

M

m 1. Meta. 2. Milli. 3. Meter. 4. Prefix or subscript used to designate the modified form of an interconvertible enzyme. 5. Molal concentration.

M 1. Molar concentration. 2. Molecular weight. 3. Metal ion. 4. Methionine. 5. Mitosis. 6. Thioinosine. 7. The M phase of the cell cycle.

M13 A filamentous phage that contains circular, single-stranded DNA and infects *E. coli* by adsorbing to the F-pilus on the surface of the cell.

MAbs Monoclonal antibodies.

macroamylase An abnormal, high molecular weight (about 200,000 daltons) form of α -amylase that occurs in some individuals; probably consists of α -amylase bound to either IgA or some other (normal or abnormal) high molecular weight plasma protein.

macroevolution Evolution that extends over long time periods, involves large steps, and leads to marked changes in the genetic makeup of an organism.

macroglobulin A globulin, such as the IgM immunoglobulin, that has a molecular weight above 400,000.

macroglobulinemia The presence of excessive amounts of macroglobulins, specifically IgM immunoglobulins, in the blood.

macroion A charged macromolecule.

macrolide antibiotic One of a number of antibiotics, such as erythromycin and oleandomycin, that are similar in their structure, action, and antimicrobial spectrum, and that are characterized by having a large lactone ring that contains anywhere from 14 to 20 carbon atoms; they are produced by various strains of *Streptomyces* and inhibit protein synthesis.

macromineral An element that is required in the diet in relatively large amounts; Ca, P, Mg, Na, K, and Cl are examples.

macromolecule A high molecular weight molecule; a polymer.

macromutation A mutation in which a large segment of a chromosome is altered, as distinct from a point mutation.

macronucleus One of two types of reproductive nuclei found in many ciliate protozoa; they are large, contain nucleoli, are usually polyploid, and contain active DNA that undergoes transcription. A cell may contain

one or more macronuclei. *See also* micronucleus.

macronutrient An essential nutrient that is needed by an organism in appreciable amounts; carbohydrates, lipids, and proteins are examples.

macrophage A cell, derived from the reticuloendothelial system, that functions in phagocytosis.

macrophage activation factor MIGRATION ENHANCEMENT FACTOR.

macrophage inhibition factor MIGRATION INHIBITION FACTOR.

macropinocytosis Pinocytosis that involves the formation of large vesicles, having diameters in excess of 300 nm.

macroscopic Descriptive of a size that is visible to the unaided eye.

macroscopic binding constant The binding constant for the binding of the first, second, or subsequent ligand to a macromolecule; K_1 , K_2 , etc. *See also* microscopic binding constant.

MAF Migration activation factor. *See* migration enhancement factor.

magainin One of two closely related peptides (23 amino acids each), isolated from frog skin, that kill a variety of bacteria, fungi, and protozoa; believed to be part of a defense system in vertebrates that is different from the immune system. The magainins appear to damage the cell membrane and work faster than antibiotics.

magic amino acids The set of 20 amino acids that are required by all living species for the biosynthesis of proteins. While more than 20 amino acids occur in proteins, these additional amino acids (such as hydroxyproline and phosphoserine) represent modifications of the "magic 20."

magic number 1. The number of different amino acids that occur in proteins. 2. The number of either the neutrons or the protons which, when they occur in an atomic nucleus, contribute to the stability of the nucleus.

magic spot One of two unusual nucleotides, originally discovered as spots on a radioautogram and designated I and II, that occur in microorganisms and that serve in a regulatory capacity; they are the effectors of the stringent response in bacteria and are believed

- to function as alarmones. The nucleotides are guanosine-5'-diphosphate, 3'-diphosphate ($_{pp}G_{pp}$) and guanosine-5'-triphosphate, 3'-diphosphate ($_{ppp}G_{pp}$). *Abbr* MS.
- magnesium** An element that is essential to all plants and animals. Symbol, Mg; atomic number, 12; atomic weight, 24.312; oxidation state, +2; most abundant isotope, ^{24}Mg ; a radioactive isotope, ^{28}Mg , half-life, 21.3h, radiation emitted, beta particles and gamma rays.
- magnetic affinity chromatography** A variation of affinity chromatography in which the irreversibly bound molecule (or ligand) binds to its complementary molecule in solution and the resulting complex is removed from suspension by the application of a magnetic field. The method is particularly useful when dealing with marginally soluble materials.
- magnetic circular dichroism** Circular dichroism that is measured in the presence of a magnetic field. Magnetic circular dichroism depends on the nature of, and the couplings between, the ground and the excited states of the chromophore; it reflects the intrinsic geometry of the chromophore and is not sensitive to the surroundings of the chromophore. *Abbr* MCD. *See also* circular dichroism.
- magnetic dipole** A substance that has two magnetic poles; the separation between the poles is measured by the magnetic dipole moment.
- magnetic dipole moment** A measure of the tendency of a substance to become oriented in a magnetic field; equal to the product of the strength of the magnetic pole and the length of the magnet. The magnetic dipole moment depends on the presence or absence of paired electrons, since a spinning electron behaves as a magnet. Substances with paired electrons have no net magnetic dipole moment and are diamagnetic; substances with unpaired electrons have a permanent magnetic dipole moment and are paramagnetic.
- magnetic field** The space surrounding magnetic poles in which a mechanical force will be exerted on a magnet introduced into it.
- magnetic moment** MAGNETIC DIPOLE MOMENT.
- magnetic resonance** *See* electron paramagnetic resonance; nuclear magnetic resonance.
- magnetic stirrer** A plastic- or glass-coated magnet that is used as a stirring bar in conjunction with an appropriate electric motor.
- magnetic susceptibility** A measure of the tendency of a substance to become oriented in a magnetic field; the proportionality constant between the total magnetic moment per unit volume in the direction of an applied magnetic field and the magnetic field strength.
- magnetic transition moment** The magnetic moment that is induced in a molecule during a transition, such as that associated with the absorption of a photon, as a result of a rotation of charge.
- magnetoliposome** An artificial structure prepared by binding ferromagnetic particles to antibody-bearing liposomes.
- magnetosome** A small, subcellular, electron-dense particle that consists of magnetite (Fe_3O_4). A chain of these particles occurs in some aquatic bacteria and functions as a compass, orienting the bacterium in the same direction as the lines of force of the earth's magnetic field.
- magnetosphere** A region in space in which planetary magnetic fields govern local physical processes.
- magnetotaxis** A taxis in which the stimulus is a magnetic field. *See also* magnetosome.
- magnetotactic** Of, or pertaining to, magnetotaxis.
- magnification** The apparent enlargement of an object when viewed through a microscope; expressed as the number of times that the diameter of the object appears to have been enlarged.
- magnitude** *See* order of magnitude.
- Maillard reaction** One of a group of nonenzymatic reactions in which aldehydes, ketones, or reducing sugars react with amino acids, peptides, or proteins; these occur as part of the browning reactions of food.
- main band DNA** The bulk DNA, as opposed to the smaller fractions referred to as satellite bands. *See also* satellite DNA.
- main diffusion coefficient** The diffusion coefficient that a component has when no other diffusing components are present; used in the treatment of diffusion data in a system showing interaction of flows. *See also* cross-term diffusion coefficient.
- mainframe computer** A large computer, storing enormous amounts of information.
- maize factor** ZEATIN.
- major gene** A gene that has a marked phenotypic effect as opposed to a modifying gene.
- major groove** The deep and wide groove in Watson-Crick type DNA that is approximately 22 Å across.
- major histocompatibility complex** 1. A multigene locus that is responsible for the production of the histocompatibility antigens. The locus has been assigned different symbols in different organisms, such as human (HLA), mouse (H-2), chicken (B), dog (DLA), guinea pig (GPLA), and rat (Rt-1). The corresponding major histocompatibility antigens (MHC antigens) have been designated as

HLA antigens, H-2 antigens, and so on. *Abbr* MHC. 2. MAJOR IMMUNOGENE COMPLEX.

major immunogene complex A genetic region that includes the major histocompatibility complex but extends beyond it to include other functions of the immune system such as transplantation rejection, killing of virus-infected cells, and synthesis of complement. *Abbr* MIC.

major-minor code An early version of the genetic code according to which the central nucleotide of a codon is the major factor in positioning the correct amino acid on the template, while the two adjoining nucleotides are minor factors in selecting the amino acid.

MAK Methylated albumin-kieselguhr.

malaria An acute, and sometimes chronic, disease of human and other vertebrates that is caused by protozoans of the genus *Plasmodium* which are transmitted by mosquitoes of the genus *Anopheles*.

malate-aspartate shuttle A shuttle, the components of which are malic acid, α -ketoglutaric acid, glutamic acid, aspartic acid, and the enzymes malate dehydrogenase and glutamic-aspartic transaminase. The shuttle achieves the oxidation of cytoplasmic NADH at the expense of the reduction of mitochondrial NAD^+ .

malathion An insecticide and nerve poison that forms a stable covalent intermediate with a serine residue in the active site of acetylcholinesterase.

male hormone TESTOSTERONE.

maleic acid The cis isomer of fumaric acid that is not an intermediate in the citric acid cycle.

male sex hormone An androgen that affects the development of secondary sex characteristics in the male. The principal male sex hormones are testosterone and dihydrotestosterone which are produced by the testes; other compounds that have male sex hormone activity, such as adrenosterone, are produced by the adrenal gland.

malic acid A dicarboxylic acid that is formed from fumaric acid in the reactions of the citric acid cycle.

malic enzyme The enzyme that catalyzes the anaplerotic reaction whereby pyruvic acid is carboxylated to malic acid.

malignant Descriptive of a tumor that metastasizes and endangers the life of the organism.

malnutrition A condition that is caused by inadequate quantity, quality, digestion, absorption, or utilization of ingested nutrients.

malolactic fermentation A type of fermentation, carried out by lactic acid bacteria, in which L-malic acid is converted to lactic acid and CO_2 .

Maloney leukemia virus A retrovirus that produces lymphocytic leukemia in mice; it can be transmitted from mother to offspring via the milk.

malonic acid A competitive inhibitor of the enzyme succinate dehydrogenase; a three-carbon, dicarboxylic acid that closely resembles succinic acid.

maltose A disaccharide that is composed of two glucose residues linked by means of an $\alpha(1 \rightarrow 4)$ glycosidic bond and that constitutes the repeating unit of starch.

malt sugar MALTOSE.

mammal A vertebrate of the class Mammalia that is characterized by possession of hair and mammary glands.

mammalian Of, or pertaining to, mammals.

mammalian expression vector A vector capable of producing large quantities of eukaryotic proteins; a shuttle vector that is usually first grown in *E. coli* and then in animals.

mammary tumor agent MOUSE MAMMARY TUMOR VIRUS.

mammothropin PROLACTIN.

Man Mannose.

mandelate pathway A degradative pathway of mandelic acid, catechol, and related aromatic compounds that occurs in *Pseudomonas fluorescens*.

manganese An element that is essential to all animals and plants. Symbol, Mn; atomic number, 25; atomic weight, 54.9380; oxidation states, +2, +3, +4, +7; most abundant isotope, ^{55}Mn ; a radioactive isotope, ^{54}Mn , half-life, 313 days, radiation emitted, gamma rays.

mannan A homopolysaccharide of mannose that occurs in bacteria, molds, and plants.

Mannich reaction The condensation of an aldehyde and an amine with a nucleophilic carbon atom; believed to constitute part of the biosynthetic pathway of alkaloids.

mannitol A sugar alcohol derived from mannose.

mannose A six-carbon aldose. *Abbr* Man.

mannosidosis A genetically inherited metabolic defect in humans that is due to a deficiency of the enzyme α -mannosidase.

manometer An instrument for measuring the pressure of a liquid or a gas.

M antigen M PROTEIN (1-3).

mantissa The fractional part of a logarithm.

Mantoux test An intradermal tuberculin test for delayed-type hypersensitivity in humans.

MAO Monoamine oxidase.

MAOI Monoamine oxidase inhibitor.

map 1. *n* GENETIC MAP. 2. *n* CYTOGENETIC MAP. 3. *v* To establish the structure or structural details for a portion of a macromolecule, as in the mapping of an active site. 4. *v* To establish

the location of either a mutable site on a genetic map or a gene on a cytogenetic map. *See also* peptide map; nucleotide map; restriction map.

MAP Microtubule-associated proteins.

map distance The distance between any two markers on a genetic map. *See also* map unit.

maple syrup urine disease A genetically inherited metabolic defect in humans that is associated with mental retardation and that is characterized by the presence of urinary ketoacids derived from valine, leucine, and isoleucine; due to a deficiency of the enzyme, ketoacid decarboxylase.

map unit A measure of distances along a linkage map that is equal to a recombination frequency of 1%. *Abbr* mu.

Marasmus A disease of infant starvation that is similar to kwashiorkor but involves, additionally, dietary deficiencies of carbohydrates and lipids; caloric starvation.

marigranules Synthetic organized particles produced from a mixture of glycine, acidic, basic, and aromatic amino acids using a modified sea medium in experiments that simulate chemical evolution in the primordial soup. *See also* marisomes.

marihuana Variant spelling of marijuana.

marijuana 1. The dried and chopped tips of the shoots of the female hemp plant (*Cannabis*); contains Δ^1 -tetrahydrocannabinol (THC) which is psychoactive; a common narcotic. *Var sp* marihuana. 2. HASHISH.

Mariotte flask A device used in column chromatography for maintaining a constant pressure head of eluent; consists of a liquid reservoir containing a tube that is open to the air.

marisomes Synthetic organized particles, with elastin-like properties, that are formed in experiments that simulate chemical evolution in the primordial soup. They are prepared by heating amino acids at 105°C for several weeks under nitrogen in a seawater medium. Marisomes may represent a protocell-type, macromolecular complex, and are believed to be precursors of marigranules.

marker 1. A mutable site on a chromosome that is useful for cell identification and for genetic studies; the site of a gene of known function and known location on the chromosome. *See also* biochemical marker; genetic marker. 2. A group or a molecule that is linked chemically to another molecule for purposes of identification. 3. A reference substance that is used in a physical technique such as chromatography, electrophoresis, or density gradient centrifugation.

marker enzyme An enzyme, the intracellular location of which is known, so that an assay of the enzyme can be used as an aid in following

the isolation and purification of subcellular fractions.

marker rescue The incorporation of a genetic marker from a mutated virus into the DNA of an active progeny virus during cross-reactivation.

Marker synthesis A partial synthetic procedure for the synthesis of steroid hormones developed by R.E. Marker; involves the conversion of diosgenin (the aglycone of the steroid saponin, dioscin) to progesterone.

Markov chain A Markov process in which either the time parameters or the values of the process are discontinuous.

Markovnikov's rule The rule, proposed by Markovnikov in 1905, that in the addition reaction of HX to an alkene, the acid hydrogen becomes attached to the carbon with fewer alkyl substituents. Conversely, the X group always bonds to the carbon with more alkyl substituents. The rule is applicable, for example, to some reduction reactions of double bonds catalyzed by pyridine-linked dehydrogenases. *Var sp* Markownikoff's rule.

Markov process A stochastic process such that the conditional probability distribution for the state at any future instant, given the present state, is unaffected by an additional knowledge of the past history of the system.

Maroteaux-Lamy syndrome A genetically inherited metabolic defect in humans that resembles Hurler's syndrome but does not involve loss of normal intelligence. A mucopolysaccharidosis due to a deficiency of the enzyme N-acetylgalactosamine sulfatase.

maser Acronym for microwave amplification by stimulated emission of radiation; a device capable of producing intense beams of microwave radiation.

masked mRNA Messenger RNA that is stored in large quantities in eukaryotic cells, particularly in unfertilized eggs (sea urchin eggs, for example). The mRNA is present in an inactive form; it is protected against digestion by nucleases and prevented from binding to ribosomes, apparently by being associated with proteins. Shortly after fertilization, the mRNA is activated and then translated.

masked residue An amino acid residue in a protein that is not accessible to, and cannot undergo a reaction with, specific reagents. The lack of activity may be due to the occurrence of the residue in the internal portion of the protein or to stereochemical, electrostatic, and other properties of its immediate environment.

masked virus A tumor virus that lacks pathogenic activity.

Mason's theory A theory that describes the first step in chemical carcinogenesis in terms

of the electronic interactions between the carcinogen and either a protein or a nucleic acid molecule of the affected cell or organism.

mass absorption coefficient A measure of the absorption efficiency of gamma radiation, defined as the ratio of the linear absorption coefficient to the density of the absorber.

mass action See law of mass action.

mass-action ratio The concentration term $\frac{[\text{products}]}{[\text{reactants}]}$ as it is used, for example, in calculating free energy changes of reactions. For the reaction $aA + bB \rightleftharpoons cC + dD$, the mass-action ratio is given by

$$\frac{[C]^c[D]^d}{[A]^a[B]^b}$$

where [] indicate actual, not equilibrium, concentrations.

mass balance equation CONSERVATION EQUATION.

mass chromatogram 1. A paper chromatogram of preparative-type separations in which the sample is streaked as a band on a large sheet of filter paper. 2. A reconstructed ion-current profile obtained by means of a computer from mass spectrometry data.

mass fragmentogram The photographic record obtained from mass fragmentography.

mass fragmentography The combined use of gas chromatography and mass spectrometry in which the effluent from a gas chromatographic column is fed into a mass spectrometer which serves as a detector for the recording of from one to three fragments at preselected mass-to-charge ratios; the mass spectrometer is preset to these mass-to-charge ratios and serves as a sensitive detector for small quantities of specific ions. *Aka* single-ion monitoring.

mass number The sum of the number of protons and neutrons in the nucleus of an atom. *Sym* A.

mass spectrogram The photographic record of a mass spectrum as obtained with a mass spectrograph.

mass spectrograph A mass spectrometer in which a photographic record of the mass spectrum is obtained.

mass spectrometer An instrument for the separation of charged particles according to their mass-to-charge ratios. Molecules and ions are fragmented by bombardment with electrons, and the ions thus formed are focused by means of electrostatic and magnetic fields and ultimately strike a photographic plate or some other detector. Both the mass-to-charge ratios and the relative amounts of the charged fragments can be determined.

mass spectrum A plot of the number of fragments as a function of their mass-to-charge ratio as measured with a mass spectrometer or

a mass spectrograph.

mass stopping power LINEAR ENERGY TRANSFER.

mass unit See atomic mass unit.

mast cell A basophilic cell of connective tissue that contains heparin and histamine and that functions in immediate-type hypersensitivity.

master gland The pituitary gland.

master pattern See King-Altman procedure.

master plate The mounted piece of sterile velvet that is used in replica plating and that is covered with the original bacterial culture.

master-slave model A genetic model according to which each cistron is present in the form of many copies, joined end to end. In this linear group of genes, there is one copy (probably at the end) that is the "master" and all the other genes are the "slaves." The latter are corrected once per life cycle of the organism so that they conform to the master copy.

master strand SENSE STRAND.

mate killer A *Paramecium aurelia* cell that carries mu particles and that kills or injures sensitive paramecia with which it conjugates; the mu particles protect the organism against other mate killers. See also kappa particle.

mathematical model An equation that describes the behavior of an actual physical system and that is derived on the basis of theoretical considerations and pertinent numerical parameters.

mating pool See Visconte-Delbrueck hypothesis.

matrix (*pl* matrices). 1. A gel-like substance that fills the space between the cristae of mitochondria and that is the site of many of the enzymes of the citric acid cycle. 2. A rectangular array having *m* rows, each containing *n* numbers (called elements).

matrix interference The interference that occurs in atomic absorption spectrophotometry when light is absorbed either by the organic solvent in which the sample is dissolved, or by the solids that are formed from this solvent by its evaporation in the flame.

matrix method A mathematical method for treating a steady-state enzyme system in which the time derivatives of the differential equations describing this state are set equal to zero, and the resultant algebraic equations are then solved by matrix inversion.

matrix proteins Protein components of the outer membrane of gram-negative bacteria; they are characterized by their tight, but noncovalent, association with peptidoglycan, and can be released from the latter by extraction with sodium dodecyl sulfate.

maturase A protein that is encoded by an intron-exon combination and that helps catalyze the excision of the intron from its own primary RNA transcript. In this mechan-

ism (known as splicing homeostasis), the maturase destroys its own mRNA and thereby limits its own level of activity. Maturase is believed not to be an enzyme but rather a factor that modifies the specificity of a splicing enzyme.

maturation 1. The development of a red blood cell from its formation to its final form as an erythrocyte. 2. The assembly of the different components of a virus that results in a complete and infectious virion. 3. The development of a spore. 4. **SPLICING** (2).

maturation-defective mutant A phage mutant that can synthesize DNA but not the viral structural proteins.

maturation factor 1. A substance in liver that aids the maturation of red blood cells; vitamin B₁₂ or a combination of vitamin B₁₂ and intrinsic factor. 2. **MATURATION PROTEIN**.

maturation protein A phage-specific protein of small RNA phages, such as MS2, ϕ 2, and R17, that is required for the production of complete and infectious phage particles. *Aka* maturation factor; A protein.

mature virion A fully assembled, infectious virus particle.

maturity-onset diabetes *See* diabetes.

max Maximum.

Maxam-Gilbert method A chemical method for sequencing DNA. The method entails labeling single-stranded DNA, derived from double-stranded DNA, with radioactive phosphate (³²P) at the 5'-end. The DNA preparation is then divided into several parts and each part is subjected to a different chemical cleavage procedure. These procedures break the DNA at specific points and the resulting fragments are separated by polyacrylamide gel electrophoresis (on the basis of their size) and detected by autoradiography. The method can also be adapted to sequencing RNA.

maximal medium A rich medium that contains all the necessary metabolites for the growth of cells and that frequently consists of a protein hydrolysate, a yeast extract, and inorganic salts.

maximum height-area method A method for calculating translational diffusion coefficients from the height of the peak of the gradient curve and from the area under the peak.

maximum permissible body burden The greatest amount of total, cumulative exposure of an individual to radioactive radiation that is permitted by federal safety standards.

maximum permissible concentration The greatest concentration of radioactive isotopes in air and water that is permitted by federal safety standards. *Abbr* MPC.

maximum permissible dose The greatest amount of radioactive radiation that an indi-

vidual may receive over a given period of time according to federal safety standards. *Abbr* MPD.

maximum stationary phase **STATIONARY PHASE** (1).

maximum velocity The greatest velocity of an enzymatic reaction that is attainable with a fixed amount of enzyme under defined conditions; the velocity that is obtained when the enzyme is saturated with substrates and cosubstrates. *Sym* V_{max} ; V .

Maxwell distribution A plot of the "fraction" of molecules of a gas or a liquid as a function of their kinetic energy. The "fraction" is equal to $(1/N)(dN/dE)$ where N is the number of molecules having a kinetic energy E .

Maxwell effect **FLOW BIREFRINGENCE**.

Maxwell's demon A whimsical creature, proposed by James Clerk Maxwell to illustrate a violation of the second law of thermodynamics. The demon is visualized as operating a gate between two chambers containing a gas in thermal equilibrium such that only fast molecules approaching from one direction, and only slow molecules approaching from the other, are let through. This would result in an increase in the average kinetic energy of the molecules in one chamber (a temperature increase) and a decrease of energy and temperature in the other chamber. Thus, a temperature difference would be produced spontaneously in a system in thermal equilibrium which is in violation of the second law. Leo Szilard pointed out later that Maxwell's argument was invalid since it did not consider the information processing activities of the demon. These consist of detecting the molecular velocities and deciding to open or close the gate. Hence, the total entropy change, that of the gas plus that of the demon and his measuring instruments, must be positive in accordance with the second law of thermodynamics.

Mb Myoglobin; related compounds are abbreviated as MbO₂ (oxymyoglobin) and MbCO (carbon monoxide myoglobin).

MBSA Methylated bovine serum albumin.

mc Millicurie.

MC Microtubule organizing center.

5-MC 5-Methylcytosine.

McArdle-Schmid-Pearson disease **GLYCOGEN STORAGE DISEASE TYPE V**.

McArdle's disease **GLYCOGEN STORAGE DISEASE TYPE V**.

MCD Magnetic circular dichroism.

M chain One of two types of polypeptide chains of lactate dehydrogenase isozymes; denoted M, since the tetramer of M chains is found predominantly in muscle tissue.

mCi Millicurie.

McLeod gauge A laboratory pressure gauge for measuring gas pressures of vacuum systems to as low as 10^{-6} mm Hg.

M component PARAPROTEIN.

MCP Methyl-accepting chemotaxis protein.

MDGC Multidimensional gas chromatography.

MDH Malate dehydrogenase.

mDNA Mitochondrial DNA.

MDR Morphology-dependent resonance.

Me Methyl group.

mean The value obtained by summing the values of a set of measurements and dividing the sum by the number of individual measurements in the set; arithmetic average.

mean activity coefficient See mean ionic activity coefficient.

mean deviation The arithmetic mean (average) of the absolute deviations from the mean.

mean free path The average distance traveled by a molecule, an ionizing particle, or some other particle between collisions in a gas at equilibrium.

mean generation time DOUBLING TIME.

mean ionic activity coefficient The average activity coefficient for the anion and cation of an electrolyte. It may be calculated from the Debye-Hueckel limiting law: $\log \gamma_{\pm} = -0.509|z_+z_-|/\sqrt{I}$, where γ_{\pm} is the mean ionic activity coefficient, $|z_+z_-|$ represents the product for the absolute values of the charges of the cation and anion, respectively, and I is the ionic strength.

mean life AVERAGE LIFE.

mean range The distance between the source of a radiation, particularly a source of alpha particles, and the point at which the intensity of the beam is reduced to one-half.

mean residue rotation The specific rotation of a polymer that is calculated on the basis of the concentration of the monomers, or residues, of the polymer rather than on the basis of the concentration of the intact polymer molecules. Specifically, $[m] = M_0[\alpha]/100$, where $[m]$ is the mean residue rotation, M_0 is the mean residue weight, and $[\alpha]$ is the specific rotation of the polymer. If the mean residue rotation is corrected to that in a medium having a refractive index of one, it is given by the expression $[m] = \{3/(n^2 + 2)\} \times M_0[\alpha]/100$, where n is the refractive index of the medium.

mean residue weight The average molecular weight of a monomer, or residue, in a polymer.

mean square VARIANCE.

mean square deviation The squared difference between an estimated and a theoretically correct value. *Aka* mean square error.

mean square displacement The average of the sum of the squared displacements of a molecule in a given time; the distances that a mole-

cule moves (displacements) are squared, the squared values are added, and the sum is divided by the number of displacements.

mean square end-to-end distance ROOT MEAN SQUARE END-TO-END-DISTANCE.

mean square error MEAN SQUARE DEVIATION.

measuring pipet A pipet consisting of a tube of uniform diameter that is drawn out to a tip and is graduated uniformly along its length.

mechanism 1. A step-by-step description of a chemical or a physical reaction or reaction sequence; for a chemical reaction this includes the electron shifts and the bond-making and bond-breaking aspects of the reaction. 2. MECHANISTIC PHILOSOPHY.

mechanistic philosophy The doctrine that life and its phenomena are explicable entirely in terms of the laws and processes of chemistry and physics. *Aka* mechanism. See also vitalism.

mechanistic process A deterministic process in which each step is a necessary and direct result of a preceding step. See also stochastic process.

mechanistic theory 1. A theory according to which the evolution of the genetic code is based on a necessary physical-chemical relation between an amino acid and its codons; consequently, the code could have evolved in one, or at most in a few, possible ways. See also selective theory. 2. A theory according to which the formation of atherosclerotic plaques in atherosclerosis is due to the precipitation and/or the coagulation of one or more of the components of the blood.

mechanochemical coupling hypothesis CONFORMATIONAL COUPLING HYPOTHESIS.

median The value of a set of measurements around which the measurements are equally distributed; one-half of the measurements are numerically greater and one-half are numerically smaller than this value.

median effective dose The dose of a drug that produces therapeutic effects in 50% of the animals in a test group within a specified time. *Sym* ED₅₀. See also EC₅₀.

median hemolytic dose The dose of complement that produces hemolysis in 50% of a standardized suspension of sensitized erythrocytes. *Sym* HD₅₀.

median immunizing dose The dose of a vaccine or an antigen that produces immunity in 50% of the animals in a test group within a specified time.

median infectious dose The dose of bacteria or viruses that produces demonstrable infection in 50% of the animals in a test group within a specified time. *Sym* ID₅₀. *Aka* median infective dose.

median lethal dose The dose of bacteria,

- viruses, or a toxic compound that produces deaths in 50% of the animals in a test group within a specified time. *Sym* LD₅₀. *See also* half-value dose.
- median paralysis dose** The dose of virus that produces paralysis in 50% of the animals in a test group within a specified time. *Sym* PD₅₀.
- median tissue culture dose** The dose of virus that produces tissue culture degeneration in 50% of the test units within a specified time. *Sym* TC₅₀; TCD₅₀. *Aka* tissue culture infectious dose.
- median toxic dose** The dose of a toxic agent that produces toxic effects in 50% of the animals in a test group within a specified time. *Sym* TD₅₀.
- mediated transport** The movement of a solute across a biological membrane that requires the participation of one or more transport agents. The transport may be passive (along a concentration gradient) or active (against a concentration gradient).
- medicine** 1. The science and art of diagnosing, treating, and preventing disease. 2. A substance used in either the treatment or the prevention of a disease.
- medium** (*pl* media) A liquid or a solid preparation of nutrients that is used for the maintenance and growth of microorganisms and cells and for the cultivation of tissues and organs.
- medium-chain fatty acid thiokinase** A fatty acid thiokinase that catalyzes the activation of fatty acids having 4 to 12 carbon atoms to fatty acyl coenzyme A.
- medulla** *See* adrenal medulla.
- MEF** Migration enhancement factor.
- mega-** Combining form meaning one million (10⁶) and used with metric units of measurement. *Sym* M.
- megadose** A very large dose such as the gram quantities of vitamin C recommended by Linus Pauling for the prevention of colds.
- megamitochondrion** An enlarged mouse liver mitochondrion that is produced artificially by exposure of the animal to the drug cuprizone (biscyclohexanone oxaldihydrazone) or the antibiotic chloramphenicol.
- Mehler reaction** A photosynthetic reaction whereby hydrogen peroxide is formed from water and molecular oxygen.
- meiosis** The nuclear division of the germ cells of sexually reproducing organisms in which the chromosome number is halved; it occurs during gametogenesis in animals and during sporogenesis in plants.
- meiospore** A spore produced by meiosis.
- meiotic** Of, or pertaining to, meiosis.
- meiotic drive** An irregularity in the segregation of the chromosomes during meiosis that leads to alterations in the allele frequencies of a population.
- meiotic effect** The phenomenon in which the mutation rate during meiosis differs from that during mitosis.
- Meister cycle** γ -GLUTAMYL CYCLE.
- melanic** 1. Of, or pertaining to, melanism. 2. Having a dark pigmentation.
- melanin pigment** One of a group of dark coloring substances that are responsible for the pigmentation of the skin and that are formed in melanocytes by the oxidation of phenylalanine, tyrosine, and other aromatic compounds.
- melanism** The abnormal coloration of the skin or other tissues that is caused by the accumulation of melanin pigments.
- melanocyte** A cell that synthesizes melanin pigments in its cytoplasm.
- melanocyte-stimulating hormone** One of two peptide hormones, denoted α and β , that are produced by the posterior lobe of the pituitary gland and that have a darkening effect by causing the dispersion of melanin pigments in the melanocytes. *Abbr* MSH.
- melanocyte-stimulating hormone regulatory hormone** One of two hypothalamic hormones (or factors) that, respectively, stimulates or inhibits the release of melanocyte-stimulating hormone from the pituitary gland. The melanocyte-stimulating hormone releasing hormone (or factor) is abbreviated variously as MRH (MRF), or MSHRH (MSHRF). The melanocyte-stimulating hormone release-inhibiting hormone (or factor) is abbreviated variously as MIH (MIF), MRIH (MRIF), MSHIH (MSHIF), or MSHRIH (MSHRIF).
- melanocyte-stimulating hormone release-inhibiting hormone** *See* melanocyte-stimulating hormone regulatory hormone.
- melanocyte-stimulating hormone releasing hormone** *See* melanocyte-stimulating hormone regulatory hormone.
- melanogen** One of a group of compounds frequently observed in the urine of patients with malignant melanoma; believed to be either precursors of melanin or metabolic byproducts of melanin biosynthesis.
- melanoma** A malignant tumor derived from melanocytes.
- melanosome** A tyrosinase-containing intracellular organelle of melanocytes.
- melanotrophin** Variant spelling of melanotropin.
- melanotropin** MELANOCYTE-STIMULATING HORMONE.
- melatonin** A tryptophan-related hormone that is formed in the pineal gland and that reverses

the darkening effect of the melanocyte-stimulating hormone by causing aggregation of the melanin granules in the melanocytes.

mellitose RAFFINOSE.

melittin A linear polypeptide of 26 amino acids that is the major component of bee venom; a toxic and hemolytic peptide that is synthesized as an inactive precursor, promelittin.

melituria GLYCOSURIA.

melphalan A mutagenic, alkylating agent. *Var sp* melphalin.

melting 1. The transition of double-helical nucleic acid segments to random coil conformations that is produced by an increase in the temperature of the solution containing the nucleic acid and that is due to the breaking of the hydrogen bonds of the paired bases. *Aka* thermal denaturation; melting out. 2. The transition of a solid to a liquid that is produced by an increase in temperature.

melting curve THERMAL DENATURATION PROFILE.

melting out profile THERMAL DENATURATION PROFILE.

melting out temperature The temperature of a thermal denaturation profile at which one-half of the maximum change in absorbance (or other property) is obtained; the temperature at which one-half of the helical structure is lost. *Sym* T_m ; $T_{1/2}$. *Aka* melting temperature.

melting point 1. MELTING OUT TEMPERATURE. 2. The temperature at which a solid changes to a liquid as a result of the application of heat; at this temperature the solid and the liquid are in equilibrium.

melting profile THERMAL DENATURATION PROFILE.

melting protein SINGLE-STRAND BINDING PROTEIN.

membrane carrier *See* carrier (3).

membrane electrode An electrode, such as the glass electrode, that has a membrane incorporated into its design.

membrane equilibrium GIBBS-DONNAN EQUILIBRIUM.

membrane filter A thin filter, made of nitrocellulose or other cellulose esters, that is used for the collection of microorganisms and of protein and nucleic acid precipitates.

membrane fluidity *See* fluid mosaic model.

membrane hydrolysis The effective hydrolysis of a protein, present on one side of a membrane, that is brought about by establishment of a pH gradient across the membrane (as in the Gibbs-Donnan equilibrium); involves conversion of a salt form of the protein (P) to a protonated or hydroxylated form. For example: $\text{NaP} + \text{H}_2\text{O} \rightleftharpoons \text{HP} + \text{NaOH}$; $\text{PCl} + \text{H}_2\text{O} \rightleftharpoons \text{POH} + \text{HCl}$.

membrane mimetic chemistry Chemical research of processes that take place in simple media and that mimic aspects of biological membranes; includes studies of aqueous micelles, reversed micelles, monolayers, black membranes, and the like.

membrane osmometer An osmometer that has a semipermeable membrane incorporated into its design and that is used for measurements of osmotic pressure and for determinations of number average molecular weights of macromolecules.

membrane potential The electrical potential across a membrane, particularly a biological membrane, that arises from the charges in the membrane and from the charges present on either side of the membrane. *See also* diffusion potential; dipolar potential; distribution potential; equilibrium potential.

membrane structure *See* Benson model; Davson-Danielli model; fluid mosaic model; supermolecule.

membrane transport The movement of materials across a biological membrane.

membrane trigger hypothesis An alternative to the signal hypothesis. According to this hypothesis, some proteins, which are synthesized on soluble polysomes, can assume two conformations, one that is more stable in aqueous solutions and another that is induced (triggered) by contact with the hydrophobic environment of the membrane. The soluble protein precursor is thought to undergo a conformational change as it inserts itself into the bilayer of the membrane.

membranochromic pigment One of a group of pigments, such as phenols and quinones, that impregnate the cell wall of plants.

membranolysis Lysis of the cell membrane.

membron A functioning, regulatable, translating complex of a polysome and a specific surface area of a biological membrane.

membron theory of cancer The theory according to which tumor cells differ from normal cells in the stability of their membrons.

memory 1. A device for storing information. 2. IMMUNOLOGICAL MEMORY. 3. The storage capacity of a computer.

memory cell A cell that is responsible for immunological memory. A lymphocyte in peripheral lymphoid tissue that is not actively engaged in making an immunological response to a given antigen but that is readily induced to do so, and to become an effector cell, by a later encounter with the same antigen.

memory response SECONDARY IMMUNE RESPONSE.

menadione Vitamin K_3 .

menaquinone Vitamin K₂.

Mendelian Of, or pertaining to, Mendel or to his laws of heredity.

Mendelian character A character that follows Mendel's laws of inheritance.

Mendel's laws The laws of inheritance proposed by Mendel in 1866 and known as the law of segregation and the law of independent assortment.

mengo virus A virus that belongs to a subgroup of picornaviruses and that can cause fatal encephalitis in mice.

meniscus The flat or crescent-shaped interface between a liquid in a tube and air.

meniscus depletion sedimentation equilibrium

A variation of the sedimentation equilibrium method in which the ultracentrifuge is operated at sufficiently high speeds so that all the macromolecules are sedimented out of the region near the meniscus. The method obviates a separate run to determine the initial concentration of the solution, is especially useful for monodisperse systems, and is generally used in conjunction with an interferometric optical system.

menu A list of computer commands that most ready-made programs will display at request.

meq Milliequivalent; also denoted mEq.

meractinomycin ACTINOMYCIN D.

mercaptan THIOL.

2-mercaptoethanol A sulfhydryl group containing compound that is used to protect the sulfhydryl groups of enzymes and other proteins against oxidation.

β-Mercaptoethylamine The sulfhydryl group-carrying component of coenzyme A.

mercapto group The sulfhydryl (—SH) group.

6-mercaptapurine A purine analogue used in cancer chemotherapy; an antitumor agent. *Abbr* MP.

mercapturic acids A large group of substances formed by the detoxification of xenobiotics. The reactions involve conjugation of the xenobiotic with glutathione (catalyzed by glutathione-S-transferases, also called ligandins), followed by removal of the glutamyl and glycyl residues of glutathione and conversion of the residual compound (containing the cysteine residue of glutathione) to a sulfur-containing acid, called mercapturic acid.

mercerization The treatment of cellulose with 20% sodium hydroxide which produces a cellulose that has an increased capacity for dyes and a greater tensile strength.

mercurial An organic compound, such as a drug, that contains mercury.

meridian The direction on the film, in x-ray diffraction, that is parallel to the fiber axis and that passes through the x-ray beam when the film is considered to be wrapped cylindrically

about the fiber axis; a line that is perpendicular to the layer lines.

meridional 1. Of, or pertaining to, a meridian. 2. At right angles to the equator.

meridional reflection An x-ray diffraction spot that lies on the meridian.

merocrine gland A gland that produces a secretion without significantly damaging its secreting cells.

meromyosin One of two fragments produced from myosin by treating it with either trypsin or chymotrypsin. *See also* heavy meromyosin; light meromyosin.

merozygote A partially diploid zygote that contains one complete and one partial genome; produced as a result of a partial genetic exchange, as that which may occur during bacterial transformation, transduction, or conjugation. The genetic complement of the merozygote consists of the endogenote and the exogenote.

Merrifield method SOLID PHASE SYNTHESIS.

mersalyl A drug that inhibits the exchange of phosphate and hydroxyl ions across the inner mitochondrial membrane.

MES 2-(*N*-Morpholino)ethanesulfonic acid; used for the preparation of biological buffers in the pH range of 5.5 to 6.7. *See also* biological buffers.

mescaline A hallucinogenic drug that occurs naturally in a cactus and that has the structure of a phenylethylamine; a narcotic.

Meselson-Stahl experiment An experiment that provides support for the semiconservative mode of DNA replication. The experiment consists of labeling the DNA in a growing culture of *E. coli* with a heavy isotope, transferring the culture to an unlabeled medium for further growth, isolating the DNA at various stages of the growth curve, and analyzing the DNA by means of density gradient sedimentation equilibrium.

mesh size A standard screen for designating the particle size of ion-exchange resins, gels, and other chromatographic supports; a larger mesh size indicates a smaller particle diameter.

meso carbon A carbon atom to which are attached two identical and two different substituents. The two identical substituents bear a mirror image relation to each other and react differently with a given enzyme. *Aka* prochiral carbon.

meso compound An optical isomer that possesses asymmetric elements, such as asymmetric carbons, but has overall molecular symmetry and is, therefore, optically inactive.

mesoderm The middle of the three germ layers of an embryo from which connective tissues, muscles, blood and lymph tissues, and urino-

genital organs develop.

mesomorphic Of, or pertaining to, a liquid crystal.

meson A subatomic particle that has a mass greater than that of a lepton but smaller than that of a nucleon.

mesophase LIQUID CRYSTAL.

mesophile An organism that grows at moderate temperatures in the range of 20 to 45°C, and that has an optimum growth temperature in the range of 30 to 37°C.

mesophilic Of, or pertaining to, mesophiles.

mesophyll cells The outer layer of cells in the leaves of C_4 plants; site of the preliminary fixation of CO_2 that precedes the reactions of the Calvin cycle which take place in the bundle sheath cells.

mesosome An infolding of the bacterial cell membrane. Mesosomes are believed to represent centers of cell respiration (electron transport system) and thus to function much as the inner mitochondrial membrane does in higher organisms. *Aka* chondrioid.

mesotocin A peptide hormone that is related to oxytocin in its structure and in its function; it is secreted by the posterior lobe of the pituitary gland and occurs in reptiles and amphibia.

mesotrophic lake A lake that has intermediate properties between those of an oligotrophic lake and those of a eutrophic lake.

Mesozoic era The geologic time period that extends from about 63 to 225 million years ago and that is characterized by the development of the reptiles.

message 1. A messenger RNA molecule. 2. The segment of a polycistronic messenger RNA molecule that codes for one polypeptide chain.

messenger ribonucleoprotein particle A messenger RNA molecule that is complexed with protein but is not associated with ribosomes. Such complexes have been isolated from the cytoplasm of eukaryotic cells. It is believed that at least some of these complexes are specific ones that function in the translation of mRNA in the absence of ribosomes. *Abbr* mRNP.

messenger ribonucleoproteins A complex of heat-shock proteins and small cytoplasmic RNA (scRNA) molecules. *Abbr* mRNP.

messenger RNA A single-stranded RNA molecule that is synthesized during transcription, is complementary to one of the strands of double-stranded DNA, and serves to transmit the genetic information contained in DNA to the ribosomes for protein synthesis. *Abbr* mRNA. *Aka* messenger.

messenger RNA hypothesis The hypothesis, proposed by Jacob and Monod, that an RNA molecule serves as the template for the syn-

thesis of proteins; this RNA molecule, the messenger RNA, is transcribed from DNA, has a base sequence that is complementary to that of one of the strands of duplex DNA, and carries the genetic information from the DNA to the ribosomes where the proteins are synthesized.

Met 1. Methionine. 2. Methionyl.

meta- Prefix indicating two substituents on alternate carbon atoms of the ring in an aromatic compound. *Sym* m.

metabolic Of, or pertaining to, metabolism.

metabolic acidosis A primary acidosis that results from changes in the concentrations of acids and bases other than carbon dioxide and carbonic acid.

metabolic alkalosis A primary alkalosis that results from changes in the concentrations of acids and bases other than carbon dioxide and carbonic acid.

metabolic antagonist ANTIMETABOLITE.

metabolic balance study *See* balance study.

metabolic block A block in a biochemical reaction, generally due to a mutation, that results in the lack of synthesis of an enzyme or in the synthesis of a defective enzyme.

metabolic bypass METABOLIC SHUNT.

metabolic depression A general reduction of the synthesis of biosynthetic enzymes that may occur when cells are grown in a rich medium in which the growth rate is very rapid. The term is meant to differentiate this type of depression from one that is specific for a given metabolic pathway.

metabolic disease A pathological abnormality of metabolism such as acidosis, alkalosis, or an inborn error of metabolism.

metabolic pathway A sequence of consecutive enzymatic reactions that brings about the synthesis, breakdown, or transformation of a metabolite from a key intermediate to some terminal compound. A metabolic pathway may be linear, cyclic, branched, tiered, directly reversible, or indirectly reversible. *See also* linear metabolic pathway; cyclic metabolic pathway; etc.

metabolic poison A substance that inhibits a metabolic reaction.

metabolic pool *See* pool.

metabolic quotient A measure of the rate of uptake or discharge of a metabolite by a tissue or an organism. The uptake of oxygen, denoted Q_{O_2} , and the evolution of carbon dioxide, denoted Q_{CO_2} , are frequently expressed in terms of microliters taken up or evolved per hour per milligram dry weight of tissue. *Sym* Q.

metabolic shunt A pathway in metabolism that uses some reactions of a major metabolic pathway and bypasses others. The glyoxylate

bypass and the γ -aminobutyrate bypass are two examples.

metabolic transformation BIOTRANSFORMATION.

metabolic turnover The rate at which cellular components are replaced by degradation and synthesis under steady-state conditions; turnover time.

metabolism 1. The sum total of all the chemical and physical changes that occur in a living system, which may be a cell, a tissue, an organ, or an organism. The reactions of metabolism are almost all enzyme-catalyzed and include transformation of nutrients, excretion of waste products, energy transformations, synthetic and degradative processes, and all the other functions of a living organism. Metabolism is broadly divided into anabolism, which encompasses the synthetic reactions, and catabolism, which encompasses the degradative reactions. 2. The sum total of all the chemical and physical changes in a living system with respect to one class of compounds, as in "amino acid metabolism."

metabolite Any reactant, intermediate, or product in the reactions of metabolism. Metabolites that are involved in those processes that are basically similar in all organisms and that are necessary for maintenance and survival are known as primary metabolites. This includes metabolites involved in the processes of growth (biosynthesis), energy production and transformation, and turnover of cellular components. Other metabolites, such as pigments, alkaloids, antibiotics, terpenes, and so on, that occur only in certain organisms and that serve no apparent biological function in the life of the organisms that produce them, are known as secondary metabolites.

metabolon 1. Proposed term to describe an organized chemical entity capable of growth and believed to have been formed in the course of chemical evolution prior to the development of protocells. 2. Proposed term to describe a supramolecular complex of sequential metabolic enzymes and cellular structural elements that exists within individual organelles and cell compartments. Ribosomes on the endoplasmic reticulum with bound mRNA and tRNAs, glycolytic enzymes bound to actin, citric acid cycle enzymes bound to the inner mitochondrial membrane, and the DNA replication complex are some examples.

metachromatic dye A dye that stains a tissue with two or more different colors depending on the extent to which the dye molecules are stacked on the chromotrope.

metachromatic granule VOLUTIN GRANULE.

metachromatic leukodystrophy A genetically inherited metabolic defect in humans that is associated with mental retardation and that is

characterized by an accumulation of sulfatides; a sphingolipidosis that is due to a deficiency of the enzyme cerebroside sulfatase (sulfatide sulfatase) which hydrolyzes sulfatides to inorganic sulfate and galactosylceramide.

metagon An RNA particle of the protozoan *Paramecium aurelia* which acts like a messenger RNA molecule in that organism, but replicates like an RNA virus when ingested by the protozoan *Didinium*.

metakentrin LUTEINIZING HORMONE.

metal-activated enzyme An enzyme that retains one or more metal ions in equilibrium with binding groups on its surface. Such metal ions are frequently lost during purification of the enzyme and must then be added back to restore the catalytic activity. *See also* metalloenzyme.

metal bridge complex *See* bridge complex.

metal chelate *See* chelate.

metalloenzyme A conjugated enzyme that contains one or more metal ions as prosthetic groups. Metalloenzymes generally fail to show activity enhancement upon addition of the free metal ions. *See also* metal-activated enzyme.

metalloflavoprotein A complex flavoprotein that contains a metal ion in addition to either FMN or FAD.

metalloporphyrin A complex composed of a metal ion that is chelated by a porphyrin.

metalloprotein A conjugated protein that contains one or more metal ions as prosthetic groups.

metallothionein A small, cytoplasmic, cysteine-rich (about 30 mol%) metal-binding protein that occurs in a wide variety of eukaryotic species including vertebrates, invertebrates, plants, and microorganisms. Metallothionein binds, and can be induced by, various metal ions such as Zn, Cd, Cu, and Hg. It is believed to be involved in the storage and regulation of Zn and Cu and in the detoxification of heavy metal ions. *Abbr* MT.

metal shadowing SHADOWCASTING.

metamorphosis A transformation in the form of an animal, such as that from larval to adult form in insects, or that from tadpole to adult form in amphibians.

metaphase The second stage in mitosis during which the chromosomes arrange themselves in an equatorial region.

metaphosphate The anionic radical PO_3^- of metaphosphoric acid, HPO_3 .

metaprotein A denatured protein, formed by the action of acids or bases, that is soluble in weak acids and bases but is insoluble in neutral solutions.

metarhodopsin One of several structurally

altered forms of rhodopsin that are produced after the exposure of rhodopsin to light and prior to its dissociation into opsin and retinal.

metastable Describing an unstable condition or substance that changes readily either to one that is more stable, or to one that is less stable.

metastable nuclide An excited nuclear isomer that emits a gamma ray upon its return to the ground state.

metastable state 1. The excited state of an atom or a molecule that is characterized by a delayed emission of the excitation energy as the atom or the molecule returns to the ground state. 2. The excited state of a nuclear isomer that is characterized by the emission of a gamma ray as the nucleus returns to the ground state. 3. Any state of an ion or a molecule that is of short duration.

metastasis (*pl* metastases) 1. The detachment of cells from a tumor and their transport, by way of blood and the lymphatic system, to distant sites in the organism where they grow to form additional tumors. 2. The tumor formed at a site distant from that of the original tumor, and produced by detachment and transport of cells from the original tumor.

metastasize To invade by means of metastasis.

metastatic tumor A tumor that is undergoing metastasis; a metastasizing tumor.

metathesis A chemical reaction in which there is a double exchange of elements or groups, as in the reaction $AB + CD = AD + BC$.

Met-enkephalin See enkephalin.

methanogens A group of anaerobic archaeobacteria that generate methane by reduction of CO_2 ; they are widely distributed but not commonly encountered since they are killed by oxygen and do not exist in the open. They can be isolated from the ocean bottom and from hot springs. See also archaeobacteria.

methanolysis An alcoholysis reaction in which the alcohol is methanol; frequently used for the formation of fatty acid methyl esters which are then analyzed by gas chromatography.

MethHb Methemoglobin.

methemoglobin A hemoglobin molecule in which the iron has been oxidized to the trivalent state. *Abbr* MethHb.

methemoglobinemia A genetically inherited metabolic defect in humans that is characterized by high concentrations of methemoglobin in the blood and that is due to a deficiency of the enzyme NADH-methemoglobin reductase.

methenyl group The grouping $-CH=$.

methionine A sulfur-containing, nonpolar alpha amino acid. *Abbr* Met; M.

methionyl transfer RNA A transfer RNA

molecule that exists in two forms, designated $tRNA^{met}$ and $tRNA^{fmet}$. The former is ordinary methionyl-tRNA, and the latter allows for the formylation of methionine after it has become attached to the tRNA; *N*-formylmethionyl-tRNA^{fmet} serves as the initiator aminoacyl-tRNA in bacterial protein synthesis.

method of continuous variation A method for studying the interaction between two components in solution, as in the formation of a duplex from two single strands. The method requires the plotting of a property that is characteristic of one component versus the mole fraction of that component in a two-component system. In the absence of interaction between the components, a straight line is obtained which connects the points corresponding to a mole fraction of one for each of the components. In the presence of interaction between the components, various deviations from a straight line are obtained.

method of least squares A method for fitting a straight line to a set of experimental points such that the sum of the squares of the deviations of the experimental points from the line has a minimum value; the line is referred to as a line of best fit.

method of optimal proportions A method for determining the equivalence zone of a precipitation reaction by measuring the proportion of antigen to antibody at which precipitation occurs most rapidly. The zone of optimal proportions measured in this fashion is generally near the equivalence zone of the precipitation curve. See also Dean and Webb method; Ramon method.

method of ultimate precision A method for measuring the absorbance of a solution in a single beam photometer with maximum sensitivity and with minimum error; measurements are made by adjusting the instrument to 0 and 100% transmission with two solutions of known concentration in the compound of interest.

methotrexate AMETHOPTERIN.

methoxatin See quinoprotein.

methyl-accepting chemotaxis protein One of a group of bacterial transmembrane proteins that are responsible for transmitting chemotactic signals across the cell membrane; they become methylated during the chemotactic response. *Abbr* MCP.

methylase An enzyme that catalyzes a methylation reaction; a methyltransferase.

methylated albumin-kieselguhr An adsorbent used for the chromatographic fractionation of nucleic acids; prepared by converting the carboxyl groups of the glutamic and aspartic acid residues of serum albumin to methyl esters,

and then precipitating the methylated albumin onto kieselguhr particles. *Abbr* MAK.

methylated cap CAP (1).

methylated xanthines *N*-Methyl derivatives of xanthine; collective term for the purine alkaloids caffeine, theobromine, and theophylline.

methylating agent *S*-ADENOSYLMETHIONINE.

methylation The introduction of a methyl group ($-\text{CH}_3$) into an organic compound.

methylation analysis EXHAUSTIVE METHYLATION.

methylcholanthrene A carcinogenic hydrocarbon.

5-methylcytosine A derivative of cytosine that is found in the DNA of certain higher plants and in tRNA.

