. They are cylindrical and bear two pairs of legs on each segment and were one of the first animals to venture onto dry land, in the Silurian period (438 million to 408 million years ago).

Diptera Insects in the order Diptera include mosquitoes, flies, gnats, and midges. Dipterons have two wings. Some dipterons are disease vectors (e.g., malaria, yellow fever), while others are important pollinators, pest predators, and parasites. Dipterons undergo complete metamorphosis and usually have more than one generation per year.

directional selection When natural selection favors a phenotype at one extreme of the phenotypic range, giving it an advantage over other individuals in the population, then that particular trait becomes more common in that population as other traits are reduced or eliminated from the population. Over geologic time, directional selection can lead to major changes in morphology and behavior of a population or species.

The classic example is England's peppered moth (*Biston betularia*) and industrial melanism, the gradual darkening of the wings of many species of moths and butterflies living in woodlands darkened by industrial pollution. The light form of the moth was camouflaged among light-colored lichens on London's darker-colored trees before the Industrial Revolution. The dark form of the moth was not observed until 1848, since it was eaten by predators that easily spotted it. After the lichens were killed off by the effects of soot pollution from the Industrial Revolution, the dark form increased in number, and by 1948, 90 percent of the peppered moths were dark colored. The light form of the moth continues to dominate populations in unpolluted areas outside London. Antibiotic resistance in bacteria and pesticide resistance in insects are other examples of directional selection.

disaccharide A class of sugar, a carbohydrate, created by linking together a pair of monosaccharides, which are simple sugars. An example of a disaccharide is sucrose, which is glucose joined to fructose. Other examples include lactose, which is glucose joined with galactose, and maltose, which is two glucoses joined together. While disaccharides can be decomposed into monosaccharides, monosaccharides cannot be degraded by hydrolysis. However, disaccharides can be degraded by hydrolysis into monosaccharides.

dismutase An ENZYME that catalyzes a DISPROPORTIONATION reaction.

dismutation *See* DISPROPORTIONATION.

dispersion The distribution pattern, or spacing apart, of individuals from each other within geographic population boundaries. Dispersion can be an aggregated clump, where individuals are concentrated in specific locations of their habitat, the most common example. This is usually because of unequal distribution of available resources or due to social or reproduction associations. Uniform dispersion, where everyone is evenly spaced, is based on individual interactions such as competition. Random dispersion is when individuals are spaced randomly in an unpredictable manner.

disposition *See* DRUG DISPOSITION.

disproportionation (**dismutation**) Any chemical reaction of the type A + A → m' + A" where A, A', and A" are different chemical species. The reverse of disproportionation is called COMPROPORTIONATION.

disruptive selection (**diversifying selection**) Acts against individuals in the middle of the range of phenotypes, instead favoring both ends of extreme or unusual traits and working against common traits in a population. Species may evolve into separate ecotypes, that is, types of individuals within the same species that have adapted to the special conditions they occupy. BATESIAN MIMICRY is often used as an example of disruptive selection. Diversifying selection results in an overall increase in genetic diversity.

dissimilatory Related to the conversion of food or other nutrients into products plus energy-containing compounds.

dissociation constant *See* STABILITY CONSTANT.

distomer The enantiomer of a chiral compound that is the less potent for a particular action. This definition does not exclude the possibility of other effects or side effects of the distomer.

See also EUTOMER.

DNA *See* DEOXYRIBONUCLEIC ACID.

DNA ligase A linking enzyme involved in replicating and repairing DNA molecules. It seals "nicks" in the backbone of a single strand of a double-stranded DNA molecule; connects Okazaki fragments—short, single-stranded DNA fragments on the lagging strand—during DNA replication, producing a complementary strand of DNA; and links two DNA molecules together by catalyzing the formation of a (phosphodiester) bond between the 5' and 3' ends of the nicked DNA backbone.

DNA methylation A biochemical event that adds a methyl group (–CH3) to DNA, usually at the base cytosine or adenosine, and may be a signal for a gene or part of a chromosome to turn off gene expression and become inactive.

DNA polymerase An enzyme that catalyzes the synthesis of new complementary DNA molecules from single-stranded DNA templates and primers. Different DNA polymerases are responsible for replication and repair of DNA, and they extend the chain by adding nucleotides to the 3' end of the growing DNA. DNA polymerase catalyzes the formation of covalent bonds between the 3' end of a new DNA fragment and the 5' end of the growing strand.

DNA probe A single strand of DNA that is labeled or tagged with a fluorescent or radioactive substance and binds specifically to a complementary DNA sequence. The probe is used to detect its incorporation through hybridization with another DNA sample. DNA probes can provide rapid identification of certain species like mycobacterium.