O-methyl derivative A carbohydrate derivative in which one or more hydroxyl groups have been methylated.

methylene blue A dye used as an oxidation-reduction indicator; the oxidized form is blue, and the reduced form is colorless.

methylene blue technique THUNBERG TECHNIQUE.

methylene group The grouping $-\text{CH}_2-$.

methylferase Methyltransferase; a methylase.

methyl green A basic dye used in cytochemistry for the staining of DNA.

methyl group The radical $-\text{CH}_3$. *Sym* Me.

ϵ -N-methyllysine A rare amino acid that is present in the protein actin.

methylmalonic aciduria METHYLMALONYL ACIDEMIA.

methylmalonyl acidemia A genetically inherited metabolic defect in humans that is characterized by massive ketosis and that is due to a deficiency of the enzyme methylmalonyl-CoA carboxymutase. *Aka* methylmalonic aciduria.

methylneogenesis The biosynthesis of methyl groups from one-carbon fragments.

methylol amino acid An amino acid derivative, formed by reaction with formaldehyde. Examples include formation of a monomethylol derivative ($\text{R}-\text{NH}-\text{CH}_2\text{OH}$) by reaction with the imidazole group of histidine, and formation of a dimethylol derivative [$\text{R}-\text{N}(\text{CH}_2\text{OH})_2$] by reaction with the alpha amino group of amino acids.

methylotroph An organism that can utilize as its sole carbon source either one-carbon compounds (such as methane and methanol) or carbon compounds that contain no carbon-to-carbon bonds (such as dimethyl ether).

methylpherase Variant spelling of methylferase.

methyl-poor transfer RNA A transfer RNA molecule that contains less than the usual amount of methylated bases.

N^5 -methyl tetrahydrofolic acid SERUM FOLATE.

methyl-trap hypothesis A hypothesis that

attempts to explain the interrelations between folic acid and vitamin B_{12} by assuming that a vitamin B_{12} deficiency results in the transformation of all of an individual's tetrahydrofolate to 5-methyltetrahydrofolate which is trapped as such. This is based on the fact that the enzyme 5-methyltetrahydrofolate methyltransferase requires a methyl-vitamin B_{12} coenzyme and that it catalyzes the major, and perhaps the only, metabolic reaction that can utilize 5-methyltetrahydrofolate.

MetMb Metmyoglobin.

metmyoglobin A myoglobin molecule in which the iron has been oxidized to the trivalent state. *Abbr* MetMb.

metopon A semisynthetic drug, made by converting morphine to methyl dihydromorphinone.

metric combining forms *See* exa; peta; tera; giga; mega; kilo; hecto; deca; deci; centi; milli; micro; nano; pico; femto; atto.

met-tRNA Methionyl-transfer RNA.

metyrapone test A test for assessing the integrity of the hypothalamus-pituitary-adrenal system; based on the fact that, in normal individuals, oral administration of metyrapone will inhibit several enzyme systems including one involved in cortisol biosynthesis. The resultant decrease of cortisol stimulates the secretion of adrenocorticotrophic hormone (ACTH).

MeV Mega-electronvolt; 10^6 eV.

mevalonic acid An intermediate in the biosynthesis of cholesterol and a precursor of squalene and other isoprenoid compounds.

mevinolinic acid A fungal metabolite that is a potent inhibitor of the enzyme HMG-CoA reductase.

Meyerhof oxidation quotient A measure of the Pasteur effect that is equal to the difference between the rates of anaerobic and aerobic glycolysis, divided by the rate of oxygen uptake.

MF 1. Mitogenic factor. 2. Maize factor. 3. Microfilaments.

MFO Mixed-function oxidase.

mg Milligram.

Mg Magnesium.

MgATP Magnesium ATP; magnesium chelated to adenosine-5'-triphosphate.

mg percent Referring to a solution, the concentration of which is expressed in terms of the number of milligrams of solute per 100 mL of solution; widely used in clinical chemistry. *Sym* mg%.

MHC 1. Myosin heavy chain; *see* myosin. 2. Major histocompatibility complex.

MHC antigens Cell surface glycoprotein antigens encoded by genes of the major histocompatibility complex. They determine the spe-

cificity of antigen recognition by lymphocytes. Class I MHC antigens have a wide tissue distribution and serve to distinguish body cells from invading cells. Class II MHC antigens are expressed only by some cell types; they are also known as Ia antigens or I region-associated antigens. They serve to distinguish immune system cells from other cells.

MHC associative recognition The property of most cytotoxic T cells of recognizing foreign antigens on the surface of cells only if the antigens are associated with self major histocompatibility complex glycoproteins, expressed on the same cell surface.

MHC molecules The antigens of the major histocompatibility complex; the MHC antigens.

MHD 1. Minimum hemagglutinating dose. 2. Minimum hemolytic dose.

mho The reciprocal of ohm; a measure of electrical conductance.

MIC 1. Major immunogene complex. 2. Minimum inhibitory concentration; the lowest concentration (generally in terms of micrograms per milliliter) at which an antibiotic is effective against a particular microorganism.

micellar Of, or pertaining to, micelles.

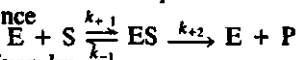
micelle An organized, spherical colloidal structure that consists of a large number of oriented surface-active molecules; micelles are generally charged and are typically formed by soaps and by phospholipids. In an aqueous micelle, formed in a polar solvent such as water, the nonpolar parts of the molecules are clustered in the interior of the spherical structure while the polar parts are distributed over the surface of the structure. In a reversed micelle, formed in a nonpolar solvent, the arrangement of the polar and nonpolar parts of the molecules is reversed.

micellisation The formation of micelles.

mic gene A gene capable of encoding an RNA complementary to all or part of a specific mRNA. Thus transcription of a mic(lpp) gene will result in the production of RNA complementary to the lpp mRNA.

Michaelis complex A structure in which the substrate is bound to an enzyme but the substrate is not in its transition state.

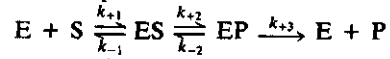
Michaelis constant A kinetic constant for a given substrate of an enzymatic reaction; it is numerically equal to that substrate concentration that yields one-half of the maximum velocity of the reaction at saturating concentrations of all cosubstrates. The Michaelis constant K_m is composed of the rate constants for the individual steps in the reaction; for the sequence



it is given by

$$K_m = (k_{-1} + k_{+2})/k_{+1};$$

for the sequence



it is given by

$$K_m = \frac{(k_{-1}k_{-2} + k_{-1}k_{+3} + k_{+2}k_{+3})}{[k_{+1}(k_{+2} + k_{-2} + k_{+3})]}$$

where the k 's are the rate constants, E is the enzyme, S is the substrate, and P is the product. *Sym* K_m .

Michaelis-Menten-Briggs-Haldane equation MICHAELIS-MENTEN EQUATION.

Michaelis-Menten equation The rate equation $v = V[S]/(K_m + [S])$, where v is the initial velocity of the reaction, V is the maximum velocity, $[S]$ is the substrate concentration, and K_m is the Michaelis constant. The equation is actually derived by means of the Briggs-Haldane treatment of enzyme kinetics.

Michaelis-Menten kinetics The kinetics of an enzymatic reaction that can be described by the Michaelis-Menten equation; such a reaction yields a typical hyperbolic curve when the velocity of the reaction is plotted as a function of the substrate concentration.

Michaelis-Menten treatment The treatment of enzyme kinetics that is based on the assumptions that (a) a rapid equilibrium is established between the enzyme, the substrate, and the enzyme-substrate complex, and (b) the velocity of the reaction is an initial velocity, proportional to the concentration of enzyme-substrate complex, so that the reverse reaction from products to enzyme-substrate complex can be neglected. The resulting rate equation has the form $v = V[S]/(K_s + [S])$, where v is the initial velocity of the reaction, V is the maximum velocity, $[S]$ is the substrate concentration, and K_s is the substrate constant. This equation has no specific name. The term Michaelis-Menten equation is used for the rate equation derived by means of the Briggs-Haldane treatment of enzyme kinetics.

Michaelis pH function An expression for the concentration of either the undissociated or the dissociated form of a substance which can undergo one or more ionizations by the loss of protons; the concentration of the substance is expressed in terms of the hydrogen ion concentration and the appropriate ionization constants.

mic RNA Messenger RNA inhibiting complementary RNA; a small synthetic RNA molecule that is complementary to the initiating region of a specific mRNA. Mic RNA molecules hybridize to the Shine-Dalgarno sequence.

micro- 1. Combining form meaning one-millionth (10^{-6}) and used with metric units of measurements. *Sym* μ 2. Combining form meaning microscopic or minute.

microaerophilic Descriptive of bacteria that grow best at partial pressures of oxygen that are considerably lower than those in air, but do not quite correspond to those of an anaerobic environment. Thus, the term describes bacteria that are incapable of growth either under aerobic conditions or in the complete absence of gaseous oxygen.

microbe A microorganism.

microbeam irradiation The irradiation of subcellular components with a very narrow beam of ionizing radiation or ultraviolet light.

microbial genetics The genetics of microorganisms.

microbial mining The use of microorganisms to leach metals from ores. The method has been used for the extraction of copper and uranium by means of *Thiobacillus ferrooxidans*. This organism carries out oxidations, yielding a mixture of H_2SO_4 and $Fe_2(SO_4)_3$ which then oxidizes and dissolves the minerals of interest.

microbiological assay The assay of a biochemical compound, such as a vitamin or an amino acid, that is based on measuring the growth of microorganisms for which the compound is an essential growth factor.

microbiology The study of microorganisms.

microscope A microscope that permits the observation of living tissues.

microbody A cytoplasmic organelle, occurring in eukaryotic cells, that consists of a number of functionally related enzymes contained within a membranous envelope. *See also* peroxisome; glyoxysome.

microcinematography The study of cells by means of motion pictures taken through a phase contrast microscope. In time-lapse microcinematography, cells are photographed at selected time intervals and the film is then projected at a faster speed to provide a better understanding of the time relations of cellular processes.

micrococcal nuclease An endonuclease, isolated from *Staphylococcus aureus*, that catalyzes the hydrolysis of phosphodiester bonds in DNA. The enzyme does not attack DNA that is in contact with protein and hence is useful for cleaving the DNA of eukaryotic chromatin at points located between nucleosomes.

microcomparator An optical instrument for making measurements on photographic plates as those used with schlieren and interferometric optical systems. The instrument resembles a toolmaker's microscope that is equipped with a screen upon which is reflected an enlarged image from a photographic plate, and measurements are made on the screen by means of cross hairs and micrometers.

microcrystalline wax A wax derived from pet-

roleum and consisting of large numbers of small crystals.

microcurie One-millionth of a curie. *Sym* μCi ; μc .

microdrop technique A technique for studying antibody formation in individual lymphocytes by suspending a single lymphocyte in a microdrop and determining whether a bacterium or a bacteriophage becomes immobilized in the drop.

microencapsulated enzyme An enzyme that is immobilized in a microcapsule, equipped with a semipermeable membrane, such that substrates and products, but not the enzyme, can diffuse across the membrane.

microencapsulation Any one of a number of techniques in which use is made of small capsules containing specific substances. Microencapsulation has been used for the delivery of drugs, pesticides, and food additives to biological systems, for boosting the output of monoclonal antibodies by hybridomas, and for studies of immobilized enzymes.

microenvironment A very small environment, as that surrounding a molecule or a functional group of a molecule.

microevolution Evolution that extends over short time periods, involves small steps, and leads to small changes in the genetic makeup of an organism.

microfilaments Thin, intracellular fibers having a diameter of about 5–7 nm and consisting largely of actin. Microfilaments are important components of the cytoskeleton. They are identical to the actin filaments of muscle and are contractile. They appear to exist in two forms, lattice microfilaments (a loose network of short, interconnected filaments) and sheath microfilaments (bundles of fibers).

microfiltration The filtration of a solution through a filter or a membrane that will retain suspended material of variable particle size.

microfossil A fossil of microorganisms.

β_2 -microglobulin The smallest known plasma protein (MW 11,800). It is present in plasma in very small amounts and its amino acid sequence shows great sequence homology to the immunoglobulins; it constitutes a subunit of the HLA complex.

micrograph *See* electron micrograph.

microheterogeneity The state of a given preparation of macromolecules of one kind, especially proteins, in which the macromolecules exhibit slight differences with respect to their charge, state of aggregation, extent of denaturation, or other properties.

microincineration The combustion of the organic material of a thin tissue slice or of a cell suspension that is placed on a glass slide. The remaining ash provides information about the

quality, quantity, and distribution of inorganic compounds in the sample.

microiontophoresis See iontophoresis.

micromanipulator An instrument for positioning and handling needles, electrodes, pipets, and the like for experimentation with microscopic specimens, including single cells.

micrometer 1. A device for measuring minute distances that is used in conjunction with optical instruments. 2. MICRON. *Sym* μm ; μ .

micromethod A method of chemical analysis that requires very small amounts of sample and reagents.

micromineral A trace element that is required in the diet in relatively small amounts; Fe, Zn, Cu, I, F, Cr, Se, and Mo are examples.

micron A unit of length equal to 10^{-6} m and useful for describing cellular dimensions; a micrometer. *Sym* μm ; μ .

micronucleus One of two types of reproductive nuclei found in many ciliate protozoa; they are small, do not contain nucleoli, are usually diploid, and contain inactive DNA that does not undergo transcription. A cell may contain one or more micronuclei. *See also* macronucleus.

micronutrient An essential nutrient that is needed by an organism in minute amounts; vitamins and minerals are examples.

microorganism An organism that is too small to be seen with the naked eye.

microperoxisome *See* peroxisome.

micropinocytosis Pinocytosis that involves the formation of small vesicles that can be visualized only by electron microscopy.

microprocessor The central arithmetic and logic unit of a computer, together with its associated circuitry, scaled down so that it fits on a single silicon chip (sometimes several) holding tens of thousands of transistors, resistors, and similar circuit elements. A microprocessor holds all the elements for manipulating the data and for performing the arithmetic calculations of the computer.

microscope An instrument for magnifying and visualizing objects that are too small to be seen with the naked eye.

microscope electrophoresis PARTICLE ELECTROPHORESIS.

microscopic binding constant A binding constant that applies to a single binding site; an intrinsic association constant. *See also* macroscopic binding constant.

microscopic reversibility *See* principle of microscopic reversibility.

microsequencing The sequencing of a protein or a nucleic acid that requires only very small amounts of sample.

microsomes A heterogeneous subcellular fraction obtained by disruption of cells by

homogenization. Microsomes are closed lipoprotein vesicles of variable size and shape, formed by resealing of the torn endoplasmic reticulum and other membranes. Microsomes derived from the rough endoplasmic reticulum are called rough microsomes and are studded with ribosomes. Microsomes lacking attached ribosomes are called smooth microsomes; these are derived in part from the smooth endoplasmic reticulum and in part from fragments of the cell membrane, the Golgi apparatus, and mitochondria.

microspectrophotometer A cytophotometer that consists of a microscope and a spectrophotometer.

microsphere A spherical cell-like structure that is formed spontaneously from proteinoids under suitable conditions and that is believed by some to have been a forerunner of primitive cells.

microspikes Hairlike, contractile extensions of cells that are believed to act as sensory devices by which cells explore their environment; they are thin (about 0.1 μm diameter), long (5–50 μm), and contain actin filaments oriented with the same polarity.

microsurgery MICRURGY.

microtome An instrument for cutting thin sections of tissues, about 1 to 10 μm in thickness, for staining and microscopic examination.

microtomy The methodology connected with the use of a microtome.

microtrabecular network A lattice of very thin, interlacing filaments which interconnect the three major components of the cytoskeleton—microtubules, microfilaments, and intermediate filaments.

microtubule-associated proteins High molecular weight proteins (MW 200,000–300,000) that are associated with, and enhance the polymerization of, microtubules. *Abbr* MAP. *See also* tau proteins.

microtubule organizing center The structure in the cell from which microtubules regrow after they have been depolymerized experimentally; the nucleating center that gives rise to microtubular arrays. Centrioles and kinetosomes have this function in some organisms. *Abbr* MTOC.

microtubules Long, cylindrical tubes that are composed of bundles of small filaments, called protofilaments. The latter are formed by end-to-end association of tubulin molecules. Microtubules have an inside diameter of about 15 nm, an outside diameter of about 25 nm, and are an important component of the cytoskeleton in general and of cilia and flagella in particular. *Abbr* MT.

microvilli Small, finger-like projections of the cell membrane, frequently packed together

like the bristles of a brush (brush border membrane).

micrurgy Microsurgery performed on a specimen that is viewed through a microscope; frequently entails operations on single cells with the aid of a micromanipulator.

middle mesophase A mesophase consisting of cylindrical micelles, arranged in a hexagonal array.

middle-repetitive DNA See repetitive DNA.

midpoint potential The electrode potential, measured at 25°C and 1 atm, at the midpoint of an oxidation-reduction titration curve; the electrode potential at which the oxidant and the reductant are present at equal concentrations.

Mie scattering The scattering of light by spherical particles that are neither very large nor very small in comparison to the wavelength of the incident light.

MIF 1. Melanocyte-stimulating hormone release-inhibiting factor; see melanocyte-stimulating hormone regulatory hormone. 2. Migration inhibition factor.

migration 1. The movement of a molecule in either electrophoresis or chromatography. 2. An intramolecular rearrangement of atoms, groups of atoms, or bonds.

migration enhancement factor A lymphokine that enhances the migration of macrophages. *Abbr* MEF. *Aka* macrophage activation factor (MAF). See also lymphokine.

migration inhibition factor A lymphokine that inhibits the migration of macrophages from a region where T cells have been activated; it also activates nearby macrophages to become more efficient at phagocytosis. *Abbr* MIF. *Aka* macrophage inhibition factor.

MIH See melanocyte-stimulating hormone regulatory hormone.

milieu intérieur The internal environment that consists of the extracellular fluid that surrounds the tissue cells of multicellular organisms.

milk agent MOUSE MAMMARY TUMOR VIRUS.

milk intolerance A syndrome of abdominal cramps, pain, and diarrhea that may occur in adults upon drinking milk; especially widespread among orientals and blacks. The syndrome is due to progressive loss of the enzyme lactase, which hydrolyzes lactose to glucose and galactose, from the brush border membrane of the small intestine. The unhydrolyzed and unabsorbed lactose passes into the large intestine where it is fermented by intestinal bacteria.

milk letdown response A physiological response that enables a nursing infant to obtain milk from the breast; initiated by suckling at

the breast which leads to release of oxytocin. The latter results in constriction of specialized cells that encircle the mammary gland and cause expulsion of the milk.

milk sugar LACTOSE.

Miller experiment An experiment in which organic compounds are synthesized under conditions believed to simulate those that have existed during the early stages of chemical evolution on the earth. The experiment demonstrates the formation of amino acids and other compounds from a mixture of reducing gases that have been subjected to an electric discharge.

Miller index (*pl* Miller indices) One of three numbers that designate a plane in which the atoms of a crystal lie.

Miller spread A method for mounting chromosomes for electron microscopy, developed by O.L. Miller; involves rupturing the nuclei and centrifuging the chromosomes onto a membrane-coated grid.

Miller tree The electron microscopic pattern of a gene, coding for rRNA, that is undergoing transcription by RNA polymerase.

milli- Combining form meaning one-thousandth (10^{-3}) and used with metric units of measurements. *Sym* m

millicurie One-thousandth of a curie. *Sym* mCi; mc.

milliequivalent One-thousandth of a gram equivalent weight. *Sym* meq; mEq.

milligram percent See mg percent.

millimicron A unit of length equal to 10^{-9} m; a nanometer. *Sym* nm; m μ m; m μ .

Millipore filter Trademark for a group of synthetic filters having pores of specified diameter.

Millon reaction A colorimetric reaction for tyrosine and other phenolic compounds that is based on the production of a red color upon treatment of the sample with a solution of mercurous and mercuric nitrates in concentrated nitric acid.

min 1. Minute. 2. Minimum.

mineralization The conversion of organic matter to inorganic matter, and the infiltration of organic matter by inorganic matter.

mineral nutrients See macrominerals; micro-minerals.

mineralocorticoid A 21-carbon steroid hormone, such as deoxycorticosterone or aldosterone, that is secreted by the adrenal cortex and that acts primarily on water and electrolyte metabolism by stimulating the retention of sodium and the excretion of potassium.

mineralocorticoid receptors A group of cytosolic receptors that mediate the action of mineralocorticoids.

mineralocorticosteroid MINERALOCORTICOID.

mineral oil 1. Paraffin oil. 2. Any oil derived from nonliving sources such as coal, petroleum, or shale.

minicell A spherical, anucleate bacterial body that results from an abnormal fission near the polar extremity of a parent cell. Such cells do not contain a bacterial chromosome and they lack a number of DNA-associated enzymes, such as DNA-dependent RNA polymerase, but they may contain plasmid DNA.

minichromosomes 1. Beaded structures of some viral DNAs that resemble the nucleosome structure of eukaryotic chromosomes. 2. Miniature derivatives of chromosomes, constructed by joining restriction endonuclease-generated fragments of the chromosomes.

minigastrin See gastrin.

minigene One of a number of chromosome segments that code for the variable regions of the heavy and light chains of the immunoglobulins.

minimal deviation hepatoma A hepatoma that is cancerous but resembles normal liver cells so closely in its enzyme content and in its histological and other properties that it can be compared with normal cells.

minimal medium A synthetic medium that contains only those compounds essential for the growth of the wild-type organism and that is incapable of supporting the growth of auxotrophs; contains inorganic compounds but no organic compounds other than a carbon source such as a sugar. *Abbr* MM.

minimal stable length The minimum size of the segment of nucleotide pairs that must be formed during renaturation, with the base-pairing in perfect register, to lead to the formation of duplex DNA or RNA. See also snapback.

minimum hemagglutinating dose The smallest dose of a virus that produces complete agglutination of a standard volume of red blood cells within a specified time. *Abbr* MHD.

minimum hemolytic dose The smallest dose of complement that produces complete lysis of a standard volume of sensitized red blood cells within a specified time. *Abbr* MHD.

minimum lethal dose The smallest dose of bacteria, a virus, or a toxic compound that produces deaths in 100% of the animals in a test group within a specified time. *Abbr* MLD.

minimum molecular weight The molecular weight of a substance that is determined by an assay for some structural element on the assumption that there must be at least one such structural element per molecule of the substance. The structural element may be a metal ion, a functional group, a ligand, a

monomer, etc.

minimum protein (nitrogen) requirement The minimum amount of protein (or nitrogen) required daily by an adult to compensate for the amount lost by excretion; approximately 40 g protein/day.

minisome The smallest ribonucleoprotein particle that is either a naturally occurring precursor of ribosomes, or is produced from ribosomes by the stepwise removal of proteins.

minor base One of a group of purines and pyrimidines that generally occur only in small amounts in most nucleic acids but that are found in relatively large amounts in transfer RNA; many of the minor bases are methylated derivatives of the commonly occurring purines and pyrimidines. See also hypermodified nucleosides.

minor groove The shallow and narrow groove in Watson-Crick type DNA that is approximately 12 Å across.

minority codon MODULATING CODON.

minus end See actin filament.

minus strand See plus strand.

minute A mutant of *Drosophila* that is characterized by prolonged cell proliferation resulting in small adult organisms that have a number of abnormal features.

minute phage One of a group of small phages that contain single-stranded DNA and that are either spherical phages, such as ØX-174 and S-13, or filamentous phages, such as M-13 and fd.

7-minute phosphate See labile phosphate.

10-minute phosphate See labile phosphate.

minute plaque mutant A plaque-type mutant that produces very small plaques.

mirror image ENANTIOMER.

misacylation MISCHARGING.

mischarging The covalent linking of an amino acid to a transfer RNA molecule that is specific for a different amino acid; acylation of a tRNA with a wrong (noncognate) amino acid; misacylation.

miscible Capable of being mixed.

miscoding MISTRANSLATION.

miscopying The occurrence of an error during transcription.

misincorporation The incorporation of either a wrong monomer or an analogue into a polymer; used specifically with regard to the synthesis of DNA.

mismatching MISPAIRING.

mismatch repair The repair of mispaired regions in DNA by excision repair; see cut and patch repair.

mispairing The occurrence of a base in one strand of a double-stranded nucleic acid mole-

cule that is not complementary to the base in the corresponding position in the second strand, resulting in incomplete base-pairing.

misreading The occurrence of an error during translation.

misreplication The occurrence of an error during replication.

missense codon A codon that has been altered from its normal sense form in which it codes for one amino acid to a codon that codes for a different amino acid.

missense mutation A mutation in which a normal sense codon is altered so that it becomes a missense codon. As a result, a different amino acid will be incorporated in the corresponding position of the polypeptide chain.

missense suppression The suppression of a missense mutation.

mistranslation The incorporation of an amino acid into a polypeptide chain in response to a codon for a different amino acid.

MIT Moniodotyrosine.

Mitchell hypothesis CHEMIOSMOTIC COUPLING HYPOTHESIS.

mit gene Mitochondrial gene; a gene of mitochondrial DNA.

MIT genes Yeast mitochondrial genes that code for proteins that function in the electron transport system and oxidative phosphorylation.

mitochondrial ATPase See F_0F_1 -ATPase.

mitochondrial DNA A circular, histone-free, double-stranded DNA molecule that is located in the mitochondria, usually in the form of 5–10 copies per mitochondrion. It codes for components of mitochondrial protein synthesis and for proteins that function in the electron transport system and oxidative phosphorylation. The genetic code of mitochondrial DNA differs slightly from the "universal" code. *Abbr* mtDNA.

mitochondrial Eve The postulated female ancestor of modern humans (*Homo sapiens sapiens*), believed to have lived in Africa some 200,000 years ago. The ancestor is inferred by reconstructing phylogenetic trees, based on an analysis of mitochondrial DNA, cut into fragments by means of restriction enzymes. Since mitochondria pass from generation to generation only through the female line (mitochondria are not present in that part of the male sperm, the head, from which the DNA is injected into the female egg), the phylogenies inferred from mitochondrial DNA data essentially trace maternal inheritance; ultimately, a single female is reached at the root of the phylogenetic tree, hence the term mitochondrial Eve.

mitochondrial shuttle See shuttle.

mitochondrion (*pl* mitochondria) A subcellular

organelle in aerobic eukaryotic cells that is the site of cellular respiration and that carries out the reactions of the citric acid cycle, electron transport, and oxidative phosphorylation. Mitochondria have a high degree of biochemical autonomy; they contain DNA and ribosomes, carry out protein synthesis, and are capable of self-replication.

mitogen An agent that causes cells to divide and multiply; a stimulant of mitosis.

mitogenic factor A lymphokine that stimulates lymphocyte division.

mitomycin A group of antibiotics, produced by *Streptomyces caseipitosus*, that are toxic for bacteria and mammalian cells and that possess antitumor activity. Mitomycin C is the principal member of the group. It binds to guanine residues in DNA and cross-links the complementary strands, thereby preventing DNA replication.

mitoplast A mitochondrion from which the outer membrane has been removed; the intact inner membrane plus the matrix.

mitoribosome A ribosome of mitochondrial origin.

mitosis (*pl* mitoses) The division of the nucleus of eukaryotic cells which occurs in four stages designated prophase, metaphase, anaphase, and telophase. *Abbr* M.

mitotic Of, or pertaining to, mitosis.

mitotic crossover MITOTIC RECOMBINATION.

mitotic cycle 1. MITOSIS. 2. CELL CYCLE.

mitotic index The fraction of cells undergoing mitosis in a given sample.

mitotic poison A compound that prevents mitosis.

mitotic recombination The crossing over between homologous chromosomes during mitosis which leads to segregation of heterozygous alleles.

mixed acid fermentation The fermentation of glucose that is characteristic of *E. coli* and related bacteria and that yields formic, acetic, lactic, and succinic acids, as well as a number of other products.

mixed amino acid fermentation The fermentation of amino acids, as that occurring in putrefaction.

mixed anhydride See acid anhydride.

mixed bed demineralizer A mixture of cation and anion exchange resins that is used for the removal of ions in the preparation of deionized water. *Aka* mixed bed ion exchanger; mixed bed resin.

mixed complex A metal ion complex that contains two or more different ligands.

mixed function oxidase MONOOXYGENASE.

mixed indicator strain A mixture of two related bacterial strains, such as a wild-type and a mutant, that is used in determining the rela-

tive amounts of two corresponding viral genotypes in a mixed population of virions.

mixed inhibition The inhibition of an enzyme that cannot be fully described in terms of one of the basic types of inhibition. In the Cleland nomenclature of enzyme kinetics most mixed-type inhibitions are considered to be varieties of noncompetitive inhibition.

mixed lactic fermentation HETEROLACTIC FERMENTATION.

mixed micelle A micelle composed of more than one type of compound. Many detergents solubilize biological membranes by forming mixed micelles consisting of detergent-lipid or detergent-lipid-protein complexes.

mixed-order reaction A chemical reaction, the observed rate of which cannot be fully described by a simple first-, second-, or third-order rate equation.

mixed surface film A monolayer composed of two or more different components.

mixed triglyceride A triacylglycerol that contains two or three different fatty acids.

mixed-type inhibitor An enzyme inhibitor that alters both the maximum velocity of the reaction and the Michaelis constant of the enzyme.

mixed vaccine A vaccine that contains antigens derived from different infectious agents.

mixotroph A cell or an organism that uses simultaneously autotrophic and heterotrophic metabolic processes; it uses organic compounds as carbon sources and inorganic compounds as energy sources.

mixotropic series A series of solvents arranged in the order of their relative polarity, and hence their miscibility with water.

ml Milliliter.

mL Milliliter.

MLC Myosin light chain; *See* myosin.

MLD 1. Minimum lethal dose. 2. Median lethal dose.

M line The dark line that bisects the H zone of the myofibrils of striated muscle.

miRNA Messenger-like RNA; a synonym of heterogeneous nuclear RNA.

MLV Multilamellar vesicle; *See* vesicle.

mM Millimolar concentration.

MM Minimal medium.

M macroglobulin An abnormal immunoglobulin of the IgM type that is produced by individuals suffering from Waldenstroem's macroglobulinemia.

MMTV Mouse mammary tumor virus.

Mn Manganese.

M_n Number-average molecular weight.

MN blood group system A human blood group system that consists of two antigens, M and N, which are present in glycoporphins A and B, respectively; the two glycoporphins differ in the

sequence of the first 5 amino acid residues.

Mo Molybdenum.

MO Molecular orbital.

mobile carrier *See* ionophore.

mobile genetic elements TRANSPOSABLE ELEMENTS.

mobile ion carrier *See* ionophore.

mobile phase The liquid or gas phase that is the bulk moving phase in chromatography.

mobile receptor model A proposed model to explain the functioning of receptors. According to this model, a receptor can exist in many states: free, complexed with its biological effector enzyme, or bound to one of a number of different ligands. Moreover, a given ligand-receptor complex can interact with several different effector enzymes, resulting in various distinct ternary complexes. *See also* two-state model.

mobility *See* electrophoretic mobility.

mobility shift analysis An early method for sequencing oligodeoxyribonucleotides by means of the shifts in electrophoretic mobility; involves two-dimensional electrophoresis homochromatography of partial degradation products.

mobility spectrum The distribution pattern of compounds that are separated by electrophoresis.

mobilizable plasmid A plasmid that can prepare its DNA for transfer to a recipient cell.

mobilization 1. The release of lipids, particularly fatty acids, from adipose tissue and their conversion to lipids that are transported by the blood. 2. The preparation of DNA for transfer that occurs when a plasmid is transferred from a donor to a recipient cell.

mobilizing lipase A lipase that functions in the mobilization of fatty acids from adipose tissue.

modal class The category in a statistical distribution that contains a larger number of observations or measurements than any other category.

mode The value of the variable that has the maximum frequency in a statistical distribution.

model A three-dimensional representation of a molecule.

model system A system that is studied and that is considered to either simulate or be representative of other systems in which the same or similar reactions take place.

MODEM Acronym for modulator-demodulator; a device that allows a computer to communicate with another computer via telephone lines.

moderately repetitive DNA *See* repetitive DNA.

moderate virus An animal virus that resembles

a temperate phage in its properties and that establishes a stable complex with the host cell.

moderator A substance that alters the rate of an enzymatic reaction; an activator or an inhibitor.

moderator protein CALMODULIN.

modification See processing.

modification allele See modification gene.

modification and restriction See restriction-modification system.

modification enzyme An enzyme that catalyzes the introduction of minor bases into RNA or DNA and that functions by modifying a normal base subsequent to its insertion into the polynucleotide strand.

modification gene A gene the product of which is a modification enzyme.

modification methylase A modification enzyme that catalyzes the methylation of DNA. See also restriction-modification system.

modified air storage GAS STORAGE.

modified base MINOR BASE.

modified inverse isotope dilution analysis A variation of the inverse isotope dilution analysis in which the amount of labeled material is determined by means of a second radioactive substance.

modifier 1. MODIFYING GENE. 2. EFFECTOR.

modifying gene A gene that effects the expression of another, nonallelic gene.

modulating codon A codon that codes for a rare transfer RNA molecule and that does not lead to the insertion of an amino acid into the growing polypeptide chain during translation. Instead, such a codon acts as a regulatory agent, leading either to release of the ribosome and interruption of translation, or to a slowing down of the rate of translation. *Aka* modulator codon.

modulation 1. The regulation of the frequency with which a specific gene is transcribed. 2. The decrease in the rate of translation of a messenger RNA brought about by a modulating codon. 3. The control of a regulatory enzyme by means of an effector.

modulator EFFECTOR.

modulator protein CALMODULIN.

modulator transfer RNA A rare transfer RNA molecule that is coded for by a modulating codon.

modulus of precision A measure of the closeness with which observations are clustered; as it increases, the width of the peak of the normal error curve becomes smaller. The modulus of precision (h) is defined as $h = \pm 1/\sigma\sqrt{2}$, where σ is the standard deviation. *Abbr* MOP.

MoFd Molybdoferredoxin; see nitrogenase.

Mo-Fe protein Molybdoiron protein; see nitrogenase.

Moffit plot A plot based on the Moffit-Yang

equation in which $[m'](\lambda^2 - \lambda_0^2)$ is plotted as a function of $(\lambda^2 - \lambda_0^2)^{-1}$ so that a straight line is obtained for a chosen value of λ_0 .

Moffit-Yang equation An equation that describes the variation of optical rotation with wavelength; specifically, $[m'] = a_0\lambda_0^2/(\lambda^2 - \lambda_0^2) + b_0\lambda_0^4/(\lambda^2 - \lambda_0^2)^2$, where $[m']$ is the reduced mean residue rotation, λ is the wavelength, and a_0 , b_0 , and λ_0 are constants. *Aka* Moffit equation.

Mohr pipet A measuring pipet in which the calibration marks are contained between two marks on the stem of the pipet and do not extend to the tip of the pipet.

MOI Multiplicity of infection.

moiety 1. One of two approximately equal parts. 2. One of two parts.

mol Symbol for mole.

molality The concentration of a solution expressed in terms of the number of moles of solute per 1000 g of solvent.

molar solution A solution that contains one mole of solute dissolved in 1000 g of solvent.

molar absorptivity index MOLAR ABSORPTIVITY.

molar absorptivity The absorbance of a one molar solution when the light path through the solution is 1 cm; frequently denoted by the symbol ϵ . The molar absorptivity is related to the absorption cross section s by the equation $s = 3.8 \times 10^{-21}\epsilon$.

molar activity A measure of enzymatic activity that is equal to the number of katal per mole of enzyme. See also molecular activity.

molar ellipticity A measure of circular dichroism that is equal to 3300 times the difference between the molar extinction coefficients for the left and right circularly polarized light beams.

molar extinction coefficient MOLAR ABSORPTIVITY.

molar growth yield The dry weight of bacteria, in grams, that is obtained per mole of substrate utilized by the bacteria during their growth.

molarity The concentration of a solution expressed in terms of the number of moles of solute per liter of solution.

molar mass MOLE.

molar rotation The optical rotation of a solute that is calculated on the basis of its molar concentration and that is corrected to that in a medium having a refractive index of one. Specifically, $[m'] = [3/(n^2 + 2)] \times M[\alpha]/100$, where $[m']$ is the molar rotation, M is the molecular weight of the solute, $[\alpha]$ is the specific rotation of the solute, and n is the refractive index of the medium. Also used in its uncorrected form as $[m'] = M[\alpha]/100$.

molar solution A solution that contains one mole of solute in one liter of solution.

mold 1. A fungus characterized by having long

mycelia. 2. TEMPLATE.

mole 1. The molecular weight expressed in grams; the weight of a compound in grams that is numerically equal to its molecular weight. 2. The amount of substance that contains as many elementary entities as there are carbon atoms in 0.012 kg of the nuclide ^{12}C (Avogadro's number). *Sym* mol.

molecular 1. Of, or pertaining to, molecules. 2. Indicating the molecularity of a reaction when used with the prefixes mono-, bi-, or ter-.

molecular activity A measure of enzyme activity equal to the number of moles of substrate (or the number of equivalents of the group concerned) that are transformed into products per minute per mole of enzyme at optimal substrate concentration. *See also* molar activity; catalytic center activity.

molecular biology 1. The science that deals with the study of biological processes at the molecular level, particularly with respect to the physical-chemical properties and changes of cellular components and the relationship of these properties and changes to biological phenomena. Nerve impulse conduction, vision, membrane transport, and molecular genetics are some of the topics of molecular biology. 2. The science that deals with molecular genetics; the replication and transcription of both DNA and RNA, and the translation of RNA.

molecular clock EVOLUTIONARY CLOCK.

molecular cloning *See* cloning (1).

molecular disease A disease that can be traced to a change in a single type of molecule; sickle cell anemia, which is caused by an abnormal hemoglobin, is an example.

molecular evolution CHEMICAL EVOLUTION.

molecular-exclusion chromatography GEL FILTRATION CHROMATOGRAPHY.

molecular fossil CHEMICAL FOSSIL.

molecular genetics The study of genetics at the molecular level; the replication and transcription of both DNA and RNA, and the translation of RNA.

molecular hybrid *See* hybridization (1, 2).

molecular ion A molecule that has lost one electron, as that produced in a mass spectrometer.

molecularity The number of reactant molecules that participate in a chemical reaction.

molecular mass MOLECULAR WEIGHT.

molecular mimicry The formation of eclipsed antigens by a parasite.

molecular orbital A composite orbital in a molecule that is derived from the overlapping, hybridized or unhybridized, atomic orbitals of the component atoms. *Abbr* MO.

molecular orbital theory The theory of chemical bonding that is developed by considering

the bonding atomic nuclei to occupy their equilibrium positions in the molecule, and then feeding orbital electrons into the resultant force field. When covalent bonds are formed, the atomic orbitals of individual atoms combine and overlap to form molecular orbitals which are a property of the whole molecule and not of single atoms. *Abbr* MO theory.

molecular photosensitization *See* photosensitization.

molecular radioautography High-resolution radioautography, as that applied to isolated DNA strands.

molecular rotation The rotation of an entire molecule about an axis.

molecular sieve 1. A substance used for fractionating molecules according to their size by means of either gel filtration or gel permeation chromatography. 2. ZEOLITE.

molecular sieve chromatography 1. GEL FILTRATION CHROMATOGRAPHY. 2. GEL PERMEATION CHROMATOGRAPHY.

molecular sieve coefficient The partition coefficient of a solute in gel filtration chromatography; equal to the ratio of the equilibrium concentration of the solute within the gel to its concentration in the mobile phase.

molecular surface The continuous surface of a molecule, equal to the sum of the contact surface and the reentrant surface.

molecular taxonomy CHEMOTAXONOMY.

molecular vibration The stretching or bending of the bonds between atoms that results in a displacement of the atomic nuclei but does not affect their equilibrium positions.

molecular weight 1. The sum of the atomic weights of all the atoms in a molecule. 2. The sum of the atomic weights of all the atoms in a molecular aggregate such as an oligomeric protein, a ribosome, or a virus. *Abbr* M; M_r ; MW; mol wt. *Aka* particle weight.

molecular weight average *See* average molecular weight.

molecule The smallest unit of a compound; a structural unit of matter that retains all its properties, has an independent existence, and is composed of like or unlike atoms.

molecule microscope A microscope for the study of surface materials by molecular beam techniques. The microscope reveals spatial variations in the evaporation of neutral molecules from the surface of a sample that is exposed to reduced pressure. The evaporating molecules may be part of the sample, may have been applied previously to the surface, or may be passed through the sample during the microscopic observation.

mole fraction A measure of concentration expressed in terms of the number of moles of a substance divided by the total number of

- moles of all the substances in a solution or in a mixture.
- mole percent** A measure of concentration expressed in terms of the number of moles of a substance per 100 mol of all related substances.
- Molisch test** A test for carbohydrates that is based on the production of a purple color upon treatment of the sample with concentrated sulfuric acid and α -naphthol.
- Moloney leukemia virus** A mouse leukemia virus that belongs to the leukovirus group.
- molting hormone** ECDYSONE.
- mol wt** Molecular weight.
- molybdenum** An element that is essential to humans and several classes of animals and plants. *Symbol*, Mo; atomic number, 42; atomic weight, 95.94; oxidation state, +6; most abundant isotope, ^{98}Mo ; a radioactive isotope, ^{99}Mo , half-life, 66.7 h, radiation emitted, beta particles and gamma rays.
- molybdoferredoxin** See nitrogenase.
- molybdoiron protein** See nitrogenase.
- molybdoprotein** A conjugated protein containing molybdenum as a prosthetic group.
- molybdopterin** A molybdenum-containing pterin that occurs, together with a heme, in the two identical subunits of rat liver sulfite oxidase. *Abbr* MPT.
- monellin** A basic and carbohydrate-free protein, consisting of two polypeptide chains of 44 and 50 amino acids, respectively. The protein has very high specificity for sweet taste receptors so that it is approximately 100,000 times sweeter than sugar on a molar basis.
- monestrous** Having one estrous cycle per year.
- mongolism** A congenital abnormality characterized by imbecility and due to the presence of one of the autosomes in the triploid rather than in the diploid state.
- monitor** A detector for determining a physical or a chemical variable either periodically or continuously; frequently refers either to a radiation detector for measuring the amount of ionizing radiation or of radioactive contamination, or to a spectrophotometer for measuring the absorbance of visible or ultraviolet light.
- mono-** Prefix meaning one.
- monoacylglycerol** An acylglycerol formed by the esterification of a glycerol molecule with one fatty acid molecule. *Aka* monoglyceride.
- monoamine oxidase** A flavoprotein enzyme that catalyzes the oxidative deamination of monoamines such as epinephrine and norepinephrine. *Abbr* MAO.
- monobactam** A monocyclic, bacterially produced, antibiotic that is similar to the β -lactam antibiotics but has a simpler structure; the four-membered ring, containing an amide group, is not fused to another ring.
- monobasic** Descriptive of a compound that contains one hydrogen atom that is replaceable by a metal (such as K_2HPO_4) or an acid that can furnish one hydrogen ion (such as HCl).
- monochromatic radiation** Electromagnetic radiation of a single wavelength; electromagnetic radiation in which all of the photons have the same energy.
- monochromator** An instrument for the isolation of narrow bandwidths of radiation by means of filters, prisms, or diffraction gratings.
- monocistronic messenger RNA** An mRNA molecule that carries the information for the synthesis of only one polypeptide chain.
- monoclonal antibodies** Immunoglobulins derived from a single clone of cells. Monoclonal antibodies are chemically and structurally identical; they have a single amino acid sequence and are specific for a single antigenic determinant. They can be obtained by propagation of a hybridoma in culture. *Abbr* MAbs. See also hybridoma.
- monocyclic cascade** The simplest cascade system involving one interconvertible enzyme and two converter enzymes. Each converter enzyme requires allosteric activation; one converter enzyme catalyzes the modification of the interconvertible enzyme and the other converter enzyme catalyzes its demodification.
- monocyte** A large amoeboid, phagocytic leukocyte derived from the bone marrow and containing one large nucleus.
- monodentate** Designating a ligand that is chelated to a metal ion through one donor atom.
- monodisperse** Consisting of macromolecules that are all alike in size.
- Monod, Wyman, and Changeux model** See concerted model.
- monoenergetic radiation** Radiation that consists of either photons or particles and in which all of the photons or all of the particles have the same energy.
- monoenoic fatty acid** A fatty acid that has one double bond.
- monoesterase** An enzyme that catalyzes the hydrolysis of an ester which is formed by the esterification of one of the hydroxyl groups of phosphoric acid.
- monogenic** Involving a single gene.
- monoglyceride** MONOACYLGLYCEROL.
- monolayer** 1. A monomolecular layer formed either at a surface or at an interface. 2. A single layer of cells that are growing on a surface.
- monomer** 1. The repeating unit in a polymer. 2. The basic unit in a molecular aggregate, regardless of the number of polypeptide chains or the number of subunits of which it is composed; thus the 70S ribosome is a

monomer while the 30S and 50S ribosomes are subunits and the 100S ribosome is a dimer. 3. The individual polypeptide chain in an oligomeric protein. 4. A protein that is composed of a single polypeptide chain. 5. STRUCTURAL UNIT. *See also* protomer; subunit.

monomolecular layer A layer, one molecule thick.

monomolecular reaction A chemical reaction in which one molecule of a single reactant is converted into products.

monomorphism The occurrence of only one form or one shape. *See also* doctrine of monomorphism.

mononuclear complex A metal ion–ligand complex that is formed from a single metal ion. *See also* polynuclear complex.

mononucleosis An increase in the number of mononuclear leukocytes in the blood. *See also* infectious mononucleosis.

mononucleotide 1. A single nucleotide. 2. A compound that is structurally related to a nucleotide, such as flavin mononucleotide or nicotinamide mononucleotide, and contains one phosphate group.

mononucleotide binding domain ROSSMAN FOLD.

monooxygenase An enzyme that catalyzes a reaction with molecular oxygen in which only one of the oxygen atoms is introduced into a compound. *Aka* hydroxylase.

monoploid state The chromosome state in which the number of chromosomes is the basic one in a polyploid series; the haploid state. *Aka* monoploidy.

monoprotic acid An acid that has one dissociable proton.

monosaccharide A polyhydroxy alcohol containing either an aldehyde or a ketone group; a simple sugar.

monose MONOSACCHARIDE.

monosome 1. The complex that consists of a single ribosome attached to a strand of messenger RNA. 2. A ribosome that has dissociated from a polysome and that contains no tRNA, mRNA, or peptidyl-tRNA. 3. A chromosome that lacks a homologue.

monospecific antiserum A purified antiserum that reacts with only one type of antigen or one type of antigenic determinant.

monovalent 1. Having a valence of one. 2. Descriptive of an allosteric enzyme that responds to only one effector.

monozygotic twins Twins that are genetically identical and that are derived from one fertilized egg; they are formed by a division of the embryo into two halves at some stage of its development.

montanic acid A saturated fatty acid that contains 28 carbon atoms.

Monte Carlo method The solution of a mathe-

matical problem by sampling methods; involves constructing an artificial stochastic model of the problem and then performing sampling experiments on it. The calculation of the time course of a reaction from the probability that the reaction will occur during a given time interval is an example.

MOP Modulus of precision.

MOPS 2-(*N*-Morpholino)propanesulfonic acid; used for the preparation of biological buffers in the pH range of 6.5 to 7.9. *See also* biological buffers.

MOPSO 3-(*N*-Morpholino)-2-hydroxypropanesulfonic acid; used for the preparation of biological buffers in the pH range of 6.2 to 7.6. *See also* biological buffers.

Morawitz theory An early formulation of the blood clotting mechanism in terms of a two-stage process, consisting of the activation of prothrombin to thrombin and the conversion of fibrinogen to fibrin.

Morgan unit A measure of the distance between genes on a chromosome that is equal to a crossover value of 100%.

Morner's test 1. A test for tyrosine that is based on the production of a green color upon treatment of the sample with sulfuric acid and formaldehyde. 2. A test for cysteine that is based on the production of a purple color upon treatment of the sample with sodium nitroprusside.

morphine An opium alkaloid that is formed from codeine as the poppy ripens; a narcotic drug which acts as an anesthetic without decreasing consciousness and is the most powerful analgesic known.

morphine rule The principle that the narcotic properties of morphine do not require the entire structure of the morphine molecule but only an aromatic ring attached to a quaternary carbon atom and the presence of a tertiary amine, two carbons farther away.

morphinomimetic Mimicking the action of morphine.

morphogen A substance that triggers growth and differentiation of cells and tissues by virtue of its concentration; all-trans retinoic acid, a derivative of vitamin A, appears to be such a substance.

morphogene A gene that functions, either directly or indirectly, in growth control and morphogenesis. Genes for hormones, inducers and mitogens are examples.

morphogenesis The developmental processes that lead to the mature size, form, and structure of organelles, cells, tissues, organs, or whole organisms.

morphogenetic Of, or pertaining to, morphogenesis. *Aka* morphogenic.

morphogenetic gene A gene that plays a role in morphogenesis through some function other

than that of specifying the synthesis of a structural protein.

morphogenic induction The determination of the differentiation of one cell mass of an embryo by its interaction with another cell mass of the same embryo.

morphology The science that deals with the structures and forms of organisms.

morphology-dependent resonance Narrow spectral resonances in the light scattered from transparent or weakly absorbing microparticles (droplets and fibers); produced when the electromagnetic modes of the microparticles are excited by some incident radiation. *Abbr* MDR.

morphopoiesis MORPHOGENESIS.

morphopoietic gene MORPHOGENETIC GENE.

mortichemistry THANATO-CHEMISTRY.

mosaic An individual composed of two or more genetically different types of cells derived from the same zygote. *See also* chimera.

mosaic theory The theory of hypertension that describes the regulation of blood pressure in terms of the interactions between eight variables placed diagrammatically at the corners of an octagon. The eight variables are chemical factors, neural factors, elasticity, cardiac output, viscosity, vascular caliber, volume, and reactivity.

Mossbauer effect The inelastic collision between a nucleus and a gamma ray in which the gamma ray is absorbed by and excites the nucleus; the nucleus remains in the excited state for a brief period of time (10^{-6} to 10^{-10} s) and subsequently returns to its ground state with the emission of the gamma ray.

Mossbauer spectrometer An instrument for detecting small changes in the interaction between a nucleus and its environment that are produced by variations in temperature, pressure, or chemical state.

MO theory Molecular orbital theory.

motilin A candidate hormone in the small intestine that, when injected into animals, leads to a marked increase in gastric and intestinal motility.

motility model FLUCTUATION THEORY (2).

motor end plate NEUROMUSCULAR JUNCTION.

motor neuron A neuron that conveys impulses to a muscle, resulting in muscle contraction.

mottled enamel A pitted and corroded form of tooth enamel that can be produced by the drinking of water that contains excessive amounts of fluoride ions.

mottled plaque A plaque produced by the joint growth of two related phages, such as two mutants, in the same infectious center.

mouse antialopeia factor INOSITOL.

mouse L cells *See* L cells.

mouse leukemia virus An oncogenic virus that

contains single-stranded RNA and causes leukemia in mice; the Friend, Graffi, Gross, Moloney, and Rauscher leukemia viruses, which belong to the leukovirus group, are examples.

mouse mammary tumor virus An oncogenic virus that is transmitted through the milk and that causes mammary cancer in mice; it contains single-stranded RNA and belongs to the group of leukoviruses. *Abbr* MMTV. *Aka* murine mammary tumor virus. *See also* A-, B-, and C-type tumors.

mouse satellite DNA A satellite DNA that has been isolated from a variety of mouse tissues and that constitutes about 10% of the total mouse DNA; it consists of highly repetitive DNA that contains about one million copies of a segment some 400 nucleotide pairs in length.

moving boundary analysis ISOTACHOPHORESIS.

moving boundary centrifugation Centrifugation in which an initially uniform solution is centrifuged so that boundaries are formed in the solution and move across the centrifuge cell; generally performed in an analytical-type ultracentrifuge.

moving boundary electrophoresis Electrophoresis, performed in a Tiselius apparatus, in which an initially uniform solution is partially separated so that boundaries are formed that move toward or away from an electrode.

moving zone centrifugation DENSITY GRADIENT CENTRIFUGATION.

mp Melting point; also abbreviated m.pt.

6-MP 6-Mercaptopurine.

MPD Maximum permissible dose.

M-protein 1. A galactoside carrier protein in the permease system of *E. coli*. *See also* lactose permease. 2. A major cell surface antigen of *Brucella*. 3. A cell wall antigen in virulent strains of *Streptococcus*. 4. A structural protein present in the M line of the myofibrils of striated muscle.

MPT Molybdopterin.

M_r Relative molecular mass; molecular weight.

MR 1. Multiplicity reactivation. 2. Metabolic rate.

MRF *See* melanocyte-stimulating hormone regulatory hormone.

MRH *See* melanocyte-stimulating hormone regulatory hormone.

MRIF *See* melanocyte-stimulating hormone regulatory hormone.

MRIH *See* melanocyte-stimulating hormone regulatory hormone.

mRNA Messenger RNA.

mRNA coding triplet CODON.

mRNA strand ANTICODING STRAND.

mRNP 1. Messenger ribonucleoprotein parti-

cle. 2. Messenger ribonucleoproteins.

MS 1. Magic spot. 2. Mass spectrometry. 3. Multiple sclerosis.

MS-2 A small, tailless, icosahedral phage that contains single-stranded RNA and infects *E. coli*.

MSD mice Myelin-synthesis-deficient mice; mice that have the Quaking mutation.

msDNA Multicopy single-stranded DNA; an unusual satellite DNA, originally detected in myxobacteria, that occurs in multiple copies per genome.