See also NUCLEIC ACID PROBE.

docking studies Molecular modeling studies aiming at finding a proper fit between a ligand and its binding site.

dodo A large and plump bird (*Raphus cucullatus*) that is now extinct. Dutch sailors began using the Indian Ocean island of Mauritius as a stopover in 1598; the last dodo was killed in 1681. The bird's extinction was due to destruction of its habitat and the importation of animals such as pigs, rats, and monkeys that ate its eggs and cut off its food supply. Overhunting also contributed to the bird's demise. Recently scientists have determined, through DNA analysis, that the long-extinct dodo belongs in the dove and pigeon family.

Doisy, Edward Adelbert (1893–1986) American *Biochemist* Edward Adelbert Doisy was born in Hume, Illinois, on November 3, 1893, to Edward Perez and his wife Ada (née Alley). Doisy was educated at the University of Illinois, receiving a B.A. degree in 1914 and an M.S. degree in 1916. He received a Ph.D. in 1920 from Harvard University.

From 1915 until 1917 he was assistant in biochemistry at Harvard Medical School, and the following two years he served in war in the sanitary corps of the U.S. Army. From 1919 until 1923 he was an instructor, associate, and associate professor at Washington University School of Medicine. In 1923 he became professor of biochemistry at St. Louis University School of Medicine, and the following year he was appointed director of the department of biochemistry retiring in 1965 (emeritus 1965–86).

Doisy and his associates isolated the sex hormones estrone (1929), estriol (1930), and estradiol (1935). He also isolated two forms of vitamin K and synthesized it

Laboratory worker reviewing DNA band patterns. ***(Courtesy of Centers for Disease Control and Prevention)***

in 1936–39. For his work on vitamin K, Doisy was awarded the Nobel Prize in physiology or medicine for 1943.

Later, Doisy improved the methods used for the isolation and identification of insulin and contributed to the knowledge of antibiotics, blood buffer systems, and bile acid metabolism.

In 1936 he published *Sex Hormones* and in 1939 published, in collaboration with Edgar Allen and C. H. Danforth, a book entitled *Sex and Internal Secretions*. He died on October 23, 1986, in St. Louis.

Domagk, Gerhard Johannes Paul (1895–1964) German *Biochemist* Gerhard Johannes Paul Domagk was born on October 30, 1895, in Lagow, a small town in the Brandenburg Marches. He attended school in Sommerfeld, where his father was assistant headmaster, until age 14. His mother, Martha Reimer, came from farming stock in the Marches, where she lived in Sommerfeld until 1945, when she was expelled from her home and died from starvation in a refugee camp.

Domagk became a medical student at Kiel and served in the army during World War I. After being wounded in 1914, he worked in the cholera hospitals in Russia. He noticed that medicine of the time had little success, and he was moved by the helplessness of the medical men of that time in treating cholera, typhus, diarrhea infections, and other infectious diseases. He recognized that surgery had little value in the treatment of these diseases, and also noticed that amputations and other radical treatments were often followed by severe bacterial infections.

In 1918 he resumed his medical studies at Kiel and graduated in 1921. In 1923 he moved to Greifswald and a year later became a university lecturer in pathological anatomy. In 1925 he held the same post at the University of Münster and in 1958 became a professor.

During the years 1927–29 he was given a leave of absence from the University of Münster to do research in the laboratories of the I. G. Farbenindustrie, at Wuppertal. In 1932 he tested a red dye, Prontosil rubrum. While the dye itself had no antibacterial properties, when he slightly changed its chemical makeup, it showed a remarkable ability to stop infections caused by streptococcal bacteria in mice. He had discovered the sulfa drugs that have since revolutionized medicine and saved many thousands of lives. He was awarded the 1939 Nobel Prize in physiology or medicine for his discovery. He died on April 24, 1964.

domain An independently folded unit within a protein, often joined by a flexible segment of the polypeptide chain. Domain is also the highest taxonomic rank in the animal kingdom, which consists of three domains: Eukarya, Bacteria, and Archaea. The Archaea are commonly known as extremophiles, occurring in the deep sea vents and hot sulfur springs, whereas the Eukarya comprise the higher life forms, including humans.

dominance hierarchy A social order, or ranking, developed by a group of individuals that live together by which certain individuals gain status and exert power over others. Every individual in the group is ranked relative to all other community members of the same sex. Female rank is usually determined by the relative rank of their mothers, and male ranking may also be determined by the mother's rank, or by competition with other males. Individuals who are higher in the dominance hierarchy usually have greater access to food, sex, and other resources. Those males or females at the highest level of ranking are called alpha male and alpha female.

dominant allele An allele that controls the phenotype produced and blocks the phenotype expression of another allele of the same gene, whether or not that gene is dominant or recessive. This is in contrast to a recessive allele, which is expressed only when its counterpart allele on the matching chromosome is recessive.