MSG Monosodium glutamate. *See also* Chinese restaurant syndrome.

MSH Melanocyte-stimulating hormone.

MSHIF *See* melanocyte-stimulating hormone regulatory hormone.

MSHIH *See* melanocyte-stimulating hormone regulatory hormone.

MSHRF *See* melanocyte-stimulating hormone regulatory hormone.

MSHRH *See* melanocyte-stimulating hormone regulatory hormone.

MSHRIF *See* melanocyte-stimulating hormone regulatory hormone.

MSHRIH *See* melanocyte-stimulating hormone regulatory hormone.

MS/MS Tandem mass spectrometry.

MT 1. Metallothionein. 2. Microtubules.

MTA Mammary tumor agent.

mtDNA Mitochondrial DNA.

mt mRNA Mitochondrial messenger RNA.

MTOC Microtubule organizing center.

mt rRNA Mitochondrial ribosomal RNA.

mt tRNA Mitochondrial transfer RNA.

mu 1. Map unit. 2. Mate killer.

mu chain The heavy chain of the IgM immunoglobulins. *Sym* μ .

mucilage A complex, colloidal, carbohydrate material that is derived from plants; it can form gels and has adhesive properties.

mucin A mucoprotein secreted by mucous glands and mucous cells.

mucin clot The clot, composed of hyaluronic acid and small amounts of protein, that is formed upon acidification of some biological fluids such as the vitreous humor of the eye and the synovial fluid.

muco Combining from meaning amino sugar.

mucoid MUCOPROTEIN.

mucopolidosis One of a group of genetically inherited metabolic storage diseases in humans in which both mucopolysaccharides and lipids accumulate in tissues. The diseases are characterized by a normal urinary concentration of mucopolysaccharides and by symptoms of sphingolipid and/or glycolipid storage abnormalities. I-cell disease is an example.

mucopeptide A peptide that is covalently linked to an amino sugar.

mucopolysaccharide GLYCOSAMINOGLYCAN.

mucopolysaccharide storage disease MUCOPOLYSACCHARIDOSIS.

mucopolysaccharidosis One of a number of genetically inherited metabolic storage diseases in humans that are characterized by excessive accumulation and excretion of the oligosaccharides of proteoglycans; the defects are due to deficiencies of specific lysosomal enzymes. Hunter's syndrome, Hurler's syndrome, and Sanfilippo's syndrome are some examples.

mucoprotein PROTEOGLYCAN.

mucosa MUCOUS MEMBRANE.

mucosal block The permeability barrier of the intestinal mucosa to the absorption of iron from the intestine.

mucous Of, or pertaining to, mucus.

mucous gland A gland that secretes mucus.

mucous membrane An epithelial membrane, the surface of which is bathed by mucus.

mucus The viscous secretion of mucous glands that consists largely of mucin and water and that serves to bathe mucous membranes.

mull A two-phase mixture made by grinding a solid sample and dispersing it in a suitable organic solvent; used for the analysis of some samples by infrared spectroscopy.

multi- Combining form meaning many.

multichannel analyzer A scintillation spectrometer that can record pulses in a number of different channels.

multicomponent survival curve MULTITARGET SURVIVAL CURVE.

multicomponent virus COVIRUS.

multicyclic cascade A system, produced by the coupling of two or more monocyclic cascades. The extrinsic and intrinsic pathways of blood clotting and the regulation of glycogen phosphorylase are some examples.

multidimensional gas chromatography A gas chromatographic technique that involves the use of two or more separate columns for a given separation. The columns may be connected serially but are most commonly used by means of column switching in which an inadequately resolved fraction from one column is shunted to a second column for more complete resolution. The technique is particularly useful for the analysis of complex mixtures. *Abbr* MDGC.

multienzyme complex 1. MULTIENZYME SYSTEM. 2. METABOLON (2).

multienzyme system The structural and functional entity that is formed by the association of several different enzymes which catalyze a sequence of closely related reactions; the aggregate may contain one or more molecules of a given enzyme. *Aka* enzyme complex; multienzyme complex.

multifactorial Of, or pertaining to, a polygene; polygenic.

multifunctional protein A protein that has two or more different catalytic and/or binding functions on a single polypeptide chain.

multigene family A group of genes, derived by duplication and variation from a common ancestral gene, that are located on the same or on different chromosomes. A multigene family exhibits four properties: multiplicity, close linkage, sequence homology, and related phenotypic functions. The genes coding for histones, immunoglobulins, and hemoglobins are examples of multigene families.

multiheaded protein MULTIFUNCTIONAL PROTEIN.

multihit survival curve 1. A survival curve that describes a radiation phenomenon in which two or more photons must be absorbed by one target before the viability of the active unit is lost. 2. MULTITARGET SURVIVAL CURVE.

multilamellar vesicle See vesicle.

multimer OLIGOMER.

multiparticle virus COVIRUS.

multiphasic zone electrophoresis DISC GEL ELECTROPHORESIS.

multiple alleles A group of three or more alternative alleles, any one of which may occur at the same locus on a chromosome.

multiple binding MULTIPLE EQUILIBRIA.

multiple codon recognition The binding of a given molecule of tRNA to more than one codon, as postulated by the Wobble hypothesis.

multiple component virus COVIRUS.

multiple development A chromatographic technique, used particularly with paper or thin-layer chromatography, in which the sample is developed repeatedly with either the same or different solvents.

multiple displacement mechanism NONSEQUENTIAL MECHANISM.

multiple equilibria The interactions that occur between the macromolecule that has several binding sites and the ligands that bind to these sites.

multiple-event curve MULTI HIT SURVIVAL CURVE.

multiple factor hypothesis The hypothesis that quantitative traits, such as size and weight, result from the cumulative effect of a group of genes. See also polygene.

multiple forms of an enzyme A collective term for all the proteins that possess the same enzyme activity and that occur naturally in a single species; includes genetically independent proteins, heteropolymers, genetic (allelic) variants, proteins conjugated with other groups, proteins derived from one polypeptide chain, polymers of a single subunit, and forms differing in conformation.

multiple gene POLYGENE.

multiple-hit survival curve See multihit survival curve.

multiple inhibition analysis A kinetic analysis of the interactions of two or more inhibitors of an enzymatic reaction. The analysis indicates whether the inhibitors are mutually exclusive or whether they can bind simultaneously to the enzyme and, if so, whether the binding of one inhibitor to the enzyme facilitates or hinders the binding of another.

multiple myeloma A malignant disease of antibody-producing plasma cells in which single, specific cells have undergone neoplastic transformation. These cells proliferate to produce excessive amounts of specific proteins, including the Bence-Jones protein, myeloma globulins, and fragments of the various classes of normal immunoglobulins.

multiple sclerosis A human demyelination disease in which the myelin sheath of nerves undergoes destruction. The cause of this is uncertain but a genetic predisposition for the disease occurs. In the absence of myelin, axons fail to conduct nerve impulses. The disease is characterized by partial paralysis, changes in speech, and inability to walk. *Abbr* MS. *Aka* demyelination disease.

multiplet A multiple peak, as that obtained in nuclear magnetic resonance.

multiplication cycle The sequence of steps from the infection of a cell by a virus to the formation of new virus particles and their release from the cell.

multiplicity See enzyme multiplicity; transfer RNA multiplicity; spin multiplicity.

multiplicity of infection 1. The number of virus particles that have either adsorbed to, or infected, cells in a culture, divided by the total number of cells in the culture. 2. The number of virus particles added to a culture divided by the total number of cells in the culture. *Abbr* MOI.

multiplicity reactivation The restoration of the activity of a virus that carries a lethal mutation by the simultaneous infection of a host cell with this and one or more other mutant viruses. The process involves a genetic exchange whereby a viable genome is produced from the undamaged sections of the mutant, and from otherwise nonviable, genomes. *Abbr* MR. See also cross-reactivation.

multistep induction theory A theory of carcinogenesis according to which cancer is induced as a result of a number of steps or stages. It is believed that, at the very least, there are two such steps, initiation and promotion. Initiation involves the acquisition of mutations, and promotion involves the expression of these mutations. *Aka* multistage induction theory.

multisubstrate enzyme system An enzyme system involving more than one substrate. The mechanism of a multisubstrate enzyme system may be random or ordered and may be sequential or nonsequential.

multitarget survival curve A survival curve that describes a radiation phenomenon in which two or more photons must be absorbed by two or more targets before the viability of the active unit is lost.

multivalent POLYVALENT.

multivalent allosteric enzyme An allosteric enzyme, the activity of which can be altered by more than one effector.

multivalent allosteric inhibition The inhibition of an allosteric enzyme by two or more negative effectors; the inhibition of a multivalent allosteric enzyme.

multivalent feedback inhibition CONCERTED FEEDBACK INHIBITION.

multivalent vaccine See polyvalent vaccine.

multivesicular body A secondary lysosome that contains a large number of vesicles.

muon See elementary particles.

mu particle See mate killer.

muramic acid A compound derived from glucosamine and lactic acid, the acetylated form of which is a major building block of the bacterial cell wall.

muramidase LYSOZYME.

Murayama hypothesis The hypothesis that the replacement of glutamic acid by valine at position 6 in the beta chains of sickle cell hemoglobin permits the formation of intermolecular hydrophobic bonds which lead to a head-to-tail stacking of hemoglobin molecules; the filaments thus formed distort the red blood cell and convert it to a sickle cell.

Murchison meteorite A large meteorite that fell near Murchison, Australia, on September 28, 1969. Analysis of the meteorite provided support for the notion that amino acids can be synthesized in outer space by mechanisms similar to those postulated to have been involved in their synthesis on the primitive earth.

murein PEPTIDOGLYCAN.

murexide test A test for purines that is based on the production of a red color upon treatment of the sample with concentrated nitric acid and then with ammonium hydroxide.

murine Of, or pertaining to, mice and rats.

murine leukemia Leukemia in mice that is produced by a mouse leukemia virus.

murine leukemia virus MOUSE LEUKEMIA VIRUS.

murine mammary tumor virus MOUSE MAMMARY TUMOR VIRUS.

muropeptide The repeating unit in peptidoglycan that consists of *N*-acetylglucosamine, *N*-acetylmuramic acid, and a tetrapeptide

side chain.

muscarine A toxin from the mushroom *Amanita muscaria*. *Var sp* muscarin.

muscarinic receptor A synaptic acetylcholine receptor to which muscarin binds, thereby mimicking the action of acetylcholine. Such receptors are found at smooth muscle end plates and in the brain. See also decamethonium.

muscarinic synapse A synapse containing muscarinic receptors.

muscle A contractile organ of the body. See also red muscle; white muscle.

muscle contraction See contraction; sliding filament model; rowboat model.

muscle fiber A long, multinucleated cell of striated muscle.

muscle hemoglobin MYOGLOBIN.

muscle phosphorylase See phosphorylase a; phosphorylase b.

muscle sugar INOSITOL.

muscular dystrophy One of a group of genetically inherited metabolic defects in humans that are characterized by painless progressive degeneration and atrophy of muscle without involvement of the nervous system. Major types of muscular dystrophy involve degeneration of the musculature of girdles and limbs.

mushroom sugar TREHALOSE.

mustard 1. SULFUR MUSTARD. 2. NITROGEN MUSTARD.

mustard oil glycoside A plant toxin that is a sulfur-containing glycoside.

mutability The capacity to undergo mutation.

mutability spectrum MUTATIONAL SPECTRUM.

mutable Capable of undergoing mutation.

mutable gene An unstable gene that is characterized by a high rate of spontaneous mutation.

mutable site Any site along the chromosome at which a mutation can occur.

mutagen A physical or chemical agent that is capable of inducing mutations; a mutagen raises the frequency of mutation above that due to spontaneous mutations.

mutagenesis The production of mutations. Mutagenesis is said to be direct if the mutagenic agent leads to mutations only at the site of the DNA damage. Mutagenesis is said to be indirect if mutations occur at other sites as well because of relaxed fidelity of replication or other causes. Many environmental chemical carcinogens are believed to lead to indirect mutagenesis.

mutagenic Capable of inducing mutations.

mutagenic agent MUTAGEN.

mutagenic repair SOS REPAIR.

mutagenize To expose nucleic acids, viruses, cells, or organisms to a mutagen.

mutant 1. A cell, a virus, or an organism that

carries a gene that has undergone mutation 2. A gene that has undergone mutation.

mutant allele See mutant gene.

mutant gene A gene that has undergone a mutation; the modified nucleotide sequence of a wild-type gene.

mutant protein A protein formed from a mutant gene.

mutarotation The change in optical rotation with time that occurs when an optical isomer, such as a carbohydrate, is dissolved in water and is converted to an equilibrium mixture of several different optical isomers.

mutase An enzyme that catalyzes the intramolecular transfer of a group, specifically a phosphate group.

mutation 1. The process whereby a gene undergoes a structural change leading to a sudden and stable change in the genotype of a cell, a virus, or an organism; any heritable change in the genome of a cell, a virus, or an organism other than that due to the incorporation of genetic material from other sources; any change in the base sequence of DNA. 2. **MUTANT GENE**. 3. The cell, the virus, or the organism that carries a mutant gene.

mutational load The genetic inadequacy of a population as a result of the mutational accumulation of deleterious genes.

mutational spectrum The genetic map of the point mutations that either arise spontaneously or are produced by exposure to a mutagen.

mutation distance The smallest number of mutational changes that is required to change one nucleotide sequence in DNA into a different one.

mutation frequency 1. The proportion of mutants of a given type in a population of growing cells or organisms. 2. **MUTATION RATE**.

mutation frequency decline The phenomenon that ultraviolet-induced reversions from auxotroph to prototroph decrease as a function of time if they are determined under conditions whereby postirradiation protein synthesis is inhibited. See also mutation stabilization.

mutation index An estimate of the mutation frequency; it is equal to the proportion of mutants in a population of cells that have been grown from an inoculum that contained such a small number of organisms that it is unlikely that any mutants were among them.

mutation pressure The continued production of specific mutants.

mutation rate The total number of mutations, or the number of mutations of a specified kind, that are produced in a population of cells or organisms per cell division, or per replication, over a given period of time.

mutation stabilization The phenomenon that

ultraviolet-induced reversions from auxotroph to prototroph achieve a constant value as a function of time if they are determined under conditions allowing for postirradiation protein synthesis. See also mutation frequency decline.

mutation theory See somatic mutation theory.

mutator gene A gene that increases the mutation rate of other genes, as in a system where the mutator gene produces a DNA polymerase that makes errors during replication.

mutator mutant A mutant carrying a mutator gene.

mutator strain A strain carrying a mutator gene.

mutein A mutant protein such as the cross-reacting material.

muton The unit of genetic mutation; the smallest section of a chromosome, which may be as small as a single nucleotide, a change in which can result in a mutation.

\bar{M}_v Viscosity-average molecular weight.

\bar{M}_w Weight-average molecular weight.

MW Molecular weight.

MWC model Monod, Wyman, and Changeux model; see concerted model.

myasthenia gravis A disease, characterized by profound muscular weakness, that is due to the formation of antibodies to the receptors for acetylcholine. Binding of the antibodies to the receptors decreases the level of active receptors in the tissues and decreases the efficiency of neuromuscular transmissions.

mycelium (*pl* mycelia) The vegetative structure of a fungus that consists of a multinucleate mass of cytoplasm, enclosed within a branched network of filamentous tubes known as hyphae.

myco- Combining form meaning fungus.

mycobacteria A genus of aerobic, gram-positive bacteria that occur in soil, water, and the tissues of various animals; includes the causative agents of tuberculosis and leprosy.

mycobactin One of a group of siderophores of the hydroxamic acid type that are found in mycobacteria.

mycolic acid One of a group of complex long-chain hydroxy fatty acids that contain from 60 to 90 carbon atoms, have varying degrees of branching and unsaturation, and contain cyclopropane rings.

mycology The branch of botany that deals with fungi.

mycoplasma A genus of primitive bacteria that are the simplest known, independently living organisms, and that differ from other bacteria in not having a cell wall.

mycorrhiza 1. A stable symbiotic association between a fungus and the root of a plant. 2. The root-fungus structure in the symbiotic re-

lationship of a fungus and the root of a plant.

mycoside A lipid composed of a long-chain, highly branched, and hydroxylated hydrocarbon that is terminated by a phenol to which a trisaccharide is linked by means of a glycosidic bond.

mycosis A disease caused by a fungus.

mycosterol A sterol of fungi.

mycotoxins Toxic substances produced by fungi that are harmful to other organisms, especially vertebrates, including humans. Those toxic for humans and animals include aflatoxins and ergot alkaloids. The term is also used frequently to include toxins produced by other microorganisms such as the endotoxins and exotoxins of bacteria.

myelination The formation and the deposition of the myelin sheath around an axon.

myelin basic protein A major myelin protein of the mammalian central nervous system. Upon injection into guinea pigs, rabbits, or rats, it induces allergic autoimmune encephalomyelitis, an inflammation of the brain and spinal column. The protein is rich in basic amino acids. *Aka* encephalitogenic protein; myelin protein A1. *See also* Cop 1.

myelin protein A1 MYELIN BASIC PROTEIN.

myelin sheath The lipid-rich, insulating covering of an axon that is formed by wrapping the plasma membrane of a Schwann cell around the axon. Myelin contains lipids, especially shingolipids, proteins, polysaccharides, salts, and water.

myeloma A tumor of cells that are derived from the hematopoietic tissue of bone marrow; a tumor in which a single antibody-secreting plasma cell, programmed to make one type of antibody, has multiplied to yield a large clone of cells, each of which produces only that antibody. As a result, the tumor secretes large amounts of a single species of antibody.

myeloma proteins Pathological immunoglobulin proteins, so called because they are formed in large amounts in patients with multiple myeloma. Myeloma proteins include the Bence-Jones protein, myeloma globulins (which have typical immunoglobulin structures with light and heavy chains), and fragments of the various classes of normal immunoglobulins.

myeloperoxidase A lysosomal enzyme of phagocytic leukocytes that aids in the destruction of alien objects by forming hypochlorite from hydrogen peroxide and chloride ions.

myelosome An organelle formed by the fusion of myelinated nerve cell axons during homogenization; contains plasma membrane vesicles encased in a myelin sheath that is open at both ends.

myo- Combining form meaning muscle.

myocardial Of, or pertaining to, the heart muscle.

myocyte 1. A muscle cell. 2. A contractile cell, especially one in sponges.

myofibril A small, contractile, threadlike structure of striated muscle; the myofibrils are arranged in parallel bundles within the cytoplasm of a muscle fiber.

myofibrillar ghost FIBRIL GHOST.

myofilament A minute, contractile, threadlike structure of striated muscle; the myofilaments are arranged in parallel bundles within a myofibril and consist of thin and thick filaments.

myogen An aqueous extract of the sarcoplasm of striated muscle that consists largely of glycolytic enzymes.

myogenesis The formation of muscle tissue.

myoglobin The oxygen-storing protein of muscle that consists of a single polypeptide chain surrounding a heme group, and that is closely related to the monomeric unit of hemoglobin. *Abbr* Mb.

myograph An instrument for recording the forces of muscular contractions.

myohematin CYTOCHROME.

myoinositol INOSITOL.

myokinase ADENYLATE KINASE.

myoneme A bundle of intracellular protein filaments found in some ciliates and believed to account for contractility.

myoneural Of, or pertaining to, muscles and nerves.

myoneural junction NEUROMUSCULAR JUNCTION.

myosin The most abundant protein of the myofilaments of striated muscle and the protein that forms the thick filaments. Myosin is an asymmetric molecule composed of two heavy chains (MHC) and two pairs of light chains (MLC). Each heavy chain consists of a long, alpha-helical section attached to a globular head. In the intact myosin molecule, the two heavy-chain alpha-helical sections are intertwined, forming a long rod-like, fibrous tail, from which the two heads project. Each head is a complex of the globular portion of a heavy chain and two light chains (one molecule of each type). Both the ATPase activity and the actin-binding capacity of myosin reside in the globular head portion of the molecule.

myosin B ACTOMYOSIN.

myosin filament A thick filament of striated muscle from which cross-bridges protrude that link the thick filament to the thin filaments; a myofilament.

myosin subfragment SF, FRAGMENT.

myotropic activity The anabolic effect of androgens on nitrogen metabolism that leads

to nitrogen retention of the body and to a limited increase in muscle strength and development.

myria- 1. Combining form meaning ten thousand and used with metric units of measurements. *Sym* my. 2. Combining form meaning a great number.

myristic acid A saturated fatty acid that contains 14 carbon atoms and that occurs in animal fat.

myxedema 1. HYPOTHYROIDISM. 2. The dry,

waxy type of skin swelling found in individuals that have marked hypothyroidism; due to infiltration of the skin with proteoglycans.

myxovirus A large, enveloped animal virus that contains single-stranded RNA. Myxoviruses are divided into two subgroups: the orthomyxoviruses, which include the influenza virus, and the paramyxoviruses, which include the mumps virus.

\bar{M}_z Z-average molecular weight.

MZE Multiphasic zone electrophoresis.

N

- n** 1. Refractive index. 2. Nano. 3. Neutron.
- N** 1. Nitrogen. 2. Normal concentration. 3. Nucleoside. 4. Asparagine. 5. Haploid number. 6. Neutron number. 7. Newton. 8. Avogadro's number. 9. Nominally labeled.
- Na** Sodium.
- NA** Noradrenaline.
- NACneu** *N*-Acetylneuraminic acid.
- NAD⁺** Nicotinamide adenine dinucleotide. *Aka* DPN⁺.
- NADH** Reduced nicotinamide adenine dinucleotide. *Aka* DPNH.
- NADH-coenzyme Q reductase complex** COMPLEX I.
- NADH-dehydrogenase complex** COMPLEX I.
- NADH: ubiquinone oxidoreductase** COMPLEX I.
- Na⁺,K⁺-ATPase** The adenosine triphosphatase that is located in the cell membrane and that functions in the active transport of sodium and potassium ions. The enzyme is vectorial in its action and requires the presence of both sodium and potassium ions. The Na⁺,K⁺-ATPase is a primary active transport mechanism.
- naked virion** A virion that consists of a nucleocapsid that is not surrounded by a membrane.
- nalidixic acid** A synthetic antibiotic that inhibits prokaryotic DNA replication; it inhibits the DNA gyrase of *E. coli*.
- NAN** *N*-Acetylneuraminic acid.
- NANA** *N*-Acetylneuraminic acid.
- nano-** Combining form meaning one-billionth (10⁻⁹) and used with metric units of measurements. *Sym* n.
- Naperian logarithm** NATURAL LOGARITHM.
- naphthol blue black** AMIDO BLACK 10B.
- narcosis** A state of stupor produced by a narcotic drug; loss of consciousness.
- narcotic** 1. Of, or pertaining to, narcosis. 2. NARCOTIC DRUG.
- narcotic drug** A substance that acts predominantly on the central nervous system and that produces, depending on the dose, sedation, stimulation, sleep, loss of consciousness, or relief of pain. According to the World Health Organization (1964), narcotic drugs are classified as follows: (a) alkaloids (LSD, mescaline, opium, etc.); (b) barbiturates and other sleeping drugs; (c) alcohol; (d) cocaine; (e) hashish and marijuana; (f) hallucinogens; (g) stimulants or antidepressants (such as amphetamines).
- nascent** Being formed; in the process of being synthesized, particularly in reference to the synthesis of macromolecules.
- nascent polypeptide chain** 1. A polypeptide chain that is in the process of being formed and that is attached to a transfer RNA molecule which, in turn, is bound to a ribosome. 2. A complete, newly synthesized, polypeptide chain prior to any post-translational modification.
- nascent RNA** 1. An RNA molecule that is in the process of being formed. 2. A complete, newly synthesized, RNA molecule prior to any post-transcriptional modification.
- Natelson microgasometer** An instrument for the manometric measurement of the oxygen, carbon monoxide, and carbon dioxide content of blood.
- National Formulary** A pharmacopeia published in the United States. *Abbr* N.F.
- native** 1. Descriptive of a protein or a nucleic acid molecule in its natural, in vivo state as opposed to its denatured state. 2. Descriptive of a protein or a nucleic acid molecule that has been isolated by mild procedures so that it is undenatured, or only slightly denatured, and is taken to represent the in vivo state of the molecule.
- native conformation** 1. The in vivo conformation of a macromolecule. 2. The normal conformation of a macromolecule that has been isolated by mild procedures, shows no apparent structural alterations, and is investigated under suitable conditions of pH, temperature, and ionic strength.
- native immunity** NATURAL IMMUNITY.
- native plasma** Plasma obtained without the addition of an anticoagulant.
- natriuretic hormone** A postulated hormone that increases the excretion of sodium ions in the urine by inhibiting reabsorption of the sodium ions by the kidney. The hormone is also believed to act on sodium ion transport of other tissues. Specifically, the hormone is thought to change the ion concentration of smooth muscles in small blood vessels, making them contract more readily and thereby raising the blood pressure. *Aka* third factor.
- natural abundance** The relative proportion of

an isotope in nature, based on the sum of the concentrations of all the other isotopes of that particular element.

natural antibody An antibody that is present in the blood and that is capable of reacting with specific antigens even though the organism had no known exposure to those antigens.

natural auxin INDOLEACETIC ACID.

natural chain elongation The elongation of a chain by tailward growth.

natural immunity The immunity that is characteristic of an organism and that is a result of the genetic makeup of the organism. Currently an outmoded concept since it is now believed that all immunity ultimately requires exposure to an antigen and, hence, is acquired immunity.

natural immunization An immunization brought about by natural exposure, as by inhalation, ingestion, skin contact, or infection.

natural killer cells Small lymphocyte-like cells that are present in normal individuals of various mammalian species. These cells spontaneously kill a variety of tumor cells and virus-infected cells and their activity is enhanced by interferon. They are known as natural killer cells because their cytolytic action does not require prior immunization. *Abbr* NK cells. *See also* killer cells.

natural logarithm A logarithm to the base e . *Abbr* \log_e ; \ln . *See also* logarithm.

natural pH gradient The pH gradient that is used in isoelectric focusing and that is produced during the experiment by the electrolysis of carrier ampholytes. The carrier ampholytes band at positions where the isoelectric pH of the ampholyte equals the pH of the solution; a pH gradient is thereby established which, once formed, is stable for prolonged times.

natural product 1. A secondary metabolite that has no known function. 2. Any organic compound produced by a living organism.

natural selection The principle, proposed by Darwin in 1859, that natural processes favor those members of the species that are better adapted to their environment and tend to eliminate those that are unfitted to their environment. Thus, the "fittest" organisms survive and through successive generations changes become established that lead to the production of new types and new species. *Aka* Darwinian selection.

nature's antacid SECRETIN.

n_D Refractive index, measured with the light of a sodium D line.

NDP 1. Nucleoside diphosphate. 2. Nucleoside-5'-diphosphate.

nearest-neighbor base frequency analysis A method for assessing base sequences in nuc-

leic acids by a comparison of the frequencies with which any pair of adjacent bases occurs in these nucleic acids. The method is used especially for DNA and, in that case, requires the synthesis of DNA by DNA polymerase in the presence of a DNA template and the four 5'-deoxyribonucleoside triphosphates, one of which is labeled with ^{32}P in its alpha phosphorus. The synthesized product is digested to the 3'-deoxyribonucleoside monophosphates which results in a shift of the ^{32}P label from the incorporated nucleotide to its nearest neighbor in the synthesized polynucleotide strand. The experiment is performed four times, using a different, labeled deoxyribonucleoside triphosphate at each time. The extent of label in the isolated 3'-deoxyribonucleoside monophosphates can then be used to calculate the frequencies of pairs of adjacent bases in the newly synthesized DNA.

nearest-neighbor cooperative model A model for the cooperative binding of multiple ligands to a macromolecule that is based on two constants; a nucleation constant K that represents the binding constant to a site whose nearest neighbors are unoccupied; and a growth constant K' that represents a binding constant to a site adjacent to an occupied one. The ratio $q = K'/K$ is a measure of the degree of cooperative binding. When $q > 1$, the binding shows positive cooperativity; when $q < 1$ it shows negative cooperativity (anticooperativity); and when $q = 0$ the binding is that of the nearest-neighbor exclusion model.

nearest-neighbor exclusion model EXCLUDED SITE BINDING.

nebulin A protein in striated muscle that may help to keep the myosin thick filaments centered within the sarcomere during force generation.

nebulizer ATOMIZER.

necrosis The sum of the morphological changes in a group of cells, a tissue, or an organ that is indicative of cell death; the pathological death of cells that is due to the progressive degradative action of enzymes.

NEFA Nonesterified fatty acids.

negative catalysis Catalysis that leads to a decrease in the rate of a chemical reaction. This may occur, for example, through the tight binding of an intermediate to an enzyme; as a result, the intermediate is prevented from reacting with a "wrong" compound by having the energy of activation for that reaction increased due to its binding to the enzyme.

negative complementation The inhibition of the activity of a subunit of a wild-type oligomeric protein by a mutant allele-type subunit.

negative contrast staining NEGATIVE STAINING.

negative control The prevention of a biological activity by the presence of a specific molecule; the prevention by a repressor of either inducible enzyme synthesis or initiation of mRNA synthesis are two examples. *See also* negative regulation.

negative cooperativity Cooperative binding in which the binding of one ligand to one site on the molecule decreases the affinity for the binding of subsequent ligands to other sites on the same molecule. *Aka* anticooperativity.

negative effector *See* effector.

negative electron ELECTRON (1).

negative feedback A feedback mechanism, as in many biological systems, in which a large output of the system leads to a decrease in the subsequent output while a small output of the system leads to an increase in the subsequent output.

negative gene control NEGATIVE REGULATION.

negative hydration Hydration in which the water molecules in the primary hydration shell of an ion have greater mobility than those in pure water.

negative labeling The process whereby a specific residue in a protein is either masked or protected so that it will not undergo a reaction with a given reagent, and all the remaining, available, and unprotected residues are then labeled by reaction with the reagent.

negative phase The stage that follows the administration of a second dose of antigen to an animal during which there is a temporary decrease in the concentration of free antibodies in the circulation due to the fact that the added antigens combine with preexisting circulating antibodies.

negative polarity Descriptive of a single-stranded RNA or single-stranded DNA molecule that has bases in a sequence that is complementary to the sequence in the corresponding mRNA molecule.

negative regulation The regulation of gene expression in which transcription is turned off by the presence of an inhibitor (repressor) on the DNA; an anti-inhibitor (inducer) is required to remove this inhibition and permit mRNA synthesis to take place.

negative staining A staining technique, used in electron microscopy, in which the material to be examined is mixed with an electron-dense substance, such as phosphotungstic acid, and appears transparent against an opaque background.

negative strand virus A virus containing single-stranded RNA that has negative polarity. The RNA strand (called a negative strand) has a base sequence that is complementary to that found in the viral mRNA. Therefore, the infecting RNA cannot code directly for pro-

teins. Instead, it must first be copied by an RNA-dependent RNA polymerase to yield a translatable mRNA molecule that does code for proteins. *See also* plus strand; virus.

negative supercoil NEGATIVE SUPERHELIX.

negative superhelix *See* superhelix.

negatron A negatively charged electron.

negentropy The negative, or lack, of entropy.

Since a positive information change can be considered to be equivalent to a negative entropy change, information can be considered to be the negative of entropy or negentropy. The information content of a molecule can, therefore, be considered to represent negentropy.

neighbor-exclusion principle EXCLUDED SITE BINDING.

neighboring group effect The effect of a group in a molecule on a nucleophilic displacement reaction in which the molecule participates; the effect is due to the group functioning as an internal nucleophile for an intramolecular displacement reaction.

neighbor restoration The reactivation of cells, damaged by irradiation with ultraviolet light, that is brought about when the cells are incubated in a liquid medium at high concentrations of cells from either the same or other strains.

NEM *N*-Ethylmaleimide.

nematic liquid crystal *See* liquid crystal.

nematosome A cytoplasmic inclusion occurring in certain neurons.

Nembutal Trademark for sodium pentobarbital; used as an anesthetic for mammals.

neoantigen An antigen that has acquired new antigenic specificity either by some modification of the original molecule and/or by the coupling of a hapten.

neobiogenesis The repeated formation of life from nonliving, inorganic matter.

neocarcinostatin *See* antitumor proteins.

neolysosome An acid phosphatase-containing vesicle that develops into a mature lysosome; derived from tubules associated with the Golgi apparatus.

neomorph A mutant gene that produces a qualitatively new effect which is not produced by the wild-type gene.

neomycin An aminoglycoside antibiotic, produced by *Streptomyces fradiae*, that inhibits protein synthesis by binding to the 30S ribosomal subunit; it also causes misreading of the genetic code.

neonatal 1. Of, or pertaining to, a neonate, 2. Of, or pertaining to, the period immediately following birth.

neonate A newborn.

neontology The science that deals with life of the current geologic era; the study of extant

(living) species. *See also* paleontology.

neoplasia The pathological condition characterized by tumor formation and tumor growth.

neoplasm A new and abnormal growth; a proliferation of cells that is not subject to the usual limitations of growth; a tumor. *See also* benign neoplasm; malignant neoplasm.

neoplastic Of, or pertaining to, a neoplasm.

neosome A collective term to describe both intersomes and minisomes.

neotenin ALLATUM HORMONE.

nephelometry The quantitative determination of a substance in suspension that is based on measurements of the light scattered by the suspended particles at right angles to the incident beam. *See also* turbidimetry.

nephrectomy The surgical removal of a kidney.

nephron The structural and functional unit of the kidney; consists of the glomerulus, Bowman's capsule, Henle's loop, and the proximal and distal tubules.

Nernst equation An expression that relates the actual electrode potential E of a given redox couple to its standard electrode potential E_0 and to the concentrations of the oxidant and the reductant. For a half-reaction, the expression is

$$E = E_0 + (0.06/n) \log ([\text{Ox}]/[\text{Red}])$$

where n is the number of electrons participating in the half-reaction, $[\text{Ox}]$ is the concentration of oxidant, and $[\text{Red}]$ is the concentration of reductant.

nerve An elongated structure of nervous tissue that consists of nerve fibers enclosed within a sheath, and that serves to connect the nervous system with other organs and tissues of the body.

nerve-end particle SYNAPTOSOME.

nerve fiber The process of a neuron.

nerve gas A mixture of compounds, including diisopropylfluorophosphate, that react with the serine hydroxyl group of the enzyme acetylcholinesterase and thereby inhibit the transmission of nerve impulses.

nerve growth factor A polypeptide that has hormone-like properties; a mitogen that produces hypertrophy and hyperplasia of nerve cells, growth of nerve cell processes, and an increase in the metabolism of various nerve cells. The nerve growth factor occurs as a monomer (MW 13,000) and as a dimer (MW 26,000); it has protease activity and is similar to insulin in its structure. *Abbr* NGF.

nerve impulse An electrical stimulus that passes along a nerve and that leads to excitation of the nerve along the way.

nerve impulse conduction The passage of a nerve impulse along a nerve cell.

nerve impulse transmission The passage of a nerve impulse from one nerve cell to another.

nervonic acid An unsaturated fatty acid that has 24 carbon atoms and one double bond; Δ^{15} -tetracosenoic acid; a constituent of cerebrosides.

nervous system The nervous tissue that, in vertebrates, consists of the central and the peripheral nervous systems.

Nesslerization The treatment of a sample with Nessler's reagent.

Nessler's reagent A solution of mercuric iodide and potassium iodide in potassium hydroxide that is used for the colorimetric determination of nitrogen in biological materials.

net charge The charge of a macromolecule obtained by summing the number of positively and negatively charged functional groups. Thus, a protein that, at a given pH, has 25 positively charged amino groups ($-\text{NH}_3^+$) and 13 negatively charged carboxyl groups ($-\text{COO}^-$), is said to have a net charge of +12.

net protein utilization A measure of the nutritional value of a protein that is based on how well the protein is digested and how well it is utilized once the amino acids have been absorbed into the system. It is defined as $(N_{\text{retention}}/N_{\text{intake}}) \times 100 = [(N_{\text{intake}} - N_{\text{output}})/N_{\text{intake}}] \times 100$. *Abbr* NPU. *See also* biological value.

network *See* computer network.

Neu Neuraminic acid.

NeuAc *N*-Acetylneuraminic acid.

Neuberg ester FRUCTOSE-6-PHOSPHATE.

Neuberg fermentation The alcoholic fermentation of yeast, either in the absence of added compounds (Neuberg's first form of fermentation) or in the presence of bisulfite (Neuberg's second form of fermentation).

NeuNAc *N*-Acetylneuraminic acid.

neural Of, or pertaining to, nerves.

neuraminic acid A compound, derived from mannosamine and pyruvic acid, the acetylated form of which is a major building block of animal cell coats; the compound 5-amino-3,5-dideoxy-D-glycero-D-galacto-nonulosonic acid. *Sym* Neu.

neuraminidase The enzyme that catalyzes the cleavage of *N*-acetylneuraminic acid from mucopolysaccharides; the enzyme is present on the surface of certain viruses and destroys the receptor activity of many cells for these viruses.

neuraminosyl group SIALOSYL GROUP.

neurilemmal cell SCHWANN CELL.

neurite A general term for a process of an embryonic nerve cell. These processes are difficult to identify as being either axons or dendrites and hence are referred to simply as neurites.

neuroaminoyl group SIALOYL GROUP.

neurochemistry The science that deals with the biochemistry of nervous tissue.

neuroendocrine Of, or pertaining to, both the nervous and the endocrine systems.

neurofibril A small, threadlike structure in a neuron.

neurofilaments See intermediate filaments.

neurohormone A hormone that is released into the circulation at nerve endings and that acts upon cells located at some distance from its point of release. Examples include the hypothalamic regulatory hormones and the hormones of the neurohypophysis. See also neurotransmitter.

neurohypophyseal Of, or pertaining to, the posterior lobe of the pituitary gland.

neurohypophysis The posterior lobe of the pituitary gland that produces vasopressin, oxytocin, and melanocyte-stimulating hormone.

neuroleukin A neurotrophic factor that promotes the survival of some neurons in tissue culture; it is also a lymphokine, produced by lectin-stimulated T cells.

neurological mutant A mutant that leads either to pronounced malformations of the central nervous system or to pronounced abnormalities in locomotion.

neurology The science that deals with the structure and function of the nervous system.

neuromuscular Of, or pertaining to, both nerves and muscles.

neuromuscular junction The junction between the axon of a motor neuron and a skeletal muscle fiber.

neuron A nerve cell; the structural and functional unit of the nervous system that consists of a cell body and its processes, the axon and the dendrites.

neuronal uptake A mechanism for terminating the biological action of catecholamines; involves an active transport whereby the catecholamines are moved across the membrane of sympathetic nerves and are then either stored or metabolized.

neuropeptide A peptide that is active in the nervous system. Some neuropeptides function as neurotransmitters. See also opioid.

neurophysin One of a group of carrier proteins to which the hormones oxytocin and vasopressin become bound noncovalently. These hormone-neurophysin complexes are stored in the neurohypophysis and are discharged upon stimulation.

neuroplasm The cytoplasm of a neuron.

neurosecretion 1. The secretion of chemical substances, such as neurohormones and neurohumors, by nerve cells. 2. The chemical substances secreted by nerve cells.

neurosecretory granule A particle, derived from the posterior lobe of the pituitary gland,

that contains oxytocin, vasopressin, and neurophysin.

neurosecretory spheres Small spherical structures, 0.1–0.2 μm in diameter, that are synthesized in the axoplasm of specialized neurons.

neurosecretosome SECRETOSOME.

Neurospora crassa The red bread mold; a fungus used for biochemical and genetic studies.

neurotensin A peptide neurotransmitter, consisting of 13 amino acids, that is present in the gastrointestinal tract; a vasodilator and an inhibitor of gastric secretion and intestinal motility.

neurotoxin A toxin that acts specifically on nervous tissues.

neurotransmitter A small molecule that is liberated at nerve endings and that diffuses to neighboring cells where it triggers a specific response; a chemical messenger between a neuron and a target cell. Acetylcholine, which functions in the transmission of nerve impulses, is an example. Other neurotransmitters include epinephrine, norepinephrine, dopamine, and γ -aminobutyrate. See also neurohormone.

neurotropic virus A virus, the target organ of which is the nervous system.

neurotypy The molecular heterogeneity of neurofilament proteins.

neutral 1. Being neither acidic nor basic; a neutral solution has a pH of 7.0. 2. Being neither positively nor negatively charged; a neutral atom has an equal number of protons and orbital electrons.

neutral amino acid An amino acid that has one amino group and one carboxyl group.

neutral fat An ester formed from a molecule of glycerol and one to three molecules of fatty acids; a mono-, di-, or triglyceride.

neutral glycolipids Glycolipids whose polar head groups consist only of neutral sugars.

neutralization 1. The reaction between an acid and a base, forming water. 2. The inactivation of a soluble antigen, such as a toxin, or a particulate antigen, such as a virus, by reaction with the appropriate antibodies.

neutral lipid A lipid, such as a glyceride or a steroid, that is devoid of pronounced polar groups. *Abbr* NL.

neutral mutation 1. A mutation that produces no change in the adaptive value of an organism. See neutral theory of molecular evolution. 2. A mutation that has no measurable phenotypic effect.

neutral sugars Simple sugars as opposed to sugar acids, amino sugars, and similar derivatives.

neutral theory of molecular evolution A theory of evolution according to which most evolutionary changes at the molecular level (nuc-

leotide substitutions in functional genes) are caused not by positive Darwinian selection but rather by random drift of mutant genes that are selectively neutral (equivalent) or nearly neutral. A number of mutations of a given gene are considered to be neutral if they are all equally effective (or essentially so) for the adaptive value, or fitness, of the organism as regards survival and reproduction. Whichever mutation is retained is considered to be due to a random fixation of a particular gene and not due to a selection process. *Aka* neutral theory; neutral gene theory.

neutrino A subatomic particle that has zero charge and essentially zero mass; it accounts for that part of the energy of beta decay that is not associated with the emitted beta particle. *See also* elementary particles.

neutron A neutral, subatomic particle of the nucleus that has a mass of 1.009 amu; it is equivalent to a combined proton and electron. *Sym* n.

neutron-activated phosphorus-Bakelite plaque A radioactive disk that contains ^{32}P atoms and that is used as a source of beta particles.

neutron activation analysis *See* activation analysis.

neutron capture The capture of a neutron by an atomic nucleus that frequently occurs during the production of artificial radioactive isotopes.

neutron contrast matching technique A technique for investigating macromolecular structures; based on measuring neutron scattering by particulate matter in solutions containing varying concentrations of light and heavy water.

neutron number The number of neutrons in the nucleus of an atom. *Sym* N.

neutron scattering A technique for investigating macromolecular structures that permits a determination of the radius of gyration; based on measurements of the scattering of a neutron beam by the atomic nuclei of a deuterated protein. Neutrons are scattered by the nuclei of atoms while x rays are scattered by the extranuclear electrons. *Aka* neutron diffraction.

Newcastle disease virus A virus that infects the respiratory tract of birds and that belongs to the group of paramyxoviruses.

Newman projection The representation of a molecule in which the arrangement of the atoms is such as would be seen by an observer viewing the molecule from one end along the carbon-to-carbon bond closest to the observer. When viewed in this fashion, some atoms appear to be fully or partially hidden by other atoms and are called eclipsed, while other

atoms are clearly visible and are called staggered.

newton The SI unit of force; kg m s^{-2} . *Sym* N.

Newtonian fluid A fluid, the viscosity of which is independent of the rate of shear.

nexin A protein (MW 150,000) that forms the "links" between doublets of microtubules (A and B subfibers) in the axoneme structure of cilia and flagella. *See also* protease nexin.

N.F. National Formulary; used to denote a chemical that meets the specifications set out in the National Formulary.

n-fold helix A helix with n residues per turn of the helix.

n-fold symmetry Having an n -fold axis of rotational symmetry. *See also* axis of rotational symmetry.

NGF Nerve growth factor.

NHI Nonheme iron.

niacin 1. NICOTINIC ACID. 2. A generic descriptor for pyridine-3-carboxylic acid and its derivatives that exhibit qualitatively the biological activity of nicotinic acid.

niacinamide NICOTINAMIDE.

nick A break in a single strand of a nucleic acid, particularly a break in a single strand of a double-stranded nucleic acid. *See also* cut.

nickase An endonuclease that introduces single-strand breaks into double-stranded DNA.

nick-closing enzyme *See* topoisomerase.

nicked-circle A double-stranded circular DNA molecule that contains one or more single-strand breaks in one or both strands.

nicked DNA A DNA molecule having one or more breaks in either one or both of its strands.

nickel An element that is essential to humans and animals. Symbol, Ni; atomic number, 28; atomic weight, 58.70; oxidation states, +1, +2, +3, +4; most abundant isotope, ^{58}Ni ; a radioactive isotope, ^{63}Ni , half-life, 2.6 h, radiation emitted, beta particles.

nicking-closing enzyme *See* topoisomerase.

nick translation An *in vitro* procedure in which the polymerase activity and the 5' → 3' exonuclease activity of DNA polymerase I function simultaneously and at comparable rates. As a result, a given nick in the DNA moves along the DNA molecule in the direction of synthesis (5' → 3'). The method is useful for producing radioactive DNA of high specific activity. This is done by carrying out the reaction in the presence of radioactively labeled deoxyribonucleoside triphosphates.

Nicol prism One of two prisms used in a polarimeter. *See also* analyzer; polarizer.

nicotiana alkaloids A group of pyridine alkaloids occurring mainly in the tobacco plant

(*Nicotiana*); includes nicotine, nicotyrine, anabasine, and others. *Aka* tobacco alkaloids.

nicotinamide The amide of nicotinic acid.

nicotinamide adenine dinucleotide A coenzyme form of the vitamin nicotinic acid; a coenzyme for pyridine-linked dehydrogenases. *Abbr* NAD⁺; DPN⁺.

nicotinamide adenine dinucleotide phosphate A coenzyme form of the vitamin nicotinic acid; a coenzyme for pyridine-linked dehydrogenases. *Abbr* NADP⁺; TPN⁺.

nicotinamide mononucleotide A precursor of nicotinamide adenine dinucleotide in which nicotinamide is linked to ribose-5-phosphate. *Abbr* NMN⁺.

nicotine A pyridine alkaloid that belongs to the group of nicotiana alkaloids and that is considered to be carcinogenic.

nicotinic acid A B vitamin, the deficiency of which causes the disease pellagra and the coenzyme forms of which are NAD⁺ and NADP⁺. Nicotinic acid is unique among the B vitamins in that it can be synthesized in animal tissues (from tryptophan).

nicotinic acid amide NICOTINAMIDE.

nicotinic receptor A synaptic acetylcholine receptor to which nicotine binds, thereby mimicking the action of acetylcholine. Such receptors are found at skeletal muscle end plates and at autonomic ganglia. *See also* α -bungarotoxin.

nicotinic synapse A synapse containing nicotinic receptors.

Niemann-Pick disease A genetically inherited metabolic defect in humans that is associated with mental retardation and that is characterized by an accumulation of sphingomyelin in the tissues; it is due to a deficiency of the enzyme sphingomyelinase.

nif genes Genes involved in nitrogen fixation.

nigericin An ionophore that transports potassium and hydrogen ions.

night blindness An early manifestation of vitamin A deficiency in which the retinal rods have an elevated visual threshold and do not respond normally to faint light.

night vision The capacity to see in dim light that is due to the rods in the retina.

NIH National Institutes of Health; an agency of the U.S. Public Health Service.

NIH shift The reaction, discovered at the National Institutes of Health, in which a proton is shifted from the para position in phenylalanine to the meta position in tyrosine during the hydroxylation of phenylalanine to tyrosine.

nine plus two arrangement A characteristic arrangement of microtubules in eukaryotic cilia and flagella; 9 pairs of tubules are

arranged in a circle around 2 central tubules.

ninhydrin reaction The reaction of ninhydrin (triketohydrindene hydrate) with the free alpha amino groups of amino acids, peptides, or proteins; the reaction yields colored compounds that are useful for the chromatographic detection and for the quantitative determination of amino acids and peptides.

nisin A peptide antibiotic, produced by *Streptococcus lactis*, that consists of 34 amino acids.

Nissl substance The rough endoplasmic reticulum of neurons.

nitratase NITRATE REDUCTASE.

nitrate A salt of nitric acid.

nitrate ammonification *See* nitrate respiration.

nitrate assimilation The reduction of nitrate to nitrite and, hence, to ammonia which is assimilated (ammonia fixation); occurs in green plants and the reducing power is provided by respiration.

nitrate dissimilation *See* dissimilatory reduction; nitrate respiration.

nitrate reductase The enzyme that catalyzes the reduction of nitrate to nitrite in nitrate assimilation by plants and fungi; it is a molybdenum-containing flavoprotein.

nitrate reduction The reduction of nitrate to nitrite, ammonia, or molecular nitrogen, that is carried out in nature by bacteria and fungi. *See also* nitrate respiration.

nitrate respiration The reduction of nitrate either to ammonia, which is not assimilated (ammonification of nitrate), or to NO, N₂, and similar gases that are excreted (denitrification). In all of these reactions, which occur in various bacterial species, nitrate serves as the terminal electron acceptor, instead of oxygen, for cellular respiration.

Nitrazine paper Trademark for a dye-impregnated paper that is used for estimation of pH values.

nitrification The oxidation of ammonia to nitrite or nitrate that is carried out in nature by nitrifying bacteria.

nitrifying bacteria Bacteria that oxidize ammonia to nitrite and that oxidize nitrite to nitrate.

nitrile A compound containing the grouping —C \equiv N.

nitrite A salt of nitrous acid.

nitrite reductase The enzyme that catalyzes the reduction of nitrite to ammonia in nitrate assimilation by plants.

nitrocellulose filter *See* membrane filtration.

nitrofurant One of a group of synthetic antibiotics that are active against many gram-positive and gram-negative bacteria; they are derivatives of 5-nitrofurant.

nitrogen An element that is essential to all plants and animals. Symbol, N; atomic num-

ber, 7, atomic weight, 14.00667; oxidation states, -1, +1, +2, +3, +4, +5; most abundant isotope, ^{14}N ; a stable isotope, ^{15}N .

nitrogenase The nitrogen-fixing enzyme system that catalyzes the reduction of atmospheric nitrogen to ammonia and that is a complex of two proteins both of which are required for activity. One of these proteins is a tetramer (MW about 200,000–270,000); it contains iron, molybdenum, and labile sulfur, and is known as Mo-Fe protein, component I, molybdoferredoxin, FeMo protein, molybdoiron protein, or azofermo. The other protein is a dimer (MW about 60,000); it contains iron and labile sulfur and is known as Fe protein, component II, iron protein, azoferredoxin, or azofer.

nitrogen balance The difference between the nitrogen intake and the nitrogen excretion of an animal. The nitrogen balance is denoted as zero, positive, or negative depending on whether the intake is equal to, greater than, or smaller than the excretion.

nitrogen catabolite repression The repression by ammonia of the synthesis of various enzymes that function in nitrogen metabolism.

nitrogen cavitation See cavitation (2).

nitrogen cycle The cyclic set of reactions involving plants, animals, and bacteria, whereby (a) atmospheric nitrogen is converted to inorganic compounds and these are then converted to complex organic compounds; and (b) the organic compounds are broken down to inorganic compounds which ultimately yield atmospheric nitrogen.

nitrogen equilibrium The state of an animal in which the nitrogen balance is equal to zero.

nitrogen fixation The conversion of atmospheric nitrogen to ammonia by means of either a biological or a synthetic reaction.

nitrogen mustard Di(2-chloroethyl)methylamine; a chemical mutagen and alkylating agent. See also alkylating agent.

nitrogenous Nitrogen-containing.

nitrogenous base 1. A purine or a pyrimidine. Aka nitrogen base. 2. A nitrogen-containing basic compound.

nitrogen rule The principle of mass spectrometry which states that a compound, containing an odd number of nitrogen atoms, has an odd-numbered molecular ion. The logic behind this rule derives from the fact that nitrogen is trivalent, thus requiring an odd number of hydrogen atoms in the molecule.

o-nitrophenol See o-nitrophenyl galactoside.

p-nitrophenol See p-nitrophenyl phosphate.

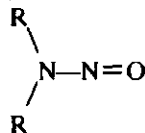
o-nitrophenyl galactoside A synthetic compound used for the assay of beta galactosidase. The enzyme hydrolyzes o-nitrophenyl galactoside to galactose and o-nitrophenol.

The latter is intensely colored and is determined spectrophotometrically. *Abbr* ONPG.

p-nitrophenyl phosphate A synthetic substrate for assaying both acid and alkaline phosphatase activity; these enzymes catalyze the removal of a phosphate group from p-nitrophenyl phosphate and the p-nitrophenol that is formed is then determined spectrophotometrically. *Abbr* PNPP.

nitroprusside reaction A colorimetric reaction for cysteine and free sulfhydryl groups in a protein that is based on the production of a red color upon treatment of the sample with sodium nitroprusside and ammonia.

nitrosamine One of a class of mutagenic and carcinogenic alkylating agents that have the structure shown below. They are formed by reaction between amines and nitrogen oxides. There is concern that nitrates, used in food preservation, may become converted to nitrosamines in the process of food preparation and/or as a result of metabolic reactions.



nitrosation A chemical reaction that results in the introduction of a nitroso group ($-\dot{\text{N}}=\text{O}$) into a compound.

nitroso group The grouping $-\dot{\text{N}}=\text{O}$.

nitroso acid A chemical mutagen that leads to the deamination of purines and pyrimidines and that converts adenine to hypoxanthine and cytosine to uracil. Since hypoxanthine base pairs with cytosine, the effect of nitrous acid treatment is that an original adenine is read as guanine and an original cytosine is read as uracil.

nitrous acid mutant A mutant produced by treatment of a nucleic acid with nitrous acid; such mutants have been produced, for example, by treating the RNA from tobacco mosaic virus with nitrous acid, infecting tobacco leaves with the mutated RNA, and isolating the mutant viral particles formed in the infected leaves. See also nitrous acid.

nkat Nanokatal.