donor atom symbol A polydentate LIGAND possesses more than one donor site, some or all of which may be involved in COORDINATION. To indicate the points of ligation, a system is needed. The general and systematic system for doing this is called the kappa convention: single ligating atom attachments of a polyatomic ligand to a coordination center are indicated by the italic element symbol preceded by a Greek kappa, κ. In earlier practice, the different donors of the ligand were denoted by adding to the end of the name of the ligand

the italicized symbol(s) for the atom or atoms through which attachment to the metal occurs.

double-blind study A clinical study of potential and marketed DRUGs, where neither the investigators nor the subjects know which subjects will be treated with the active principle and which ones will receive a placebo.

double circulation A transportation system for the blood that has separate pulmonary and systemic systems. The heart pumps blood to the lungs and back, then to the body and back via a network of blood vessels. In humans (but not all animals) the blood travels through the heart twice on each complete journey around the body. There is no mixing of the two kinds of blood (oxygen-rich blood is completely separated from oxygen-poor blood). A double circulation system maintains the high blood pressure needed for efficient transport of materials around the body.

double fertilization Restricted to angiosperms, the flowering plants, it is a process where one male sperm cell pollinates an egg to form a zygote, a diploid embryo, while another male sperm joins with two other polar nuclei to form a triploid cell, becoming the endosperm in the ovule. Corn is an example.

double helix Two strands of DNA coiled about a central axis, usually a right-handed HELIX. The two sugar–phosphate backbones wind around the outside of the bases (A = adenine, G = guanine, T = thymine, C = cytosine). The strands are antiparallel, thus the phosphodiester bonds run in opposite directions. As a result, the structure has major and minor grooves at the surface. Each adenine in one strand of DNA is hydrogen bonded to a thymine in the second strand; each guanine is hydrogen bonded to a cytosine.

See also DEOXYRIBONUCLEIC ACID.

double prodrug (pro-prodrug) A biologically inactive molecule that is transformed in vivo in two steps (enzymatically and/or chemically) to the active species.

Down's syndrome The most common and readily identifiable chromosomal abnormality associated with mental retardation. There are 47 instead of the usual 46 chromosomes, and the extra chromosome, chromosome 21, changes the orderly development of the body and brain, showing several symptoms including a characteristic body type, mental retardation, increased susceptibility to infections, and various heart and other organ abnormalities. It is caused by one of the parent's gametes not dividing properly or

This photograph depicts a newborn with the genetic disorder Down's syndrome due to the presence of an extra 21st chromosome. The estimated incidence of Down's syndrome is between 1:1,000 to 1:1,1000 live births. Each year approximately 3,000 to 5,000 children are born with this chromosomal disorder. ***(Courtesy of Centers for Disease Control and Prevention)***

where one of the parents has chromosome 14 and 21 merge.

Approximately 4,000 children with a Down's syndrome are born in the United States each year, or about one in every 800 to 1,000 live births. The incidence is higher for women over age 35, but the condition can occur at any age for women.

drug Any substance presented for treating, curing, or preventing disease in human beings or in animals. A drug can also be used for making a medical diagnosis or for restoring, correcting, or modifying physiological functions (e.g., the contraceptive pill).

drug disposition Refers to all processes involved in the absorption, distribution, METABOLISM, and excretion of DRUGs in a living organism.

drug latentiation The chemical modification of a biologically active compound to form a new compound, which in vivo will liberate the parent compound. Drug latentiation is synonymous with PRODRUG design.

drug targeting A strategy aiming at the delivery of a compound to a particular tissue of the body.

drumlin An oval or elongated hill of glacial drift that looks like an overturned canoe from the air.

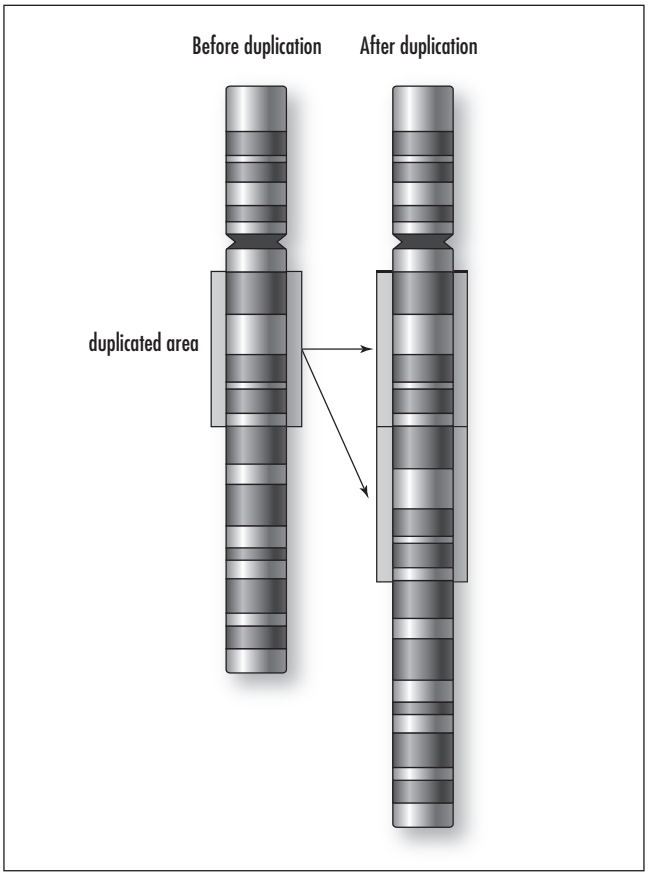
drupe A fleshy or pulpy fruit with a single seed enclosed in a pit.

dual-action drug A compound that combines two desired different pharmacological actions at a similarly efficacious dose.

duodenum The first part of the small intestine; short, wide, U-shaped, about 12 inches long, and closest to the stomach. The bile duct (gallbladder) and pancreatic duct (pancreas) both open into the duodenum. After food mixes with stomach acid, it moves into the duodenum and mixes with digestive juices from the pancreas, liver, and gallbladder, which starts the process of breaking down food into its constituent parts.

duplication A specific kind of mutation: production of one or more copies of any piece of DNA, including a gene or even an entire chromosome. A chromosome structural aberration from an error in meiosis. Duplication of a portion of a chromosome resulting from fusion with a fragment from a homologous chromosome.

dwarfism Animals that evolve on islands are affected by gigantism or dwarfism, the evolution of body form



A duplication is a particular kind of mutation resulting in the production of one or more copies of any piece of DNA, including a gene or even an entire chromosome. ***(Courtesy of Darryl Leja, NHGRI, National Institutes of Health)***

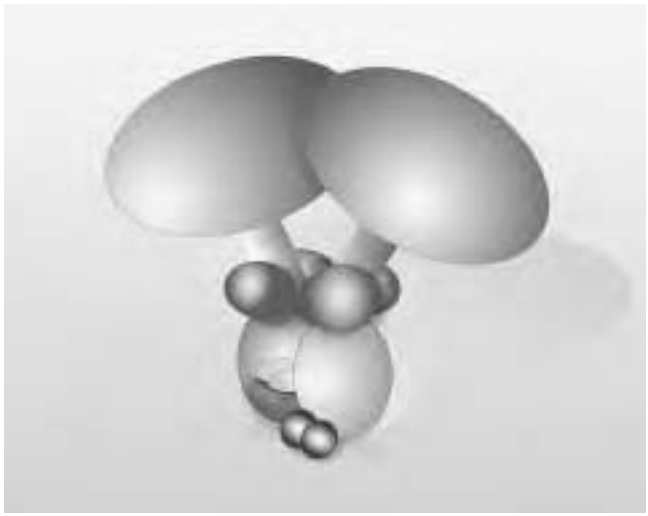
as either large (e.g., Komodo dragon weighs up to 365 pounds) or small (e.g., Island fox in the Channel Islands). Island animal populations tend to acquire different sizes than their mainland counterparts. Dwarfism may be due to limited food supply, but the reasons for both gigantism and dwarfism are not known fully.

See also GIGANTISM.

dynein A molecular motor, a complex believed to be made of 12 distinct protein parts, that performs basic transportation tasks critical to the cell. Converts chemical energy stored in an ATP molecule into mechanical energy that moves material though the cell along slender filaments called microtubules. One of the most important functions occurs during cell division, when it helps move chromosomes into proper position. It also plays a part in the movement of eukaryotic flagella and cilia.

Molecular motors play a critical role in a host of cell functions, such as membrane trafficking and cell movement during interphase, and for cell asymmetry development. During cell division, they are responsible for establishing the mitotic or meiotic spindle, as well as segregating chromosomes and dividing the cell at cytokinesis. It is the last part of the mitotic cycle during which the two daughter cells separate. Motors either move along actin tracks (members of the myosin superfamily) or microtubules (the dynein and kinesin superfamilies). Based on the Greek *dunamis,* meaning "power."

See also ATP.



The dynein motor, a cellular complex believed to be composed of 12 distinct protein parts, performs fundamental transportation tasks critical to the cell. Defects in its structure can prove fatal. This machine converts chemical energy stored in an ATP molecule into mechanical energy that moves material though the cell along slender filaments called microtubules. One of the dynein motor's most important functions occurs during cell division, when it helps move chromosomes into proper position. ***(Courtesy of U.S. Department of Energy Genomes to Life program: www.DOEGenomesToLife.org)***

dysentery Sickness that usually involves the abdomen causing cramps, vomiting, and swelling. Caused by a bacterium, *Shigella bacillus,* or a protozoon, *Entamoeba histolytica.*