NK cells Natural killer cells.

NL Neutral lipid.

Nle Norleucine.

N-linked oligosaccharides See glycosylation.

nm Nanometer; also indicated as $\text{m}\mu\text{m}$ or as $\text{m}\mu$ (millimicron).

NMN⁺ Nicotinamide mononucleotide.

NMP 1. Nucleoside monophosphate. 2. Nucleoside-5'-monophosphate.

NMR Nuclear magnetic resonance.

NMR desert A nuclear magnetic resonance technique in which the differential relaxation

rate of a nucleus, observed before and after a specific deuterium substitution for a proton, is converted into an internuclear distance through the use of rotational correlation times obtainable from a C-13 measurement. Desert is an acronym for deuterium substitution effect on relaxation time.

nodal compound The compound that is common both to a linear metabolic pathway and to its branch.

node 1. NODAL COMPOUND. 2. The crossover region in the figure-of-eight structure of superhelical DNA. The node is called positive when the left strand in the upper part of the 8 is closest to the viewer; the node is called negative when that same strand is in back of the other strand. Thus,



NOD mouse Nonobese diabetic mouse; a strain of mice that develop diabetes mellitus and that are characterized by destruction of pancreatic beta cells and by lymphocyte infiltration of pancreatic islets. The NOD mouse appears to have a unique major histocompatibility complex.

nodoc ANTICODON.

nodule bacteria See Rhizobium.

NOE Nuclear Overhauser effect.

NOESY Nuclear Overhauser effect spectroscopy; See nuclear Overhauser effect.

noise The background interference in an instrument that may be caused, for example, by electronic, optical, or chemical disturbances.

noise analysis FLUCTUATION ANALYSIS.

nojirimycin An antibiotic, synthesized by several strains of *Streptomyces*, that is a potent inhibitor of α -glucosidases; a glucose analogue (5-amino-5-deoxy-D-glucose) in which an NH— group substitutes for the oxygen atom in the pyranose ring.

Nomarski differential interference microscope A microscope that provides a three-dimensional view of an object and that permits the observation of transparent structures in the living cell. Like the phase contrast microscope, it employs the differences in the phase of the light wave as it passes through different parts of the specimen.

nomenclature A system of names, designations, and symbols that are used in a given discipline.

nominally labeled Designating a compound in which some, and usually a significant amount, of the label is at a given position or positions in the molecule, but for which no further information is available as to the extent of label,

if any, at other positions in the molecule. *Sym* N.

nomogram An alignment chart for the rapid determination of a variable from the given values of two or more variables. A typical nomogram consists of a minimum of three scales such that when known values of two scales are connected by a straight line, the line intersects the third scale at the sought value. The hemoglobin concentration in blood, for example, can be determined from a scale of the specific gravity of plasma and a scale of the specific gravity of whole blood.

nona- Combining form meaning nine.

nonagglutinating antibody INCOMPLETE ANTIBODY.

non-AIS-suppressible insulin INSULIN-LIKE ACTIVITY.

nonamer An oligomer that consists of nine monomers.

nonbasic chromosomal proteins Nonhistone proteins associated with the DNA in chromosomes; acidic or neutral proteins such as specific enzymes or regulatory proteins. *Aka* nonhistone chromosomal proteins.

nonbonding interaction NONCOVALENT INTERACTION.

nonbonding orbital A molecular orbital that contains electrons that take little part in the actual bonding of the atomic nuclei. Such orbitals usually have energies intermediate between those of bonding orbitals (σ , π) and those of antibonding orbitals (σ^* , π^*).

noncoding strand ANTICODING STRAND.

noncollisional energy transfer The energy transfer from an excited molecule to another molecule that occurs when the two molecules remain farther apart than the contact distance that they attain during molecular collisions.

noncompetitive inhibition The inhibition of the activity of an enzyme that is characterized by an increase in the slope of a double reciprocal plot ($1/\text{velocity}$ versus $1/\text{substrate concentration}$) and by a decrease in the maximum velocity compared to those of the uninhibited reaction.

noncompetitive inhibitor An inhibitor that produces noncompetitive inhibition and that in general is structurally unrelated to the substrate. A noncompetitive inhibitor can bind to either the enzyme or the enzyme-substrate complex. See also degree of inhibition.

noncoupled pump A pump for the transport of one solute across a membrane that also drives the transport of a second solute across the same membrane in the opposite direction and in such a fashion that the transport of the second solute is physically independent of the pump.

noncovalent bond A bond between atoms and/or molecules that does not involve shared pairs of electrons and that is due to other types of interactions. Examples of such bonds are electrostatic bonds, hydrogen bonds, and hydrophobic bonds.

noncovalent interaction An interaction between atoms and/or molecules that does not involve the formation of chemical bonds and that is based on the formation of noncovalent bonds.

noncovalent structure Collective term for the secondary, tertiary, and quaternary structure of a protein.

noncyclic electron flow The light-induced, photosynthetic electron flow in which the electrons flow from water, or some other electron donor, to NADP^+ , or some other electron acceptor; in chloroplasts, it is the electron flow from water through photosystems II and I to NADP^+ .

noncyclic photophosphorylation The synthesis of ATP that is coupled to the noncyclic electron flow of photosynthesis.

nonelectrolyte A substance that does not dissociate into ions in water; solutions of nonelectrolytes do not conduct an electric current.

nonenergized conformation CONDENSED CONFORMATION.

nonequilibrium thermodynamics IRREVERSIBLE THERMODYNAMICS.

nonessential amino acids Amino acids that an organism can synthesize from various intermediates in metabolism and that, therefore, do not have to be obtained through the diet.

nonessential enzyme An enzyme that is not required for either the growth or the survival of a cell or an organism.

nonessential gene A gene, the product of which is a nonessential enzyme.

nonexclusive binding The binding to an allosteric enzyme that takes place when both the relaxed and the constrained forms of the enzyme are present in significant amounts. *See also* concerted model.

nonexclusive binding coefficient The ratio of the intrinsic dissociation constants for the substrate in the concerted model of allosteric enzymes; specifically, the ratio K_R/K_T , where K_R and K_T are the intrinsic dissociation constants for the substrate binding site on a protomer in the R state and T state, respectively.

nonheme iron Iron that occurs in biological systems but that is not in the form of a heme group. *Abbr* NHI.

nonheme-iron chromophore A pair of iron atoms, as in plant-type ferredoxin, that are located close enough to each other in a mole-

cule so that they can engage in antiferromagnetic coupling; such atoms possess a characteristic absorption spectrum and a distinct electron paramagnetic resonance spectrum.

nonheme-iron protein A conjugated protein that contains iron but not in the form of a heme group. *See also* iron-sulfur protein.

nonhistone chromosomal proteins NONBASIC CHROMOSOMAL PROTEINS.

noninducible enzyme CONSTITUTIVE ENZYME.

nonionic detergent A surface-active agent that has polar and nonpolar groups but carries no charges. *Aka* nonionic surface-active agent.

nonionized acids COMBINED ACIDITY.

nonketotic hyperglycinemia A genetically inherited metabolic defect in human that is characterized by mental retardation and a high urinary excretion of glycine; a severe neonatal disease that is due to a deficiency of the glycine cleavage enzyme.

nonmediated transport Transport across a biological membrane that does not involve a transport agent; simple diffusion.

non-Mendelian inheritance CYTOPLASMIC INHERITANCE.

non-Newtonian fluid A fluid, the viscosity of which depends on the rate of shear; solute molecules of a non-Newtonian fluid, especially asymmetric molecules, tend to become oriented as the rate of shear is increased.

nonnucleic acid base A base that rarely, if ever, occurs in a nucleic acid under normal circumstances.

nonose A monosaccharide that has nine carbon atoms.

nonoverlapping code A genetic code in which each nucleotide is used in only one codon for the synthesis of a given nucleic acid molecule.

nonpalindromic helix A helix that has no end-to-end symmetry so that both ends are different either in composition and/or by virtue of the helix having a sense of direction. The rotation of such a helix by 180° about an axis perpendicular to the longitudinal axis of the helix produces a structure that is not identical to that before rotation.

nonparametric statistics Statistical calculations that are not based on any prior assumptions with respect to the variable and the probability distribution of the data.

nonpermissible substitution RADICAL SUBSTITUTION.

nonpermissive cell 1. A cell in which a conditional lethal mutant cannot grow. 2. A cell that does not support the lytic infection by a virus.

nonpermissive conditions RESTRICTIVE CONDITIONS.

non-plasma-specific enzyme An enzyme that is present in blood plasma but has no known

specific function in the plasma.

nonpolar Lacking polarity; lacking a permanent dipole moment.

nonpolar amino acid An amino acid that has a nonpolar side chain.

nonpolar bond 1. A covalent bond in which the electron pair or pairs of the bond are held with equal strength by the two bonded atoms.

2. **HYDROPHOBIC BOND.**

nonpolar solvent A solvent that is devoid of significant concentrations of charged groups and/or dipoles.

nonprecipitating antibody COPRECIPTATING ANTIBODY.

nonproductive complex An enzyme-substrate complex in which the substrate is bound to the enzyme in such a fashion that catalysis is impossible and that products cannot be formed.

nonprotein amino acid An amino acid that rarely, if ever, occurs in a protein under normal circumstances. Many such amino acids occur in nature in the form of precursors of normal (protein) amino acids, as intermediates in catabolic pathways, and as D-enantiomers of normal amino acids.

nonprotein nitrogen The nitrogen in serum that is not present in the form of serum proteins. *Abbr* NPN.

nonprotein respiratory quotient The respiratory quotient that is calculated on the basis of a volume of oxygen equal to the total volume utilized minus that utilized for protein catabolism, and on the basis of a volume of carbon dioxide equal to the total volume produced minus that produced by protein catabolism.

nonreciprocal recombination GENE CONVERSION.

nonreducing end That end of an oligo- or polysaccharide that does not contain a hemiacetal or hemiketal grouping and, hence, will not reduce certain inorganic ions in solution.

nonreducing sugar A sugar that does not contain an aldehyde or potential aldehyde group, and hence, will not reduce certain inorganic ions in solution.

nonrepetitive DNA UNIQUE DNA.

nonsaponifiable lipid A lipid that cannot be hydrolyzed with alkali to yield soap as one of the products; steroids and terpenes are two major nonsaponifiable lipids.

nonsecretor An individual who does not secrete water-soluble forms of the blood group substances in body fluids.

nonselective medium A medium that allows the growth of all genotypes present.

nonsense codon A codon that does not code for an amino acid; now called a termination (stop) codon.

nonsense mutation A mutation in which a normal codon that specifies an amino acid is

changed to one of the three termination codons or vice versa.

nonsense suppression The suppression of a nonsense mutation.

nonsense suppressor A gene that codes for a tRNA molecule which is altered in its anticodon such that it is able to recognize a nonsense (termination, stop) codon. The chain termination function of a stop codon is thereby suppressed and the polypeptide chain is extended beyond its normal end ("read through").

nonsequential mechanism PING-PONG MECHANISM.

nonspecific immunity The immunity that is produced by nonimmunological mechanisms such as lysozyme action, phagocytosis, or interferon action.

nonsuppressible insulin-like activity INSULIN-LIKE ACTIVITY.

nonsymbiotic nitrogen fixation The conversion of atmospheric nitrogen to ammonia by organisms, such as photosynthetic bacteria or blue-green algae, without the participation of plants.

nontransmissible plasmid A plasmid that cannot be transferred from one cell to another.

nonviable Descriptive of a cell or an organism that is dead and incapable of reproduction.

napaline *See* opine.

nor Prefix used in steroid nomenclature to indicate elimination of an angular methyl group or elimination of a methylene group from a side chain. *See also* norsteroid.

NOR Nucleolus organizer region; *See* nucleolus organizer.

noradrenaline NOREPINEPHRINE.

n orbital Nonbonding orbital.

norepinephrine A catecholamine hormone that is secreted by the adrenal medulla and that has a biological activity that is similar to that of epinephrine but less pronounced. *Var sp* norepinephrin.

n orientation The sense of insertion of a DNA fragment into a vector such that the genetic maps of both the fragment and the vector have the same orientation. *See also* u orientation.

Norit Trademark for a purified charcoal made from birch; used for the decolorization of solutions and for the adsorption of compounds in adsorption chromatography. *Var sp* Norite.

Norit eluate factor FOLIC ACID.

norleucine An amino acid analogue that can be incorporated into protein during protein synthesis. A straight-chain isomer of leucine.

normal amino acids STANDARD AMINO ACIDS.

normal configuration The configuration of steroids in which substituents at positions 5 and

10 are cis with respect to the plane of rings A and B.

normal distribution A continuous frequency distribution characterized by a bell-shaped curve and described by the equation $Y = (1/\sigma\sqrt{2\pi})e^{-(x-m)^2/2\sigma^2}$ where m is the mean, σ is the standard deviation, e is the base of natural logarithms, π is a constant equal to 3.1416... and Y is the height of the ordinate for a given value of X on the abscissa. Different values of m shift the curve along the abscissa without changing its shape. Different values of X change the shape of the curve without changing the position of the center.

normal electrode potential STANDARD ELECTRODE POTENTIAL.

normal enzyme An enzyme, the substrates of which are metabolites normally occurring within the organism, as distinct from a drug-metabolizing enzyme, the substrates of which are compounds foreign to the organism.

normal error curve NORMAL DISTRIBUTION.

normal frequency distribution NORMAL DISTRIBUTION.

normality The concentration of a solution expressed in terms of the number of gram-equivalent weights of solute in one liter of solution. *Sym* N.

normalized substrate concentration REDUCED SUBSTRATE CONCENTRATION.

normalizing The adjustment of data to an arbitrary standard; the normalizing of a spectrum, for example, is done by multiplying the observed absorbance values at all measured wavelengths by a factor that is equal to the ratio of the desired absorbance to the observed absorbance at one particular wavelength.

normal-phase chromatography *See* partition chromatography.

normal saline PHYSIOLOGICAL SALINE.

normal solution A solution that contains one gram-equivalent weight of solute per liter of solution.

normal temperature and pressure STANDARD TEMPERATURE AND PRESSURE.

normal value The amount of a chemical constituent in, or the value of a physical property of, a body fluid or an excretion that is found in 95% of a population of clinically normal and apparently healthy individuals.

norsteroid A steroid-like molecule; a modified steroid in which a ring has been contracted. *See also* nor.

northern blotting A variation of the Southern blotting technique in which RNA fragments are separated electrophoretically, transferred to a special paper which binds them covalently, and are then located by hybridization with probes of radioactive RNA or single-stranded

DNA. *Aka* northern transfer; northern hybridization. *See also* blotting.

norvaline A straight-chain isomer of valine.

notatin Glucose oxidase; a flavoprotein enzyme that catalyzes the oxidation of glucose to the delta lactone and that can be isolated in a highly active form from the mold *Penicillium notatum*.

nothing dehydrogenase effect An abnormality in the electrophoretic determination of lactate dehydrogenase isozymes in which blank preparations, from which substrate has been omitted, exhibit faint replicas of the normal isozyme pattern. The effect is believed to be due to the presence of alcohol dehydrogenase in the enzyme preparation.

novobiocin An antibiotic, produced by *Streptomyces niveus*, that inhibits DNA replication mainly in gram-positive bacteria.

np Nucleotide pair.

NP antigen A nucleoprotein core antigen of poxviruses.

NPH insulin A neutralized zinc salt of protamine insulin developed by Hagedorn. The salt is insoluble and, when injected into an animal, provides a slowly adsorbed insulin depot so that fewer injections of insulin are required in clinical treatments of diabetes.

n-pi star transition The excitation of an electron from an n orbital to a pi star orbital.

NPN Nonprotein nitrogen.

NPU Net protein utilization.

nRNA Nuclear RNA.

NSF National Science Foundation.

NSILA Nonsuppressible insulin-like activity.

N-terminal The end of a peptide or of a polypeptide chain that carries the amino acid that has a free alpha amino group; in representing amino acid sequences, the N-terminal is conventionally placed on the left side. *Aka* N-terminus.

NTP 1. Nucleoside triphosphate. 2. Nucleoside-5'-triphosphate. 3. Normal temperature and pressure.

nu body NUCLEOSOME.

Nuc Nucleoside.

nuclear Of, or pertaining to, the nucleus of either an atom or a cell.

nuclear body NUCLEOID (1).

nuclear column A column of cell nuclei that are immobilized with small pieces of membrane filters and through which a solvent is passed.

nuclear cycle CELL CYCLE.

nuclear division KARYOKINESIS.

nuclear duplication MITOSIS.

nuclear emulsion A photographic emulsion that has been specially sensitized for the detection of alpha or beta particles; it is generally thicker and more concentrated in silver

halide than ordinary photographic emulsions.

nuclear envelope The envelope that surrounds the nucleus of eukaryotic cells and that consists of two membranes, an inner and an outer one; both membranes are lipid bilayers and they are separated by a gap of 20–40 nm, known as the perinuclear space.

nuclear equivalent NUCLEOID.

nuclear fission A reaction in which a heavier atomic nucleus is broken up into two or more lighter and more stable nuclei with the release of large amounts of energy.

nuclear fusion A reaction between two atomic nuclei in which two lighter nuclei combine to form a heavier and more stable nucleus with the release of large amounts of energy.

nuclear isomer One of two or more nuclides that have the same atomic number and the same atomic mass but that have nuclei that are at different energy levels.

nuclear magnetic resonance A method for studying the interaction of an atomic nucleus, having an odd mass number and an odd number of protons, with the environment of the nucleus. A nucleus of this kind has a spin and a magnetic moment and may exist in one of several allowed energy levels. When placed in an applied magnetic field of suitable magnitude, the nucleus will undergo a transition from one energy level to another, accompanied by the absorption of electromagnetic radiation. The relative magnitudes of the applied magnetic field and of the absorbed radiation are interpreted in terms of the interaction of the nucleus with its environment. The method is used particularly for protons and, when so used, is also referred to as proton magnetic resonance. *Abbr* NMR.

nuclear membrane *See* nuclear envelope.

nuclear Overhauser effect The decrease in area of a given line in a nuclear magnetic resonance spectrum that is due to the transfer of energy from one proton to another; involves the change of a population of nuclei in a given energy level by saturating a nearby nucleus. The magnitude of the effect (that is, the decrease in the area of the line) increases the closer the two protons are to each other. The effect can, therefore, be used to measure intramolecular distances. *Abbr* NOE. *Aka* nuclear Overhauser enhancement.

nuclear reaction 1. A reaction taking place in the nucleus of a cell. 2. A physical reaction in which there are changes in the nuclei of reacting atoms as distinct from a chemical reaction in which there are changes in the orbital electrons.

nuclear reactor A device for the controlled use of nuclear reactions for the production of radioactive isotopes and energy. A fission

reactor permits a controlled chain reaction to produce energy; a breeder reactor is designed to produce more fissionable material than it consumes; and a tokamak fusion reactor employs a doughnut-shaped magnetic field to hold the plasma in which fusion occurs.

nuclear resonance scattering MOSSBAUER EFFECT.

nuclear zone NUCLEOID.

nuclease An enzyme that catalyzes the hydrolysis of phosphodiester bonds in nucleotides and nucleic acids.

nucleated Possessing a nucleus.

nucleation 1. The formation of regions of three-dimensional structure in separate portions of a protein molecule prior to attainment of the complete tertiary structure of the molecule. 2. The formation of a crystal or an aggregate by the condensation of matter on minute particles that serve as nuclei. 3. The first step in the polymerization of actin and tubulin. *See also* helix nucleation. 4. The formation of bone around collagen.

nucleic acid A polynucleotide of high molecular weight that is synthesized by living cells. Nucleic acids occur as either DNA or RNA and may be either single-stranded or double-stranded. DNA functions in the transfer of genetic information, and RNA functions in the biosynthesis of proteins.

nucleic acid bases *See* purine; pyrimidine.

nuclein The nucleoprotein discovered by Miescher in 1868.

nucleo- Combining form meaning nucleic acid.

nucleocapsid The protein coat of a virus together with the nucleic acid which it encloses. In some viruses, the nucleocapsid is contained within a lipoprotein membrane (enveloped); in others, it exists in naked form (nonenveloped).

nucleocidin A purine antibiotic, produced by *Streptomyces calvus*, that inhibits protein synthesis.

nucleo-cytoplasmic ratio The ratio of the volume of the nucleus to the volume of the cytoplasm for a given cell.

nucleodisome A structural fragment consisting of two nucleosomes connected via linker DNA.

nucleohistone A conjugated protein consisting of histone and nucleic acid.

nucleoid 1. A DNA mass, not bounded by a membrane, that occurs in a prokaryotic cell, a chloroplast, a mitochondrion, or a virus, and that is analogous to the nucleus of a eukaryotic cell. 2. The RNA core of an RNA virus that is surrounded by the protein capsid.

nucleolar organizer NUCLEOLUS ORGANIZER.

nucleolin The major nucleolar protein (MW 100,000) of exponentially growing eukaryotic

cells; it is found in association with intranucleolar chromatin and preribosomal particles and is barely detectable in resting cells. Nucleolin is believed to play a direct role in pre-rRNA transcription and ribosome assembly. *Aka* C23.

nucleolus (*pl* nucleoli) An RNA-rich region in the cell nucleus that contains a variety of enzymes, the primary products of the genes present in the nucleolus organizer, and proteins associated with these genes. The nucleolus is the site where ribosomes are partially synthesized.

nucleolus organizer A portion of the chromosome that is associated with the nucleolus and that contains the genes for the synthesis of ribosomal RNA.

nucleon A constituent particle occurring within the atomic nucleus; a proton or a neutron.

nucleonics The application of nuclear phenomena to other fields.

nucleon number MASS NUMBER.

nucleophile An atom or a group of atoms that is electron pair donating.

nucleophilic Of, or pertaining to, either a nucleophile or a reaction in which a nucleophile participates.

nucleophilic catalysis Catalysis in which the catalyst donates a pair of electrons to a reactant.

nucleophilic displacement A chemical reaction in which a nucleophilic group attacks and displaces a susceptible group in a compound and then binds covalently to the compound at that site. *See also* S_N1 mechanism; S_N2 mechanism.

nucleophilic substitution NUCLEOPHILIC DISPLACEMENT.

nucleoplasm The protoplasm of the cell nucleus.

nucleoplasmin An acidic protein that has been isolated from the nuclei of many eukaryotic cells and that appears to function in the assembly of nucleosomes; its mechanism of action is unknown.

nucleoprotein A conjugated protein in which the nonprotein portion is a nucleic acid, and the protein portion is frequently either a histone or a protamine.

nucleosidase An enzyme that catalyzes the hydrolysis of a nucleoside to the pentose and the base.

nucleoside A glycoside composed of D-ribose or 2-deoxy-D-ribose and either a purine or a pyrimidine. *Abbr* Nuc; N.

nucleoside antibiotic One of a large number of antibiotics, many produced by species of *Streptomyces*, that contain a nucleoside as part of their structure.

nucleoside cyclic monophosphate A nucleotide in which the phosphoric acid residue is ester-

ified to two hydroxyl groups on the sugar.

nucleoside diphosphate A high-energy derivative of a nucleoside in which a pyrophosphate group is esterified to a hydroxyl group of the sugar. *Abbr* NDP.

nucleoside diphosphate kinase An enzyme that catalyzes the transfer of a phosphate group from a nucleoside-5'-triphosphate to a nucleoside-5'-diphosphate.

nucleoside diphosphate sugar One of a group of compounds that consist of a sugar linked to a nucleoside diphosphate and that serve as glycosyl group donors in the biosynthesis of starch, glycogen, and other oligo- and polysaccharides. *Abbr* NuDP-sugar.

nucleoside monophosphate NUCLEOTIDE.

nucleoside monophosphate kinase An enzyme that catalyzes the transfer of a phosphate group from a nucleoside-5'-triphosphate to a nucleoside-5'-monophosphate.

nucleoside triphosphate A high-energy derivative of a nucleoside in which three phosphate groups are linked in succession to one hydroxyl group of the sugar. *Abbr* NTP.

nucleosome A repeating, bead-like structure of eukaryotic chromosomes; a macromolecular complex consisting of two molecules each of histones H2A, H2B, H3, and H4 around which is wrapped a DNA segment of 140 bp. Any two nucleosomes are connected via a segment of linker DNA to which a molecule of histone H1 is attached. *Aka* nucleosome core; platysome; core particle. *See also* chromatosome.

nucleosome phasing The sequence-specific placing of nucleosomes along the chromosome that leaves certain sections of DNA in association with histones and other sections as free linker DNA.

nucleosome spacing The distance between adjacent nucleosomes along the chromosome.

nucleotidase An enzyme that catalyzes the hydrolysis of a nucleotide to the nucleoside and orthophosphate.

nucleotide 1. The building block of the nucleic acids that consists of a nucleoside plus a phosphoric acid residue which is esterified to one of the hydroxyl groups of the sugar. 2. Any phosphorylated nucleoside, whether or not it is a genuine building block of nucleic acids. 3. One of a number of compounds, structurally somewhat related to a nucleotide. *See also* mono- and dinucleotides.

nucleotide anhydride NUCLEOTIDE COENZYME.

nucleotide-binding domain ROSSMAN FOLD.

nucleotide coenzyme One of a group of compounds, derived from uracil, cytosine, or thymine, that function as either coenzymes or substrates in carbohydrate and lipid metabolism; UDP-glucose, CDP-ethanolamine, and

TDP-ribose are some examples.

nucleotide exchange reaction The reaction, catalyzed by the enzyme nucleoside diphosphate kinase, in which a nucleoside diphosphate and a nucleoside triphosphate are converted to the opposite pair of nucleoside di- and triphosphates by the transfer of a phosphate group.

nucleotide map A fingerprint of nucleotides.

nucleotide pair Two nucleotides, in a double-stranded nucleic acid structure, that are linked by means of complementary base pairing (H bonds).

nucleotide sugar NUCLEOSIDE DIPHOSPHATE SUGAR.

nucleus (*pl* nuclei) 1. The structure in eukaryotic cells that contains the chromosomes. 2. The central core of an atom that consists of protons and neutrons. 3. The ring structure of an organic compound.

nuclide An atom that is characterized by the composition of its nucleus, having a specified atomic number and mass number; an atom that has a specific number of protons, a specific number of neutrons, and a specific energy content in its nucleus.

nuclidic mass ATOMIC MASS.

nude mice A strain of laboratory mice that are congenitally hairless and that lack a thymus (athymic); they are unable to make T cells and are virtually devoid of them. Nude mice must be raised in an essentially germ-free environment.

NuDP-sugar Nucleoside diphosphate sugar.

null allele An allele that does not produce a functional product.

null cells Lymphocytes that lack the cell surface markers characteristic of B and T lymphocytes.

null hypothesis A hypothesis stating that there is no difference between two values, such as between the means of two populations. The

hypothesis is advanced to evaluate data; it is subsequently tested statistically and either accepted or rejected.

number-average molecular weight An average molecular weight that is weighted toward those molecules present in largest number; specifically, $\bar{M}_n = \sum n_i M_i / \sum n_i$, where n_i is the number of moles of component i , and M_i is the molecular weight of component i . *Sym* \bar{M}_n . *See also* average molecular weight.

number of degrees of freedom *See* degrees of freedom.

Nutrasweet *See* Aspartame.

nutrient A substance that promotes the growth, maintenance, function, and reproduction of a cell or an organism.

nutrient agar Nutrient broth gelled with agar; a solid medium for the growth of bacteria.

nutrient broth A liquid medium that contains a meat extract and that is used in bacteriology.

nutrient medium MEDIUM.

nutrilite A compound that fits the definition of a vitamin with the exception that it is required by a microorganism and not by an animal; a vitamin of microorganisms.

nutriment Nourishment; food.

nutrition The supplying to, and the intake and utilization by, an organism of all the necessary elements required by it for normal growth, maintenance, function, and reproduction.

nutritional calorie A large calorie; 1000 (small) calories. *Sym* kcal; Cal.

nutritional mutant AUXOTROPH.

nyctalopia NIGHT BLINDNESS.

Nylander's reagent A reagent that contains bismuth subnitrate, potassium-sodium tartrate, and potassium hydroxide, and that is used for the detection of reducing sugars; the sugars yield a black precipitate of metallic bismuth when treated with the reagent.

nylon Polyhexamethylene adipamide; a synthetic polymer.

O

- o** 1. Ortho. 2. Prefix or subscript used to designate the original (unmodified) form of an interconvertible enzyme.
- O** 1. Oxygen. 2. Orotic acid. 3. Orotidine.
- OA** Ovalbumin.
- OAA** Oxaloacetic acid.
- OAc** Acetyl group.
- O antigens** Polysaccharide antigens of the cell surface of gram-negative bacteria. *See also* K antigens; H antigens; lipopolysaccharide; rough strain; smooth strain.
- obesity** The state of being overweight, frequently due to overnutrition; usually interpreted as being 10% or more above the average standard weight for the individual.
- objective** The microscope lens closest to the specimen.
- oblate ellipsoid of revolution** An ellipsoid of revolution formed by rotation of an ellipse about its minor axis.
- obligate** Limited to living under a specific set of conditions.
- obligate aerobe** An organism or a cell that can grow only in the presence of molecular oxygen.
- obligate anaerobe** 1. An organism or a cell that can grow only in the absence of molecular oxygen. 2. An organism or a cell that lacks the ability to synthesize an oxygen-linked respiratory chain and must, therefore, utilize fermentation. *See also* strict anaerobe.
- obligatory reactant** LEADING REACTANT.
- oc** Abbreviation for ochre mutation.
- Occam's razor** A guiding principle for the selection of a hypothesis or a theory from among several alternative ones. The principle states that when several competing and possible alternative hypotheses or theories are presented, the simplest one is to be preferred and the more complex ones are to be discarded. *Aka* principle of simplicity.
- occlude** To produce an occlusion.
- occlusion** 1. The blocking of a passageway, such as the blocking of an artery. 2. The trapping of a substance by adsorption and adhesion, such as the trapping of soluble substances in a precipitate.
- occult blood** Small amounts of blood, as those in urine and feces, that cannot be detected visually.
- occult virus** A virus that has infected a host but cannot be detected.
- occupation theory** A theory according to which the action of drugs is due to their interaction with specific receptor sites in the organism that is being treated.
- ochre codon** The codon UAA; one of the three termination codons.
- ochre mutation** A mutation in which a codon is mutated to the ochre codon, thereby causing the premature termination of the synthesis of a polypeptide chain.
- ochre suppression** The suppression of an ochre codon.
- ochronosis** Abnormal pigmentation of cartilage and other connective tissue; may occur in alkaptonuria.
- octa-** Combining form meaning eight.
- octamer** An oligomer that consists of eight monomers.
- octopine** *See* opine.
- octose** A monosaccharide that has eight carbon atoms.
- ocular** The eyepiece of an optical instrument, such as that of a microscope.
- ocytocin** Variant spelling of oxytocin.
- o.d.** Outside diameter.
- OD** Optical density.
- odd base** MINOR BASE.
- odd electron** UNPAIRED ELECTRON.
- odd-numbered fatty acid** A fatty acid molecule that has an odd number of carbon atoms; refers to the total number of carbon atoms, those in the hydrocarbon portion of the molecule plus that in the carboxyl group. *Aka* odd-carbon fatty acid.
- ODP** 1. Orotidine diphosphate. 2. Orotidine-5'-diphosphate.
- oestradiol** Variant spelling of estradiol.
- oestrogen** Variant spelling of estrogen.
- OEt** Ethoxy group.
- ogen** Suffix meaning inactive precursor of an enzyme.
- Ogston hypothesis** POLYAFFINITY THEORY.
- ohm** A unit of electrical resistance; equal to the resistance of a conductor that carries a current of 1 A when a potential difference of 1 V is applied across its terminals.
- Ohm's law** The law stating that the strength of a direct electric current is proportional to the potential difference and inversely proportional to the resistance.
- oil** A fat that is liquid at room temperature.
- oiled coils** Fibrillar segments in the elastin molecule that may be stretched from 2.0 to 2.5 times their length in the relaxed molecule

and that are believed to account for the elasticity of the molecule.

oil-immersion objective An objective lens used to increase the resolution attainable with the light microscope; based on filling the space between the coverslide of the specimen and the objective with an oil that has the same refractive index as the coverslide.

Okazaki fragments A group of short DNA fragments that are produced during the initial stages of the discontinuous replication of DNA; they represent precursor fragments of the lagging strand that are subsequently joined by DNA ligase to form longer fragments. Okazaki fragments have been demonstrated, in the case of *E. coli*, by exposing the cells to tritiated thymine for short periods during their growth. *Aka* precursor fragments.

old age disease ALZHEIMER'S DISEASE.

old cells 1. Bacterial cells in the stationary phase of growth. 2. Cells that have been stored for a prolonged time.

old tuberculin Tuberculin prepared by concentrating and filtering a culture of the tubercle bacillus, *Mycobacterium tuberculosis*. *Abbr* OT.

old yellow enzyme A flavoprotein from yeast that catalyzes the oxidation of NADPH and that was isolated in 1932 by Warburg and Christian.

oleandomycin An antibiotic, produced by *Streptomyces antibioticus*, that is closely related to erythromycin.

olefin An unsaturated aliphatic hydrocarbon; an alkene.

oleic acid An unsaturated fatty acid that contains 18 carbon atoms and one double bond. *See also* promoter.

oleophilic HYDROPHOBIC.

oleophobic HYDROPHILIC.

oleosome A spherosome that is rich in lipids but devoid of acid phosphatase and other hydrolytic enzymes.

Olestra Trademark for a synthetic fat substitute not yet approved by the FDA.

oligodynamic effect The growth inhibitory effect of some metals (such as silver and copper) in their elementary form on bacteria; tested for by placing a metal disk on a freshly inoculated petri plate and measuring the zones of nongrowth surrounding each disk after incubation.

oligogene A gene that, by itself, produces a significant phenotypic effect as opposed to a polygene which, by itself, produces only a small effect.

oligomer A protein molecule that consists of two or more polypeptide chains, referred to as either monomers or protomers, linked together covalently or noncovalently. *See also*

monomer; promoter.

oligomycin A polyene antibiotic produced by *Streptomyces diastatochromogenes*. It is an inhibitor of oxidative phosphorylation where it blocks ATP synthesis by inhibiting the F_0F_1 -ATPase.

oligomycin-sensitivity-conferring factor The F_0 component of the F_0F_1 -ATPase. *Abbr* OSCF.

oligonucleotide A linear nucleic acid fragment that consists of from 2 to 10 nucleotides joined by means of phosphodiester bonds; oligoribonucleotides consist of ribonucleotides, and oligodeoxyribonucleotides consists of deoxyribonucleotides.

oligopeptide A linear peptide that consists of from 2 to 10 amino acids joined by means of peptide bonds.

oligosaccharide A linear or branched carbohydrate that consists of from 2 to 10 monosaccharide units joined by means of glycosidic bonds.

oligosaccharin One of a group of plant regulatory molecules. They differ from plant hormones, which have multiple effects, in that each one regulates only a single plant function such as defense against disease, growth, reproduction, or differentiation. Oligosaccharins are fragments of the cell wall, released from the latter by enzymatic action.

oligotrophic lake A deep and clear-water lake, having a depth of 15 m or more, that has a plant population at various depths, and that has a low rate of nutrient supply in relation to its volume of water. In such a lake, both the biomass and the productivity are low. The bottom layers of the lake are saturated with dissolved oxygen throughout the year. *See also* eutrophic lake; mesotrophic lake.

O-linked oligosaccharides *See* glycosylation.

O-locus The locus of the operator.

-oma Suffix meaning tumor.

-OMe Methoxy group.

omega angle The torsion angle that denotes the rotation about the C^1-N peptide bond in proteins. *Sym* ω .

omega fraction CHYLOMICRONS.

omega loop A polypeptide chain conformation in globular proteins that is shaped like the Greek letter omega. A loop is a continuous segment of a polypeptide chain, folded back upon itself, and defined in terms of the (a) segment length, (b) absence of regular secondary structure, and (c) distance between segment termini.

omega oxidation An oxidative pathway of fatty acids in which the terminal methyl group of the fatty acid (usually one containing 8-12 carbon atoms) is oxidized first to a hydroxyl group and then to a carboxyl group, leading to the formation of a dicarboxylic acid; the

pathway occurs in both animal and microbial cells.

omega protein The first topoisomerase to be discovered; a type I topoisomerase that occurs in *E. coli* and that relaxes only negatively supercoiled DNA. *Abbr* ω -protein.

ommochrome One of a group of pigments that are derived from tryptophan and that occur in the eyes of insects.

OMP 1. Orotidine monophosphate (orotidylic acid). 2. Orotidine-5'-monophosphate (5'-orotidylic acid).

Oncley equation An equation expressing the frictional ratio of a macromolecule as a product of two factors, one of which is a measure of the hydration, and the other is a measure of the asymmetry of the molecule. Specifically, $f/f_0 = (f/f_h)(f_h/f_0)$, where f , f_0 and f_h are, respectively, the frictional coefficients for the macromolecule, an anhydrous sphere, and a hydrated sphere; f_h/f_0 is the hydration factor, and f/f_h is the shape, or asymmetry, factor.

onco- Combining form meaning tumor.

oncogene A gene that has the potential to cause cancer; a gene that can bring about malignant transformation of cells. Such genes occur in oncogenic RNA viruses (oncornaviruses) and in normal cells. Cellular oncogenes are known as protooncogenes and contain introns while viral oncogenes do not. Cellular protooncogenes are converted to oncogenes by activation as a result of mutation or recombination with a viral genome. It is believed that the cellular genes were the progenitors of the viral oncogenes.

oncogenesis The origin and growth of a tumor.

oncogene theory A theory of cancer according to which normal cells contain latent retrovirus genes (provirus; virogene) that become activated by carcinogens and radiation to yield viral oncogenes. These oncogenes then become determinants of cancer through the synthesis of specific enzymes and/or the synthesis of complete oncogenic virus particles. The information for the production of oncogenic viruses and malignant transformations of cells is, therefore, vertically transmitted through the germ line and is present in the DNA of all the cells of all the animals prone to cancer. *Aka* virogene theory; virogene-ocogene theory; provirus theory. *See also* provirus hypothesis.

oncogenic Capable of inducing tumors.

oncogenic virus A DNA- or RNA-containing virus that can transform infected cells so that they proliferate in an uncontrolled fashion and may form a tumor. *See also* oncornavirus.

oncology The study of tumors.

oncolytic Capable of destroying tumor cells.

oncornavirus Acronym for oncogenic RNA

virus. Oncornaviruses were originally characterized by (a) their content of a high molecular weight RNA genome (60S-70S RNA, 10^7 daltons.), (b) their banding at a particular density level in density gradient centrifugation, and (c) their content of RNA-dependent DNA polymerase (reverse transcriptase). The oncornaviruses were originally divided into three classes, denoted A, B, and C. Type A viruses constitute a small group of protein-encapsulated viruses that have not been shown to be oncogenic; they occur either in the cytoplasm, believed to be immature forms of type B viruses, or in body fluids, believed to be immature forms of type C viruses. Type B viruses have a somewhat eccentric nucleoid and glycoprotein surface spikes; they are associated primarily with the formation of carcinomas. Type C viruses have a roughly spherical nucleoid surrounded by an electron-translucent lipid layer; they infect a large number of animal species and cause leukemias, lymphomas, and sarcomas. The term oncornavirus is now also used as a synonym for retrovirus.

oncotic pressure The effective colloid osmotic pressure; it is equal to the difference between the osmotic pressure of the plasma proteins and that of the tissue fluid proteins.

one-carbon fragment A group of atoms or a compound that contains one carbon atom; examples are the methyl group ($-\text{CH}_3$), hydroxymethyl group ($-\text{CH}_2\text{OH}$), formyl group ($-\text{CHO}$), and formaldehyde (HCHO).

one-enzyme-one-linkage hypothesis The hypothesis that at least one specific glycosyltransferase is required for the synthesis of each specific type of glycosidic linkage found in nature.

one-gene-one-enzyme hypothesis The hypothesis that there is a large group of genes among the genes of an organism in which each gene codes for a specific enzyme or other protein. Since it is now known that many enzymes, as well as other proteins, consist of several polypeptide chains coded for by different genes, this hypothesis has been replaced by the one-gene-one-polypeptide chain hypothesis.

one-gene-one-polypeptide chain hypothesis The hypothesis that there is a large group of genes among the genes of an organism in which each gene codes for a specific polypeptide chain; the polypeptide chain may be part of a protein, or constitute an entire functional protein. In some cases, however, more than one gene may be involved in coding for a polypeptide chain. This is true for the immunoglobulins where separate genetic elements in the same chromosome code for dif-

ferent segments of the polypeptide chain. Such cases are described by the term two-genes-one-polypeptide chain.

one-hit theory A theory according to which the damage of one site on the erythrocyte membrane, resulting from a reaction with complement, is sufficient to bring about cell lysis.

one-phase chromatography FIELD FLOW FRACTIONATION.

one-sided test A test for which the region of rejection is wholly located at one end of the distribution of the test statistic.

one-sigma level The confidence interval corresponding to the standard deviation; a confidence interval such that there is a 68.27% chance that a measurement will fall within it.

one-step conditions A set of conditions that are used for infecting cells with viruses when it is desired to produce infected cells that contain only a single virus particle per cell. For bacterial cultures this may be achieved by incubating the cells briefly with the phage to allow attachment of the phage to the bacteria, and then diluting the phage-cell suspension drastically prior to additional incubation.

one-step growth experiment An experiment in which virus growth is carried out under one-step conditions.

one-step multiplication curve A curve that describes the production of progeny virus under one-step conditions.

one-tail test ONE-SIDED TEST.

ONPG *O*-Nitrophenyl galactoside.

Onsager's equations PHENOMENOLOGICAL EQUATIONS.

ontogenetic Of, or pertaining to, ontogeny.

ontogeny The development of an individual. *Aka* ontogenesis.

ontogeny recapitulates phylogeny RECAPITULATION THEORY.

oocyte A cell that develops into a mature ovum upon meiosis.

oocyte assay of mRNA An assay for the specificity of mRNA translation that is based on the injection of small amounts of exogenous RNA into *Xenopus* oocytes.

oogenesis The formation of a mature egg.

olemma The cell membrane of an ovum.

ooplasm The cytoplasm of an ovum.

oosperm A fertilized ovum; a zygote.

opal codon The codon UGA, one of the three termination codons. *Aka* amber codon.

opal suppression The suppression of an opal codon.

Oparin's hypothesis The hypothesis that simple organic compounds were formed spontaneously during an early stage of the earth as a result of physical and chemical processes in the primitive atmosphere. These compounds are believed to have dissolved in the primitive

oceans and to have led, by a large number of small spontaneous reaction steps, to the formation of macromolecules which ultimately gave rise to the first living cell. *See also* chemical evolution; biochemical evolution; biological evolution.

open chain A chain of atoms in which the two ends are not linked together covalently.

open circle *See* nicked circle.

open-circuit system A system for measurements of indirect calorimetry in which both the oxygen consumption and the carbon dioxide production are determined.

open culture CONTINUOUS CULTURE.

open gene A gene that is engaged in transcription.

open hemoprotein A hemoprotein in which the fifth and/or the sixth coordination positions of the heme are unoccupied.

opening transformation The transformation of a micellar membrane from one having small spaces between the micelles ("closed") to one having large spaces between them ("open").

open-promoter complex The conformation in transcription that follows the initial binding of RNA polymerase to the promoter and in which the RNA polymerase has undergone a conformational change and the two DNA strands have become locally unwound.

open reading frame A segment in mRNA that contains codons that can be translated into an amino acid sequence and that does not contain a termination codon.

open system A thermodynamic system that can exchange both matter and energy with its surroundings.

operating potential The potential at which a Geiger-Mueller plateau is obtained and at which a Geiger-Mueller counter is normally operated.

operational definition A definition that is based upon properties relevant to one or more specific experimental procedures or conditions, regardless of the possibility that different and more fundamental properties may apply to that which is defined.

operator A gene that is adjacent to a structural gene or to a group of contiguous structural genes and that controls the transcription of this gene or group of genes; the operator interacts with a specific repressor protein, thereby controlling the functioning of the adjacent gene or genes. *Aka* operator gene.

operator-constitutive mutant A mutant resulting from a constitutive mutation in which the operator gene has been mutated so that the repressor cannot combine with it; as a result, a previously inducible enzyme becomes a constitutive one.

operator gene OPERATOR.

operon A functional unit of transcription; the combination of operator and the adjacent structural gene or genes that are controlled by it. *Aka* transcription unit.

operon hypothesis The model, proposed by Jacob and Monod, according to which enzyme induction and enzyme repression result from the control of one or more structural genes by an adjacent operator gene. The operator is blocked ("turned off") during enzyme repression and is unblocked ("turned on") during enzyme induction. The blocking occurs through the binding to the operator of either a repressor or an aporepressor-corepressor complex. An inducer binds to the repressor and thus prevents the blocking of the operator; a corepressor binds to the repressor and leads to an even more effective blocking of the operator than that produced by the repressor alone. The synthesis of the repressor is controlled by a regulator gene which need not be adjacent to the operon, the term used to describe the combination of operator and structural gene or genes. Inducers are generally substrates of the enzyme or compounds similar to the substrates, while corepressors are generally products of the enzymatic reaction or compounds similar to the products.

operon network A system of interacting operons and their associated regulator genes such that the product of a structural gene from one operon acts as a repressor or an inducer for another operon.

opiate A narcotic that resembles opium in its action and that may be a natural, a semisynthetic, or a synthetic compound. Generally refers to the alkaloids derived from the juices of the opium poppy, as well as to derivatives of morphine and related compounds.

opiate receptors *See* opioid receptors, which is the preferred term.

opine One of a number of simple derivatives of amino acids, ketoacids, and sugars that are synthesized specifically by cells of crown gall tumors and that are coded for by Ti plasmid genes; examples are octopine and nopaline. *See also* crown gall tumor.

opioid Any compound that acts directly on narcotic receptors. A broad term that includes both the opiates and the opioid peptides.

opioid peptides A group of naturally occurring polypeptides that influence nerve transmissions in some parts of the brain. They are called opioid peptides since they bind to specific receptors that bind opiates, and thus they mimic some of the pharmacological properties of the opiates (morphine and related drugs) such as pain killing and alteration of mood perception. But, unlike the opiates, the opioid

peptides are rapidly degraded after being released and do not accumulate in large enough amounts to induce the tolerance seen in morphine addicts. There are three major groups of opioid peptides: endorphins, enkephalins, and dynorphins. These are derived, respectively, from three precursors: proopiomelanocortin, proenkephalin A, and prodynorphin. *Aka* endogenous opiates.

opioid receptors Specific cell surface sites in the brain to which opioid peptides become bound. The term opioid receptor is preferred to opiate receptor since the opioid peptides are, in fact, the physiological ligands for these sites. It is a coincidence that opiates mimic the opioid peptides in their interaction with these receptors.

opium The dried exudate derived from the seeds of the oriental poppy *Papaver somniferum* that contains the narcotic drugs morphine and codeine.

opportunistic microorganism A microorganism that utilizes the opportunity, offered by generalized or localized defects in the antimicrobial defense mechanisms of a host, to inflict damage on that host.

opportunistic pathogen A microorganism that occurs normally in the body and does not cause infection in healthy individuals but may become pathogenic under certain conditions. This may take place, for example, when the individual's antimicrobial defense mechanisms are impaired as a result of one of a number of unrelated diseases.

opposing resonance The principle that a molecule is destabilized if two atoms compete for unshared electrons of a third atom. As an example, successive phosphorus atoms in ATP are considered to compete for the unshared electrons of the oxygen atom, sandwiched between them. This contributes to the instability of ATP and to its being a high-energy compound.

opposing rolling circle model A variation of the rolling circle model for the replication of duplex circular DNA. According to this model, replication begins with two nicks, not far from each other, and with one in each of the strands of the circular duplex. As a result, both strands grow in opposite directions and the molecule replicates in the form of two rolling circles that move in opposite directions.

opposing unidirectional reactions SUBSTRATE CYCLE.

opsin A protein, occurring in both the rods and the cones of the retina, that combines with either retinal₁ or retinal₂ to form the major visual pigments of vertebrates.

opsonic effect The enhancement of the pha-

gocytosis of antigen-antibody complexes that is produced by antibodies.

opsonic index The ratio of the phagocytic index of an immune serum to that of a normal serum.

opsonin A substance that enhances phagocytosis by modifying the particles to be engulfed so that they are more readily taken up by the phagocytic cells. Some of these substances are antibodies, called immune opsonins, against surface antigens of the bacteria or the particles that are engulfed; others are non-antibody, heat-labile substances, related to components of complement.

opsonization The enhancement of phagocytosis by the action of opsonins.

optical activity 1. The capacity of a substance to interact with radiation in such processes as optical rotation and circular dichroism. 2. OPTICAL ROTATION.

optical antipode ENANTIOMER.

optical density ABSORBANCE.

optical isomer One of two or more isomers that differ from each other in their symmetry as a result of the presence of either asymmetric carbon atoms or overall molecular asymmetry; many, but not all, optical isomers exhibit optical rotation.

optically active Possessing optical activity.

optical path LIGHT PATH.

optical phonon See phonon.

optical quenching The quenching that occurs in liquid scintillation counting as a result of changes in the light-transmitting properties of the sample, such as those produced by the partial freezing of the sample solution, or by the fogging of the outside of the sample vial.

optical rotation The rotation of the plane of plane-polarized light by a substance when such light is passed through a solution containing the substance. Optical rotation is shown by a substance that can exist in the form of mirror images as a result of the presence of either asymmetric carbon atoms or overall molecular asymmetry. Because of this asymmetry, the substance has different refractive indices for left and right circularly polarized light and hence shows optical rotation.

optical rotatory dispersion The variation of optical rotation as a function of the wavelength of the light that is used for measuring it; optical rotatory dispersion is useful for studying the secondary structure of macromolecules. *Abbr* ORD.

optical system See absorption optical system; interferometric optical system; schlieren optical system.

optimal proportions See method of optimal proportions.

optimum pH The pH at which an enzyme exhibits maximal activity under specified conditions.

optimum temperature The temperature at which an enzyme exhibits maximal activity under specified conditions.

oral contraceptive One of a number of synthetic combinations of steroids designed to inhibit ovulation. Most preparations (known as "the pill") contain a mixture of progesterin and estrogen.

oral hypoglycemic drug See Orinase.

oral insulin See Orinase.

orbital The probability distribution, or the wave function, for an electron that is in a particular energy level in either an atom or a molecule.

orbital electron capture See electron capture.

orbital steering The concept that the active sites of enzymes are so constructed that they align the orbitals of the substrate and the catalytic groups on the enzyme in an optimal fashion for entering the transition state.

orbivirus A virus belonging to a subgroup of arboviruses according to some authors. The virion contains 10 or more double-stranded, linear RNA molecules.

orchietomy The surgical removal of a testis. *Aka* orchidectomy.

orcinol reaction A colorimetric reaction for carbohydrates that is based on the production of a green color upon treatment of the sample with orcinol and with ferric chloride dissolved in concentrated hydrochloric acid. The reaction is used particularly for pentoses and for the determination of RNA.

Ord Orotidine.

ORD Optical rotatory dispersion.

ordered mechanism The mechanism of an enzymatic reaction in which two or more substrates are added to the enzyme in an orderly fashion; thus, in the case of a reaction with two substrates, the formation of a ternary complex, composed of the enzyme and the two substrates, is preceded by the formation of a complex between the enzyme and one of the substrates.

order of a reaction See reaction order.

order of magnitude A range of magnitudes from some value to ten times that value; a factor of 10.

order parameter A quantity that contains information about molecular orientations in a membrane and that is useful primarily for testing theories or models of molecular conformation and motion in membranes. The order parameter can be obtained from NMR and ESR studies.

order with respect to concentration The order

of a chemical reaction that is determined on the basis of a number of experiments in which the initial reactant concentration is varied; the order of the reaction is then determined from a plot of the logarithm of the initial velocity of the reaction versus the logarithm of the initial reactant concentration.

order with respect to time The order of a chemical reaction that is determined on the basis of a single experiment in which a single initial reactant concentration is used; the order of the reaction is then determined from the decrease in the reactant concentration as a function of time.

ordinate The vertical axis, or y-axis, in a plane rectangular coordinate system.

O region CORE SEQUENCE.

organ A differentiated part of an organism that has a specific structure and performs specific functions.

organ culture The in vitro maintenance of an organ or of parts of an organ so that the structure and/or the function are retained.

organelle A specialized structure in the cell that has definite functions.

organic 1. Pertaining to the compounds of carbon. 2. Pertaining to an organ. 3. Pertaining to a living organism.

organicism HOLISM.

organic quenching The quenching of an ionization detector that occurs when organic compounds are added to the mixture used for gas amplification. *See also* internal quenching.

organism A living plant, animal, or protist.

organizer A portion of an embryo that, through a group of substances produced by it, affects the development (determination and differentiation) of another part of the embryo. *See also* inductor.

organogenesis The development of an organ or organs.

organotroph A cell or an organism that utilizes organic compounds as electron donors in its energy-yielding oxidation-reduction reactions.

organ-specific enzyme TISSUE-SPECIFIC ENZYME.

oriC A nucleotide sequence (245 bp) that constitutes the replication origin (ori site) in the *E. coli* chromosome.

orientation effect 1. The contribution to the catalytic activity of an enzyme that is due to the stereochemical arrangement of the reactants on the surface of the enzyme in a manner that favors their undergoing a reaction. *See also* proximity effect. 2. DIPOLE-DIPOLE INTERACTION.

origin 1. The point of sample application on an electrophoretic or a chromatographic support. 2. The point of intersection of the vertical and horizontal axes in a plane rectangular coordin-

ate system. 3. REPLICATION ORIGIN.

original antigenic sin *See* doctrine of original antigenic sin.

origin of life The processes whereby biomolecules, subcellular structures, and ultimately, living cells have come into existence. *See also* biochemical evolution; biological evolution; chemical evolution.

origin of replication *See* replication origin.

Orinase Trademark for a synthetic sulfonyl urea derivative, tolbutamide, that has a hypoglycemic effect and is used in the control of diabetes. Orinase is administered orally and stimulates the secretion of insulin from the beta cells of the pancreas.

ori site REPLICATION ORIGIN.

Orn Ornithine.

ornithine A nonprotein, alpha amino acid that is an intermediate in the urea cycle. *Abbr* Orn.

ornithine cycle UREA CYCLE.

Oro 1. Orotic acid. 2. Orotate.

orosomuroid A conjugated plasma protein that contains a number of carbohydrates.

orotic acid A nonnucleic acid pyrimidine that is a precursor in the biosynthesis of the pyrimidine nucleotides of nucleic acids. *Abbr* O.

orotic aciduria A genetically inherited metabolic defect in humans that is characterized by the excretion of orotic acid and that is due to a deficiency of a protein that contains two enzymatic activities, orotate phosphoribosyl transferase and orotidylate decarboxylase.

orotidine The ribonucleoside or orotic acid. Orotidine mono-, di-, and triphosphate are abbreviated, respectively, as OMP, ODP, and OTP. The abbreviations refer to the 5'-nucleoside phosphates unless otherwise indicated. *Abbr* Ord; O.

orotidylic acid The nucleotide of orotic acid.

orphan drug According to the United States Department of Health and Human Services, an orphan drug is a drug that is used to prevent or treat a rare disease or condition, usually one that affects fewer than 200,000 persons in the United States. A drug that is not widely researched or available due to limited commercial interest or that has a limited market because of the rarity of the disease, may also qualify for "orphan" status.

orphan virus A virus, such as the echo virus, that occurs in healthy individuals and is not associated with any human disease.

orphan A dispersed single gene or pseudogene, derived from a multigene family (gene cluster). An unclustered tRNA gene and pseudogenes for histones and hemoglobins are some examples.

ortet The original single ancestor of a clone.

ortho- Prefix indicating two substituents of adjacent carbon atoms of the ring in an aromatic compound. *Sym* o.

orthochromatic dye A dye that stains cells or tissues with a single color as opposed to a metachromatic dye.

orthodox conformation A high-energy conformation of mitochondria that occurs in mitochondrial preparations containing little or no ADP and that is characterized by a mitochondrial matrix which is squeezed together tightly and which stains heavily. *See also* condensed conformation.

orthologous Descriptive of genes, or their protein products, that occupy the same genetic locus in different species. Only orthologous genes must be compared in constructing phylogenetic trees. *See also* paralogous.

orthomolecular medicine The maintaining of good health and the treatment of disease that is achieved by varying the concentrations in the human body of substances that are normally present in, and are required by, the body. The increased dietary intake of ascorbic acid for the control of respiratory infections is an example.

orthomyxovirus *See* myxovirus.

orthophosphate INORGANIC PHOSPHATE.

orthophosphate cleavage The hydrolytic removal of an orthophosphate group from a nucleoside di- or triphosphate.

oryzamin VITAMIN B₁.

osazone *See* phenylosazone.

OSCF Oligomycin-sensitivity-conferring factor.

oscillating reactions Reactions that vary in their amplitude and frequency. Those that vary in a regular manner are called periodic; those with ever-changing and unpredictable frequencies and amplitudes are called chaotic. Oscillating reactions play an important role in biological clock functions, in inter- and intracellular signal transmissions, and in cellular differentiation.

oscillographic polarography A polarographic technique in which the polarographic wave is depicted on an oscilloscope.

osm 1. Osmole. 2. Osmolal.

osM Osmolar.

osmiophilic Descriptive of a specimen, prepared for electron microscopy, that has a tendency to take up the electron-dense stain of osmium tetroxide.

osmium tetroxide A compound used for fixing and staining specimens for electron microscopy.

osmol An osmole.

osmolality The concentration of a solution expressed in terms of the number of osmoles of

solute per 1000 grams of solvent.

osmolal solution A solution that contains one osmole of solute dissolved in 1000 grams of solvent.

osmolarity The concentration of a solution expressed in terms of the number of osmoles in one liter of solution.

osmolar solution A solution that contains one osmole of solute in one liter of solution.

osmole A measure of the osmotically effective amount of solute; equal to the mole of the solute divided by the number of ions formed per molecule of the solute, on the assumption that electrolytes dissociate completely into ions in solution. Thus, one mole of sodium chloride is equivalent to two osmoles and one mole of phosphoric acid is equivalent to four osmoles. *Abbr* osmol; osm.

osmolute An osmotically active solute or solute particle.

osmometer An instrument for measuring osmotic concentration, osmotic pressure, and number average molecular weight.

osmophile An organism that grows preferentially in solutions that have high osmotic pressures.

osmophilic Of, or pertaining to, an osmophile.

osmoreceptor A receptor in the central nervous system that responds to changes in the osmotic pressure of the blood.

osmoregulation Regulation brought about by changes in osmolarity. Thus, for example, expression of the genes that code for the two major porin proteins in *E. coli* is regulated in opposite directions by osmolarity; as the latter is increased, the synthesis of one porin is increased and that of the other is depressed.

osmoregulator An organism that maintains a constant internal osmotic concentration irrespective of variations in the osmotic concentration of its external environment.

osmosis The movement of water or another solvent across a semipermeable membrane from a region of low solute concentration to one of higher solute concentration.

osmotic Of, or pertaining to, osmosis.

osmotic barrier PERMEABILITY BARRIER.

osmotic coefficient A factor that relates the observed osmotic pressure of a solution to that of an ideal solution.

osmotic concentration 1. OSMOLARITY. 2. OSMOLALITY.

osmotic potential The osmotic pressure that a solution is capable of producing if it were separated from the pure solute by a semipermeable membrane.

osmotic pressure The pressure that causes water or another solvent to move in osmosis from a solution having a low solute concentra-

tion to one having a high solute concentration; it is equal to the hydrostatic pressure that has to be applied to the more concentrated solution to prevent the movement of water (solvent) into it.

osmotic shock The sudden and drastic dilution of a suspension of cells, or their exposure to a hypotonic medium, that results in the movement of water into the cells and leads to cell rupture.

osmotic work The work performed by cells or cellular organelles in transporting substances across biological membranes, with the result that some substances accumulate inside the cell or inside the organelle, while others are eliminated. Work performed by moving a substance against a concentration gradient; concentration work.

ossification The formation of bone.

osteocalcin A small protein of 49 amino acids that is found in bone and that appears to function in the regulation of calcium in bone and teeth.

osteocyte A bone-forming cell.

osteomalacia The softening and bending of bones and the deficient bone mineralization that occurs in an adult due to a deficiency of vitamin D. *Aka* adult rickets.

osteoporosis A pathological condition characterized by progressive loss of both the organic matrix and the mineral content of bone; bones become brittle and the overall mass of the skeleton is reduced without any change in the ratio of bone mineral to bone matrix. *See also* rickets.

Ostwald-Folin pipet A blow-out pipet that is similar to a volumetric pipet but has the bulb closer to the tip of the pipet; used for the delivery of viscous fluids such as blood or serum.

Ostwald viscometer A simple capillary viscometer constructed in the shape of a U-tube with a small upper bulb in one arm, a larger lower bulb in the second arm, and a capillary connecting the two bulbs. The instrument is especially useful for measuring relative viscosities.

OT 1. Oxytocin. 2. Old tuberculin.

OTP 1. Orotidine triphosphate. 2. Orotidine-5'-triphosphate.

ouabain A cardiac glycoside that is a specific inhibitor of the sodium and potassium ion transport across the cell membrane.

Ouchterlony method A method for double immunodiffusion in which antigen and antibody solutions are placed in wells that are cut in agar and are spaced in one of a number of geometric arrangements. Both the antigens and the antibodies diffuse through the agar and interact to form precipitation arcs.

Oudin technique A method for single immunodiffusion in which the antibodies are mixed with agar in a narrow vertical tube and a solution of antigens is layered above the agar. The antigens diffuse through the gel and interact with the antibodies to form precipitation zones.

outbreeding The crossing of genetically unrelated plants or animals.

outer coat CELL COAT.

outer membrane 1. The layer of lipopolysaccharide, protein, and lipoprotein that is external to the peptidoglycan layer in the cell envelope of gram-negative bacteria. It provides a protective environment for certain hydrolytic enzymes and acts as a diffusion barrier against various compounds. 2. SHEATH (2). 3. The external membrane of the nuclear envelope that is continuous with the endoplasmic reticulum and that is often studded with ribosomes, engaged in protein synthesis. 4. The external membrane of mitochondria. 5. The external membrane of chloroplasts.

outer orbital An orbital that functions in the bonding of a high-spin complex.

outer sphere SECONDARY HYDRATION SHELL.

outer sphere activated complex An oxidation-reduction transition state that is formed by the transfer of electrons without a change in the inner coordination shells of the participating ions.

outer sphere complexing ligand A ligand that is within the secondary hydration shell of a metal ion and that participates in ion-pairing.

outer volume The volume of solvent that is contained in the spaces among the gel particles of the bed in gel filtration chromatography.

outgrowth The third stage in the conversion of a spore to a vegetative cell during which the spore core grows and the wall of the vegetative cell develops.

outlier An experimental value that clearly falls outside the range of values of a given population and should, therefore, be rejected.

ovalbumin The principal protein of egg white. *Abbr* OA.

ovariectomy The surgical removal of an ovary.

Overhauser effect *See* nuclear Overhauser effect.

overlap method The classical method for determining the amino acid sequence of a protein or the base sequence of a nucleic acid; involves partial digestion of the polymer into smaller fragments and elucidation of the amino acid or base sequence of each fragment. By using different ways to hydrolyze the original polymer and/or sections of it, fragments with varying degrees of overlap are produced and this helps in deducing the sequence of the

original molecule.

overlapping code A genetic code in which one or more nucleotides of one codon also serve as nucleotides for an adjacent codon.

overlapping genes Genes that have some nucleotide sequences in common. The overlapping sequences may involve control genes or structural genes. In phage ϕ X174, a number of different proteins are synthesized from overlapping genes by virtue of having different reading frames for the various genes.

overlap zones Thick regions in collagen fibers resulting from the overlap of staggered collagen fibrils.

overloading 1. The application of excessive amounts of material to an electrophoretic or a chromatographic support. 2. The addition of large amounts of a labeled or unlabeled intermediate to a system to study metabolic pathways. 3. The administration of large doses of protein antigens to an animal to produce immunological unresponsiveness.

overnutrition Malnutrition that results from an excessive intake of one or more nutrients.

overproducer A genetically engineered organism that produces large amounts of a given protein.

overspeeding technique The initial spinning of an analytical ultracentrifuge rotor at high speeds to decrease the time required to establish sedimentation equilibrium.

overwinding Positive supercoiling. *See* superhelix.

oviduct The duct that serves for the passage of eggs from the ovary to the uterus.

ovine Of, or pertaining to, sheep.

ovoflavin An impure preparation of riboflavin from egg white.

ovogenesis OOGENESIS.

ovomucoid A mucoprotein from egg white.

ovotransferrin *See* siderophilin.

ovulation inhibitor *See* oral contraceptive.

ovum (*pl* ova) The female reproductive cell; an egg cell; the female gamete.

oxaloacetate pathway A metabolic pathway whereby aspartic acid and asparagine are catabolized through conversion to oxaloacetic acid, which then feeds into the citric acid cycle.

oxaloacetic acid A dicarboxylic acid that initiates the reactions of the citric acid cycle by condensing with acetyl coenzyme A to form citric acid and coenzyme A. *Abbr* OAA.

oxalosis A pathological condition characterized by the deposition of calcium oxalate in the kidneys and other tissues.

oxaluria *See* primary oxaluria.

oxamycin CYCLOSERINE.

oxane ring *See* thromboxanes.

oxidant The electron acceptor species of a

given half-reaction; the species that undergoes reduction in an oxidation-reduction reaction.

oxidase An enzyme that catalyzes the oxidation of a substrate, with molecular oxygen serving as the electron acceptor.

oxidation The change in an atom, a group of atoms, or a molecule that involves one or more of the following: (a) gain of oxygen; (b) loss of hydrogen; (c) loss of electrons.

oxidation number A measure of the oxidized or the reduced state of an atom. For monoatomic ions, the oxidation number is equal to the charge of the ion. For complex ions and for molecules containing covalent bonds, the oxidation number is equal to the number of electrons gained or lost when (a) the electrons of a covalent bond are assigned completely to the more electronegative atom, and (b) the sum of the oxidation numbers of all the atoms is set equal to either zero in the case of a neutral molecule, or to the charge of the ion in the case of a complex ion. For elements in the free state, the oxidation number is taken as equal to zero.

oxidation potential The electrode potential that measures the tendency of an oxidation-reduction reaction to occur through a loss of electrons. *Sym* E. *See also* electrode potential; standard electrode potential.

oxidation quotient *See* Meyerhof oxidation quotient.

oxidation-reduction enzyme OXIDOREDUCTASE.

oxidation-reduction potential The electrode potential expressed either as a reduction potential or as an oxidation potential.

oxidation-reduction reaction A reaction composed of two half-reactions, one of which is a reduction half-reaction and one of which is an oxidation half-reaction.

oxidation state OXIDATION NUMBER.

oxidative assimilation The metabolism of microorganisms in which a large fraction of the substrates that are being oxidized are converted to cellular components to permit growth; this contrasts with the metabolism in a fully grown animal or human where the bulk of the substrates are oxidized to carbon dioxide and water which are then excreted.

oxidative deamination A deamination reaction with a concomitant oxidation, as in the conversion of an alpha amino acid to an alpha ketoacid.

oxidative pathway of hexose metabolism HEXOSE MONOPHOSPHATE SHUNT.

oxidative phosphorylation The synthesis of ATP from ADP that is coupled to the operation of the mitochondrial electron transport system. *See also* conformational coupling hypothesis; chemical coupling hypothesis; chemiosmotic coupling hypothesis.

oxidizing agent OXIDANT.

oxidizing atmosphere An atmosphere that is rich in gases that are readily reduced; the present-day atmosphere of the earth, which is rich in oxygen, is an example.

oxidizing power The capacity of a substance to function as an oxidizing agent.

oxidoreductase An enzyme that catalyzes an oxidation-reduction reaction. *See also* enzyme classification.

oxidoreduction reaction An oxidation-reduction reaction.

oximeter An instrument for determining the degree of oxygenation of blood by a direct measurement of a translucent part of the organism.

oxirane EPOXIDE. $\begin{array}{c} \text{H} \\ | \\ \text{---C---O---} \\ | \end{array}$

oxoacid KETOACID.

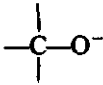
oxonium ion The ion $\text{R}-\text{O}^+-\text{H}$; ROH_2^+ .

5-oxoprolinone PYROGLUTAMIC ACID.

oxoprolinuria A genetically inherited metabolic defect in humans that is characterized by the formation of large amounts of pyroglutamic acid from γ -glutamylcysteine; due to a deficiency of the enzyme that catalyzes the synthesis of glutathione from γ -glutamylcysteine. *Aka* pyroglutamic aciduria; 5-oxoprolinuria.

oxosteroid KETOSTEROID.

oxyanion A negatively charged carbonyl oxygen atom and, by extension, the transient tetrahedral intermediate of which it is a part:



oxyanion hole A pocket in the active site of chymotrypsin into which the carbonyl oxygen of the susceptible peptide bond fits. *Aka* oxyanion pocket; oxyanion binding site.

oxybiontic Capable of using atmospheric (molecular) oxygen for growth. *Aka* oxybiotic. *See also* aerobic (2,3).

oxybiotin A synthetic analogue of biotin in which the sulfur has been replaced by oxygen and which can generally substitute for biotin.

oxycellulose Oxidized cellulose that is insoluble in water and common organic solvents; a cation exchanger.

oxygen An element that is essential to all plants and animals. Symbol, O; atomic number, 8; atomic weight, 15.9994; oxidation number, -2; most abundant isotope, ^{16}O ; a stable isotope, ^{18}O .

oxygenase An enzyme that catalyzes an oxidation reaction by molecular oxygen, in which both of the oxygen atoms are inserted into a compound. *Aka* dioxygenase. *See also* monooxygenase.

oxygenation 1. The saturation of a liquid with oxygen, as in the oxygenation of blood. 2. The introduction of oxygen into a compound, as in the oxygenation of hemoglobin.

oxygen capacity of blood OXYGEN COMBINING POWER OF BLOOD.

oxygen carrier A pigment, such as hemoglobin, myoglobin, or hemerythrin, that combines with and serves to transport oxygen.

oxygen combining power of blood The volume of oxygen that is required for combining with all of the hemoglobin in 100 mL of blood.

oxygen content of blood The total amount of oxygen, both physically dissolved and combined with hemoglobin, that is present in 100 mL of blood and that is determined at partial pressures of oxygen corresponding to those of the blood when it flows through either the arteries or the veins.

oxygen cycle The group of reactions whereby oxygen is generated from water by photosynthetic organisms and is reconverted to water by heterotrophic organisms.

oxygen debt The extra amount of oxygen that is required by a mammal after a period of strenuous exercise. The oxygen is used to oxidize a portion of the lactic acid that accumulated during the exercise, and the energy thus obtained drives the conversion of the remainder of the lactic acid to glycogen.

oxygen dissociation curve OXYGEN SATURATION CURVE.

oxygen electrode One of a number of membrane probes that permit the determination of dissolved oxygen. *See also* Clark electrode.

oxygen saturation The percentage of oxygen actually bound to either hemoglobin or myoglobin at a given partial pressure of oxygen, compared to the maximum amount that can be bound at high partial pressures of oxygen.

oxygen saturation curve A plot of oxygen saturation of either hemoglobin or myoglobin as a function of the partial pressure of oxygen.

oxygen transferase DIOXYGENASE.

oxygen transport The carrying of oxygen by the blood from the lungs to the tissues.

oxyhemoglobin An oxygenated hemoglobin molecule. *Abbr* HbO_2 ; HHbO_2 .

oxymyoglobin An oxygenated myoglobin molecule. *Abbr* MbO_2 .

oxysome A macromolecular aggregate that functions as a unit in oxidative phosphorylation. It is referred to as either a lumped or a distributed oxysome depending on whether the components for oxidative phosphorylation are all present in one aggregated particle or are distributed over a number of different aggregated particles. *See also* complexes I-IV.

oxytetracycline *See* tetracyclines.

oxytocic hormone OXYTOCIN.

oxytocin A cyclic peptide hormone that consists of nine amino acids and that causes the contraction of smooth muscle; it is secreted by the posterior lobe of the pituitary gland. *Abbr* OT.

Oz group A group of allotypic antigenic sites in the constant region of the lambda chain of human immunoglobulins.

ozone The triatomic allotropic form of oxygen

that is present in the stratosphere and that is generated by a silent electric discharge in oxygen or air.

ozonolysis The oxidation of a compound by means of ozone; used for locating the double bonds in a fatty acid molecule, since ozonolysis leads to a cleavage of the molecule at those points.

P

p 1. Para position. 2. Pico. 3. Proton. 4. Phospho-, as in p-creatine. 5. Phosphate, as in glucose-1-p.

P 1. Inorganic phosphate. 2. Phosphate in an abbreviation, as in ATP. 3. Phosphorus. 4. Product. 5. Probability. 6. Proline. 7. Poise. 8. Pressure. 9. Peta.

~**P** A phosphate group in a high-energy compound that, when removed by hydrolysis, results in a reaction that has a large, negative free energy change.

P₁₁ P protein.

P₄₅₀ See cytochrome P₄₅₀.

P₆₈₀ The pigment of photosystem II of chloroplasts that functions in conjunction with the photolysis of water.

P₇₀₀ The pigment of photosystem I of chloroplasts that is a special chlorophyll molecule, the properties of which are influenced by its environment.

³²P A radioactive isotope of phosphorus that is a strong beta emitter and has a half-life of 14.3 days.

Pa Pascal.

PA 1. Proton affinity. 2. Phosphatidic acid.

PAABS Pan-American Association of Biochemical Societies.

PABA *p*-Aminobenzoic acid; also abbreviated PAB.

PAbs Polyclonal antibodies.

pacemaker enzyme An enzyme that catalyzes a reaction that is essentially irreversible in the chemical sense; such enzymes frequently catalyze either the initial, the final, or a branch point reaction of a metabolic pathway. Pacemaker enzyme reactions are rate-limiting reactions. The committed step of a biosynthetic pathway is frequently such a reaction.

packaging The process of folding DNA so that the long molecule can fit into smaller spaces. Formation of nucleosomes and chromosomes represents packaging of DNA into eukaryotic cells. Likewise, folding and insertion of DNA into phage heads represents packaging of viral DNA. *See also* packing ratio.

packed cell volume HEMATOCRIT (1).

packing 1. *v* The process of setting up the stationary phase in column chromatography. 2. *n* The solid bed material in column chromatography; the stationary phase; the chromatographic support.

packing ratio The ratio of the length of the

DNA molecule to the length of the subcellular structure containing it. Thus, in a human cell, the total length of the DNA is about 1 m and the total length of the 46 chromosomes is about 50×10^{-6} m, resulting in a packing ratio of $1/(50 \times 10^{-6})$ or 20,000/1.

PAF Platelet-activating factor.

PAGE Polyacrylamide gel electrophoresis.

Paget's disease A disease of unknown cause that is characterized by changes in bone remodeling (formation and resorption).

PAH *p*-Aminohippuric acid.

pair annihilation The production of a photon from the energy dissipated when the electron collides with a positron.

paired Designating bases in two nucleic acid strands, or in one strand folded back upon itself, that are linked by hydrogen bonding according to the base pairing rules.

paired electrons The two electrons, of opposite spin, that are normally present in an atomic orbital.

paired-ion chromatography ION-PAIR CHROMATOGRAPHY.

paired sera An acute serum and a convalescent serum.

paired source method A method for determining the resolving time of a radiation counter by counting two radiation sources, first separately and then together.

pair production A unique reaction of energy to mass transition in which a high-energy photon is converted to a positron and an electron in the strong magnetic field of an atomic nucleus.

PAL Pyridoxal phosphate.

Palade granule RIBOSOME.

paleobiochemistry A branch of biochemistry that deals with the study of the organic constituents of fossils.

paleontology The science that deals with life of earlier geologic eras and that is based on the study of plant and animal fossils; the study of extinct species. *See also* neontology.

paleoprotein One of a group of proteins isolated from fossils, particularly the exoskeleton of mollusks.

Paleozoic era The geologic time period that extends from about 225 to 600 million years ago and that is characterized by the development of land animals and plants.

palindrome A segment of DNA that has a

symmetrical structure; the sequence of bases in one strand (for example, in the 5' to 3' sense) is identical to that in the second strand, read in the same 5' to 3' sense. An example is

5'...GAATTC...3'
3'...CTTAAG...5'

palindromic helix A helix that has end-to-end symmetry so that both ends are indistinguishable. A palindromic helix can be rotated by 180° about an axis perpendicular to the longitudinal axis of the helix and thereby produce a structure that is identical to that before rotation.

palmitic acid A saturated fatty acid that contains 16 carbon atoms and is present in animal fat.

palmitoleic acid An unsaturated fatty acid that contains 16 carbon atoms and one double bond.

PALP Pyridoxal phosphate.

PAM Percentage of accepted point mutations; the number of amino acid differences per 100 amino acid residues of a given protein. A unit that is used in comparing the sequence homology of proteins.

pancreas An endocrine gland that secretes the hormones, insulin, and glucagon, and that is located behind the stomach.

pancreatectomy The surgical removal of the pancreas.

pancreatic Of, or pertaining to, the pancreas.

pancreatic cholera A clinical syndrome, characterized by diarrhea, hypokalemia, and hypochlorhydria, that is due to the decreased secretion of gastric acid; appears to be brought about by the action of high concentrations of vasoactive peptide on the intestine, the pancreas, and the stomach.

pancreatic deoxyribonuclease DEOXYRIBONUCLEASE I.

pancreatic diabetes Diabetes that is caused by either a lesion or the removal of the pancreas.

pancreatic juice The digestive juice that consists of the secretion of the pancreas and that is discharged into the small intestine; contains proteolytic enzymes, secreted as zymogens, nucleases, carbohydrases, and lipases. *Aka* pancreatic fluid.

pancreatic polypeptide A polypeptide candidate hormone, discovered in the chicken and subsequently isolated from the F cells of the pancreas from a variety of species; it contains 36 amino acids and has marked gastrointestinal effects but its physiological role is unknown.

pancreatic ribonuclease *See* ribonuclease A.

pancreatin An acetone powder preparation of the pancreas that contains active pancreatic enzymes.

pancreatitis An inflammation of the pancreas that may be acute or chronic.

pancreatropic Exerting an effect on the pancreas.

pancreozymin CHOLECYSTOKININ.

pandemic Of, or pertaining to, an epidemic disease of unusually widespread occurrence.

Pandred's syndrome A hereditary disease, associated with nerve deafness and characterized by a lower than normal incorporation of iodine into thyroglobulin.

pangamic acid *See* vitamin B₁₅.

panspermy hypothesis The hypothesis that life originated elsewhere in the universe before the solar system was formed and that it was later transported in some fashion through interstellar space and deposited on the earth in the form of heat-resistant spores or in some other form. *Aka* panspermia hypothesis.

pantetheine An intermediate in the biosynthesis of coenzyme A in mammalian liver and in some microorganisms, and a growth factor for a species of lactic acid bacteria, *Lactobacillus bulgaricus*; consists of pantothenic acid linked to β-mercaptopethylamine.

P antigen One of a number of glycosphingolipid blood group antigens of human erythrocytes.

pantothenic acid One of the B vitamins, the coenzyme form of which is coenzyme A.

pantropic virus A virus that affects more than one tissue or more than one organ.

PAP 3'-Phosphoadenosine-5'-phosphate; the compound formed from PAPS in the presence of a suitable acceptor; PAPS + acceptor ⇌ PAP + product.

papain A proteolytic enzyme that is derived from papaya and that has a broad specificity.

paper chemistry Chemical reactions that are combined in a stoichiometrically correct way but that have no basis in fact and do not portray the actual mechanisms involved.

paper chromatogram The developed strip or sheet of filter paper that is obtained in paper chromatography.

paper chromatography Partition chromatography in which the stationary phase is a moistened strip or sheet of filter paper and the mobile phase is a solvent that either ascends or descends along the paper. *Abbr* PC.

paper electrophoresis Electrophoresis in which a strip or sheet of filter paper is used as a supporting medium; the filter paper is moistened with buffer and dips into two buffer compartments that contain the electrodes.

papergram PAPER CHROMATOGRAM.

papilloma A benign tumor of the skin or of a mucous surface; a wart.

papilloma virus A small, naked, icosahedral

virus that contains double-stranded DNA and that produces papillomas in animals; belongs to the group of papovaviruses.

papovavirus A small, naked, icosahedral virus that contains double-stranded DNA; most papovaviruses produce either benign or malignant tumors.

PAPS 3'-Phosphoadenosine-5'-phosphosulfate. *See also* PAP.

para- Prefix indicating two substituents on opposite carbon atoms of the ring in an aromatic compound. *Sym p.*

parabiosis The natural or artificial joining of two organisms so that they are linked both anatomically and physiologically.

parabolic inhibition Inhibition that yields a curve that is concave upward when either slopes or intercepts from a primary plot are plotted as a function of inhibitor concentration.

paracasein *See* chymosin.

paracrine hormone A substance, such as a prostaglandin, a neurotransmitter, or a polypeptide growth factor, that acts on cells close to those that released it.

paracrystalline Descriptive of a solid that has a somewhat lesser order than the regular three-dimensional arrangement of the atoms in a true crystal. *See also* tactoid.

paradigm An example, model, or pattern; a scientific hypothesis that serves as an example; a known event that serves as an illustration for a more general phenomenon.

paraffin method A method of preparing a tissue specimen for microscopic examination in which the tissue is embedded in paraffin and then cut with a microtome to produce thin paraffin sections.

paraffin oil A mixture of saturated aliphatic hydrocarbons; a liquid petroleum derivative.

paraffin section *See* paraffin method.

paraffin wax A macrocrystalline wax obtained from petroleum.

parahematin FERRIHEMOCHROME.

parahemophilia A genetically inherited metabolic defect in humans that is caused by a deficiency of accelerator globulin, a factor in the blood clotting system.

parallel chains Two polypeptide chains that run in the same direction; both progress from the C-terminal to the N-terminal, or vice versa.

parallel spin The spin of two particles in the same direction.

parallel strands Two polynucleotide strands that run in the same direction; both progress from the 3'-terminal to the 5'-terminal, or vice versa.

paralogous Descriptive of genes, or their pro-

tein products, that occupy different genetic loci in different species. *See also* orthologous.

paralysis *See* immunological paralysis.

paralysis time COINCIDENCE TIME.

paramagnetic Descriptive of a substance that has unpaired electrons and that has a permanent magnetic dipole moment as a result of the magnetic properties of its spinning electrons; when such a substance is placed in a magnetic field, it tends to become oriented in line with the applied field.

Paramecium A genus of freshwater protozoans possessing kappa particles.

parameter 1. An independent variable through functions of which other variables may be expressed. 2. A quantity (such as a mean or a standard deviation) that is calculated for an entire population. *See also* statistic. 3. A property, associated with a molecule or some other particle, that can be expressed quantitatively and that has specific values; molecular weight, sedimentation coefficient, and axial ratio are some examples.

parametric statistics Statistical calculations that are based on prior assumptions with respect to the variable and the probability distributions of the data, and that are valid only if these assumptions hold.

paramylon A linear homopolysaccharide that occurs in *Euglena* and that is composed of D-glucose units linked by means of $\beta(1 \rightarrow 3)$ glycosidic bonds.

paramyosin A fibrillar element of some smooth muscles, such as the catch muscles of mollusks, whose main component is tropomyosin A.

paramyxovirus *See* myxovirus.

parameric coiling The coiling of two threads in opposite directions so that they can be separated without uncoiling the threads. *See also* plectonemic coiling.

paranuclein Obsolete designation for a phosphorus-containing protein that is not a nucleoprotein.

paraprotein An abnormal, monoclonal immunoglobulin. Paraproteins are formed by proliferating concentrations of immunoglobulin producing cells and occur in the serum of individuals suffering from multiple myeloma or from Waldenstroem's macroglobulinemia. *Aka* M component.

paraproteinemia The presence of paraproteins in the blood.

parapyruvate A dimer of pyruvate that accumulates when pyruvate is stored.

parasite An organism that lives in or upon another organism from which it derives some or all of its nutrients.

parathion An insecticide and nerve poison that

forms a stable covalent intermediate with a serine residue in the active site of acetylcholinesterase.

parathormone A polypeptide hormone, secreted by the parathyroid glands, that stimulates the release of calcium from bone and leads to an increase in the level of calcium in the blood.

parathyrin PARATHORMONE.

parathyroidectomy The surgical removal of a parathyroid gland.

parathyroid gland One of two endocrine glands that secrete parathormone and that are adjacent to, or embedded within, the thyroid gland.

parathyroid hormone PARATHORMONE.

paratope ANTIGEN-BINDING SITE.

parenchymal cell A cell of the functional tissue of a gland or an organ.

parent 1. A cell in relation to the cells formed from it by cell division. 2. A molecule of DNA or a chromosome in relation to the molecules or the chromosomes formed from it by replication. 3. A virus in relation to its progeny. 4. A radioactive nuclide in relation to the nuclides formed from it by radioactive decay.

parenteral Referring to the introduction of a substance into an animal organism by ways other than that of the digestive tract, as in the case of an intradermal injection.

parent gelatin The product of the thermal helix-coil transition of collagen in solution; ordinary gelatin is derived from parent gelatin by heat denaturation or by degradation with acid or alkali.

parenthosome A septal pore structure in many basidiomycete fungi that consists of the pore and two hemispherical bulbs, one at each side of the pore. The structure is believed to be involved in the transport of structural components of the hypha.

parietal cell A hydrochloric acid-secreting cell of the gastric glands.

Park and Johnson method A method for determining reducing sugars based on the reduction of ferricyanide to ferrocyanide in alkaline solution.

Parkinson's disease A disorder of amino acid metabolism in humans that is not of genetic origin; it generally develops late in life and is characterized by a loss of dopamine, norepinephrine, and serotonin. The underlying pathology is impairment of the synthesis of these compounds. Treatment involves administration of L-dopa (levodopa) which is decarboxylated to dopamine, a reaction catalyzed by the enzyme dopa decarboxylase. *Aka* Parkinsonism.

Park nucleotide The compound UDP-*N*-acetylmuramyl pentapeptide, an intermediate in the biosynthesis of peptidoglycan.

paromomycin A broad-spectrum aminoglycoside antibiotic produced by *Streptomyces rimosus*.

parsimony principle OCCAM'S RAZOR.

parthenogenesis The development of an organism from an unfertilized egg; the ability to reproduce without fertilization; the activation of an egg in the absence of a sperm.

partial agonist A ligand that binds to a receptor and causes a less than maximum biological response even when it occupies all of the available receptor sites. *See also* agonist; full agonist.

partial digest PARTIAL HYDROLYSATE.

partial hydrolysate The solution that contains the mixture of substances obtained by partial hydrolysis. *Var sp* partial hydrolyzate. *Aka* partial digest.

partial hydrolysis Incomplete hydrolysis, as the hydrolysis of a polymer by an enzyme that is specific for only some of the bonds between the monomers.

partial inhibition The inhibition of the activity of an enzyme in which a saturating concentration of inhibitor cannot cause the reaction velocity to become zero.

partial molar quantity The rate of change of an extensive property of a substance with the number of moles of the substance.

partial pressure The pressure exerted by a gas when it is part of a mixture of gases; it is equal to the pressure that the gas would exert if it alone occupied the entire volume occupied by the mixture at the same temperature.

partial reactions A group of 4 reactions that are catalyzed by intact mitochondria and that are greatly affected by 2,4-dinitrophenol and oligomycin. The reactions are ATP hydrolysis (ATPase activity), phosphate-ATP exchange, phosphate-water exchange, and ADP-ATP exchange. These reactions are believed to represent steps in the mechanism by which ATP is synthesized in oxidative phosphorylation.

partial specific quantity The rate of change of an extensive property of a substance with the number of grams of the substance.

partial specific volume The rate of change of solution volume with the number of grams of solute; the volume increase of a very large volume of solution upon the addition of 1 g of solute. *Sym* \bar{v} .

particle diffusion The diffusion of ions through the granules of an ion-exchange resin which proceeds at such a rate that the diffusion controls the rate of ion-exchange taking place.

particle electrophoresis The electrophoretic movement of large colloidal particles in an electrophoresis cell that is mounted under a microscope; used for the direct measurement of the electrophoretic mobility of such particles.

particle immunoassay An immunoassay in which particles (erythrocytes, polystyrene spheres, gold sols, latex particles, dyes, etc.) are used as labels for either antigens or antibodies. *Abbr* PIA.

particle scattering factor A factor that allows for the angular dependence of light scattered by particles that have at least one dimension that is greater than one-twentieth of the wavelength of the incident light; the factor depends on the radius of gyration of the particles.

particle weight MOLECULAR WEIGHT (2).

particulate antigen An antigen that is part of an insoluble structure of a microbial or other cell, a virus, or some other particle.

particulate enzyme An enzyme that is bound to an insoluble structure of a cell, a cellular organelle, or some other particle.

particulate fraction A fraction consisting of cellular and intracellular insoluble structures but devoid of the intracellular fluids and their dissolved solutes.

partition chromatography Chromatography in which the distribution of compounds between a mobile and a stationary liquid phase is based on the solubilities of the compounds in the two phases; the stationary liquid phase is held in place by a porous solid such as a sheet of filter paper or a column of starch. Partition chromatography refers particularly to those cases in which the stationary phase is a more polar liquid than the mobile phase. Also referred to as normal-phase chromatography to distinguish it from reversed-phase chromatography. *Abbr* PC.

partition coefficient The ratio of the concentrations of a substance in two immiscible phases at equilibrium; the phases may be two liquids, or a liquid and a gas. In chromatography, the partition coefficient refers to the concentration ratio of the stationary to the mobile phase.

partitioner phase STATIONARY PHASE (2).

partition function A thermodynamic function that describes the distribution of molecules over all possible energy levels.

partition isotherm PARTITION COEFFICIENT.

partition law The law that a solute, added to a system composed of two immiscible phases, will distribute itself between the two phases according to its solubility in each phase; the phases may be two liquids, or a liquid and a gas.

parturition Childbirth; giving birth to young.

parvalbumin One of a group of muscle proteins that are found in lower vertebrates where they have a calcium-binding function much like troponin in higher organisms.

parvovirus A small, naked, icosahedral animal virus that contains single-stranded DNA. Some parvoviruses (subgenus A) are capable of autonomous replication; others (subgenus B) are capable of replication only in cells that are infected by adenoviruses; these are called adenovirus-associated viruses.

PAS 1. *p*-Aminosalicylic acid. 2. PA/S procedure.

PAS-1 GLYCOPHORIN.

pascal The SI unit of pressure ($\text{kg m}^{-1}\text{s}^{-2}$); 1 mm Hg = 133.3224 pascals. *Sym* Pa.

PASCAL A high-level computer language named after the seventeenth century French mathematician Blaise Pascal and designed to facilitate structured programming.

PA/S procedure Periodic acid/Schiff procedure. *Abbr* PAS.

PAS reagent SCHIFF'S REAGENT.

passage SUBCULTURE.

passenger The DNA segment that is spliced into a vector and that subsequently replicates along with the vector in a host cell in the cloning stage of recombinant DNA technology. *Aka* passenger DNA.

passenger virus A virus, the presence of which is not associated with the disease, if any, that is occurring in the tissue from which the virus is isolated.

passive agglutination The agglutination reaction of soluble antigens attached covalently, or noncovalently, to cell surfaces.

passive anaphylaxis The anaphylactic reaction produced in an animal by injecting it first with antibodies from another animal and then with the corresponding antigens.

passive diffusion *See* passive transport.

passive hemagglutination The passive agglutination of red blood cells.

passive hemolysis The lysis of red blood cells in the presence of complement that is brought about by antibodies to antigens that have been artificially attached to the surface of the cells.

passive immunity The immunity acquired by an animal organism as a result of the injection of antibodies into it.

passive mediated transport *See* mediated transport.

passive spread The spread of an electrical signal as a function of distance that occurs in an axon in the absence of any amplification through the opening of voltage-gated channels.

passive transfer 1. The transfer of immunity by

- the injection of serum, antibodies, or lymphocytes from an immune individual to a normal one. 2. The transfer of hypersensitivity by the injection of serum, antibodies, or lymphocytes from an allergic individual to a normal one.
- passive transport** The movement of a solute across a biological membrane that is produced by diffusion, is directed downward in a concentration gradient, does not require carriers, and does not require the expenditure of energy. *Aka* simple diffusion.
- Pasteur effect** The inhibition of glycolysis and the decrease of lactic acid accumulation that is produced by increasing concentrations of oxygen. The effect is due to the inhibition of phosphofructokinase by the ATP formed as a result of oxidative phosphorylation. *See also* Meyerhof oxidation quotient; Crabtree effect.
- pasteurization** The brief heating of a food, such as milk or wine, that is designed to kill pathogenic microorganisms without actually sterilizing the food.
- Pasteur-Liebig controversy** A controversy that raged during the second half of the nineteenth century between Louis Pasteur and Justus Liebig. Pasteur believed that fermentation and similar processes were carried out by the metabolic activities of living cells; Liebig believed that such processes were due to chemical substances and that the reactions resulted from self-perpetuating instabilities in the solution that were initiated by exposure of the solution to air.
- Pasteur pipet** A drawn-out ungraduated pipet with a constriction in the wider part of the pipet for insertion of a cotton plug.
- patch and cut repair** A repair mechanism of DNA in which repair replication begins after the first incision by a nuclease, and the damaged segment is fully excised only after the repair replication is complete. The final step requires the action of DNA ligase to join the newly synthesized segment to the existing strand. *See also* cut and patch repair.
- patching** The clustering of membrane proteins on the surface of a cell that is brought about by their being cross-linked when either antibodies or lectins are added.
- patch recording** A method for measuring the current passing through a few (or a single) voltage-gated channels by stretching a small patch of membrane across the tip of a pipet.
- patch test** A test for delayed-type hypersensitivity to the cutaneous application of tuberculin.
- pathogen** A virus, a microorganism, or some other substance that can produce a specific disease.
- pathogene** VIROID.
- pathogenesis** The origin and development of a disease.
- pathogenic** Disease-producing.
- pathogenicity** The disease-producing capacity of a microorganism, a virus, or other substance.
- pathogenic RNA** VIROID.
- pathological** Of, or pertaining to, pathology.
- pathological biochemistry** The biochemistry of pathological tissues and fluids.
- pathology** The science that deals with the origin, nature, and course of diseases.
- pathway** *See* metabolic pathway.
- pattern method** A viral assay based on measuring the extent of hemagglutination by dilutions of the viral sample.
- Patterson function** A mathematical function used in the construction of a Patterson map.
- Patterson map** A graphical projection used in determining the positions of heavy atoms in x-ray diffraction patterns that have been obtained by the isomorphous replacement method.
- paucidisperse** Consisting of macromolecules that fall into a small number of classes with respect to their size.
- Pauli exclusion principle** The principle that no two electrons in an atom can be in the same detailed state described by the same four quantum numbers; as a result, a maximum of two electrons can occupy a single atomic orbital, and they must be of opposite spin.
- Pauly reaction** A colorimetric reaction for histidine and other imidazole compounds that is based on the production of a red color on treatment of the sample with an alkaline solution of diazotized sulfanilic acid.
- Pauly's reagent** A sulfanilamide-containing reagent that is used for the detection of tyrosine and other phenolic compounds in chromatograms.
- pause** The reduction in the rate of RNA chain elongation that occurs during the transcription of DNA by RNA polymerase at specific regions of the DNA; these regions are known as pausing sites.
- PBB** Polybrominated biphenyls; *See* polychlorinated biphenyls.
- PBG** Porphobilinogen.
- PBI** Protein-bound iodine.
- P blood group** *See* P antigen.
- PC** 1. Phosphatidylcholine. 2. Phosphocreatine. 3. Paper chromatography. 4. Partition chromatography. 5. Plastocyanin.
- PCA** 1. Passive cutaneous anaphylaxis. 2. Perchloric acid.
- PCB** Polychlorinated biphenyls.
- PCMB** *p*-Chloromercuribenzoic acid.
- PCNA** Cyclin.
- P_{CO₂}** 1. Carbon dioxide tension. 2. Partial pressure of carbon dioxide.

PCP Angel dust.

PCr Phosphocreatine.

pD A term that is equivalent to pH for a system that contains deuterons.

PD₅₀ Median paralysis dose.

PDC Pyruvate dehydrogenase complex.

³²P decay See radiophosphorus decay.

PDGF Platelet-derived growth factor.

PDH Pyruvate dehydrogenase. See pyruvate dehydrogenase complex.

PE 1. Phosphatidylethanolamine. 2. Polyethylene.

pectate lyase The enzyme that catalyzes the degradation of pectins whereby the glycosidic bonds between the monosaccharide residues are cleaved and water molecules are eliminated. *Aka* eliminase; transeeliminase.

pectic acid Pectin in which the galacturonic acid residues are present as free acids rather than as methyl esters. *Aka* pectinic acid.

pectic substance Pectin, pectic acid, and related compounds.

pectins A group of heterogeneous, branched, and highly hydrated polysaccharides that contain large amounts of galacturonic acid, some of it in the form of methyl esters. Pectins are abundant in fruits and are used as gelling agents.

PEG Polyethylene glycol.

PEI-cellulose Polyethyleneimine-cellulose; an anion exchanger.

P element One of a group of transposable elements in the fruit fly, *Drosophila melanogaster*.

pellagra The disease caused by a deficiency of the B vitamin nicotinic acid; it is characterized by dermatitis, stomatitis, impaired digestion, and diarrhea.

pellagra-preventative factor NICOTINIC ACID.

pellet The material collected by sedimentation of a solution in a centrifuge tube.

pellicular Descriptive of a column chromatographic packing, used in high-performance liquid chromatography, that consists of small, spherical, glass particles which are coated with a thin layer of a chromatographic support such as a gel, an adsorbent, or an ion-exchange resin.

peloscope A device for obtaining samples of soil microorganisms; consists of several bundles of short (1–2 cm) rectangular capillaries that are filled with sterile water and are inserted vertically into the soil. After suitable periods, the peloscope is removed and examined microscopically.

Pendred's syndrome A genetically inherited metabolic defect in humans that is characterized by lower than normal incorporation of iodine into thyroglobulin. The specific biological defect is unknown.

penems A class of β -lactam antibiotics that act on the bacterial cell wall and are capable of killing resting cells. This is in contrast to penicillin which kills only growing cells by inhibiting cell wall synthesis.

penicillin One of a group of antibiotics, produced by the mold *Penicillium notatum*, that function by inhibiting the synthesis of the bacterial cell wall; penicillin G, or benzylpenicillin, is the most widely used of the group. See also β -lactam antibiotics; penems.

penicillinase The enzyme that catalyzes the hydrolysis of the amide linkage of the β -lactam structure in β -lactam antibiotics. The enzyme is produced by many gram-positive and gram-negative bacteria and is sometimes a constitutive and sometimes an inducible enzyme. *Aka* β -lactamase.

penicillin enrichment A method for concentrating bacterial auxotrophs. Wild-type or mutagenized cells are grown on a minimal medium and are subjected to penicillin-induced lysis. This destroys the growing cells but not the nongrowing auxotrophs. The latter can then be supplied with an enriched medium to allow their growth subsequent to the destruction of the penicillin by means of penicillinase. *Aka* penicillin method; penicillin selection technique.

Penning ionization electron spectroscopy A technique for investigating the environment of atoms in the few outermost layers of a solid by using metastable argon atoms that are allowed to collide with the solid surface. The argon atoms capture electrons from molecules of the solid to fill their 3p orbitals and, subsequently, eject 4s electrons.

pent- Combining form meaning five.

pentagonal capsomer See capsomer.

pentamer 1. An oligomer that consists of five monomers. 2. PENTAGONAL CAPSOMER.

pentitol A 5-carbon sugar alcohol such as ribitol.

penton A capsomer composed of five protomers; a morphological subunit of some viruses.

penton antigen An antigen of the penton capsomer of adenoviruses.

pentosan A polysaccharide of pentoses.

pentose A monosaccharide that contains five carbon atoms.

pentose cycle HEXOSE MONOPHOSPHATE SHUNT.

pentose nucleic acid RIBONUCLEIC ACID.

pentose oxidation cycle HEXOSE MONOPHOSPHATE SHUNT.

pentose phosphate carboxylase RIBULOSE-1,5-BISPHOSPHATE CARBOXYLASE.

pentose phosphate pathway HEXOSE MONOPHOSPHATE SHUNT.

pentose phosphoketolase pathway A pathway that is related to the hexose monophosphate

shunt and that occurs in some bacteria.

pentosuria A genetically inherited metabolic defect in humans that is characterized by the presence of excessive amounts of L-xylulose in the urine; due to a deficiency of the enzyme L-xylulose dehydrogenase which leads to a block in the glucuronic acid oxidation pathway. *Aka* idiopathic pentosuria.

penultimate carbon The carbon atom preceding the last one in a chain.

PEP Phosphoenolpyruvic acid.

peplomer One of a group of proteins that project from the surface of the envelope of enveloped viruses (such as herpesvirus and arbovirus) forming a "fringe" over the lipoprotein coat surrounding the virion.

pepsin A proteolytic enzyme in the stomach that is unique because of its very low optimum pH. The major sites of pepsin action are peptide bonds in which the carbonyl group is contributed by either aromatic or acidic amino acids.

pepsin inhibitor A polypeptide fragment that inhibits pepsin and that has a molecular weight of about 3000; it is removed, together with other peptides, from pepsinogen in the course of its activation to pepsin.

pepsinogen The inactive precursor of pepsin.

peptic 1. Of, or pertaining to, pepsin. 2. Of, or pertaining to, the stomach and gastric digestion.

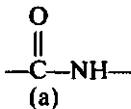
peptic peptides The peptides obtained by digestion of a protein with the enzyme pepsin.

peptidase 1. An enzyme that catalyzes the hydrolysis of peptide bonds in both peptides and proteins; a protease. 2. EXOPEPTIDASE.

peptide A linear compound that consists of two or more amino acids that are linked by means of peptide bonds.

peptide antibiotic An antibiotic, such as gramicidin or actinomycin D, that consists largely or entirely of a peptide.

peptide bond A covalent bond formed by splitting out a molecule of water between the carboxyl group of one amino acid and the amino group of a second amino acid. The grouping (a). *Aka* peptide link.



Aka peptide link.

peptide hormone One of a group of hormones that are peptides; oxytocin, vasopressin, and the hypothalamic hormones are some examples.

peptide map A fingerprint of peptides. *See* fingerprint.

peptide synthetase PEPTIDYL TRANSFERASE.

peptidoglycan The rigid framework of bacterial

cell walls that consists of a cross-linked network of mucopeptides; the mucopeptides are pentapeptides which are linked to the disaccharide *N*-acetylglucosamine-*N*-acetylmuramic acid.

peptidoglycolipid A compound composed of a peptide, a carbohydrate, and a lipid.

peptidolipid LIPOPEPTIDE.

peptidyl-puromycin A peptide attached to puromycin; formed between a growing polypeptide chain and puromycin when protein synthesis is inhibited by puromycin.

peptidyl site The site on the ribosome at which the peptidyl-tRNA is bound at a time when the next aminoacyl-tRNA becomes bound to the aminoacyl site. *Abbr* P site.

peptidyl transferase The enzymatic activity in protein synthesis that catalyzes peptide bond formation between the growing polypeptide chain and the next amino acid to be added. In prokaryotes, the active site of this enzyme consists of portions of several (presumably at least 10) different proteins of the 50S ribosomal subunit and is known as the peptidyl transferase center. No single protein having peptidyl transferase activity has yet been isolated.

peptidyl transferase center *See* peptidyl transferase.

peptidyl-tRNA A transfer RNA molecule with an attached peptide, as the tRNA with the attached growing polypeptide chain in protein synthesis.

peptidyl-tRNA site PEPTIDYL SITE.

peptolide *See* depsipeptide antibiotics.

peptolipid A lipid linked to an amino acid or a peptide; leukotrienes LTC, LTD, and LTE are examples.

peptone A partially hydrolyzed protein that is not precipitated by ammonium sulfate; a secondary protein derivative used as a component of microbiological culture media.

peptonization The enzymatic conversion of a protein into a peptone.

percentage average deviation The ratio of the average deviation to the mean, multiplied by 100; $100A/M$, where A is the average deviation, and M is the mean.

percentage error PERCENTAGE AVERAGE DEVIATION.

percentage law The law stating that the percentage of virus particles that are neutralized by a given antiserum is constant and does not depend on the virus titer, provided that the formation of antibody-virus complexes is reversible and that the antibody is present in excess.

percentile The value of a statistical variable below which the indicated percentage of the measurements of the frequency distribution

fall; thus, the 10th percentile is that value below which 10% of the measurements fall.

percent ionization The degree of ionization multiplied by 100; percent hydrolysis and percent dissociation are defined likewise.

percent saturation The ratio of the salt concentration of a solution to that of a saturated solution of the same salt, multiplied by 100.

percent solution A measure of concentration that, unless otherwise indicated, refers to the number of grams of solute in 100 mL of solution (w/v). Other expressions for percent concentration are volume/volume (v/v) and weight/weight (w/w).

percent transmittance The ratio of the intensity of the transmitted light to that of the incident light, multiplied by 100; $100/I_0$, where I is the intensity of the transmitted light, and I_0 is the intensity of the incident light. *Aka* percent transmission.

percutaneous Through the skin.

performance index A rating of ultracentrifuge rotors that expresses their relative effectiveness in accomplishing the complete sedimentation of a given material under idealized conditions.

perfusate The liquid leaving a perfused organ.

perfused organ An organ that either has been or is being subjected to perfusion.

perfusion The passage of blood, plasma, or other fluids through the blood vessels of an isolated organ or a tissue; used for metabolic studies and for keeping organs alive during organ transplantation.

perhydrocyclopentanophenanthrene The system of four fused rings that is the parent structure of the steroids.

periclinal Parallel to the surface or the circumference; surrounding.

pericyclic reaction A chemical reaction that is characterized by a concerted regrouping of bonding orbitals in the molecule and that proceeds by way of a cyclic transition state.

perikaryon The cytoplasmic cell body that surrounds the nucleus of a neuron.

perimysium The sheath, containing fat deposits and connective tissue, that encloses a mammalian muscle.

perinuclear space *See* nuclear envelope.

periodate oxidation The oxidative cleavage by periodate of the bond between two adjacent carbon atoms carrying any combination of hydroxyl, aldehyde, ketone, or primary amine groups. The periodate ion is reduced to the iodate ion ($\text{IO}_4^- \rightarrow \text{IO}_3^-$) and the reaction mixture is analyzed by titration. The reaction is used for elucidating the structure of an unknown carbohydrate.

periodic acid/Schiff procedure A staining procedure for polysaccharides in which period-

ate oxidation of the polysaccharide is followed by staining with Schiff's reagent for aldehydes. *Abbr* PA/S procedure.

periodicity 1. An occurrence at regular intervals in either time or space; used to describe the spacing of diffraction spots in x-ray diffraction patterns of biopolymers. 2. The number of base pairs per complete turn of the DNA double helix.

periodic oscillations *See* oscillating reactions.

periodic polymer REPEATING POLYMER.

periodic table The arrangement of the chemical elements as a function of their atomic number; elements with similar properties are placed one under the other to form groups of elements.

peripheral At or near an outer surface or a boundary.

peripheral nervous system That part of the nervous system of vertebrates that consists of the nerves and the ganglia but excludes the components of the central nervous system. *Abbr* PNS.

peripheral proteins Membrane proteins that are loosely attached to the surface of the cell membrane on either the extracellular or the cytoplasmic side of the membrane. They are easily extracted by mild procedures which do not disrupt the membrane. *Aka* extrinsic proteins.

peripherals Items of equipment (usually hardware) that are external to the computer itself; disk drives and printers are examples.

periplasmic component *See* periplasmic permeases.

periplasmic enzyme A bacterial enzyme that exists either in free or in bound form in a region between the cell wall and the cell membrane.

periplasmic permeases Permeases that function in the periplasmic space and that are inactivated during osmotic shock because of the loss of an essential component that binds the transported solute and which is referred to as the periplasmic component. *Aka* shock-sensitive permeases.

periplasmic space The space between the inner (cell, cytoplasmic) membrane and the outer (lipopolysaccharide) membrane in gram-negative bacteria.

peristalsis The progressive wave-like movements occurring in the intestine and in other hollow, muscular structures that serve to mix the contents present in the structure and to move it forward.

peristaltic Of, or pertaining to, peristalsis.

peristaltic pump A pump that moves contents along a flexible tube by intermittently pressing on the tube from the outside; this may be achieved by the rotation of a cylinder with

spaced protuberances over the tube.

peritrichous Descriptive of a bacterium that has flagella all over its surface.

permanent cell strain ESTABLISHED CELL LINE.

permanent dipole moment A dipole moment that is due to the structure of the substance and not due to the influence of an external electric or magnetic field.

permeability The property of a membrane that is measured by the qualitative and quantitative aspects of the passage of ions and molecules across it.

permeability barrier The limited ability, or the complete inability, of a substance to cross a biological membrane.

permeability coefficient The diffusion coefficient of a substance moving across a membrane, divided by the thickness of the membrane. It is equal to the number of moles of substance passing through a unit cross-sectional area of the membrane in unit time when there is a unit concentration difference across the membrane. *See also* Fick's first law.

permeability factor VITAMIN P.

permeable Descriptive of a membrane that permits the passage of both solutes and solvent across it.

permeant 1. *n* A substance that permeates. 2. *adj* Capable of permeating.

permeaphore A compound, located in the cell membrane, that aids in the transport of solutes across the membrane; a channel protein is an example.

permease 1. TRANSPORT AGENT. 2. The transport agent for galactosides in *E. coli*.

permeate To pass into or through a substance, such as a gel or a membrane.

permeation chromatography GEL FILTRATION CHROMATOGRAPHY.

PER method Protein efficiency ratio method.

permethylation An exhaustive methylation. *See also* Hakamori methylation.

permissible dose *See* maximum permissible dose.

permissible substitution CONSERVATIVE SUBSTITUTION.

permissive cell 1. A cell in which a conditional lethal mutant can grow. 2. A cell that supports the lytic infection by a virus.

permissive conditions Conditions (such as temperature or type of host) under which a conditional mutant can either grow or express its normal (nonmutant) phenotype.

permittivity An electrical unit that is identical to the dielectric constant when the electric field is static and of moderate intensity.

permselective membrane A membrane that is impermeable to water and that is selectively permeable to positive ions only or to negative ions only; such a membrane may be prepared

synthetically by incorporating a polyelectrolyte into a suitable matrix.

permutation Any ordered subset of a collection of *n* distinct objects. The number of permutations, each containing *r* objects, that can be formed from a collection of *n* distinct objects is given by

$$n(n-1)\cdots(n-r+1) = \frac{n!}{(n-r)!}$$

and is variously denoted as ${}_n P_r$, P_r^n , $P(n,r)$, or $(n)_r$.

permutation of the map CIRCULAR PERMUTATION.

permutite A synthetically produced, alkali metal- or alkaline earth-aluminum silicate that is used as an ion-exchange resin for water softening. *See also* zeolite.

pernicious anemia A fatal disease caused by the inadequate absorption of vitamin B₁₂ from the intestine and characterized by changes in the hematopoietic system and by degeneration of the central nervous system.

per os By way of the mouth, as in the giving of food or medicine.

peroxidase An enzyme that catalyzes the oxidation of a substrate by using hydrogen peroxide as the electron acceptor.

peroxidasome A peroxisome that has an abnormally high peroxidase activity.

peroxidation *See* lipid peroxidation.

peroxide number A measure of the peroxide content of a fat as determined by the amount of iodine that is liberated from KI by the fat; equal to the number of milliliters of 0.002 N sodium thiosulfate required to titrate the iodine liberated per gram of sample.

peroxisome A membrane-enclosed, cytoplasmic organelle that contains a variety of enzymes that use or produce hydrogen peroxide (H₂O₂). These enzymes include catalase, urate oxidase, and D-amino acid oxidase. *Aka* peroxidosome; microbody; glyoxisome.

Perrin equation One of two complex equations that relate the axial ratio of either an oblate or a prolate ellipsoid of revolution to its frictional ratio.

persistence length A parameter related to the conformational rigidity of a worm-like coil; it is equal to the length of the projection of the end-to-end distance of the coil onto an axis tangential to one end of the coil.

persistent fraction 1. The fraction of stable virus-antibody complexes that is formed during the neutralization of a virus by antibodies and that contains nonneutralized virus particles. 2. The fraction of interferon-resistant virus particles.

persistent induction Enzyme induction in which enzyme synthesis does not drop off rapidly when the inducer is removed.

persistent virus A virus that is transmitted from plant to plant via insect vectors.

personal computer A small computer, inexpensive enough to be owned by an individual.

perspective formula A two-dimensional representation of a molecule in which bonds projecting forward with respect to the plane of the page are indicated by wedges, and bonds projecting backward are indicated by dotted lines.

perspiration 1. The excretion of fluid by the sweat glands. Perspiration is referred to as sensible or insensible depending on whether the loss of water through the skin is accompanied or unaccompanied by visible sweat formation. 2. The fluid excreted by the sweat glands.

perturbation See solvent perturbation.

pervaporation The evaporation of a solvent through a membrane; used for concentrating solutions.

PEST hypothesis The hypothesis that proteins that are rapidly degraded within eukaryotic cells contain regions rich in proline (P), glutamic acid (E), serine (S), and threonine (T).

pesticide A chemical, such as an insecticide or a herbicide, that kills forms of animal or plant life.

PET Positron emission tomography.

peta- Combining form meaning 10^{15} and used with metric units of measurements. *Sym* P.

PET genes A group of nuclear genes whose expression is required for the morphogenesis of mitochondria that have a competent respiration system. These genes may code for products that have a direct function in mitochondrial respiration and oxidative phosphorylation, or they may affect the oxidative metabolism of mitochondria indirectly.

petite mutant A mutant of the yeast *Saccharomyces cerevisiae* that grows in small colonies because of mutations affecting mitochondria. A segregational petite carries a mutated nuclear gene that results in mitochondrial defects; a cytoplasmic or vegetative petite carries a mutated mitochondrial gene. In cases where all of the mitochondrial-encoded gene products are missing, the yeast forms promitochondria. See also promitochondrion.

pet mutant An organism that carries a mutation in a PET gene; the segregational petite mutants of yeast are an example.

petri dish A flat, covered, glass container used for growing bacteria on a nutrient gel.

petri plate A petri dish containing agar mixed with cells and viruses for use in the plaque assay of viruses.

Petroff-Hausser counting chamber A special hollowed-out microscope slide that holds a known volume of liquid in a ruled grid and

that is used for the direct counting of bacteria under a microscope.

PETT Acronym for positron emission transaxial tomography; a noninvasive technique that can be used to detect biochemical and physiological abnormalities in living tissue. A compound labeled with a positron emitting nuclide, such as ^{11}C , is administered to a subject by inhalation or injection. Inside the body, a positron travels only a short distance before it encounters an electron, its antimatter twin. The resulting annihilation produces two gamma-ray photons that shoot off in nearly opposite directions. All of the gamma-ray photons resulting from annihilation events in a given volume are picked up by a rotating assembly of detectors. A computer is used to reconstruct the spatial distribution of these annihilation events and hence to produce cross-sectional images of the radionuclide's distribution in the organ or the tissue being examined. See also tomography.

P face See fracture faces.

PFC Plaque-forming cell.

PFGE, PFGE Pulsed field gel electrophoresis.

PFK Phosphofructokinase.

PFU Plaque-forming unit.

PG 1. Prostaglandin. 2. Phosphatidyl glycerol. 3. Phosphoglycerate.

PGA 1. Prostaglandin A; See prostaglandins. 2. Pteroylglutamic acid. 3. Phosphoglyceric acid.

PGAH₄ Tetrahydropteroylglutamic acid.

PGB Prostaglandin B; See prostaglandins.

PGC Prostaglandin C; See prostaglandins.

PGD Prostaglandin D; See prostaglandins.

PGE Prostaglandin E; See prostaglandins.

PGF Prostaglandin F; See prostaglandins.

PGG Prostaglandin G; See prostaglandins.

PGH Prostaglandin H; See prostaglandins.

PGI₂ Prostacyclin.

pH A measure of the hydrogen ion concentration in solution. The pH was originally defined as the negative logarithm, to the base 10, of the hydrogen ion concentration expressed in terms of equivalents (or grams, or moles) per liter; commonly, $\text{pH} = -\log[\text{H}^+]$. The pH is now defined operationally by reference to standard solutions of assigned pH values. The difference in pH between an unknown and a standard solution is directly proportional to the difference in electromotive force between a cell containing the unknown solution and a cell containing the standard solution when these are measured with the same electrodes under identical conditions of temperature and pressure (a hydrogen or a glass electrode, and a reference electrode). See also pH scale; pH unit.

phage BACTERIOPHAGE.

phage conversion See conversion; lysogenic conversion.

phage cross The production of recombinant phage progeny, carrying genes of two or more parental phage types, that is brought about when a single bacterium is infected with two or more phages that differ in one or more of their genes.

phage induction See induction (2).

phage lambda See lambda.

phage lysate The suspension of newly synthesized phage particles obtained after phage-infected bacteria have undergone lysis.

phage lysozyme The enzyme, present in many phages, that has a specificity similar to that of lysozyme and disrupts the cell wall. It functions in the injection of phage nucleic acid into, and the release of progeny phage from, the bacterial cell.

phage M13 See M13.

phage MS-2 See MS-2.

phage Q β See Q-beta.

phage T See T-even phage; T-odd phage.

phage ϕ X174 See Phi X174.

phagocyte A cell that engulfs bacteria and other foreign particles by phagocytosis.

phagocytic Of, or pertaining to, phagocytosis or phagocytes.

phagocytic cell PHAGOCYTE.

phagocytic index 1. The average number of bacteria or particles that are taken up by phagocytosis per phagocytic cell; frequently measured *in vitro*. 2. The rate at which inert particles are removed from the blood and are taken up by the phagocytic cells; a measure of the activity of the reticuloendothelial system that is usually determined by means of an injection of carbon particles into an animal.

phagocytin A bactericidal, heat-stable protein that occurs in leukocytes and functions in phagocytosis.

phagocytosis The engulfment and destruction of foreign cells and foreign particulate matter by a cell.

phagolysosome An endocytotic vacuole that contains lysosomal hydrolytic enzymes and that is formed by the fusion of a phagocyte with one or more primary or secondary lysosomes. *Aka* phagolyosome.

phagosome An endosome that contains particulate material taken up by phagocytosis and destined for hydrolytic digestion.

phallotoxin One of a group of cyclic heptapeptides that are toxic components of the poisonous mushroom *Amanita phalloides*. See also amatoxin.

phantom A mass of material that approximates a tissue in its physical properties and that is used in determining the dose of radiation to

be applied to the tissue.

pharmaceutical 1. *n* A drug. 2. *adj* Of, or pertaining to, pharmacy.

pharmaceutical chemistry The branch of chemistry that deals with the preparation, composition, and testing of drugs.

pharmacodynamics The branch of pharmacology that deals with the reactions between drugs and living structures, specifically the action and the fate of drugs in animal organisms.

pharmacogenetics The area of molecular genetics that deals with the genetic mechanisms that underlie individual differences in the response to drugs.

pharmacognosy A branch of pharmacology that deals with the identification of drugs.

pharmacokinetics The area of pharmacology that deals with the quantitative distribution of drugs in the body.

pharmacology The science that deals with the origin, the composition, and the identification of drugs, and with the effects of drugs on living systems.

pharmacopela An official compilation of the names, the composition, and the medicinal doses of drugs, and of tests and procedures relating to these drugs. *Var sp* pharmacopoeia.

pharmacy The branch of pharmacology that deals with the origin, the composition, the preparation, and the dispensing of drugs.

phase A solid, liquid, or gaseous homogeneous substance that exists as a distinct and mechanically separable fraction in a heterogeneous system.

phase contrast microscope A microscope that converts differences in refractive index into visible variations of light intensity and permits the observation of transparent structures in the living cell; based on changes in the phase of the light wave as it passes through different parts of the specimen. *Aka* phase microscope.

phase partition A technique for the isolation and purification of subcellular fractions in which the material is allowed to partition itself between two or more immiscible or partially miscible phases. See also cross partition.

phase plate A plate that serves as a schlieren diaphragm in the schlieren optical system; it has a coating over half of its area so that incident light will be retarded by half a wavelength when it strikes this area.

phase problem A problem in the interpretation of x-ray diffraction patterns which is due to the fact that reflections from different sets of atomic planes can be evaluated with respect to their intensities but not with respect to their phase angles.

phase rule A mathematical generalization of

systems in equilibrium; expressed as $P + F = C + 2$, where P is the number of independent phases, F is the number of degrees of freedom, and C is the number of independently variable components. The expression can be used to assess the purity of a protein preparation on the basis of the solubility behavior of the protein.

phase shift mutation FRAMESHIFT MUTATION.

phase test A test for chlorophyll that is based on the change in color produced by treating chlorophyll with cold alcoholic potassium hydroxide.

phase transfer The transfer of an inorganic ion from one phase to another. The substance that brings about such transfer is called a phase transfer catalyst. Many types of organic reactions are subject to phase transfer catalysis.

phase variation A phenomenon shown by some strains of *Salmonella typhimurium*. These organisms have two genes (called H1 and H2) that are responsible for the synthesis of two distinct types of flagellin which then lead to the formation of two distinct types of flagella. Upon prolonged growth of bacteria making one type of flagella, the bacteria making the other type of flagella will in time arise. This change in the type of flagellin (flagella) produced is known as phase variation and is a manifestation of the expression of alternate structural genes.

phasing See nucleosome phasing.

Phe 1. Phenylalanine. 2. Phenylalanyl.

pH electrode An electrode that is sensitive to the hydrogen ion concentration of solutions.

phene A phenotypic character that is controlled by genes.

phenocopy 1. A nonhereditary change, resembling the change caused by a mutation, that occurs in the phenotype, but not in the genotype, of an organism. The change is brought about by nutritional or environmental factors and results in an organism that resembles another organism; the change leads to an effect that is characteristic of that produced by a specific gene of the other organism. 2. The organism produced by a nonhereditary change in the phenotype of a parent organism.

phenol 1. Hydroxybenzene. 2. An aryl hydroxide; an aromatic alcohol.

phenol coefficient A measure of the sterilizing capacity of a compound; equal to the ratio, under standard conditions, of the minimal sterilizing concentration of the compound to the minimal sterilizing concentration of phenol.

phenolic group See phenolic hydroxyl group.

phenolic hydroxyl group A hydroxyl group

attached to a benzene ring.

phenol reagent The reagent used in the Folin-Ciocalteu reaction.

phenolsulfonphthalein test A clinical test in which the renal blood flow and the secretory capacity of the renal tubules are assessed by means of the dye phenolsulfonphthalein.

phenome A collective term for all of the components of a living cell other than the genome.

phenomenase Any enzyme that is named after the phenomenon with which it is associated; disulfide bond rearrangease and ATP translocase are two examples. Such names are generally not approved by the Enzyme Commission of the IUB.

phenomenological coefficients A set of coefficients in the phenomenological equations that are functions of temperature, pressure, and composition.

phenomenological equations A set of equations of irreversible thermodynamics that represent the fluxes that take place within a system as a linear combination of driving forces and that describe the possible couplings which may give rise to new effects.

phenomic lag PHENOTYPIC LAG.

phenon A taxonomic grouping of organisms of similar phenotype; a group of organisms classified by methods of numerical taxonomy.

phenotype 1. The physical appearance and the observable properties of an organism that are produced by the interaction of the genotype with the environment. 2. A group of organisms that have the same physical appearance and the same observable properties. See also genotype.

phenotypic Of, or pertaining to, phenotype.

phenotypic adaptation The preferential growth of a phenotypically varied organism.

phenotypic curing The restoration of biological activity, lost through mutation, that is produced by changes in the environmental conditions; the changes result in a temporary alteration of transcription and/or translation that leads to the production of a functional protein even though the protein is specified by a mutant gene.

phenotypic lag The time between the exposure of an organism to a mutagen and the phenotypic expression of a mutation by that organism or by its progeny.

phenotypic mixing The production of a virus in which the phenotype differs from the genotype; may be achieved by infecting a bacterial cell with two related phages, such as two mutants of the same phage, so that components of one phage are incorporated into the structure of the second phage during phage assembly in the host cell. See also

transcapsidation.

phenotypic suppression The suppression of a mutant phenotype by nongenetic factors at the level of mRNA transcription or ribosome translation. Thus, the presence of 5-fluorouracil or streptomycin may cause misreading in transcription and translation, respectively, and hence lead to suppression of certain mutations.

phenotypic variation A change that is within the range of the potential changes of a phenotype and that is shown by essentially all of the organisms in a population.

phenylacetic acid A compound formed by the conjugation of phenylacetic acid with glycine; the form in which phenylacetic acid is detoxified and excreted in the urine.

phenylalanine An aromatic, nonpolar alpha amino acid. *Abbr* Phe; F.

phenylalanine hydroxylase The enzyme that catalyzes the synthesis of tyrosine from phenylalanine. *See also* phenylketonuria.

phenylalanine load test *See* load test.

phenylalanine tolerance index The composite of the concentrations of phenylalanine in serum after 1, 3, and 4h following the administration of a dose of phenylalanine to an individual; used in characterizing individuals who are suffering from, or are carriers for, phenylketonuria.

p-phenylenediamine A substrate used for assaying ceruloplasmin activity. *Abbr* PPD.

phenylhydrazine The compound formed by the reaction of a monosaccharide with equimolar amounts of phenylhydrazine.

phenylisothiocyanate *See* Edman degradation.

phenylketonuria A genetically inherited metabolic defect in humans that is characterized by mental retardation, if the defect is not corrected for in childhood, and that is due to a deficiency of the enzyme phenylalanine hydroxylase. *Abbr* PKU.

phenylsazone The compound formed by the reaction of a monosaccharide with excess phenylhydrazine; phenylsazones are useful for the identification of unknown monosaccharides.

phenylpyruvic oligophrenia PHENYLKETONURIA.

phenylthiocarbonyl amino acid An intermediate in the formation of a phenylthiohydantoin amino acid. *Abbr* PTC-amino acid.

phenylthiohydantoin amino acid An amino acid derivative formed by the reaction of phenylisothiocyanate with the free alpha amino groups of amino acids, peptides, or proteins. *Abbr* PTH-amino acid. *See also* Edman degradation.

pH 5 enzyme AMINOACYL-tRNA SYNTHETASE.

pheophytin Chlorophyll without the chelated magnesium atom.

pheoporphyrin PHORBIN.

pherogram ELECTROPHEROGRAM.

pheromone A chemical that is produced and discharged by an organism and that elicits a physiological response in another organism of the same species; the sex attractant of insects is an example. *See also* allelochemicals; gamone.

pH 5 fraction A subcellular fraction obtained by centrifuging a suspension of broken cells at $100,000 \times g$ and then precipitating the tRNA and the aminoacyl-tRNA synthetases by adjusting the pH of the solution to 5. *See also* S-100 fraction.

pH gradient electrophoresis ISOELECTRIC FOCUSING.

PhIA Phosphoroimmunoassay.

phi angle The torsion angle that denotes the rotation about the N—C α bond of the peptide backbone in proteins. *Sym* ϕ .

Philpot-Svensson optics A schlieren optical system that incorporates a cylindrical lens in its design.

phi X174 A phage that infects *E. coli* and that contains single-stranded, circular DNA. *Sym* ϕ X174.

pH jump method A relaxation technique in which pH is the variable that disturbs the equilibrium of a system. *See also* relaxation technique.

phloem A group of specialized plant cells that have lost their nuclei and much of their cytoplasm. They are aligned to form tubes and function in the transport of organic compounds in the plant. *See also* xylem.

phloretin A derivative of trihydroxyacetophenone that acts as a competitive inhibitor of glucose transport across the erythrocyte membrane. *Aka* dihydronaringenin.

phloridzin A toxic glycoside that blocks the reabsorption of glucose by the kidney tubules.

pH meter An instrument for measuring pH values of solutions, commonly by means of a glass electrode and a reference electrode or by means of a combination electrode.

phonon A packet of energy associated with oscillating atoms; a quantized wave within a polymer. Oscillations of side chains at right angles to a polymer or the compression and stretching of a polymer along its axis generate waves called phonons; the former are called optical phonons and the latter are called acoustical phonons. An analysis of phonons is of use in the study of biological membranes.

porbin The porphyrin derivative that consists of five rings and that constitutes the parent structure of the chlorophylls.

phorbol esters Esters of the alcohol phorbol (4,9,12- β ,13,20-pentahydroxy-1,6-tigliadien-3-on) which occurs in croton oil (*tigium*

oil). Phorbol esters, such as TPA (12-*O*-tetradecanoyl phorbol-13-acetate) are potent tumor promoters. They also evoke pleiotypic responses in cultured cells, including stimulation of macromolecular synthesis and cell proliferation, stimulation of prostaglandin synthesis, loss of surface-associated fibronectin, alteration in cell morphology and permeability, and various other effects.

pho regulon A regulon that responds to a deficiency of inorganic phosphate. The *E. coli* pho regulon consists of at least 24 genes scattered throughout the chromosome.

phosphagen A high-energy phosphate compound, such as phosphocreatine or phosphoarginine, that serves as a storage form of free energy in muscle.

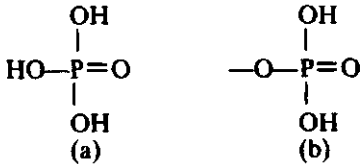
phosphatase An enzyme that catalyzes the hydrolysis of the esters of orthophosphoric acid.

phosphate 1. An anionic radical of phosphoric acid, specifically one of orthophosphoric acid; inorganic phosphate. *Sym* P_i; P. 2. A salt of phosphoric acid.

phosphate acceptor peptide KEMPTIDE.

phosphate bond energy The free energy change of a reaction in which a phosphorylated compound is hydrolyzed to yield either inorganic phosphate or inorganic pyrophosphate as one of the products.

phosphate group The molecule (a) or the radical (b) that, under physiological conditions, is dissociated to give the corresponding anionic forms. *See also* phosphoryl group.



phosphate-group transfer A reaction in which a phosphate group is transferred from one compound to another, as in the reactions involving high- and low-energy phosphate compounds; in actuality, a phosphoryl group, rather than a phosphate group, is transferred. *Aka* phosphoryl-group transfer.

phosphatemia HYPERPHOSPHATEMIA.

phosphate potential The concentration of ATP in a system divided by the product of the concentrations of ADP and inorganic phosphate; the term $[\text{ATP}]/[\text{ADP}][\text{P}_i]$. A measure of the energy state of cells. *See also* energy change.

phosphate regulon The pho regulon.

phosphate transfer potential PHOSPHORYL TRANSFER POTENTIAL.

phosphatidal choline A choline-containing plasmalogen.

phosphatidal ethanolamine An ethanolamine-containing plasmalogen.

phosphatidal group The parent structure of the plasmalogens; consists of a molecule of glycerol in which phosphoric acid is esterified to the first carbon, a fatty acid is esterified to the central carbon, and an α,β -unsaturated ether is linked to the third carbon of the glycerol.

phosphatidal serine A serine-containing plasmalogen.

phosphatidase PHOSPHOLIPASE.

phosphatidate GLYCEROPHOSPHOLIPID.

phosphatide 1. GLYCEROPHOSPHOLIPID. 2. PHOSPHOLIPID.

phosphatidic acid The parent compound of many phosphoglycerides; consists of a molecule of glycerol in which phosphoric acid is esterified to the first carbon and fatty acids are esterified to the remaining two carbons of the glycerol.

phosphatidylcholine A major phosphoglyceride in higher plants and animals; consists of choline that is esterified to the phosphoric acid residue of phosphatidic acid. *Abbr* PC. *Aka* lecithin.

phosphatidylethanolamine A major phosphoglyceride in higher plants and animals; consists of ethanolamine that is esterified to the phosphoric acid residue of phosphatidic acid. *Abbr* PE. *Aka* cephalin.

phosphatidylglycerol A condensation product of phosphatidic acid and glycerol. *Abbr* PG.

phosphatidyl group The group derived from phosphatidic acid by removal of a hydrogen from the phosphate group.

phosphatidylinositol A phosphoglyceride present in biological membranes where it generally turns over rapidly upon external stimulation of the cells; consists of inositol that is esterified to the phosphoric acid residue of phosphatidic acid. *Abbr* PI.

phosphatidylinositol cycle A cyclic set of reactions that characterizes some hormone-receptor systems; involves degradation of phosphatidylinositol and its rapid resynthesis. The cycle may be coupled to calcium mobilization. The rapid resynthesis of phosphatidylinositol is known as the phosphatidylinositol response (PI response). *Abbr* PI cycle.

phosphatidylinositol response *See* phosphatidylinositol cycle.

phosphatidylserine A phosphoglyceride consisting of serine that is esterified to the phosphoric acid residue of phosphatidic acid. *Abbr* PS. *Aka* cephalin.

phosphatidyl sugar GLYCOPHOSPHOGLYCERIDE.

phosphaturia The presence of excessive amounts of phosphate in the urine.

phosphine oxide An organic compound containing the group



phosphite-triester method A nonaqueous, solid-phase method for the synthesis of oligonucleotides; involves anchoring the growing chain at its 3'-end to a solid support, using a dimethoxytrityl group to protect the 5'-end, and then reacting the 5'-end with a 3'-phosphoramidite derivative of the next nucleotide to be polymerized.

3'-phosphoadenosine-5'-phosphosulfate See active sulfate (1).

phosphoarginine A phosphagen that is present in many invertebrates; consists of arginine in which a phosphate group is attached via a P—N bond to the guanido group of the amino acid.

phosphocozymase NICOTINAMIDE ADENINE DINUCLEOTIDE PHOSPHATE.

phosphocreatine A phosphagen occurring in the muscle of many vertebrates; consists of creatine in which a phosphate group is attached via a P—N bond to the guanido group of creatine. *Abbr* PC.

phosphodiester A compound consisting of two alcohols that are esterified to a molecule of phosphoric acid; a phosphoric acid molecule that is esterified twice.

phosphodiesterase An enzyme that catalyzes the hydrolysis of a doubly esterified phosphoric acid molecule, as that occurring in oligo- and polynucleotides; phosphodiesterases may be of either the endo- or the exonuclease type.

phosphodiester bond A linkage between two molecules by means of phosphoric acid to which each of the molecules is esterified once.

3',5'-phosphodiester bond The bond by which nucleotides are linked in both DNA and RNA; formed by esterification of the phosphoric acid residue, which is already esterified to the 5'-position of the sugar of one nucleotide, to the 3'-position of the sugar of an adjacent nucleotide. *Aka* 3',5'-phosphodiester link.

phosphoenolpyruvate carboxylase The enzyme that catalyzes the anaplerotic reaction whereby phosphoenolpyruvic acid is carboxylated to oxaloacetic acid.

phosphoenolpyruvic acid A high-energy compound, the dephosphorylation of which to pyruvic acid leads to the synthesis of ATP from ADP in the second stage of glycolysis. *Abbr* PEP.

phosphofructokinase The enzyme that cataly-

zes the formation of fructose-1,6-bisphosphate from fructose-6-phosphate and ATP. A key regulatory enzyme in glycolysis; an allosteric enzyme whose inhibition by ATP forms the basis of the Pasteur effect. *Abbr* PFK.

phosphogluconate oxidative pathway HEXOSE MONOPHOSPHATE SHUNT.

phosphogluconate pathway HEXOSE MONOPHOSPHATE SHUNT.

phosphoglyceric acid A phosphate ester of glyceric acid, various forms of which are intermediates in glycolysis. *Abbr* PGA. See also 1,3-bisphosphoglycerate; 2,3-bisphosphoglycerate.

phosphoglyceride GLYCEROPHOSPHOLIPID.

phosphoguanidine A high-energy compound, such as phosphocreatine or phosphoarginine, that contains a phosphorylated guanido group.

phosphoinositide INOSITOLPHOSPHOLIPID.

phosphoketolase The key enzyme of the phosphoketolase pathway; it catalyzes the cleavage of xylulose-5-phosphate to glyceraldehyde-3-phosphate and acetylphosphate.

phosphoketolase pathway A pathway of hexose and pentose degradation that occurs in various microorganisms, especially *Lactobacillus*. The pathway forms part of the reactions in heterolactic fermentation and involves phosphoketolase as the key enzyme.

phosphokinase KINASE.

phospholipase An enzyme that catalyzes the hydrolysis of fatty acids or other groups from phosphoglycerides. Phospholipase A₁ catalyzes the hydrolysis of the fatty acid from position 1; phospholipase A₂ catalyzes the hydrolysis of the fatty acid from position 2; phospholipase C catalyzes the cleavage of the bond between the phosphate group and glycerol; and phospholipase D catalyzes the hydrolysis of phosphoglycerides to yield phosphatidic acid. Phospholipases L₁ and L₂ remove the acyl group from the product formed by phospholipase A₁ and A₂, respectively. Phospholipases L₁ and L₂ are also known as lysophospholipases. *Aka* phosphatidase.

phospholipid A lipid that contains one or more phosphate groups (in mono- or diester form), particularly a lipid derived from glycerol, sphingosine, or inositol. Phospholipids are polar lipids that are of great importance for the structure and functioning of biological membranes. *Abbr* PL.

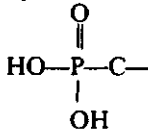
phospholipid effect The stimulation of ³²P incorporation into phospholipids that is brought about by acetylcholine or carbamylcholine; the effect has been observed in both the pancreas and the brain cortex.

phospholipoprotein A conjugated protein that

contains phospholipid and that is soluble in aqueous solutions.

phosphomonoesterase An enzyme that catalyzes the hydrolysis of a once-esterified phosphoric acid (phosphomonoester). The enzyme is called specific if it catalyzes the hydrolysis of a small number of phosphomonoesters, and it is called nonspecific if it catalyzes the hydrolysis of a large number of phosphomonoesters at similar rates.

phosphonolipid A lipid that contains a carbon-to-phosphorus bond; a lipid containing the phosphoryl group attached to a carbon atom



phosphonomycin An antibiotic that is a structural analogue of phosphoenol pyruvate and that inhibits one of the enzymes involved in peptidoglycan synthesis.

phosphopantetheine A derivative of 4'-phosphopantothenic acid that is the prosthetic group of the acyl carrier protein; the phosphate ester of *N*-(pantothenyl)- β -mercaptoethylamine. Intermediates in fatty acid synthesis are linked via a thioester bond to the sulfhydryl group of β -mercaptoethylamine. *Aka* 4'-phosphopantetheine. *See also* acyl carrier protein.

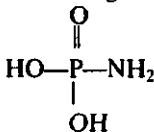
phosphoprotein A conjugated protein in which the nonprotein portion is a residue of phosphoric acid.

phosphoprotein phosphatase A converter enzyme that catalyzes the interconversion of the two allosteric forms of phosphorylase (a and b); it catalyzes the dephosphorylation of phosphorylase a to phosphorylase b. *Abbr* PP-1.

phosphor FLUOR.

phosphoramidate A salt or an ester of phosphoramidic acid.

phosphoramidic acid An amide of phosphoric acid; a compound having the structure



phosphoramidite chemistry A widely used chemical approach for the synthesis of phosphodiester bonds between deoxynucleoside residues; uses phosphite ester derivatives of nucleosides as starting material. A phosphite amide is known as a phosphoramidite. *See also* phosphite-triester method.

phosphorescence The emission of radiation by an excited molecule in which the excited molecule first undergoes an electronic transition to a long-lived excited state and then

slowly returns from that state to the ground state, dissipating the excitation energy by the emission of radiation at the same time. The emitted radiation is of a different wavelength than that of the exciting radiation, and the time interval between excitation and emission is usually several seconds or longer. *See also* fluorescence.

α -5-phosphoribosyl-1-pyrophosphate A compound that is formed by the transfer of a pyrophosphate group of ATP to ribose-5-phosphate and that serves as a key intermediate in the biosynthesis of both purine and pyrimidine nucleotides. *Abbr* PRPP.

phosphorimetry The measurement of phosphorescence.

phosphoroclastic reaction A cleavage reaction by means of inorganic phosphate, as the cleavage of pyruvate by inorganic phosphate to acetyl phosphate, carbon dioxide, and hydrogen.

phosphoroimmunoassay An immunoassay employing antigens labeled with a phosphorescent compound. *Abbr* PhIA.

phosphorolysis The cleavage of a covalent bond of an acid derivative by reaction with phosphoric acid H_3PO_4 , so that one of the products combines with the H of the phosphoric acid and the other product combines with the H_2PO_4 group of the phosphoric acid.

phosphorus An element that is essential to all plants and animals. *Sym*, P; atomic number, 15; atomic weight, 30.9738; oxidation states, -3,+3,+5; most abundant isotope, ^{31}P ; a radioactive isotope, ^{32}P , half-life, 14.3 days, radiation emitted, beta particles.

phosphorylase An enzyme that catalyzes a phosphorolysis reaction; glycogen and starch phosphorylases are key regulatory enzymes in the catabolism of glycogen and starch. Glycogen phosphorylase exists in two allosteric forms, a and b, which are interconverted by the converter enzymes synthase-phosphorylase kinase (SPK) and phosphoprotein phosphatase (PP-1). Glycogen phosphorylase is a dimer; the a form is phosphorylated and is the more active form; the b form is dephosphorylated and is less active.

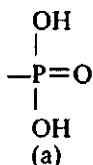
phosphorylase kinase SYNTHASE-PHOSPHORYLASE KINASE.

phosphorylase phosphatase PHOSPHOPROTEIN PHOSPHATASE.

phosphorylation The introduction of a phosphate group into a compound through the formation of an ester bond between the compound and phosphoric acid; more precisely referred to as the introduction of a phosphoryl group.

phosphorylation potential PHOSPHATE POTENTIAL
phosphoryl group The radical (a) which, under

physiological conditions, is dissociated to give the corresponding anionic forms:



phosphoryl-group carrier The ADP-ATP system that serves as an intermediate for phosphoryl-group transfer between high- and low-energy phosphate compounds.

phosphoryl-group transfer A reaction in which a phosphoryl group is transferred from one compound to another, as in the reactions involving high- and low-energy phosphate compounds. *Aka* phosphate-group transfer.

phosphoryl transfer potential The group transfer potential for the phosphoryl group.

phosphosphingolipid *See* spingophospholipid.

phosphotransferase system A bacterial transport system that moves monosaccharides across the cell membrane and phosphorylates them by using phosphoenolpyruvate as the phosphate donor. Since sugar phosphates do not penetrate the cell membrane, the monosaccharides are thus trapped inside the bacterial cell. *Abbr* PTS.

phosvitin A phosphoglycoprotein in hen's egg yolk; a phosphorus-rich glycoprotein that contains about 10% phosphate and that is derived from vitellogenin. *Aka* phosphovitin.

phot A unit of illumination that is equal to 1 lm/cm² of surface.

photo- Combining form meaning light.

photoactivated cross-linking A method for determining the regions in RNA that interact, and make contact, with a given protein. The protein is allowed to bind to the RNA and the complex is then irradiated with ultraviolet light which causes covalent bonds (cross-links) to form between bases in the RNA and amino acids in the protein. An endonuclease is then added to degrade most of the RNA outside the region protected by the cross-linked protein and oligonucleotides linked to the protein are subsequently identified. The method has been used, for example, to study the binding of aminoacyl-tRNA synthetase to its cognate tRNA.

photoaffinity labeling Affinity labeling in which a chemical labeling reagent R—P is used such that R can bind specifically and reversibly to an active site, and P is a chemical group that is unreactive in the dark. Upon photolysis, R—P is converted to a highly reactive intermediate R—P*, which can then form a covalent bond with a group at the active site before R—P* dissociates from the site. In true

photoaffinity labeling, the rate of formation of this covalent bond is much greater than the rate at which R—P* dissociates from the site; the reverse is the case for pseudophotoaffinity labeling. The latter is essentially identical to ordinary affinity labeling, with the exception that the labeling agent R—P* is produced by photolysis.

photoautotroph A phototrophic autotroph.

photobleaching FLUORESCENCE MICROPHOTOLYSIS.

photocell A device, the electrical properties of which, such as voltage or resistance, are altered in response to changes in the intensity of light that impinges upon it.

photochemical Of, or pertaining to, photochemistry.

photochemical action spectrum A plot of photochemical efficiency, such as photosynthetic efficiency, as a function of the wavelength of the incident light.

photochemical effect The initiation of a chemical reaction by the absorption of light.

photochemical reaction A chemical reaction initiated by the absorption of light.

photochemical reaction center *See* reaction center.

photochemical sensitizer PHOTOSENSITIZER.

photochemistry The area of chemistry that deals with the interaction of radiant energy and chemical processes. *See also* first law of photochemistry; second law of photochemistry.

photochrome A molecule, or a group in a molecule, that is sensitive to light and shows the phenomenon of photochromism.

photochromism The reversible change of color by a compound upon excitation by either ultraviolet or infrared radiation.

photocoupler A photoreceptor that, upon stimulation by light, initiates a reaction that is driven by energy derived from the absorbed light energy. *See also* photosensor.

photodisintegration A nuclear reaction in which an atomic nucleus absorbs a high-energy photon and ejects a neutron, a proton, or an alpha particle.

photodynamic action The oxidation of biologically important molecules in the presence of molecular oxygen, a photodynamic substance, and visible light. *See also* photodynamic substance; photosensitization.

photodynamic dye A pigment that can serve as a photodynamic substance.

photodynamic inactivation The inactivation of a molecule, a virus, or a cell by photodynamic action.

photodynamic substance A substance, frequently a pigment, that sensitizes a biologically important molecule toward oxidation and

achieves this by absorbing light energy and transferring this energy by means of various mechanisms to the target molecule. *See also* photosensitization.

photoelectric cell PHOTOCCELL.

photoelectric effect The ejection of an orbital electron from an atom as a result of the impingement on the atom of a photon of sufficient energy; all of the energy of the photon is used to eject the electron and to impart kinetic energy to it.

photoelectron The electron ejected from an atom in a photoelectric effect.

photofootprinting A technique for studying the sites of interaction between protein and DNA; based on the principle that ultraviolet light interacts with DNA only if the DNA has been distorted slightly from its double-helical configuration. If protein contacts with DNA cause the necessary distortion, then the sites of photoreaction correspond to those of protein contact with the DNA. The method can also be used for RNA and for protein-nucleic acid interactions in whole cells. *See also* footprinting.

photographic rotation technique A technique for determining the symmetry of a structure from its photograph; used for the determination of the symmetry of a virus from its electron micrograph. The micrograph is printed n times and the printing paper is rotated by $360^\circ/n$ between successive exposures. A structure that has an n -fold radial symmetry will yield a photograph in which the details have been reinforced, while this is not the case for a structure that has an $(n - 1)$ - or $(n + 1)$ -fold radial symmetry.

photoheterotroph A phototrophic heterotroph.

photoinduction The development of fruiting bodies or spores in fungi that is brought about by exposure to light.

photoinhibition 1. The inhibition of photosynthesis by light. 2. The inhibition of growth and/or sporulation that is brought about in some microorganisms by exposure to light.

photoisomerization An isomerization brought about by the absorption of light.

photolithotroph An organism or a cell that utilizes primarily light as its source of energy, inorganic compounds as electron donors, and carbon dioxide as its source of carbon atoms.

photolyase PHOTOREACTIVATING ENZYME.

photolysis The fragmentation of a molecule into smaller parts by irradiation with light; the dissociation of water in photosynthesis is an example.

photolytic Of, or pertaining to, photolysis.

photometer 1. An instrument for the measurement of light scattered at different angles by means of a photomultiplier tube that can be

rotated around the sample cell. 2. An instrument for the direct measurement of light intensities; two basic types are the filter photometer and the spectrophotometer.

photometry The measurement of light intensity by means of a photometer; applicable to ultraviolet, visible, and infrared radiations.

photomicrograph A photograph taken through a light microscope.

photomicrography The methodology for obtaining photomicrographs.

photomorphogenesis The development of new tissues as a result of photoinduction.

photomultiplier tube An electronic tube that amplifies the beam of electrons released by the incident radiation and that is used in high-quality spectrophotometers.

photon A corpuscular unit of light; a quantum of light energy that is equal to $h\nu$, where h is Planck's constant (6.625×10^{-27} erg-s) and ν is the frequency of the light in cycles per second. A photon has no charge and is believed to have a mass of exactly zero. *See also* elementary particles.

photoneutron A neutron ejected from an atomic nucleus by photodisintegration.

photon fluence The number of photons that cross a unit area; the photon fluence rate refers to the number of photons that cross a unit area per unit time.

photonuclear reaction PHOTODISINTEGRATION.

photoorganotroph An organism or a cell that utilizes primarily light as its source of energy, organic compounds as electron donors, and organic compounds as well as carbon dioxide as its source of carbon atoms.

photooxidation An oxidation reaction that is caused by light. The cleavage of water in association with photosystem II in photosynthesis is an example.

photoperiodism The periodicity in the response of an organism that results from changes in either light intensity or the length of days.

photophobia Lack of tolerance for light; unusual sensitivity to light that is characteristic of conditions that result from vitamin A deficiency.

photophosphorylation The synthesis of ATP that is coupled to the operation of an electron transport system in photosynthesis.

photopic vision Vision in bright light in which the cones of the retina function as light receptors.

photopolymerization A polymerization reaction that is induced by exposure to light.

photoprotection The protection of cells against the damaging effects of ultraviolet irradiation by prior exposure of the cells to light in the wavelength range of 310 to 370 nm; the effect may be due to an inhibition of cellular growth

which allows more time for the repair of damaged DNA *Abbr* PP.

photoprotein One of a group of proteins that are responsible for luminescence in the jellyfish and related coelenterates. Light emission by photoproteins does not involve the luciferin-luciferase system.

photoreaction PHOTOCHEMICAL REACTION.

photoreactivating enzyme The enzyme that catalyzes photoreactivation. It binds to the thymine dimers that were produced in DNA as a result of ultraviolet irradiation. The DNA-enzyme complex then becomes activated by absorption of visible light and the enzyme cleaves the C—C bonds of the cyclobutyl rings of the thymine dimer, thereby converting it back to a normal pair of adjacent thymine residues. *Abbr* PR enzyme.

photoreactivation The recovery of cells from the damage caused by irradiation with ultraviolet light that is brought about by a photoreactivating enzyme when the damaged cells are exposed to visible light. *Abbr* PHR.

photoreactive center *See* reaction center.

photoreceptor A receptor that is stimulated by light; a photoreceptor may be either a photosensor or a photocoupler.

photorecovery PHOTOREACTIVATION.

photoreduction A reduction reaction that is caused by light. The conversion of NADP⁺ to NADPH in association with photosystem I in photosynthesis is an example.

photorespiration The respiration of plant cells that occurs in the presence of light and while the cells are concurrently carrying on photosynthesis. Photorespiration utilizes reducing power generated by photosynthesis for the reduction of molecular oxygen; it does not involve mitochondria and does not yield ATP.

photorestitution PHOTOREACTIVATION.

photoselection The principle, in fluorescence polarization, that molecules having specific orientations of their dipoles will be preferentially excited.

photosensitive Sensitive to light; capable of being stimulated by light.

photosensitization The process whereby a substance, frequently a dye, sensitizes a biologically important molecule toward oxidation and achieves this by absorbing light energy and transferring this energy by means of various mechanisms to the target molecule. The oxidation of the target molecule may then occur either in the presence of molecular oxygen, resulting in a photodynamic action, or in the absence of oxygen, but in the presence of appropriate electron and/or hydrogen acceptors, resulting in a dye-sensitized photo-oxidation.

photosensitizer 1. A substance that, when

added to a biological system, will increase the damage to the system when it is exposed to a subsequent dose of radiation. 2. A substance that brings about photosensitization. 3. PHOTODYNAMIC SUBSTANCE.

photosensor A photoreceptor that, upon stimulation by light, initiates a reaction that is driven by energy derived from sources other than the absorbed light energy. *See also* photocoupler.

photosynthate A product obtained as a result of photosynthesis.

photosynthesis The reaction whereby solar energy is captured by an organism and converted to chemical energy and which, in its most general form, can be written as $H_2D + A \xrightarrow{\text{light}} H_2A + D$, where D is an electron donor and A is an electron acceptor. Photosynthesis is carried out by a large number of organisms, both prokaryotic and eukaryotic, including plants, algae, and bacteria, and involves a variety of electron donors and electron acceptors. In green plants, photosynthesis takes place in chloroplasts and leads to the synthesis of carbohydrates from water and carbon dioxide and to the evolution of oxygen; it occurs in the presence of light and several chlorophyll pigments that are assembled in two photosystems (I and II) which are connected with electron transport systems.

photosynthesis cycle CALVIN CYCLE.

photosynthetic 1. Of, or pertaining to, photosynthesis. 2. PHOTOTROPHIC.

photosynthetic carboxylation The enzymatic fixation of carbon dioxide in photosynthesis.

photosynthetic cycle CALVIN CYCLE.

photosynthetic electron transport The flow of electrons through a chain of electron carriers that is induced by the light reaction of photosynthesis.

photosynthetic organism *See* photolithotroph; photoorganotroph.

photosynthetic phosphorylation PHOTOPHOSPHORYLATION.

photosynthetic pigment *See* primary pigment; accessory pigment.

photosynthetic quotient A measure of the photosynthetic activity of a system that is equal to the number of moles of oxygen evolved divided by the number of moles of carbon dioxide taken up.

photosynthetic unit The number of chlorophyll molecules that are required for the fixation of one molecule of carbon dioxide in photosynthesis.

photosystem A photosynthetic pigment or group of pigments that absorb light energy and that participate in the light reaction of photosynthesis. The photosynthetic reactions of chloroplasts are carried out by two such

systems, designated I and II; each photosystem consists of a reaction center and associated antenna molecules and immediate electron carriers.

photosystem I The photosystem of chloroplasts that is based on the P_{700} pigment, requires light of longer wavelength, and is associated with the reduction of $NADP^+$ and with photophosphorylation.

photosystem II The photosystem of chloroplasts that is based on the P_{680} pigment, requires light of shorter wavelength, and is associated with the photolysis of water and the evolution of oxygen.

phototaxis A taxis in which the stimulus is light.

phototroph A cell or an organism that uses light as a source of energy.

phototropism A tropism in which light is the stimulus.

photovoltaic cell An electrical cell that operates on the principle that when light strikes certain metals or semiconductors, the flow of electrons produced is proportional to the intensity of the light; used in photometers and in some spectrophotometers.

pH paper Paper that is impregnated with indicator dyes and that is used for the approximate measurement of the pH values of solutions.

PHR Photoreactivation.

pH scale The range of pH values from 0 to 14 in which the value of 7 is that for pure water and the values of 0 and 14 represent approximately the hydrogen ion concentrations of 1.0 and 1.0×10^{-14} mol/L, respectively. *See also* pH.

pH-stat An instrument for maintaining a constant pH during the course of a chemical reaction. The acidic or basic groups released as the reaction proceeds signal the addition of titrant (base or acid) to the reaction mixture. The amount of titrant added as a function of time provides an assay of the kinetics of the reaction.

pH unit A change of 1.0 between two pH values on the pH scale.

phycobilin A linear tetrapyrrole derivative that occurs in conjugation with proteins and that functions in the form of a phycobiliprotein as an accessory pigment of photosynthesis in algal chloroplasts.

phycobiliprotein A conjugated protein that functions as an accessory pigment of photosynthesis in algal chloroplasts. Phycobiliproteins occur in phycobilisomes and include the phycocyanins, phycoerythrins, and allophycocyanins. *Aka* biliprotein.

phycobilisome A granule in red and blue-green algae that serves to harvest light energy and to

transfer it to chlorophyll. Phycobilisomes are attached to the surface of the thylakoid membranes and contain the phycobiliprotein pigments; phycocyanin, allophycocyanin, and phycoerythrin.

phycocyanin A blue accessory pigment of algal chloroplasts that consists of a protein conjugated to a phycobilin.

phycoerythrin A red accessory pigment of algal chloroplasts that consists of a protein conjugated to a phycobilin.

phycology The study of algae.

phyloquinone Vitamin K_1 .

phylogenesis PHYLOGENY.

phylogenetic Of, or pertaining to, phylogeny.

phylogenetic tree A diagrammatic representation of the development of species which indicates their interrelations and the times of their evolutionary divergence. Phylogenetic trees have been constructed on the basis of amino acid sequences in selected proteins, such as cytochrome c. *Aka* cladogram.

phylogeny The evolutionary development of a group of organisms, such as a species. *Aka* phylogenesis.

physical adsorption Adsorption that is brought about by physical forces, such as van der Waals forces.

physical biochemistry A branch of biochemistry that deals with the transformations of physical and chemical energies in biological systems, particularly as they relate to macromolecules.

physical half-life *See* half-life (1).

physical map A genetic map in which the distances between the genes have been determined by methods other than genetic recombination.

physicochemical Physical-chemical.

physics The science that deals with matter and energy, their interactions, and their changes.

physiological Of, or pertaining to, physiology.

physiological chemistry Biochemistry, particularly that of higher animal organisms.

physiological conditions The normal conditions pertaining to an organism such as, in the case of humans, a temperature of 37°C and a pH of about 7.0.

physiological saline A 0.9% (w/v) solution of sodium chloride that is approximately isotonic to the blood and lymph of mammals and that is used for the temporary maintenance of living cells and tissues.

physiology The science that deals with the processes and the activities of living organisms or parts of organisms.

physisorption Sorption that is weaker than chemisorption and that is mainly the result of van der Waals interactions.

phytanic acid An oxidation product of phytol.

See also Refsum's disease.

phytanic acid storage syndrome REFSUM'S DISEASE.

phytic acid The hexaphosphate of myoinositol, an important phosphate storage compound in plants.

phytin The mixed calcium-magnesium salt of phytic acid.

phyto- Combining form meaning plant.

phytoagglutinin A lectin that is derived from plants and that agglutinates cells.

phytoalexins A group of stress metabolites produced by higher plants in response to fungal infection, physical damage, or exposure to certain chemicals.

phytochemistry The science that deals with the chemistry of plant materials.

phytochrome A chromophore-protein complex that occurs in plants and that is associated with photoperiodism; it functions as a switch, enabling a plant to sense its environment. Phytochrome is involved in the control of many types of plant growth including flowering, branching, leaf formation, and seed germination. The chromophore is an open chain tetrapyrrole, linked covalently to the protein. Phytochrome is believed to be a light-activated transcription factor.

phytoestrogen A compound, such as a specific flavonoid, that is derived from plants and that has estrogenic activity even though it is not a steroid.

phytohemagglutinin 1. A lectin that is derived from plants and that agglutinates red blood cells. 2. LECTIN.

phytohormone PLANT HORMONE.

phytokinin CYTOKININ.

phytol A long-chain alcohol that occurs in chlorophyll.

phytology Botany.

phytolysosome A lysosome of plant origin.

phytopathology The science that deals with the origin, the nature, and the course of plant diseases.

phytosterol A sterol that occurs in plants.

phytotoxin PLANT TOXIN.

phytylmenaquinone Vitamin K₁. Aka phyloquinone; phytonadione; phytylmenadione.

P_i Inorganic phosphate.

pi 1. A mathematical constant that is equal to 3.1416... and that expresses the ratio of the circumference of a circle to its diameter. 2. Osmotic pressure. *Sym* π .

pl Isoelectric point.

PI Phosphatidylinositol.

PIA Particle immunoassay.

pi bond A chemical bond formed by electrons that are in pi orbitals; a bond formed by the parallel overlap of p orbitals so that the electron density is concentrated above and below

the axis joining the two atomic nuclei.

picket fence porphyrin A synthetic porphyrin that contains bulky nonpolar peripheral substituents. The latter restrict access to the iron atom and provide a hydrophobic pocket that shields the bound oxygen molecule.

pico- Combining form meaning 10^{-12} and used with metric units of measurement. *Sym* p.

picornavirus A small, naked, icosahedral animal virus that contains single-stranded RNA; the poliovirus belongs to this group.

4-pi counter A geometrical arrangement for the standardization of beta radiation sources; produced by placing two windowless Geiger-Mueller detectors face to face and suspending the radiation source between them.

PI cycle Phosphatidylinositol cycle.

pi electron delocalization RESONANCE.

piericidin A An antibiotic, produced by *Streptomyces mobaraensis*, that resembles coenzyme Q in its structure and inhibits the electron transport system between NADH dehydrogenase and cytochrome b.

piezoelectric effect The generation of an electric current by application of pressure on certain crystals, such as quartz. The effect is reversible, that is, certain crystals can be made to oscillate by application of an electric field.

PIF See prolactin regulatory hormone.

pigeon crop sac assay A bioassay for prolactin; based on changes in the crop sac (proliferation and peeling of the epithelium) of pigeons in response to injected prolactin.

pigment 1. A naturally occurring coloring matter in an animal, a plant, or a microorganism; a biochrome. 2. A synthetic coloring matter; a dye.

PIH See prolactin regulatory hormone.

pi helix A variant of the alpha-helical structure of proteins that is occasionally seen in short stretches of the polypeptide chain. In this structure, the separation between successive hydrogen bonds is lengthened by one amino acid residue. *Sym* π helix.

pilus (pl pili) A small filamentous projection attached to the surface of a bacterium.

pinelectomy The surgical removal of the pineal gland.

pineal gland A small endocrine gland in the brain; it produces the hormone melatonin.

ping-pong chromatography A form of affinity chromatography that is useful for the purification of enzymes capable of forming covalent intermediates; involves attaching the substrate of the enzyme to the column, allowing the enzyme to become covalently linked to the substrate, and then eluting the enzyme by breaking the bond between it and the substrate.

ping-pong mechanism The mechanism of an

enzymatic reaction in which two or more substrates and two or more products participate, and the enzyme shuttles back and forth between its original and a modified form. According to this mechanism, after the binding of the first substrate by the enzyme, a product is released and the enzyme is converted to a modified form. The second substrate then binds to the modified form of the enzyme, and this is followed by the release of a second product and the regeneration of the original form of the enzyme.

pinocytosis The taking up of droplets of liquid. The uptake of small particles, solutes, and liquid droplets by a cell.

pinosome An endosome that contains nonparticulate soluble material destined for hydrolytic digestion.

pi orbital A molecular orbital that is a delocalized bond orbital, spread over two or more atoms, or over an entire molecule.

piperidine alkaloids See alkaloids.

PIPES Piperazine-*N,N'*-bis(2-ethanesulfonic acid); used for the preparation of biological buffers in the pH range of 6.1 to 7.5. See also biological buffers.

pipet A graduated open tube, usually made of glass, and used for measuring and transferring small and definite volumes of liquids. *Var sp* pipette.

pi-pi-star transition The excitation of an electron from a pi orbital to a pi-star orbital; such transitions are responsible for the most intense absorption bands of molecular spectra.

Pirani gauge A thermal conductivity vacuum gauge.

PI response See phosphatidylinositol cycle.

piscine Of, or pertaining to, fish.

pi-star orbital See antibonding orbital.

PITC Phenylisothiocyanate; See Edman degradation.

pitch The distance between two identical points along the axis of a helix; equal to the number of residues per turn of the helix, multiplied by the distance per residue along the axis of the helix.

pitocin OXYTOCIN.

Pitressin Trade name for vasopressin.

pituitary basophilism A tumor of the pituitary gland that is sometimes associated with Cushing's disease.

pituitary dwarfism Dwarfism that is caused by a deficiency in the secretion of growth hormone by the pituitary gland.

pituitary gland An endocrine gland, located below the brain, that regulates a large portion of the endocrine activity of vertebrates. The gland consists of an anterior lobe called adenohypophysis and a posterior lobe called

neurohypophysis. See also adenohypophysis; neurohypophysis.

pituitary lactogen PROLACTIN.

Pituitrin Trade name for hypophysin.

pK The negative logarithm, to the base 10, of an equilibrium constant based on activities. 2. The same as pK' .

pK' The negative logarithm, to the base 10, of an apparent equilibrium constant based on molar concentrations.

PK 1. Protein kinase. 2. Prekallikrein.

pK_a The negative logarithm, to the base 10, of an acid dissociation constant.

pkat Picokatal.

pK_b The negative logarithm, to the base 10, of a base dissociation constant.

P-K chain Porod-Kratky chain.

pK_{int} The negative logarithm, to the base 10, of an intrinsic dissociation constant.

P-K reaction Prausnitz-Kuestner reaction.

PKU Phenylketonuria.

pK_w The negative logarithm, to the base 10, of the ion product of water.

PL 1. Phospholipid. 2. Pyridoxal. 3. Placental lactogen.

placebo 1. An inactive substance that is identical in appearance to a biologically active one and that is given to a number of individuals out of a group while the remainder of the individuals receive the biologically active substance. The individuals receiving the placebo thus serve as controls which permit an evaluation of the effectiveness of the biologically active substance given to the other individuals. 2. An inert medication given to an individual for its suggestive and psychological effect.

placenta The structure by which the fetus is attached to the uterus and through which it exchanges materials with the maternal circulation, receiving nutrients and excreting waste products.

placental barrier A semipermeable membrane that restricts the type and quantity of material exchange between the fetus and the mother and that represents a partial block to the passage of antibodies from the mother to the fetus.

placental lactogen A single-chain polypeptide hormone that is synthesized by the placenta in increasing amounts during pregnancy and that has an amino acid sequence that is almost identical to that of growth hormone. It has lactogenic activity and some growth-promoting activity like growth hormone; it also stimulates the production of progesterone by the corpus luteum in rodents. *Abbr* PL. *Aka* chorionic somatomammotropin (CS); choriomammotropin.

plain dispersion SIMPLE DISPERSION.

planchet A thin disk, commonly of metal, used for the deposition and counting of radioactively labeled material.

planchet counter A radiation counter for radioactive samples deposited in planchets.

Planck's constant A universal constant that relates the energy of a photon to its frequency; equal to 6.625×10^{-27} erg-s or 1.58×10^{-34} cal-s. *Sym h*.

Planck's law The law that the energy of a photon is equal to the frequency of the radiation multiplied by Planck's constant.

plane of symmetry An imaginary plane that divides a symmetrical body into two mirror image halves.

plane-polarized light Light in which the electric field vectors oscillate in a plane that passes through the axis along which the light is being propagated.

planetesimals Small bodies of matter, believed to have been formed from primordial dust and gas, and to have consolidated subsequently to form the terrestrial planets and the asteroids.

planimeter A device for measuring the area under a curve; a graphical integrator that is used in chromatography and electrophoresis for estimating the relative amounts of separated components.

plant agglutinin A lectin extracted from plants. *See also* lectin.

plant bile pigments A group of open tetrapyrrole pigments, such as phycocyanins and phycoerythrins, that occur in plants; so called because of their chemical relation to the pigments of animal bile.

plant hormone *See* hormone.

plant lectin *See* lectin.

plant pigment A pigment of plant origin. *See also* carotenoid; chlorophyll; flavonoid.

plant sex hormone GAMONE.

plant sulfolipid A sulfonic acid derivative of a glycosyldiacylglycerol that occurs in plants.

plant toxin A toxin of plant origin such as the viscotoxins and the toxalbumins.

plant-type ferredoxin IRON-SULFUR PROTEIN (b).

plant virus A virus that infects plants and multiplies in them. *See also* virus.

plaque 1. A clear region in a culture plate that represents an area of cell lysis, devoid of intact cells. *See also* plaque assay; plaque technique. 2. An atheromatous deposit.

plaque assay An assay for counting the number of infections bacterial or animals viruses. The host cells are mixed with the virus in a gel, and the virus particles diffuse through the gel and infect and lyse the host cells. The viral progeny thus produced in turn infect and lyse adjacent host cells, resulting in the formation

of a plaque or clear region that is devoid of intact cells at each site of infection by a viral particle.

plaque-forming cell *See* plaque assay; plaque technique.

plaque-reduction method An assay for interferon that is based on determining the dilution of interferon that will inhibit plaque formation in a plaque assay, using a tissue culture challenged with a virus.

plaque technique A technique, devised by Jerne, for counting antibody-producing lymphocytes. Lymphocytes from animals that have been immunized with red blood cells are mixed with some of the same red blood cells in a gel. The red blood cells become bound to the lymphocytes by means of the antibodies synthesized by the lymphocytes; the addition of complement then causes the complex to lyse and leads to the formation of a plaque around each antibody-producing cell.

plaque titer The number of virus particles, per unit volume of viral suspension, that are capable of forming a plaque under a given set of conditions.

plaque-type mutant A phage mutant that gives rise to a plaque of changed morphology.

plasma 1. The fluid obtained from blood by removal of the formed elements by means of centrifugation; serum plus fibrinogen. 2. A gas form present at very high temperatures (above 10^5 °C). At such high temperatures, atoms are stripped of their electrons and the plasma that results is a neutral gas mixture of nuclei and electrons.

plasmablast A proliferative cell that has developed from a small B lymphocyte but has not yet become a mature, immunoglobulin-secreting, plasma cell.

plasma cell A lymphocyte that is capable of synthesizing antibodies; a differentiated cell derived from a B lymphocyte.

plasma clearance CLEARANCE.

plasmacyte PLASMA CELL.

plasma-derived growth factor PLATELET-DERIVED GROWTH FACTOR.

plasma factors *See* extrinsic pathway; intrinsic pathway.

plasma gel ECTOPLASM.

plasmagene The smallest heritable unit in the plasmon; a self-replicating cytoplasmic gene such as the fertility factor.

plasmakinin *See* kinin.

plasmalemma CELL MEMBRANE.

plasmalemmasome MESOSOME.

plasmalemmosome MESOSOME.

plasma lipoproteins *See* lipoproteins.

plasmalogen A generic descriptor for glycerophospholipids in which the glycerol moiety

bears a 1-alkenyl ether group. A phosphoglyceride that contains a phosphatidal group, such as phosphatidal choline, phosphatidal serine, or phosphatidal ethanolamine; plasmalogens are abundant in the membranes of muscle and nerve cells. *See also* phosphatidal group.

plasma membrane CELL MEMBRANE.

plasmapheresis A technique for decreasing the concentration of the plasma proteins of an animal; achieved by bleeding the animal repeatedly, collecting the blood cells, and reinjecting the blood cells, suspended in saline, into the animal.

plasma proteins A large group of proteins such as albumin, fibrinogen, prothrombin, and immunoglobulins, that are present in blood plasma. It is estimated that there are more than 100 plasma proteins, most of which are glycoproteins. Plasma proteins have a variety of functions such as the regulation of blood pH and osmotic pressure; the transport of ions, hormones, lipids, vitamins, and other metabolites; and the control of blood coagulation and immune reactions.

plasma sol ENDOPLASM.

plasma-specific enzyme An enzyme that is present in blood plasma and that has a specific function in plasma; an enzyme that functions in the reactions of blood clotting is an example.

plasma thromboplastic factor ANTIHEMOPHILIC FACTOR.

plasma thromboplastic factor B CHRISTMAS FACTOR.

plasma thromboplastin antecedent The factor that is activated by the Hageman factor in the intrinsic pathway of blood clotting. *Abbr* PTA.

plasma thromboplastin component CHRISTMAS FACTOR.

plasma transferrin *See* transferrin.

plasma transglutaminase Factor XIII. Actually, plasma protransglutaminase.

plasmic acid Any derivative of *sn*-glycero-3-phosphate in which carbon 1 bears an *O*-(1-alkenyl) residue, and carbon 2 is esterified with a fatty acid.

plasmid An extrachromosomal genetic element in bacteria. A plasmid is a circular, double-stranded DNA molecule that usually confers some evolutionary advantage to the host organism such as resistance to antibiotics, production of colicins, and so on. Plasmids replicate independently of the bacterial chromosome and constitute a useful tool in recombinant DNA technology. *See also* episome.

plasmid amplification An increase in the number of plasmids per cell that occurs with high-

copy number plasmids when protein synthesis in the host cell is inhibited. The lack of proteins, involved in the initiation of DNA synthesis, inhibits initiation of replication for the host chromosomal DNA but not for the plasmid DNA.

plasmid cloning vector A plasmid that serves as a vector in recombinant DNA technology. *See* vector (3); recombinant DNA technology.

plasmid conduction *See* conduction (2).

plasmid copy number *See* copy number.

plasmid curing *See* curing.

plasmid donation *See* donation.

plasmid engineering RECOMBINANT DNA TECHNOLOGY.

plasmid fusion The linking together of two plasmids, one of which carries a transposon; a type of replicon fusion which involves formation of a cointegrate structure.

plasmid incompatibility *See* incompatible plasmids.

plasmid transfer *See* effective contact; mobilization; repliconation.

plasmin The proteolytic enzyme that catalyzes the hydrolysis of fibrin and thereby leads to the dissolution of intravascular blood clots.

plasminogen The inactive precursor of plasmin; it is converted to active plasmin by a number of serine proteases such as urokinase.

plasminogen activator One of a group of proteolytic enzymes that convert inactive plasminogen to active plasmin.

plasmodesmata (*sing* plasmodesma) Fine cytoplasmic channels that pierce cell walls and connect one cell to neighboring cells in higher plants. Each channel is lined with a plasma membrane, which is common to the two connected cells, and usually contains a fine tubular structure, called a desmotubule.

plasmodium A genus of parasitic protozoans which includes the organism that causes malaria in humans.

plasmogeny The artificial production of microscopic structures, the properties of which bear some resemblance to those of living cells.

plasmolysis The shrinking of cellular protoplasm that occurs when a cell is placed in a hypertonic solution so that water moves out of the cell.

plasmon A collective term for the total extrachromosomal hereditary complement of a cell.

plasmoptysis The swelling and rupturing of a cell and the escape of its protoplasm that occurs when a cell is placed in a hypotonic solution so that water moves into the cell.

plasmosome NUCLEOLUS.

plastic chlorophyll A chlorophyll molecule that undergoes somewhat different photochemical reactions from the normal ones because it dif-

fers from ordinary chlorophyll in its conformation, its packing within the chloroplast, or its environment.

plastid A DNA-containing cytoplasmic, self-replicating subcellular organelle of higher plants, some of which function in photosynthesis (chloroplasts) while others serve as storage vessels. Plastids that contain pigments are known as chromoplasts. These are responsible for plant and flower coloration. Plastids that are devoid of pigments are known as leucoplasts. These serve as storage sites for starch.

plastocyanin A copper-containing protein that serves as an electron carrier in chloroplast photosynthesis. *Abbr* PC. *Aka* blue protein.

plastogene The plasmagene of a plastid.

plastome The genetic complement of a plastid.

plastoquinone A compound that is closely related to coenzyme Q and that functions as a hydrogen donor and acceptor in the photosynthetic electron transport system. *Abbr* PQ.

plate 1. PETRI PLATE. 2. The tail plate of a T-even phage.

plateau 1. A region in a solution in which the concentration remains uniform but changes with time. This region is below the boundary in sedimentation, above the boundary in flotation, and between boundaries in moving boundary electrophoresis. A plateau is formed in these cases if the initial concentration was uniform throughout the solution. 2. That portion of the characteristic curve of a radiation detector in which the count rate is almost independent of the applied voltage.

plateaued rat A rat that has a slow rate of growth and that is used in the assay of growth hormone.

plateau phenomenon The progressive flattening of the pH gradient in the region of neutrality that occurs in isoelectric focusing during prolonged runs.

plate count A viable count of bacteria that is based on the number of colonies that develop on a solid nutrient medium when appropriately diluted aliquots of the original culture are plated out.

platelet A small, irregularly shaped disk that is present in the blood and that functions in blood clotting by releasing thromboplastin.

platelet-activating factor A phospholipid that, in vitro, causes platelets to change shape, aggregate, and release their contents. In vivo, it is present during anaphylactic shock and appears to mediate inflammation and allergic responses. The factor is released from IgE-sensitized leukocytes in the presence of antigen. *Abbr* PAF.

platelet cofactor I ANTIHEMOPHILIC FACTOR.

platelet cofactor II CHRISTMAS FACTOR.

platelet-derived growth factor A low molecular

weight protein mitogen (MW 13,000), isolated from human platelets, that causes proliferation of mouse fibroblasts and a variety of other cells. *Abbr* PDGF.

plate theory The application of the theoretical plate concept, derived from countercurrent distribution, to chromatography and particularly to gas chromatography. *See also* theoretical plate.

plating The cultivation of microorganisms on a solid nutrient medium in a petri dish.

plating efficiency *See* absolute plating efficiency; relative plating efficiency.

platinosome An artificially induced, electron-dense, lysosomal body that contains platinum and that is formed in cultured animal cells after exposure to platinum complexes.

platsome NUCLEOSOME.

playback experiment An experiment in which a DNA strand, that has been used to form a DNA-RNA hybrid, is recovered and subjected to a reassociation kinetics experiment to show that it consists of nonrepetitive DNA. *See also* RNA-driven hybridization.

pleated sheet A configuration of protein molecules in which the polypeptide chains are partially extended. The chains are held together by means of interchain hydrogen bonds between the CO and NH groups of all the peptide bonds. The pleated sheet structure occurs predominantly in fibrous proteins; the pleated sheet is referred to as being parallel or antiparallel, depending on whether the polypeptide chains are parallel or antiparallel. *Aka* beta sheet.

plectonemic coiling The coiling of two threads in the same direction so that they cannot be separated except by uncoiling the threads; applies to the two strands in double-helical DNA. *See also* paranemic coiling.

pleiotropic mutation A single mutation that gives rise to multiple phenotypic effects.

pleiotropism The production of multiple, and apparently unrelated, phenotypic effects by a single gene. *Aka* pleiotropy.

pleiotypic response The coordinate control of the growth-related processes involved in the initiation of cell division and cell proliferation. These include membrane transport, RNA synthesis, DNA synthesis, protein synthesis, and protein degradation.

pleomorphism The occurrence of two or more forms, such as the different forms of an organism during its life cycle. *See also* doctrine of pleomorphism.

pleromer A component that can replace another component in a polymer with respect to the overall "balance" of components in that polymer. Thus, in a DNA molecule in which the mole percent of guanine equals that

of cytosine plus 5-methylcytosine, the components cytosine and 5-methylcytosine are considered to be pleromers.

plexiglass Polymethylmethacrylate; a plastic.

PLI Pulsed-laser interferometry.

PLK Polylysine-kieselguhr.

-ploid Combining form indicating the multiple of the chromosome set in the nucleus, as in diploid and polyploid.

ploidy The degree of chromosome multiplicity; the chromosome state in which each chromosome is represented once, twice, etc. *See also* aneuploid state; euploid state; heteroploid state; polyploid state.

PLP Pyridoxal phosphate.

plus end *See* actin filament.

plus-minus method SANGER-COULSON METHOD.

plus strand That strand of viral nucleic acid that has the same (for RNA viruses) or essentially the same (for DNA viruses) base sequence as the corresponding viral mRNA. A minus strand is the corresponding complementary and antiparallel strand. (a) *RNA viruses*. In single-stranded RNA viruses containing a plus strand (classes IV and VI), the viral mRNA ultimately produced has the same base sequence as the original viral RNA; in single-stranded RNA viruses containing a minus strand (class V), the base sequence of the mRNA is complementary to the base sequence of the original viral RNA. In double-stranded RNA viruses (class III), the positive strand of the viral RNA has the same base sequence as that of the viral mRNA. (b) *DNA viruses*. In single-stranded DNA viruses containing a plus strand (class II), the base sequence of the viral DNA is the same as that of the viral mRNA (except that thymine in DNA is changed to uracil in RNA). In double-stranded DNA viruses (class I), the plus strand has the same base sequence as that of the viral mRNA (except that thymine in DNA is changed to uracil in RNA). *See also* virus; positive strand virus.

PM 1. Pyridoxamine. 2. Puromycin.

PMF Proton motive force.

PMP Pyridoxamine phosphate.

PM particle A ribosomal subparticle isolated from bacterial cells in which protein synthesis was inhibited by puromycin.

PMR Proton magnetic resonance.

PMS 1. Phenazine methosulfate; a reducible dye that can serve as an electron acceptor. 2. Pregnant mare's serum; *See* pregnant mare's serum gonadotropin.

PMSF Phenylmethylsulfonyl fluoride; an inhibitor of serine proteases.

PMSG Pregnant mare's serum gonadotropin.

PN 1. Pyridoxine. 2. Protease nexin.

PNA Pentose nucleic acid.

pneometer SPIROMETER.

Pneumococcus The organism, *Streptococcus pneumoniae*, which is the causal agent of pneumonia. A large number of strains are known; some are virulent, some are not. *See also* rough strain; smooth strain.

PNP 1. *p*-Nitrophenol. 2. Pyridoxine phosphate.

PNPP *p*-Nitrophenylphosphate.

PNS Peripheral nervous system.

P_{O₂} 1. Oxygen tension. 2. Partial pressure of oxygen.

pocket ionization chamber A small dosimeter designed to be worn by an individual and used for monitoring the amount of radiation to which the individual has been exposed. *Aka* pocket dosimeter.

pock method A method for counting the number of infectious viral particles by counting the lesions produced in the chorioallantoic membrane of chick embryos following the infection of the membrane with the viral particles.

pOH The negative logarithm, to the base 10, of the hydroxyl ion concentration in moles per liter; $-\log[\text{OH}^-]$.

-poiesis Combining form meaning formation or production.

poikilocyte A red blood cell of irregular shape.

poikilothermic Descriptive of an organism whose temperature varies with the temperature of its environment. *Aka* cold-blooded.

pointed end *See* actin filament.

point group The combination of point symmetry operations that can be carried out for a given object; a symmetry class to which objects may belong by virtue of possessing elements of symmetry that pass through, or are arranged about, a single point which serves as the center of symmetry.

point mutation A mutation in which there is a change in only one nucleotide of a nucleic acid. *See also* transition (1); transversion.

point quenching The quenching that occurs in liquid scintillation counting when beta particles are absorbed by insoluble sample particulate matter.

point symmetry Any type of symmetry operation, such as rotation, rotoreflection, and inversion, about a point.

poise 1. *n* A unit of dynamic viscosity; one-hundredth of this unit is called the centipoise; the dimensions of poise are $\text{g cm}^{-1}\text{s}^{-1}$. 2. *v* To buffer an electrode potential. *See also* poisoning.

Poiseuille's law An equation for the volume rate of flow dV/dt of a liquid through a capillary; specifically, $dV/dt = \pi a^4 P / 8 \eta l$, where π is a constant equal to 3.1416..., a is the radius of the capillary, P is the pressure, η is the viscosity of the liquid, and l is the length of the capillary.

poising The resistance to change in electrode potential that is shown by an oxidation-reduction couple at and near the midpoint potential of the couple. At the midpoint potential the concentrations of the oxidant and the reductant are equal, and an oxidation-reduction couple acts as a potential buffer at and near this point, much as a weak acid and its conjugate base act as a pH buffer at and near the pK value where their two concentrations are equal.

poison A substance that alters the normal metabolism of an organism, is injurious to health, and may be lethal when a small amount of it is either taken into, or comes in contact with, the organism.

poisoning The inhibition of a catalyst by the product of the reaction. In enzymology this phenomenon is usually called feedback inhibition or end-product inhibition.

Poisson distribution A discontinuous probability distribution in which the variance equals the mean. If the total number of objects observed under certain conditions varies according to a Poisson distribution with a mean m , then the probability P_x of obtaining x objects is given by $P_x = e^{-m} m^x / x!$, where x is a whole number between zero and infinity, and e is the base of natural logarithms. The Poisson distribution is a limiting form of the binomial distribution for the case in which the probability of success for an individual trial is very small, the number of trials is very large, but the product of these two quantities is finite. The distribution applies to systems in which the number of events per unit of observation is being determined; the number of radioactive disintegrations in a fixed period of time or the number of bacterial colonies formed from a fixed volume of solution are two examples. *Aka* Poisson's law.

pokeweed mitogen A lectin, isolated from pokeweed (*Phytolacca americana*) that stimulates lymphocyte proliferation.

poky mutant A slow-growing mutant of the mold *Neurospora crassa*; the reduced growth rate is associated with a deficiency, or an absence, of certain components of the respiratory chain.

pol DNA polymerase. DNA polymerases I, II, and III of prokaryotes are designated as pol I, pol II, and pol III, respectively. DNA polymerases α , β and γ of eukaryotes are designated as pol α , pol β , and pol γ , respectively. *See* DNA polymerase.

polar Possessing polarity; having a permanent dipole moment.

polar amino acid An amino acid that has a polar side chain.

polar bond A covalent bond in which the elec-

tron pair or pairs of the bond are held with unequal strength by the two bonded atoms.

polarimeter An instrument for measuring optical rotation. The instrument contains two nicol prisms (polarizer and analyzer) and is generally operated using light from a sodium lamp; the light passes in succession through the polarizer, the solution of the compound being studied, and the analyzer. *Aka* polariscope.

polarity 1. The property of having two poles, specifically in reference to a molecule in which the center of the positive charges does not coincide with the center of the negative charges; the degree to which a molecule is polar and possesses a permanent dipole moment. 2. The phenomenon in which a mutant gene leads to a decrease in the synthesis of proteins that are specified by genes that belong to the same operon as the mutant gene but are farther removed (more downstream) from the operator. 3. The sense in which a polynucleotide, or some other biopolymer, is transversed, synthesized, or functioning. Thus, the two strands in double-helical DNA are said to be antiparallel or to have opposite polarity; one strand runs $3' \rightarrow 5'$, the other runs $5' \rightarrow 3'$. 4. The existence of two mating types in a unicellular organism due to either the presence or the absence of a fertility factor.

polarity gradient The variation with distance along the operon of the effect of a polarity mutation in one gene on the expression of the remaining genes in the operon.

polarity mutation POLAR MUTATION.

polarity ratio The ratio of polar to nonpolar amino acid residues in a protein.

polarizability A measure of the tendency of a substance to have dipoles induced in it when placed in an electric field; equal to the magnitude of the induced dipole moment per unit strength of the applied electric field.

polarization 1. The state of charge separation, as that across a biological membrane, that results from the orientation and the distribution of ions and molecules and leads to establishment of a membrane potential. 2. The state of light, as that produced by passing light through certain substances, in which the electric and magnetic field vectors of the light oscillate only in specific directions.

polarization curve POLAROGRAPHIC WAVE.

polarization fluorescence *See* fluorescence polarization.

polarization microscope A microscope used for studying the anisotropic properties of objects and for visualizing objects by virtue of their anisotropic properties. *Aka* polarizing microscope.

polarized electrode An electrode, the potential of which varies with the current passing through it.

polarized light Light in which the electric and magnetic field vectors oscillate only in specific directions.

polarizer The nicol prism in a polarimeter that is used for producing plane-polarized light. *See also* analyzer.

polar lipid An amphipathic lipid.

polar mutation A mutation in a gene that reduces the rate of synthesis of proteins that are coded by genes that belong to the same operon as the mutant gene but are farther removed (more downstream) from the operator.

polar-nonpolar AMPHIPATHIC.

polarogram The record of a polarographic wave, either in the form of a direct visual display or in the form of a plot.

polarograph An instrument for conducting polarographic measurements.

polarographic wave The variation of electrode current as a function of potential that is produced in polarography.

polarography A method for electroanalytical studies of chemical substances, including the reduction of anions and cations, and for qualitative and quantitative microanalysis; based on measurements of the current produced at a microelectrode, such as at a dropping mercury electrode, as a function of the changing potential applied to an electric cell.

polaron A section of a chromosome within which gene conversion results in polarized genetic recombination.

polar requirement The slope of the line that is obtained by plotting the logarithm of the R_m value of an amino acid in a series of pyridine solvents as a function of the logarithm of the mole percent of water in the solvent. Amino acids having similar polar requirements are considered to be closely related. *See also* R_m value.

polar solvent A solvent that contains charged groups and/or dipoles.

Polenske number A measure of the volatile fatty acids in a fat that is equal to the number of milliliters of 0.1 N alkali which are required to neutralize the volatile, water-insoluble fatty acids in 5 g of fat. *Aka* Polenske value.

poliomyelitis The disease caused by the poliovirus; infantile paralysis. An acute infectious disease. Most cases involve respiratory and gastrointestinal infections but in some the disease develops with varying degrees of paralysis.

poliovirus A virus that causes poliomyelitis and that belongs to the enterovirus subgroup of picornaviruses.

poly- 1. Combining form meaning many. 2.

Combining form meaning excessive.

poly(A) Polyadenylic acid.

polyacrylamide gel A cross-linked acrylamide gel prepared from the monomer acrylamide and the cross-linking compound, *N,N'*-methylenebisacrylamide, in the presence of a polymerizing agent such as ultraviolet light.

polyacrylamide gel electrophoresis A zone electrophoretic technique of high resolution in which a polyacrylamide gel is used as the supporting medium; important applications include SDS-PAGE and disc gel electrophoresis. *Abbr* PAGE.

polyadenylation The enzymatic reactions by which a sequence of adenylic acid residues (a poly(A) tail) is added to the 3'-end of most eukaryotic mRNAs.

polyaffinity theory The concept that there must be at least three points of contact (binding sites) between an enzyme and its substrate to account for the different reactivity of identical groups that are either part of a symmetrical substrate molecule, or are attached to a meso carbon of the substrate. *Aka* three-point landing; three-point attachment.

polyallomer A plastic that has a highly crystalline structure and that consists of polymerized crystalline segments of the constituent olefinic monomers.

polyamine A long-chain aliphatic compound that contains multiple amino and/or imino groups. Polyamines are widely distributed in nature and include compounds such as spermine, spermidine, cadaverine, and putrescine. Polyamines affect ribosomes, DNA, RNA, and other biological components, and their action is frequently attributed to an electrostatic interaction between the polyamine cation and a negatively charged molecule.

polyamino acid A synthetic, or naturally occurring, polymer of a given amino acid; polyglycine and polyglutamic acid are examples. *See also* sequence polymer.

polyampholyte A polyelectrolyte that can function as either a proton donor or a proton acceptor.

polyanion A molecule that possesses a large number of negative charges.

poly(A) tail A sequence of 20–200 adenylic acid residues that is added to the 3'-end of most eukaryotic mRNAs and that is believed to serve to increase the stability of mRNA by making it more resistant to nuclease digestion.

poly(C) Polycytidylic acid.

polycarbonate Polybisphenol-A-carbonate; a thermoplastic linear polyester of carbonic acid.

polycation A molecule that possesses a large number of positive charges.

polycephalic protein MULTIFUNCTIONAL PROTEIN.

polychlorinated biphenyls A group of industrial chemicals that are used as lubricants, heat-exchange fluids, insulators, and as plasticizers in paints, synthetic resins, and plastics. Polychlorinated biphenyls are of ecological interest, since residues of these compounds are found in a wide variety of tissues in fish, wildlife, and humans. Polychlorinated biphenyls have been shown to induce steroid hydroxylases, drug-metabolizing enzymes, and several cytochromes. *Abbr* PCB.

polycistronic messenger RNA A messenger RNA molecule that serves as a template for the translation of two or more polypeptide chains which are specified by adjacent cistrons in the DNA. *Aka* polycistronic message.

polyclonal antibodies Immunoglobulins derived from multiple clones of cells. The antibodies elicited in an individual organism by even a single pure antigen represent a mixture of molecules since different antibodies react with different parts of the same antigen molecule. Such an antibody preparation is, therefore, polyclonal; it contains antibodies synthesized by different clones of antibody-producing lymphocytes. *Abbr* PABs.

polycloning site A short segment in a DNA vector that has been engineered to contain a number of cleavage sites for different restriction enzymes and thereby enhances the versatility of the vector.

polycythemia A condition characterized by the presence of abnormally large numbers of circulating red blood cells.

poly(dA) tail *See* homopolymer tail-joining.

polydeoxyribonucleotide A linear polymer of more than 10 deoxyribonucleotides that are linked by means of 3',5'-phosphodiester bonds; a polynucleotide.

polydipsia Excessive thirst.

polydisperse Consisting of macromolecules that fall into a large number of classes with respect to their size.

poly(dT) tail *See* homopolymer tail-joining.

polyelectrolyte A linear polymer in which each monomer carries one or more ionic groups so that the polymer is a polyvalent ion with the charges distributed all along the chain.

polyene antibiotics A group of macrolide antibiotics, produced by *Streptomyces* species, that have 4-7 conjugated double bonds in the lactone ring.

polyenoic fatty acid A polyunsaturated fatty acid.

polyestrous Having more than one estrous cycle per year.

polyethylene A thermoplastic polymer of ethylene.

polyethylene glycol A chemical used for phase partitioning and as a fusogenic agent to pro-

mote the fusion of cells in tissue culture.

polyetiological theory A theory of cancer according to which cancer can be caused by a variety of chemical, physical, and biological agents.

polyfunctional *See* bifunctional.

polyfunctional protein POLYPROTEIN.

poly(G) Polyguanylic acid.

polygene One of a group of genes that control a quantitative trait such as size, weight, or pigmentation, and that are believed to function together and to have a cumulative effect. *See also* oligogene.

polygenic messenger POLYCYSTRONIC MESSENGER RNA.

polyglucosan GLUCAN.

polygon A plane and closed figure that is bounded by many straight lines.

polyhead A long, hollow cylinder, produced by some phage mutants, that has the diameter of a normal phage head but differs from it in its properties.

polyhedron A solid that is bounded by many plane faces.

polyhydroxy Containing two or more hydroxyl groups.

polyisoprene A polymer of isoprene; the cis isomer is natural rubber and the trans isomer is gutta percha. *Aka* polyterpene.

polykaryocyte A multinucleated cell.

polyketide ACETOGENIN.

polylinker *See* linker DNA (2).

polylysine-kieselguhr An adsorbent that consists of polylysine bound to diatomaceous earth and that is used for column chromatographic fractionation of nucleic acids. *Abbr* PLK.

polymer A high molecular weight compound consisting of long chains that may be open, closed, linear, branched, or cross-linked. The chains are composed of repeating units, called monomers, which may be either identical or different.

polymerase *See* DNA-dependent DNA polymerase; DNA-dependent RNA polymerase; RNA-dependent DNA polymerase; RNA-dependent RNA polymerase.

polymerase chain reaction A technique for the synthesis of large quantities of specific DNA segments; consists of a series of repetitive cycles, one step of which involves a high temperature. The latter inactivates the DNA polymerase used originally, thus requiring the addition of fresh enzyme at each cycle.

polymerization The repetitive reactions whereby the repeating units of a polymer are linked together to form long chains; the formation of a polymer.

polymetaphosphate LINEAR POLYPHOSPHATE.

polymetaphosphate ethyl ester A polyphos-

phate compound, the hydrolysis of which has been used to drive the polymerization of amino acids in studies on the origin of life.

polymorph POLYMORPHONUCLEAR LEUKOCYTE.

polymorphic gene A gene that exists in the form of several prevalent alleles.

polymorphism 1. The occurrence of two or more forms, such as the different forms of a protein in individuals of the same species. 2. The occurrence of two or more genetically different individuals in the same breeding population.

polymorphonuclear leukocyte A white blood cell that contains a lobed nucleus and granular cytoplasm; includes neutrophils, basophils, and eosinophils, so named because of the affinity of their cytoplasmic granules for specific dyes. *Aka* granulocyte, polymorph.

polymyxin One of a group cyclic peptide antibiotics, produced by *Bacillus polymyxa*, that are surface active and that damage the bacterial cell membrane and increase its permeability to small molecules.

polyneme hypothesis The hypothesis that a newly formed chromatid contains more than one double-stranded DNA molecule.

polyneuritis A disease of birds caused by a deficiency of thiamine.

polynomial function A function that is given by an equation of the form $Y = b_0 + b_1x + b_2x^2 + \dots + b_kx^k$. The highest power of x , having a nonzero coefficient, is the degree of the polynomial.

polynuclear complex A metal ion-ligand complex of the type $-M-L-M-L-M-$ where the metal ions M are held together in chains by means of ligands L , each of which binds to two metal ions.

polynucleotidase A polynucleotide phosphatase.

polynucleotide A linear polymer of more than 10 nucleotides that are linked by means of 3',5'-phosphodiester bonds. *See also* polydeoxyribonucleotide; polyribonucleotide.

polynucleotide kinase An enzyme that catalyzes the transfer of a phosphate group from ATP to the 5'-hydroxyl group of RNA or DNA; useful for the terminal labeling of a nucleic acid with ^{32}P .

polynucleotide ligase DNA LIGASE.

polynucleotide phosphorylase The enzyme that catalyzes the random polymerization of ribonucleoside diphosphates to polyribonucleotides, a reaction that is useful for the synthesis of synthetic mRNA molecules.

polyol A polyhydroxy alcohol.

polyoma virus A small, naked, icosahedral, oncogenic virus that contains double-stranded DNA and belongs to the group of papovaviruses; produces tumors in rodents.

polyoxin One of a group of antibiotics, produced by *Streptomyces cacaoi*, that are active against fungi.

polypeptide A linear polymer of more than 10 amino acids that are linked by means of peptide bonds.

polypheny PLEIOTROPISM.

polyphosphate granule VOLUTIN GRANULE.

polyploid state The chromosome state in which each type of chromosome is represented more than twice. *Aka* polyploidy.

polyprotein A polyfunctional protein; a large protein molecule that serves as a precursor for a number of biologically active peptides or proteins. Polyproteins are made from a polycistronic mRNA molecule and are cleaved by proteolytic enzymes after synthesis of the polypeptide chain has been completed.

polyprotic acid An acid that has several dissociable protons.

polyribonucleotide A linear polymer of more than 10 ribonucleotides that are linked by means of 3',5'-phosphodiester bonds; a polynucleotide.

polyribonucleotide phosphorylase POLYNUCLEOTIDE PHOSPHORYLASE.

polyribosome POLYSOME.

polysaccharide A linear or branched polymer of more than 10 monosaccharides that are linked by means of glycosidic bonds.

polysaccharide phosphorylase *See* glycogen phosphorylase; starch phosphorylase.

polysheath A long phage sheath that is produced by some phage mutants in the absence of a phage tube.

polysome A strand of mRNA with two or more ribosomes attached to it.

polysome profile The tracing that shows the types and the relative amounts of different polysomes in a sample, and that is obtained by monitoring the sample material after it has been fractionated by density gradient centrifugation.

poly(T) Polythymidylic acid.

polytailtube A long fiber, produced by some phage mutants, that has the diameter of a normal phage tube.

polytene chromosome An exceptionally large chromosome that contains numerous strands of DNA attached side by side in the form of a giant cable. Polytene chromosomes are characterized by specific patterns of bands, perpendicular to the long axis of the chromosome, which result from the chromomeres being in register.

polyteny The replication of chromosomes that results in the formation of polytene chromosomes.

polyterpene *See* terpene.

poly(U) Polyuridylic acid.

polyunsaturated Highly unsaturated; containing many double and/or triple bonds between carbon atoms.

poly(U) paper A strong paper support to which polyuridylic acid has been linked covalently; serves to bind specifically the 3'-poly(A) tail of eukaryotic mRNA and hence is used for the isolation and purification of polyadenylated eukaryotic mRNA.

polyuria The excretion of excessive amounts of urine.

polyvalent 1. Having a high valence. 2. Having more than one valence.

polyvalent allosteric inhibition See multivalent allosteric inhibition.

polyvalent antiserum An antiserum that contains antibodies against many different kinds of antigens.

polyvalent vaccine A vaccine that contains antigens derived from two or more different types of bacteria or viruses.

polywater A liquid that has a density of about one and a half times that of ordinary water and is prepared by condensation of water in fine capillaries; originally described as a new, stable form of water, but now known to be an ordinary aqueous solution containing substances dissolved from the capillaries by the condensing vapor.

POMC Proopiomelanocortin.

Pompe's disease GLYCOGEN STORAGE DISEASE TYPE II.

pontal atom BRIDGING ATOM.

pool The total amount of a substance, or a group of similar substances in equilibrium with each other, that is not covalently bound and that is available for, participates in, the anabolic and the catabolic reactions of the steady state; may refer to substances in a cell, an organ, a tissue, or an organism.

POPOP 1,4-Bis-2-(5-phenyloxazolyl)benzene; a secondary fluor.

POPSO Piperazine-*N,N'*-bis(2-hydroxypropane sulfonic acid); used for the preparation of biological buffers in the pH range of 7.2 to 8.5. See also biological buffers.

population A collection of organisms, cells, or molecules that have some quality or characteristic in common; generally refers to a large collection contained within a particular space.

por The bare 16-membered ring structure of the porphyrin ring system.

P:O ratio A measure of oxidative phosphorylation in a system that is equal to the number of moles of ATP formed per gram-atom of oxygen taken up; also the number of molecules of ATP formed per oxygen atom taken up.

porcine Of, or pertaining to, swine.

pore A minute opening through a solid.

porin An integral protein of the outer membrane in gram-negative bacteria. Porins are arranged in a hexagonal lattice, with trimers at each corner, resulting in electron micrographs that have been interpreted as being indicative of pores; the latter are believed to be responsible for the permeability of the membrane to small polar (hydrophilic) molecules. See also osmoregulation.

Porod-Kratky chain A model for a stiff chain, used to describe the hydrodynamic behavior of DNA. The model envisions the polymer as a continuously curving chain, as opposed to the jagged, uneven contour of a highly flexible chain. The direction of curvature at any point is assumed to be random. *Abbr* P-K chain.

porosity The porous quality of a solid.

porous Having a large number of pores.

porous disk method A method for measuring the apparent translational diffusion coefficient of a macromolecule by an application of Fick's first law. The apparatus consists of two chambers connected by a porous disk across which diffusion takes place. The diffusion coefficient is calculated from the mass transfer across the disk. The method may be used for impure preparations provided an assay for the macromolecule of interest is available. *Aka* porous diaphragm method; porous plate method.

porphin The parent tetrapyrrole ring structure of the porphyrins.

porphobilinogen The monopyrrole that is formed by the condensation of two molecules of δ -aminolevulinic acid and that serves as an intermediate in the biosynthesis of the porphyrins. *Abbr* PBG.

porphyria One of a number of pathological conditions that are due to abnormalities in the metabolism of heme and porphyrins and that are characterized by the presence of excessive amounts of porphyrin in the urine. Some porphyrias are hereditary diseases; others are nongenetic in nature.

porphyrin The heterocyclic compound, present in hemoglobin, cytochromes, and other hemo-proteins, that has a tetrapyrrole ring structure in which iron is chelated. Physiologically important types of porphyrins are (a) uroporphyrins—each pyrrole group carries an acetate and a propionate side chain; (b) coproporphyrins—each pyrrole group carries a methyl and a propionate side chain; (c) protoporphyrin—each of two pyrrole groups carries a methyl and a propionate side chain; each of the other two pyrrole groups carries a methyl and a vinyl side chain.

porphyrinuria The presence of excessive amounts of porphyrins, particularly of coproporphyrin, in the urine.

porphyropsin A visual pigment, present in freshwater fish, that consists of rod opsin and retinal₂ and that has an absorption maximum at 522 nm.

porter TRANSPORT AGENT.

Porter diagram The representation of an immunoglobulin molecule by means of straight and parallel lines for the light and heavy chains.

position isomer One of two or more isomers that differ from each other in the position of either substituents or functional groups on a chain or on a ring.

positive catalysis Catalysis that leads to an increase in the rate of a chemical reaction, as in the case where the binding of a substrate by an enzyme leads to a decrease of the activation energy for the conversion of the substrate to products.

positive control The initiation of a biological activity by the presence of a particular molecule; the initiation of gene expression in an induction-repression system by the presence of a particular regulatory protein is an example. *See also* positive regulation.

positive cooperativity Cooperative binding in which the binding of one ligand to one site on the molecule increases the affinity for the binding of subsequent ligands to other sites on the same molecule.

positive effector *See* effector.

positive electron POSITRON.

positive feedback A feedback mechanism, as in an autocatalytic reaction, in which there is a direct relation between the magnitude of the input into, and the output of, a system; a small input leads to a small increase in the subsequent output, while a large input leads to a large increase in the subsequent output.

positive gene control POSITIVE REGULATION.

positive hydration Hydration in which the water molecules in the primary hydration shell of an ion have lesser mobility than those in pure water.

positive polarity Descriptive of a single-stranded RNA or a single-stranded DNA molecule that has bases in the same sequence as that found in the corresponding mRNA molecule.

positive regulation The regulation of gene expression in which transcription is turned on by the binding of some effector (a protein, a small molecule, or a molecular complex) to the promoter. This activation of the promoter permits the binding of RNA polymerase and the subsequent synthesis of mRNA.

positive staining A staining technique, used in electron microscopy, in which components of the sample are visualized through their binding of an electron-dense material; the sample

appears darker than the background. The staining of nucleic acids with uranyl acetate and the staining of antigens with ferritin-labeled antibodies are two examples.

positive strand virus 1. A virus containing single-stranded RNA that has positive polarity. The strand (called a plus strand) has the same base sequences as that found in the viral mRNA. The infecting single-stranded RNA could, therefore, function directly as viral mRNA; it contains sequence that can be translated into viral proteins after the RNA enters the cell. Actually, the infecting strand first gives rise to a negative strand which then leads to synthesis of a positive strand that function as mRNA. 2. A virus containing single-stranded DNA that has positive polarity. After infection, the positive strand gives rise to \pm DNA which then is transcribed to yield viral mRNA having the same base sequence as that of the infecting single-stranded DNA (except that thymine in DNA is replaced by uracil in RNA). 3. A retrovirus containing single-stranded RNA that has positive polarity. The RNA is first copied by reverse transcriptase to yield a negative DNA strand which is converted to \pm DNA and which then gives rise to viral mRNA having the same base sequence as the original viral single-stranded RNA. *See also* plus strand; virus.

positive supercoil POSITIVE SUPERHELIX. *See* superhelix.

positive superhelix *See* superhelix.

positron A positively charged electron. *See also* elementary particles.

positron emission tomography *See* PETT.

positron emission transaxial tomography *See* PETT.

postabsorptive state The state of a person or an animal after a fast that was of sufficient duration so that all of the last nutrients have been absorbed through the intestinal wall.

post dimer initiation The initiation of DNA synthesis that occurs by passing a thymine dimer and restarting chain growth beyond the thymine dimer block. This mechanism forms the basis of recombination repair.

posterior 1. Behind, or in the back part of, a structure. 2. After, in relation to time.

postmortem Of, or pertaining to, the period after death.

postnatal Of, or pertaining to, the period after birth.

postoperative Of, or pertaining to, the period following a surgical operation.

postpartum Of, or pertaining to, the period after childbirth.

postprandial Of, or pertaining to, the period following a meal.

postreplication repair 1. The repair of DNA that occurs after the replicating fork has moved some distance past the region requiring repair. 2. The repair of nonreplicating DNA.

postreplicative modification The series of chemical reactions whereby various purines and pyrimidines are occasionally modified after the DNA has been synthesized. This includes the formation of such derivatives as 5-hydroxymethyl cytosine in the T-even phages and the formation of 5-methyl cytosine and 6-methyl adenine in animal and bacterial cells.

post-transcriptional modification PROCESSING (1).

post-translational modification PROCESSING (2).

post-translational transport The transfer of a protein across a biological membrane that occurs after synthesis of the polypeptide chain has been completed. *Aka* post-translational transfer. *See also* cotranslational transport.

potassium An element that is essential to all plants and animals. Symbol, K; atomic number, 19; atomic weight, 39.102; oxidation state, +1; most abundant isotope, ³⁹K; a radioactive isotope, ⁴²K, half-life, 12.4 h, radiation emitted, beta particles and gamma rays.

potato spindle tuber viroid *See* viroid.

potency The degree of effectiveness of a drug in terms of the quantities required to produce certain effects.

potential A measure of the electrical energy of a half-cell in comparison to an arbitrary standard; the difference in electrical energy between an indicator and a reference electrode.

potential difference The difference in electrical potential between two points in an electrical circuit.

potential-drop method HIGH-RESISTANCE-LEAK METHOD.

potential energy barrier ENERGY BARRIER (1).

potential energy diagram A graphical representation of the potential energy barrier of a molecule in which the potential energy of the molecule is plotted as a function of the internuclear distance of its atoms.

potential energy well The ground state and the low energy levels of a molecule as represented by a potential energy diagram.

potential gradient The rate of change of potential with distance in a specified direction.

potential mediator An electromotively active system that is added during potentiometric titrations to accelerate the establishment of equilibrium.

potential well *See* potential energy well.

potentiation 1. The increase in the effectiveness of a drug, a hormone, or a carcinogen that is produced by either prior or simul-

taneous treatment of the organism with another agent. 2. The increase in the reaginic antibody response of an animal that is produced by injecting it with certain parasites. 3. SYNERGISM.

potentiometer An instrument for measuring electrical potentials.

potentiometric titration A titration in which the electrical potential is measured as a function of titrant added.

potentiometry The measurement of either electromotive force or electrical potential and the application of these measurements to the study of oxidation-reduction systems.

Potter-Elvehjem homogenizer A homogenizer that consists of a glass tube in which a tightly fitting pestle is rotated; the shear forces that develop between the pestle and the wall of the tube lead to the homogenization of materials introduced into the tube.

pour plate A solid medium that contains bacteria and that is prepared by adding a bacterial inoculum to melted nutrient agar, pouring the mixture into a petri dish, and allowing it to solidify.

powder method A method of x-ray diffraction in which a sample is used that is in powdered form.

powder pattern The x-ray diffraction pattern that is obtained from a sample in powdered form and that is equivalent to the aggregate pattern that would have been obtained from the same sample if it were present in the form of a large number of small, randomly oriented crystals. *Aka* powder diagram.

power stroke *See* rowboat model.

poxvirus The largest and most complex of the animal viruses that is brick-shaped and contains a double-stranded DNA core surrounded by membranes. Poxviruses infect mammals (including humans) and birds, and some are oncogenic.

PP 1. Inorganic pyrophosphate 2. Protoporphyrin. 3. Photoprotection.

PP-1 Phosphoprotein phosphatase.

ppb Parts per billion; a measure of concentration equal to the number of parts of a component per billion parts of the total sample, such as parts of solute per billion parts of solution.

pp60C-src *See* c-src gene.

PPD 1. Purified protein derivative. 2. *p*-Phenylenediamine.

PP factor Pellagra-preventative factor.

ppGpp *See* magic spot.

PP_i Inorganic pyrophosphate.

ppm Parts per million; a measure of concentration equal to the number of parts of a component per million parts of the total sample, such as parts of solute per million parts of solution.

PPO 2,5-Diphenyloxazole; a primary fluor.

PPP Pentose phosphate pathway.

pppGpp See magic spot.

P protein A regulatory protein that functions in the reactivation of glutamine synthetase after its inactivation by adenylation. *Aka* P_{II}.

ppt Precipitate.

PQ Plastoquinone.

PQQ See quinoprotein.

PRA 5-Phosphoribosyl-1-amine; an intermediate in the biosynthesis of purines.

practical Denoting a chemical that has not been rigorously purified.

Prausnitz-Kuestner reaction A skin test for the detection of human reagins in serum; performed by injecting the test serum intradermally into a healthy person and then eliciting a wheal and erythema response by injecting a dose of allergen into the same site 24 h later.

prealbumin 1. A plasma albumin that moves ahead of the major albumin fraction when subjected to electrophoresis under alkaline conditions. 2. See thyroxine-binding prealbumin.

pre-beta fraction VERY LOW-DENSITY LIPOPROTEIN.

prebiotic Pertaining to the period prior to the occurrence of life on the earth.

prebiotic soup PRIMORDIAL SOUP.

Precambrian era The geologic time period that extended over about 1.6 billion years and that ended about 600 million years ago; it is divided into the Proterozoic and Archeozoic eras.

precancerous Descriptive of a cell or a tissue that is presently benign but from which a malignant tumor is expected to develop with a high degree of probability.

precession diagram An x-ray diffraction pattern obtained by means of a precession camera.

precipitant A substance that, when added to a solution, causes the formation of a precipitate.

precipitate The deposit of insoluble material that is obtained from a solution by an alteration of the conditions or by the addition of specific substances.

precipitating agent PRECIPITANT.

precipitating antibody PRECIPITIN.

precipitation membrane An artificially constructed membrane that, like a biological membrane, is specifically permeable to certain ions. An example is a BaSO₄ membrane, prepared by counterdiffusion of Ba(OH)₂ and H₂SO₄ across a sheet of cellophane.

precipitin 1. An antibody that forms a precipitate with an antigen in a precipitin reaction. 2.

The precipitate formed in a precipitin reaction.

precipitin curve A plot of the amount of antibody precipitated as a function of increasing amounts of antigen added to the solution.

precipitin reaction The formation of an insoluble precipitate by a reaction between antigens and antibodies.

precision A measure of the reproducibility of a measurement; the degree of agreement between two or more measurements made in an identical fashion.

precursor 1. A compound that precedes another compound in a metabolic pathway by one or more steps. 2. A simple low molecular weight molecule in the environment, such as carbon dioxide or nitrogen, that is used by living organisms for the synthesis of biomolecules.

precursor fragments OKAZAKI FRAGMENTS.

precursor messenger RNA A large RNA transcript that is a precursor of mRNA; contains both introns and exons and must be subjected to splicing to produce the final, functional mRNA molecule. *Abbr* Pre-mRNA.

precursor of serum prothrombin conversion accelerator PROCONVERTIN.

precursor ribosomal RNA The giant precursor RNA molecule from which the various species of rRNA are cleaved off by post-transcriptional processing. *Abbr* Pre-rRNA.

precursor transfer RNA A large RNA transcript that is a precursor of tRNA. In *E. coli*, this represents the actual tRNA molecule with two extra nucleotides at the 3'-end and 41 extra nucleotides at the 5'-end; in eukaryotes, precursor tRNA may contain one or more tRNA sequences. *Abbr* Pre-tRNA.

preearly RNA A virus-specific RNA that is synthesized by RNA polymerase very soon after the infection of the host cell by the virus (within 1 min in the case of phage infection). *Aka* immediate early RNA; prereplicative RNA; very early RNA.

preelectrophoresis The removal of ionic contaminants from an electrophoretic support, such as a gel, by subjecting it to an electric field prior to the electrophoresis of the sample.

preenzyme See preprotein.

pre-equilibrium approximation A method for deriving the rate equation of a chemical reaction that is based on two assumptions: (a) There exists a rate-determining step in the mechanism; (b) the concentrations of the intermediates, preceding this step, are governed by equilibrium conditions. The pre-equilibrium approximation is used in the Michaelis-Menten treatment of enzyme kinetics. *Aka* prior equilibrium approximation;

- rapid equilibrium approximation.
- preexponential factor** See Arrhenius equation.
- preferential association** An immunological theory according to which specific viral antigens interact more strongly with certain allelic products of the host immunogenes than with others. As a result of this preferential association, or binding, the virus becomes more immunogenic, and hosts, having such allelic products, become more immune to viral infection.
- prefolic A SERUM FOLATE.**
- preformation** The concept that an organism develops through the appearance and growth of structures and functions that are already present in the egg. See also epigenesis.
- performed gradient isodensity centrifugation** DENSITY GRADIENT SEDIMENTATION VELOCITY.
- pregnancy hormone** PROGESTERONE.
- pregnane** The parent ring system of the progestogens, mineralocorticoids, and glucocorticoids.
- pregnanediol** A major catabolite of progesterone that occurs as a glucuronide, especially in pregnancy urine.
- pregnant mare's serum gonadotropin** A gonadotropic hormone, present in the serum of pregnant mares, that is produced by the endometrium and that has similar biological effects to those of follicle-stimulating hormone. *Var sp* pregnant mare's serum gonadotropin. *Abbr* PMSG.
- pregnenolone** A precursor of the steroid hormones. See also desmolase.
- preincubation** The incubation of a reaction mixture prior to the test incubation, the effect of which is being measured; preincubation may be for such purposes as the depletion of an endogenous component or the establishment of a binding equilibrium.
- preinductive phase** The time period that precedes the administration of an antigen to an animal.
- prekallikrein** A precursor of kallikrein; the conversion of prekallikrein to kallikrein can initiate the intrinsic pathway of blood coagulation. *Abbr* PK.
- prelumirhodopsin** BATHORHODOPSIN.
- premature initiation** The phenomenon, seen in some preparations of rapidly growing bacteria or rapidly replicating phages, in which a second initiation of DNA replication occurs before the first one is completed.
- premelting** The phenomenon that DNA, and other double-stranded nucleic acid molecules, begin to melt out much before the melting-out temperature (T_m) is reached. Due to the fact that some base pairs open up even at room temperature and the number of such base pairs increases gradually as the temperature is raised. See also breathing.
- pre-messenger RNA** 1. PRECURSOR MESSENGER RNA. 2. HETEROGENEOUS NUCLEAR RNA.
- premix burner** A burner used in atomic absorption spectrophotometry and designed so that the gases are mixed and the sample is atomized before entering the flame.
- pre-mRNA** 1. Precursor messenger RNA. 2. Heterogeneous nuclear RNA.
- prenol** A long-chain isoprenoid alcohol.
- prenyl group** The isoprene moiety.
- PR enzyme** Photoreactivating enzyme.
- preparative method** A method, such as ultracentrifugation, electrophoresis, or chromatography, that requires relatively large amounts of sample and that is used primarily for the isolation and purification of specific substances. See also analytical method.
- preparative ultracentrifuge** An ultracentrifuge, equipped with rotors of varying capacities, that is used for the preparative fractionation of macromolecules.
- prephenic acid** See chorismic acid.
- prepriming protein** One of a number of proteins that form part of the primosome complex; they enable the enzyme primase to synthesize RNA primers during DNA replication.
- preprimosome** The primosome complex without the enzyme primase.
- preprohormone** The initial ribosomal product of a peptide hormone. A molecule that is larger than the hormone and that undergoes post-translational proteolysis to form, first, the prohormone and, finally, the biologically active hormone. See also preproprotein.
- preproinsulin** See preprohormone; preproprotein.
- preproopiomelanocortin** The common precursor of several hormones (corticotropin, lipotropin, melanotropin) and endorphins (β -endorphin, γ -endorphin).
- preproprotein** The preprotein form of a proprotein; the inactive precursor of a secretory protein (a proprotein) that has the signal sequence still attached (a preprotein). See also preprotein; proprotein; signal hypothesis propeptides.
- preprotein** A secretory protein with the signal sequence still attached; the protein, according to the signal hypothesis, before the enzyme signal peptidase has cleaved off the signal sequence. See also signal hypothesis.
- prereplicative RNA** PREEARLY RNA.
- pre-ribosomal RNA** PRECURSOR RIBOSOMAL RNA.
- pre-rRNA** PRECURSOR RIBOSOMAL RNA.
- pressor agent** HYPERTENSIVE AGENT.
- pressor amine** An amine, such as vasopressin, that functions as a hypertensive agent.
- pressor effect** An increase in blood pressure.

pressor principle VASOPRESSIN.

pressure dialysis Dialysis in which there is either an application of pressure to the dialysis bag, or an application of a vacuum to the space surrounding the dialysis bag.

pressure-jump method A relaxation technique in which pressure is the variable that disturbs the equilibrium of a system. *See also* relaxation technique.

pre-steady-state kinetics The kinetics of an enzymatic reaction proceeding under conditions that precede the establishment of a steady state; generally investigated by means of rapid flow or relaxation techniques that permit a study of both the initial and the intermediate steps of the reaction. During the pre-steady-state period (induction period), the concentration of a given intermediate rises from zero to its steady-state level.

pre-transfer RNA PRECURSOR TRANSFER RNA.

pre-tRNA PRECURSOR TRANSFER RNA.

previtamin A precursor of a vitamin that is formed either during the *in vivo* conversion of a provitamin to the vitamin or during the *in vitro* conversion of a synthetic compound to the vitamin. *See also* provitamin.

PRF *See* prolactin regulatory hormone.

PRH *See* prolactin regulatory hormone.

Pribnow box A nearly universal sequence of nucleotides in prokaryotic DNA, about 10 base pairs upstream from the site at which transcription of structural genes starts. It has the consensus sequence TATAAT and is a site in the promoter to which the sigma subunit of RNA polymerase binds. *See also* TATA box.

PRIF *See* prolactin regulatory hormone.

PRIH *See* prolactin regulatory hormone.

primaquine An antimalarial drug.

primaquine sensitivity A genetically inherited metabolic defect in humans that is characterized by the tendency of erythrocytes to hemolyze upon the administration of a variety of compounds, including primaquine, to an individual; due, in most cases, to a deficiency of the enzyme glucose-6-phosphate dehydrogenase. *See also* glucose-6-phosphate dehydrogenase deficiency.

primary acidosis A deviation from the normal acid-base balance in the body that is due to overproduction, ingestion, or retention of acid. In the absence of compensatory mechanisms, such conditions lead to a lowering of the blood pH.

primary active transport *See* active transport.

primary alkali deficit PRIMARY ACIDOSIS.

primary alkali excess PRIMARY ALKALOSIS.

primary alkalosis A deviation from the normal acid-base balance in the body that is due to

excessive loss of acid or an overdose of sodium bicarbonate. In the absence of compensatory mechanisms, such conditions lead to an increase in the blood pH.

primary amino acids STANDARD AMINO ACIDS.

primary bile acids *See* bile acids.

primary carbon dioxide deficit RESPIRATORY ALKALOSIS.

primary carbon dioxide excess RESPIRATORY ACIDOSIS.

primary charge effect The charge effect in a solution containing charged macromolecules that results from the differential movement of the charged macromolecules and their oppositely charged counterions. The primary charge effect leads to a decrease in the sedimentation rate and to an increase in the diffusion rate of a charged macromolecule.

primary culture A culture that is started from cells, tissues, or organs that are derived directly from an organism.

primary deficiency 1. A decreased hormone level that is due to impaired function or destruction of the endocrine gland that produces this hormone. 2. DIETARY DEFICIENCY.

primary derived protein *See* derived protein.

primary filament MYOSIN FILAMENT.

primary fluor A fluor that is excited by the radiation from a radioactive sample and that produces a flash of light during scintillation counting.

primary food producer A photosynthetic organism; a photolithotroph or a photoorganotroph.

primary hydration shell The layer of water molecules that are closest to an ion and which, in the case of a metal ion, are frequently considered to be molecules acting as ligands.

primary hypertension ESSENTIAL HYPERTENSION.

primary immune response *See* primary response.

primary ionization The ionization of matter that is produced by the ionizing radiation that impinges upon it or passes through it.

primary isotope effect An isotope effect in which the isotope itself is involved in bond cleavage, such that the bond to the isotope is broken in the transition state of the reaction.

primary lysosome *See* lysosome.

primary messenger HORMONE.

primary metabolite *See* metabolite.

primary oxaluria A genetically inherited metabolic defect in humans that is characterized by increased formation of oxalic acid and deposition of calcium oxalate in the kidneys and other tissues; involves a disorder in glycine metabolism such that virtually all of the synthesized glycine is oxidized via glyoxylic acid

to oxalic acid as a result of a deficiency of the enzyme α -ketoglutarate:glyoxylate carboxylase.

primary pigment The major photosynthetic pigment of an organism; the primary pigment of plants is chlorophyll and that of bacteria is bacteriochlorophyll. *See also* accessory pigment.

primary plot A direct plot of experimental enzyme kinetics data, such as a Lineweaver-Burk plot. *Aka* primary kinetic plot.

primary prostaglandin A prostaglandin of either type PGE or type PGF; so called, since prostaglandins of types PGA and PGB can be derived from them.

primary protein derivative *See* primary derived protein.

primary response 1. The immune response of an animal that is produced when the animal is first exposed to, or injected with, an antigen. 2. The direct induction of transcription of a few specific genes that is brought about by a steroid hormone.

primary solvent The solvent used in scintillation counting for the transfer of energy from the radioactive sample to the fluor.

primary standard 1. A purified chemical that can be weighed out and used for the preparation of solutions of known concentrations (standard solutions). 2. A reference, such as a source of radiation, that is used for purposes of calibration.

primary stimulus The immunogen that stimulates an animal to produce a primary immune response.

primary structure The basic structure of a polypeptide chain or a polynucleotide strand that is described by the type, the number, and the sequence of either the amino acids in the polypeptide chain or the nucleotides in the polynucleotide strand. The primary structure of proteins excludes the spatial arrangement of the atoms except for the configuration about the alpha carbon atoms of the amino acids; it likewise excludes disulfide bonds and, hence, is not equivalent to the covalent structure of the molecule.

primary tissue culture A short-term tissue culture.

primary transcript The initial RNA molecule transcribed from a section of DNA between a start and a stop signal for RNA polymerase; frequently, an RNA molecule that requires post-transcriptional modification (processing) to become a functional mRNA, rRNA, or tRNA molecule.

primary tumor The original tumor as contrasted with a secondary tumor, formed through metastasis.

primase The DNA-dependent RNA polymerase that functions in DNA replication by synthesizing the RNA primers which are then extended by DNA polymerase to yield newly synthesized DNA fragments. While being an RNA polymerase, primase is distinct from the RNA polymerase that functions in the transcription of DNA. *See also* DNA replication.

primate A mammal of the order Primates, which includes humans, apes, and monkeys.

primed cell A lymphocyte that has "recognized" an antigen; a Y cell according to the XYZ cell theory.

primed synthesis method SANGER-COULSON METHOD.

primer A macromolecule that stimulates the synthesis of another macromolecule by participating in the initiation of polymerization and that is linked covalently to the product of the reaction. In nucleic acid chemistry, a primer is a short, single-stranded RNA or DNA segment that functions as the starting point for the polymerization of nucleotides.

primer-template *See* template-primer.

prime strain A viral strain that is not well neutralized by antibodies that are specific for the wild-type strain.

primeval PRIMITIVE.

priming 1. The administration of antigens to an animal organism in such a fashion that the responsive immunocytes are activated. 2. The conversion of X cells to Y cells according to the XYZ cell theory.

priming dose The first dose of an antigen administered to an animal organism to produce an immune response.

primitive Of, or pertaining to, the early stages in the development of the earth and the evolution of life.

primitive atmosphere The atmosphere that surrounded the primitive earth and that is considered by many to have been a reducing atmosphere.

primitive earth The earth at an early stage of development at which time the first organic compounds are believed to have been formed.

primordial PRIMITIVE.

primordial soup The primitive oceans and other primitive bodies of water that contained a variety of organic compounds and that are thought to have been the site for the reactions in the primitive earth that led to the synthesis of the first macromolecules and to the assembly of the first living cells. *Aka* prebiotic soup.

primordium The early group of cells that subsequently undergoes mitosis to form a particular organ or structure.

primosome A multiprotein complex required for the priming action that precedes the synth-

esis of each Okazaki fragment during DNA replication; consists of prepriming proteins, proteins having ATPase activity, and the enzyme primase. Binding of the primosome to DNA is followed by synthesis of an RNA primer by primase and synthesis of a DNA fragment (Okazaki fragment) linked to the RNA primer. The primosome moves along the DNA strand that is synthesized discontinuously and moves in a direction that is opposite to that of RNA and DNA synthesis. This movement requires the input of energy that is obtained by the hydrolysis of ATP.

principle of evolutionary continuity The concept that the formation of biomolecules, subcellular structures, and ultimately living cells required a large number of small, but reasonably probable, steps.

principle of Le Chatelier See Le Chatelier's principle.

principle of maximum orbital overlap The principle, enunciated by Linus Pauling in 1931, that the strongest covalent bond between two atoms will be formed when the two atomic orbitals achieve maximum overlap.

principle of microscopic reversibility The thermodynamic principle which states that, at equilibrium, the forward rate must be equal to the reverse rate for every elementary step in the reaction mechanism. Applied to a simple reaction, consisting of a single elementary step, the principle leads to the conclusion that both the forward and the reverse reactions must proceed via the same activated complex. Applied to a complex reaction, consisting of several elementary steps, the principle leads to the conclusion that, if there are several paths whereby A can be converted to B, then each step in the mechanism must be reversible. Thus, the mechanism (a) is not possible while the mechanism (b) is possible



principle of simplicity OCCAM'S RAZOR.

principle of unattainability of absolute zero An alternative statement of the third law of thermodynamics: it is impossible for any process, involving a finite number of steps, to reduce the temperature of any system to absolute zero.

prion A small, infectious protein that is believed to be the cause of a number of degenerative neurological diseases such as scrapie in sheep and goats and Creutzfeldt-Jakob disease, kuru, and Gerstmann-Strausler syndrome in humans. Prions were formerly called "slow viruses" but are now known to be devoid of nucleic acids and are, therefore, neither viruses nor viroids. The name prion is a

contraction of *protein* and *infection*. Prions are resistant to inactivation by procedures that modify nucleic acids. A link between prions and Alzheimer's disease has been postulated.

prion equilibrium approximation PRE-EQUILIBRIUM APPROXIMATION.

private antigen A rare blood group antigen that occurs only in one or in a few individuals.

privileged site A region in an organism that lacks normal lymphatic drainage and that constitutes a location where a tissue transplant may persist for extended periods of time without inducing transplantation immunity.

PRL Prolactin.

pro- Prefix indicating an inactive precursor, as that of an enzyme, a vitamin, or a hormone.

Pro 1. Proline. 2. Prolyl.

proaccelerin An accessory protein that participates in the activation of prothrombin to thrombin in both the extrinsic and intrinsic pathways of blood clotting.

proacrosome The acrosome at an early developmental stage.

pro-ACTH-endorphin PROOPIOMELANOCORTIN.

probability The relative frequency of occurrence of a specific type of event out of the total number of occurrences of this and other types of events, all equally likely to take place.

Sym p.

probability curve NORMAL DISTRIBUTION.

probability distribution A frequency distribution in which a variable is divided into classes and the probabilities for these classes are indicated.

probability paper Graph paper in which one scale has been changed so that a plot of a normal distribution curve will yield a straight line.

probability value The probability expressed as a decimal fraction.

probable error An error, equal to 0.6745 times the standard deviation, such that there is a 50-50 chance that any other error will be larger than it.

probe 1. A group of atoms or a molecule that is attached to other molecules or cellular structures and that is used as an aid in studying the properties of these molecules and structures. See also reporter group; spin labeling. 2. A substance, frequently labeled with radioactive isotopes, that is used to identify or isolate a gene, a gene product, or a protein. The hybridization of mRNA with its DNA gene, the hybridization of chromosomal DNA with corresponding cDNA fragments, and the binding of specific protein molecules to monoclonal antibodies are some examples of the use of probes. See also northern blotting; Southern blotting; western blotting.

probiogenesis Primordial biosynthetic reactions; primordial biogenesis.

probit A statistical unit of measurement of probability based on deviations from the mean of a normal frequency distribution.

procarboxypeptidase The inactive precursor of carboxypeptidase that is synthesized by the pancreas. It is converted to the active enzyme by proteolytic action.

procarcinogen The inactive precursor of a carcinogen.

procaryon The nuclear region of a prokaryotic cell. *Var sp* prokaryon.

procaryote Variant spelling of prokaryote.

procaryotic Variant spelling of prokaryotic.

process An outgrowth or an extension, such as an axon or the dendrite of a neuron.

processed gene A eukaryotic gene that lacks introns but contains the 3'-poly(A) tail of the parental mRNA species; believed to arise *in vivo* by aberrant reverse transcription (using viral or cellular enzymes) of the mature mRNA or of nuclear RNA to yield a piece of double-stranded DNA which is then reintegrated into the host chromosome. *Aka* retrogene; processed retropseudogene.

processing 1. The series of chemical reactions whereby a primary RNA transcript is converted to a functional mRNA, rRNA, or tRNA molecule. These modifications include such reactions as removal of introns, splicing of exons, addition of a methylated cap, and addition of a poly(A) tail. *Aka* post-transcriptional modification. 2. The series of chemical reactions whereby a newly synthesized polypeptide chain is converted to a functional protein. These modifications include such reactions as removal of the *N*-formyl group from methionine, phosphorylation, acetylation, hydroxylation, formation of disulfide bonds from sulfhydryl groups, attachment of prosthetic groups, and cleavage of peptide bonds to convert a proprotein (proenzyme) to a protein (enzyme). *Aka* post-translational modification. 3. *See also* postreplicative modification.

processive enzyme An enzyme that remains bound to its substrate for a series of repeated catalytic events before being released; the continued polymerization of DNA by DNA polymerase I (or III) that occurs during DNA replication without release of the enzyme from the template, is an example of processivity.

processive exonuclease An exonuclease that, once bound to a polynucleotide strand, completely degrades the strand before it is released.

processivity 1. The repeated catalytic steps carried out by a processive enzyme. 2. CHANNELING.

prochiral compound An organic compound that has no chiral centers but has a potential

for "handedness" (chirality); it is potentially able to react asymmetrically with an asymmetric site. Such a compound contains one or more carbon atoms to which are attached two identical and two different substituents (prochiral carbon; meso carbon). The two identical substituents have the potential of not reacting equally, for example, on the surface of an enzyme (at the active site). Replacement of one of the two identical ligands by a different one results in formation of a chiral center.

prochirality The potential for "handedness" (chirality) shown by prochiral compounds.

procollagen A high molecular weight (MW 150,000) precursor of collagen.

proconvertin The precursor of the active proenzyme convertin which activates factor X in the extrinsic pathway of blood clotting.

proctodone An insect hormone that terminates diapause.

prodrug A drug that is inactive by itself but undergoes transformation to a reactive form as a result of metabolic reactions at some location in the body; a compound that is converted to an anticancer drug by a tumor-associated enzyme is an example.

product An atom, an ion, or a molecule that is produced in a chemical reaction. *Sym P*.

product inhibition The inhibition of an enzyme by a product of the reaction that the enzyme catalyzes.

production strain A strain of microorganisms that is used for the direct synthesis of an industrial product or for a step in the synthesis of such a product.

productive cell A cell that produces viral progeny when it is infected with a virus.

productive complex An enzyme-substrate complex in which the substrate is bound to the enzyme in such a fashion that catalysis is possible and that products can be formed.

productive infection A viral infection that leads to the formation of infectious viral progeny.

productive phase The stage in an immune response that follows the first appearance of antibodies in the serum and that corresponds to the time during which antibodies are synthesized vigorously.

prodynorphin The precursor from which dynorphin and rimorphin are derived.

proelastase The inactive precursor of elastase.

proenkephalin A The precursor from which the enkephalins are derived.

proenzyme ZYMOGEN.

profibrinolysin PLASMINOGEN.

profilactin A complex of profilin and actin molecules.

profile *See* elution profile; polysome profile; thermal denaturation profile.

profilin One of a number of small, cytoplasmic

- proteins that bind primarily to actin monomers and retard actin polymerization.
- proflavin** A mutagenic acridine dye that causes frameshift mutations.
- progenote** The common ancestor of present day cells. The ancestor from which, it is believed, three lines of descent lead to prokaryotes, eukaryotes, and archaeobacteria.
- progeny** 1. The offspring of an organism or of a cell. 2. The newly formed DNA molecules or viral particles.
- progeria** A genetically inherited metabolic defect in humans that involves defective DNA repair and that is associated with early aging and death.
- progestational** Preceding gestation.
- progesterone** The major female sex hormone required for the maintenance of pregnancy; a 21-carbon steroid that is secreted largely by the corpus luteum.
- progestin** Any substance with progesterone-like activity; includes both natural and synthetic compounds.
- progestogen** A substance that induces progestational changes in the uterus; progestin or related synthetic compounds.
- program** See computer program.
- progress curve** A plot of the concentration of either a reactant or a product of a chemical reaction as a function of the time that the reaction has been allowed to proceed.
- progression** See tumor progression.
- prohead** One of a number of precursor structures of the hexagonal, DNA-containing head of a T-even phage.
- prohormone** The inactive precursor of a peptide hormone. A molecule that is larger than the hormone and from which the active hormone is produced by proteolysis.
- proinsulin** The inactive, cyclic precursor of insulin that is converted to active insulin by hydrolytic removal of a peptide of 33 amino acids.
- projection formula** A two-dimensional representation of a molecule in which bonds projecting forward with respect to the plane of the page are indicated by horizontal lines, and bonds projecting backward are indicated by vertical lines.
- prokaryon** Variant spelling of procaryon.
- prokaryote** A simple, unicellular organism, such as a bacterium, that lacks a discrete nucleus surrounded by a nuclear membrane, and that contains its genetic material within a single chromosome. See also eukaryote.
- prokaryotic** Of, or pertaining to, prokaryotes.
- prolactin** A protein hormone, secreted by the anterior lobe of the pituitary gland, that is essential for the initiation of lactation in mammals. Prolactin also has a gonadotropic effect and stimulates progesterone secretion by the corpus luteum. *Abbr* PRL.
- prolactin regulatory hormone** One of two hypothalamic hormones (or factors) that, respectively, stimulate or inhibit the release of prolactin from the pituitary gland. The prolactin releasing hormone (or factor) is abbreviated PRH (PRF); the prolactin release-inhibiting hormone (or factor) is abbreviated as PIH (PIF) or PRIH (PRIF).
- prolactin release-inhibiting hormone** See prolactin regulatory hormone.
- prolactin releasing hormone** See prolactin regulatory hormone.
- prolactoliberin** PROLACTIN RELEASING HORMONE.
- prolactostatin** PROLACTIN RELEASE-INHIBITING HORMONE.
- prolamin** A simple, globular protein of plant origin that is insoluble in water but is soluble in 50 to 90% ethanol solutions. *Var sp* prolamine.
- prolate ellipsoid of revolution** An ellipsoid of revolution formed by rotation of an ellipse about its major axis.
- prolidase** An exopeptidase that is specific for N-terminal proline or hydroxyproline.
- proline** A heterocyclic, nonpolar alpha imino acid. Proline is a helix-breaking amino acid. *Abbr* Pro;P.
- prolonged test** A toxicity test that is performed on laboratory animals and that requires the administration of a chemical at least once daily for periods of about 1 to 3 months.
- promiscuous DNA** Sections of DNA that have been transferred as a result of transposition which took place during the early stages of evolution; the transfer can have occurred between organelles, such as mitochondria and chloroplasts, or between an organelle and a nucleus.
- promitochondrion** An abnormal mitochondrion in which all of the mitochondrially encoded gene products are missing. Such mitochondria are found in some types of petite mutants of yeast; they have a normal outer membrane but the inner membrane contains poorly developed cristae. Promitochondria are nonfunctional in oxidative phosphorylation but contain proteins specified by nuclear genes such as DNA and RNA polymerases, enzymes of the citric acid cycle, and inner membrane proteins. The term is also used to describe other degenerate or precursor mitochondria from which functional mitochondria are believed to develop.
- promoter** 1. The site on the DNA molecule to which RNA polymerase attaches and at which transcription is initiated. In an operon, the promoter is usually located adjacent to the operator and upstream from it (farther away

from the point at which transcription begins) but other arrangements also occur. 2. A carcinogenic agent that brings about the second stage (promotion stage) in a two-stage or multistage mechanism of carcinogenesis; a cocarcinogen. A substance that, when applied repeatedly or continuously, can induce tumors in animals previously exposed to a tumor initiator. A promoter, by itself, is neither mutagenic nor carcinogenic. Several factors in the diet, such as pickled and salted foods and refined sugars, are suspected of being promoters. The dietary factor most clearly established as a promoter is dietary fat. For example, high-fat diets rich in linoleic acid (found in corn, safflower, and sunflower oils) act as promoters but similar diets rich in oleic acid (found in olive oil) do not act as promoters. *Var sp* promotor. *Aka* tumor promoter. *See also* antipromoter.

promoter-down mutation *See* promoter mutation.

promoter gene PROMOTER (1).

promoter mutation One of three types of mutations involving the promoter region of DNA: (a) a mutation that decreases the efficiency of the initiation of transcription or inactivates a promoter and prevents mRNA synthesis (promoter-down mutation); (b) a mutation that increases the efficiency of the initiation of transcription or increases the binding of RNA polymerase to the promoter (promoter-up mutation); (c) a mutation that creates a new promoter sequence where one did not exist before.

promoter strength The relative rate of synthesis of the full length RNA product from a given promoter; can also be expressed in terms of transcription initiation frequency (for example, 10 strands/min, once/generation).

promoter-up mutation *See* promoter mutation.

promotion The second stage in a two-stage or multistage mechanism of carcinogenesis, and the stage during which a precancerous cell is converted to a dependent cancer cell through the action of a promoter. Promotion causes transformed cells to proliferate and form a tumor. The promoting agent must be applied continuously; if it is removed, its effects are reversible. *See also* promoter (2).

promotor Variant spelling of promoter.

pronase A nonspecific proteolytic enzyme isolated from *Streptomyces griseus*.

pronucleus The haploid nucleus of a gamete.

proofreading Any mechanism that allows for the correction of errors in the process of replication, transcription, or translation; involves removal of an incorrectly incorporated unit (nucleotide or amino acid) in the growing polymer and its replacement by the correct

unit. *Aka* editing. *See also* proofreading function; kinetic proofreading; ribosome editing; double sieve mechanism.

proofreading function The 3' → 5' exonuclease activity of DNA polymerase. The catalytic site for this activity is believed to be separate from, but close to, the polymerization center on the enzyme molecule. The 3' → 5' exonuclease activity removes a mismatched nucleotide from the 3'-end of the growing strand; it thus moves in an opposite direction to that of the polymerase activity. It functions to ensure fidelity (lack of errors) in DNA replication and is found associated with DNA polymerases I, II and III. *Aka* editing function.

proopiocortin PROOPIOMELANOCORTIN.

proopiomelanocortin A large precursor molecule that is differentially processed in a tissue-specific manner to yield multiple active peptides such as corticotropin, β-lipotropin, and neuropeptides. *Abbr* POMC.

prooxidant A substance that accelerates an autoxidation reaction.

propagation ELONGATION.

propagation of errors The carryover of an error from one experiment, measurement, or observation to another; the cumulative effect of an error is frequently much larger than the initial error.

propagule Any disseminative or reproductive particle; gametes, spores, or mycelial fragments are examples.

propeptides 1. Large peptides, of the order of 100 amino acids, that occur at the N- and C-terminals of the tropocollagen molecule. 2. The peptides subsequently removed from a proprotein in its conversion to an active protein.

properdin A normal serum globulin that plays a key role in the activation of complement (complement fixation) via the alternative pathway. A number of other factors, including magnesium ions, are required for this process. *See also* complement.

properdin pathway The alternative pathway of complement fixation. *See* complement.

prophage The stable, inherited, noninfectious, provirus form of a temperate phage in which the phage DNA has become incorporated into, and replicates with, the host bacterial DNA. The term also refers to the plasmid phage DNA for those cases in which the phage DNA does not become integrated into the host DNA.

prophage attachment sites 1. The base sequences in the bacterial chromosome at which the phage DNA can become integrated to form a prophage. 2. The base sequences in the phage DNA that attach to the bacterial

chromosome during phage DNA integration.

3. The two base sequences flanking the integrated prophage in the bacterial chromosome.

prophage excision See excision (2).

prophage induction See induction (2).

prophage integration See integration (c).

prophage map The genetic map of a phage as determined from recombination studies between prophages.

prophage-mediated conversion See conversion.

prophase The first stage in mitosis during which the nuclear membrane breaks down.

propinquity effect PROXIMITY EFFECT.

propionate rule A rule that accounts for the number of methyl side chains in the aglycone portion of macrolide antibiotics which are produced by bacteria of the genus *Streptomyces*. The rule states that propionate may replace acetate in the building of the carbon skeleton of the antibiotic, and that one methyl side chain occurs every time that a propionate unit is incorporated.

propionibacteria See propionic fermentation.

propionic acidemia A genetically inherited metabolic defect in humans, characterized by massive ketosis, that is due to a deficiency of the enzyme propionyl CoA carboxylase.

propionic fermentation The fermentation of glucose, and generally also of lactic acid, that yields propionic acid and other products and that is characteristic of propionic acid bacteria (propionibacteria).

proplastid A colorless, and largely structureless, precursor of a plastid that reproduces by division.

proportional counter A radiation counter designed for operation in the proportional region.

proportional region That portion of the characteristic curve of an ionization chamber in which, during gas amplification, the chamber yields a charge that is proportional to the initial charge produced by the radiation.

proprotein An inactive precursor of a protein that is converted to the active form by removal of a peptide fragment; procarboxypeptidase and proinsulin are two examples. See also preproprotein.

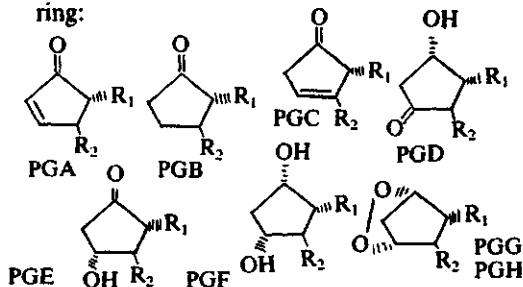
prosome A ribonucleoprotein associated with repressed messenger ribonucleoproteins (mRNP) and believed to be involved in post-transcriptional cytoplasmic repression of mRNA translation.

ProSPCA Precursor of serum prothrombin conversion accelerator.

prostacyclin A compound derived from arachidonic acid and related to the prostaglandins. It contains a second 5-membered ring and is an inhibitor of platelet aggregation and a powerful vasodilator. These effects are oppo-

site those produced by thromboxanes. *Sym* PGI₂. *Aka* prostaglandin I₂.

prostaglandins A group of biologically active lipids that are derived from arachidonic acid and that are named by reference to a hypothetical compound, called prostanoic acid. Prostaglandins were first found in the prostate gland but are now known to occur in most, if not all, mammalian tissues. Prostaglandin effects appear to be hormonal in nature and include lowering of blood pressure, stimulating smooth muscle contraction, and the regulation of inflammatory reactions, blood coagulation, and the immune response. Prostaglandins are divided into groups, based on the structure of the substituted 5-membered ring:



prostanoic acid A hypothetical, 20-carbon fatty acid, that contains a 5-membered ring and that is considered to be the parent compound for naming the prostaglandins, prostacyclins, and thromboxanes.

prostanoids Collective term for the compounds derived from the hypothetical fatty acid, prostanoic acid; includes prostaglandins, prostacyclins, and thromboxanes. See also eicosanoids.

prosthetic group The cofactor of an enzyme or the nonprotein portion of a conjugated protein that is bound so tightly to either the enzyme or the protein that it cannot be removed by dialysis.

protamine A small, simple, and globular protein that is virtually devoid of sulfur but contains large amounts of arginine. Protamines are basic proteins that have a molecular weight of about 5000 and that are found in association with nucleic acids, primarily in sperm cells of fish.

protamine zinc insulin The zinc salt of a protamine-insulin complex which is less soluble than insulin. *Abbr* PZI. See also NPH insulin.

protean An insoluble, primary derived protein that is obtained by treatment of a protein with heat, acid, enzymes, or other agents.

protease PROTEOLYTIC ENZYME.

protease nexin One of a group of proteins, secreted by cultured normal human fibroblasts, that selectively form covalent linkages with certain serine proteases and thus modulate

their activities. *Abbr* PN.

protecting group A chemical group that is reacted with, and bound to, a functional group in a molecule to prevent the functional group from participating in subsequent reactions of the molecule.

protective antigen An antigen that is derived from a pathogenic microorganism and that, when injected into an animal, will produce an immune response that will provide protection for the animal against infection by that microorganism.

protective colloid A colloid that is added to a food to prevent the separation of components in that food.

protective immunity Immunity that is produced in an organism to protect the latter against possible exposure to a pathogen or other harmful agent.

proteid Obsolete term for either protein or conjugated protein.

protein A high molecular weight polypeptide of L-amino acids that is synthesized by living cells. Proteins are biopolymers with a wide range of molecular weights, structural complexity, and functional properties. Proteins are variously classified on the basis of their (a) solubility (albumins, globulins, scleroproteins, etc.); (b) function (transport proteins, storage proteins, contractile proteins, enzymes, hormones, antibodies, etc.); (c) shape (globular proteins and fibrous proteins); (d) composition (simple proteins, conjugated proteins, and derived proteins).

protein A A cell wall protein of some strains of *Staphylococcus aureus* that combines with most human immunoglobulin molecules of the IgG type.

proteinaceous Consisting in part, or entirely, of protein.

proteinase 1. PROTEOLYTIC ENZYME. 2. A protease that shows specificity for intact (native) proteins.

protein biosynthesis See protein synthesis.

protein blotting A method for identifying and characterizing proteins in complex mixtures. Involves separating the protein mixture into its components by some gel electrophoretic technique, most commonly by SDS-PAGE. After electrophoresis, the proteins are eluted from the gel by a second electrophoresis, diffusion, or convection, and are adsorbed onto an immobilized matrix (nitrocellulose membrane filters, nylon-based membranes, diazotized paper, etc.) such that the original electrophoretic separation pattern is maintained. The immobilizing matrix, or blot, is reacted with an appropriate probe (antibody, lectin, etc.) so that the protein of interest can be detected.

protein-bound iodine The iodine in the blood that is conjugated to protein and that is a measure of the concentration of circulating thyroid hormone. *Abbr* PBI.

protein C FACTOR XIV. See also C-protein.

protein-calorie malnutrition The combined deficiency of both calories and proteins as it occurs during famine; a combination of the conditions of marasmus and kwashiorkor.

protein coat The protein shell that surrounds the nucleic acid of a virus. See also capsid.

protein conformation See chain conformation; primary structure; secondary structure; tertiary structure; quaternary structure; super secondary structure; domain.

protein domain See domain.

protein efficiency ratio A measure of the nutritive value of a protein defined as the gain in weight (in grams) per gram of protein consumed; eggs are considered to have a maximum protein efficiency ratio of about 4.4.

protein efficiency ratio method A method for determining the nutritive value of a protein by measuring the gain in weight of young rats that are fed a diet containing 10% of the particular protein. *Abbr* PER method.

protein engineering The design and construction of new proteins or enzymes, which have novel properties, by the methods of recombinant DNA technology.

protein error The change in the relative amounts of the undissociated and dissociated forms of an indicator that is brought about by the binding of one of these forms to a protein. The change in the relative amounts of indicator forms leads to a change in color; such a color change forms the basis of the albusix test.

protein evolution The molecular evolution of proteins. See also chemical evolution.

protein export The transport of a protein out of a cell; the secretion of an extracellular protein.

protein factor The factor 6.25 that, when multiplied by the weight of nitrogen (in grams) derived from a sample containing protein, gives the approximate weight (in grams) of the protein in the sample.

protein folding The processes involved in the conversion of an ensemble of newly synthesized (or denatured) polypeptide chain conformations to the unique, three-dimensional conformation of the native protein.

protein fractionation The separation of a mixture of different proteins for the purpose of isolating one particular type of protein; requires the use of one or more physical-chemical techniques such as precipitation, chromatography, centrifugation, or electrophoresis.

protein-free filtrate A liquid, such as plasma or serum, from which protein has been removed by precipitation and filtration.

protein import The transport of a protein within a cell; the movement of a protein, assembled on the ribosomes in the cytoplasm, to some other intracellular compartment.

protein index The polarographic wave height, expressed in terms of current density, for a plasma filtrate divided by that for a plasma digest. The plasma filtrate is obtained by treating plasma with sulfosalicylic acid; the plasma digest is obtained by treating plasma with potassium hydroxide.

protein kinase An enzyme that catalyzes the phosphorylation of a protein; a kinase acting on a protein.

protein machine 1. MULTIENZYME SYSTEM. 2. METABOLON (2).

protein modification See processing (2).

proteinoid A protein-like polymer formed by thermal polymerization of amino acids in the dry state.

proteinosis The accumulation, in a tissue, of excessive amounts of normal proteins or of abnormal proteins.

protein overloading IMMUNOLOGICAL UNRESPONSIVENESS (2).

proteinopolysaccharide MUCOPROTEIN.

protein processing See processing (2).

protein release factor See release factor.

protein score See chemical score.

protein sequencer See sequenator.

protein sequencing See overlap method; sequenator.

protein-sparing action The decrease in protein catabolism that is produced by the intake of dietary carbohydrates or lipids.

protein structure See chain conformation; primary structure; secondary structure; tertiary structure; quaternary structure; super secondary structure; domain.

protein synthesis The process whereby proteins are synthesized on ribosomes according to the genetic information contained within mRNA. It is synonymous with protein biosynthesis and includes amino acid activation and the three stages of translation: chain initiation, chain elongation, and chain termination. The amino acids are brought to the ribosome in the form of aminoacyl-tRNA molecules and are then polymerized on the ribosome. The ribosome moves along the mRNA molecule and the amino acids are polymerized in the order dictated by the codons in the mRNA. See also translation; amino acid activation; initiation; elongation; termination.

protein synthesis factor See initiation factor; elongation factor; termination factor.

protein-synthesizing system CELL-FREE AMINO

ACID INCORPORATING SYSTEM.

protein turnover See turnover (2).

proteinuria The presence of protein in the urine.

protein value BIOLOGICAL VALUE.

proteo- Combining form meaning protein.

proteoglycan A high molecular weight substance that contains large amounts (95% or more) of heteropolysaccharide side chains linked covalently to a polypeptide chain backbone. Proteoglycans are polyanionic compounds that have properties that resemble those of polysaccharides more than those of proteins. They form the ground substance in the extracellular matrix of connective tissue and serve as lubricants and support elements. The carbohydrate portion of the proteoglycans was formerly called mucopolysaccharide but is now referred to as glycosaminoglycan. See also glycoprotein.

proteoglycan aggregates The proteoglycan fraction extracted from cartilage. It can be fractionated into hyaluronic acid, disaggregated proteoglycans (proteoglycan subunits), and low molecular weight proteins, known as link proteins. The latter serve to connect the proteoglycan subunits to a long molecule of hyaluronic acid. The polypeptide backbone of each proteoglycan subunit is known as core protein.

proteoglycan subunits See proteoglycan aggregates.

proteohormone A hormone that is a protein.

proteolipid 1. A conjugated protein that contains a lipid component and that is soluble in some nonpolar solvents but is insoluble in aqueous solutions. See also lipoprotein. 2. A hydrophobic protein that may or may not contain a lipid component but that is soluble in some nonpolar solvents. Such proteins have a high content of hydrophobic amino acids, many of which are clustered at the surface of the protein. Some integral membrane proteins are proteolipids and interact strongly with the hydrocarbon core of the membrane bilayer.

proteoliposome An artificial organelle, constructed by combining phospholipids with specialized proteins and enzymes to form a functional vesicle.

proteolysis The hydrolysis of proteins, particularly that due to the action of proteolytic enzymes.

proteolytic Of, or pertaining to, proteolysis.

proteolytic coefficient A measure of peptidase activity that is equal to the unimolecular rate constant of the reaction catalyzed by a peptidase, divided by the peptidase concentration.

proteolytic enzyme An enzyme that catalyzes the hydrolysis of peptide bonds.

proteolytic quotient The ratio of two proteoly-

tic coefficients that are determined with one enzyme and two different substrates.

protease A partially hydrolyzed protein that is water soluble and precipitable with ammonium sulfate; an intermediate form between a protein and a peptone.

proteosomes Hydrophobic, membranous, multimolecular preparations of meningococcal outer membrane proteins that are also B cell mitogens and that are believed to serve as carrier proteins and as adjuvants to enhance peptide immunogenicity.

Proterozoic era The more recent of the two subdivisions of the Precambrian era that extended over about one billion years and ended about 600 million years ago; an era during which primitive invertebrates and algae evolved.

prothoracicotropic hormone A polypeptide hormone, produced by neurosecretory cells in the brain of insects, that stimulates the synthesis and secretion of ecdysone by the prothoracic gland. *Abbr* PTTH. *Aka* brain hormone.

prothrombin The inactive precursor of thrombin that is converted to thrombin by the action of accelerin.

prothrombin derivatives theory A theory of blood clotting according to which different factors, similar to those of the cascade mechanism, participate in the clotting reactions but are not present as such in the blood; the factors are newly made molecules, derived from prothrombin during the process of clot formation.

prothrombin factor Vitamin K₁.

prothrombokinase FACTOR X.

proti-, proto Proposed prefixes for the ¹H isotope. Proposed prefixes for the mixture of hydrogen isotopes that occur in nature are hydri- and hydro-. Thus, the term proton would mean the ¹H⁺ exclusively and not the H⁺ in natural abundance; the latter would be called hydron. Likewise, the transfer of H⁺ to a substrate would be called a hydronation reaction and not a protonation reaction.

proticity The flow of protons from a region of high protic potential (high [H⁺]) to one of low protic potential (low [H⁺]).

protic solvent 1. PROTOPHILIC SOLVENT. 2. PROTOGENIC SOLVENT.

protist 1. A unicellular or multicellular organism that lacks the tissue differentiation and the elaborate organization that is characteristic of plants and animals; some protists are plant-like, some are animal-like, and some have properties common to both kingdoms. The taxon protist includes algae, fungi, and protozoa (all of which are eukaryotic protists) and bacteria, blue-green algae, and prochlorophyta (all of which are prokaryotic protists).

2. Any unicellular organism.

protium The ordinary isotope of hydrogen that contains one proton and no neutrons in the nucleus. *Sym* H.

protoalkaloids The biogenic amines, so called because they can be precursors of alkaloids.

protobiochemistry The developments in the science of biochemistry that preceded the foundation of modern chemistry by Lavoisier and Dalton.

protobiont A primitive forerunner of a living organism.

protocell A primitive forerunner of a living cell.

protocollagen An experimentally produced form of procollagen that is deficient in hydroxyproline and hydroxylysine.

protoenzyme A primitive forerunner of an enzyme.

protofibril 1. MYOFILAMENT. 2. A small bundle of fibrous proteins such as a two-stranded fibrin molecule or a three-stranded keratin molecule.

protofilament See microtubules.

protogen LIPOIC ACID.

protogene A gene for a primitive protein such as the gene for a protoenzyme.

protogenic solvent An aqueous or nonaqueous, acidic solvent that has the capacity of donating protons to a solute; a hydroxylic solvent such as water, ethanol, or acetic acid.

protoheme HEME (2).

protolysis A reaction in which there is a transfer of a proton from an acid to a base; an acid-base reaction; the Bronsted concept of neutralization.

protolyte 1. ACID. 2. BASE.

protolytic Of, or pertaining to, protolysis.

protomer 1. The individual polypeptide chain in an oligomeric protein, such as the alpha or beta chain in hemoglobin. 2. One of the identical subunits, or monomers, of an allosteric enzyme, each of which has a catalytic site. 3. The basic building block of the capsomere of a virus. See also subunit; monomer.

proton An elementary particle of the atomic nucleus that has a charge of +1 and a mass of 1.0073 amu; identical to the nucleus of the hydrogen atom. *Sym* p.

proton abstraction The removal of a proton from a compound.

proton affinity A mass spectrometric term; the proton affinity of a molecule M is defined as the negative of the enthalpy change for the protonation reaction $M + H^+ \rightleftharpoons MH^+$. *Abbr* PA.

protonate To add protons to a group of atoms or to a compound, as in the conversion of an $-NH_2$ group to an $-NH_3^+$ group.

proton gradient The change in hydrogen ion

concentration with distance, particularly that across a biological membrane. The formation of an energy-rich proton gradient across the mitochondrial membrane constitutes a postulate of the chemiosmotic coupling hypothesis.

protonic acid BRONSTED ACID.

proton magnetic resonance *See* nuclear magnetic resonance.

proton motive force The total electrochemical potential arising from an energy-rich gradient of protons; equal to the sum of the free energy changes due to the proton concentration gradient and due to the difference in electrical potential. *Abbr* PMF.

proton-motive hypothesis CHEMIOSMOTIC COUPLING HYPOTHESIS.

proton noise-decoupled mode A method of operating ^{13}C nuclear magnetic resonance instruments such that a single sharp resonance line is obtained for each unique (nonequivalent) kind of carbon atom present in the molecule being examined.

protonometry The determination of changes in proton concentration by measurements of the changes in the potential of a glass electrode.

protonophore A lipid-soluble compound that conducts protons across a membrane; a compound functioning like an ionophore for protons.

proton pump The structure and/or the mechanism that mediates the active transport of hydrogen ions across the inner mitochondrial membrane according to the chemiosmotic coupling hypothesis of oxidative phosphorylation.

proton pumping ATPase F_0F_1 -ATPase.

proton transfer potential The free energy change per mole for the reaction $\text{HA} + \text{H}_2\text{O} \rightleftharpoons \text{A}^- + \text{H}_3\text{O}^+$.

proton translocating ATP synthase F_0F_1 -ATPase.

proton translocation TRANSPROTONATION.

protooncogene A cellular gene that is a homologue of a retroviral oncogene and that controls the normal proliferation, and possibly also the differentiation, of cells. Protooncogenes can be converted to oncogenes (become activated) as a result of mutation or recombination with a viral genome. *See also* oncogene.

protoorganism The most recent common ancestor of all living things.

protopectin An insoluble form of pectin that occurs as the ground substance in the cell wall of plants; consists of pectin chains, linked covalently and noncovalently.

protophilic solvent A nonaqueous, basic solvent that has the capacity of accepting protons from a solute.

protophytolysosome A vesicle, derived from

the Golgi apparatus, that is rich in acid phosphatase and that is believed to function in the transport of acid phosphatase to intracellular sites.

protoplanet A body of matter considered to have been a forerunner of the planets.

protoplasm The living matter that forms the basis of animal, plant, and microbial cells; the substance of the cell that is surrounded by the cell membrane; the cytoplasm and the nucleus or the nuclear zone.

protoplast A bacterial cell that has been freed entirely of its cell wall. Protoplasts are prepared artificially by lysozyme digestion of gram-positive bacteria; they can survive only in hypertonic media and generally cannot multiply. *See also* spheroplast.

protoplast membrane CELL MEMBRANE.

protoporphyrin A genetically inherited metabolic defect in humans that is due to a deficiency of heme synthetase (ferrochelatase).

protoporphyrin The biochemically most important porphyrin derivative that occurs in hemoglobin in the form of protoporphyrin IX. *Abbr* PP.

prototroph 1. An organism or a cell that is capable of synthesizing all of its metabolites from inorganic compounds and a carbon source; it can grow on a minimal medium. 2. A microorganism that has no nutritional requirements over and above those of the wild-type strain from which it is derived.

prototropic group A group capable of losing a proton; an enol group that tautomerizes to a keto group is an example.

prototropism TAUTOMERISM.

prototropy TAUTOMERISM.

protozoan (*pl* protozoa) A unicellular animal organism; a nonphotosynthetic, eukaryotic protist.

protransglutaminase FACTOR XIII.

provirus 1. A virus that is integrated into the chromosome of a host cell and is transmitted in that form from one host cell generation to another without leading to the lysis of the host cells. *See also* prophage. 2. A double-stranded DNA segment in a eukaryotic chromosome, equivalent to the genome of an oncogenic RNA virus, that is replicated with the cellular DNA and transmitted from one generation to another without causing cell lysis.

provirus hypothesis A hypothesis of cancer according to which infection of a eukaryotic cell with an oncogenic RNA virus results in the transcription of the viral RNA by reverse transcriptase to form a provirus. The provirus then becomes integrated into the host DNA and is replicated with it. The cell is thereby transformed and contains the information necessary for synthesis of new viral particles and for maintenance of the transformed state.

See also oncogene theory.

provitamin A naturally occurring precursor of a vitamin that is transformed to the vitamin in the animal body; beta carotene of plants, for example, is a provitamin of vitamin A. See also previtamin.

provitamin A BETA CAROTENE.

provitamin A carotenoid A generic descriptor for all carotenoids that exhibit qualitatively the biological activity of beta carotene.

provitamin D A sterol such as ergosterol that is converted to vitamin D upon irradiation with ultraviolet light.

Prower factor STUART FACTOR.

proximal Close to a particular location or to a point of attachment.

proximal carcinogen That form of a carcinogen in which it participates in the first chemical reaction of a multistep induction mechanism of cancer.

proximate analysis Quantitative analysis, rationally interpreted. Thus, the proximate analysis of a living tissue may consist of determining water by the weight lost upon drying at 100–105°C, determining protein by multiplying the amount of Kjeldahl nitrogen by the conversion factor of 6.25, determining lipids by the weight lost upon extracting the dry matter with nonpolar solvents, and so on.

proximity effect The contribution to the catalytic activity of an enzyme that results from the reactants being brought closer together on the surface of the enzyme which leads to a great increase in the effective concentrations of the reactants. See also orientation effect.

prozone 1. The concentration range in some agglutination reactions in which an undiluted, or slightly diluted, cell suspension fails to lead to agglutination, while a more dilute cell suspension produces a normal agglutination reaction. 2. AUTOINTERFERENCE.

PrP Prion protein; the scrapie agent.

PRPP 5-Phosphoribosyl-1-pyrophosphate.

PS 1. Peptide synthetase. 2. Phosphatidylserine.

pseudoacrosome A transient structure, formed in spermatozoa, that resembles the acrosome but disappears during development.

pseudoalleles Closely linked genes that behave in the complementation test as if they were alleles but that can be separated by crossing over.

pseudocholinesterase CHOLINESTERASE.

pseudocyclic photophosphorylation A process that is similar to cyclic photophosphorylation but is dependent on the presence of oxygen; it leads to the reduction of an added hydrogen acceptor and the reoxidation of this acceptor by oxygen.

pseudofeedback inhibition Feedback inhibition that is caused by the analogue of a metabolite

which is produced by, or participates in, a biosynthetic reaction. The feedback inhibition produced by a nucleotide that is formed by the incorporation of a base analogue is an example.

pseudo-first-order kinetics The kinetics of a chemical reaction in which more than one reactant is involved but which behaves kinetically as if only one reactant were present. Thus, in enzyme studies, when the [substrate]/[enzyme] is large (≥ 100), one can assume that the reaction is a pseudo-first-order reaction so that the velocity is directly proportional to the substrate concentration.

pseudogene A sequence in DNA that is nearly homologous to that of a functional gene but is unable to produce a functional product. A pseudogene is considered to be derived from a once functional gene by one or more mutations which resulted in the inactivation of this gene. See also processed gene.

pseudoglobulin A globulin that is sparingly soluble in water.

pseudohemoglobin An artificially prepared hemoglobin-like molecule in which the globin molecules are combined with iron porphyrins other than protoporphyrin IX. See also hybridization (2).

pseudoisoenzyme One of two or more different forms of an enzyme that catalyze the same reaction but are not true isoenzymes since they do not have genetically determined different primary structures. Pseudoisoenzymes consist of in vivo or in vitro modified enzymes, or enzymes in varying stages of aggregation, and are identical to isozyme (1).

pseudomessenger RNA See premessenger RNA.

Pseudomonas A genus of gram-negative bacteria that are widespread in soil and water; some species are capable of nitrate respiration.

pseudonucleoprotein Obsolete designation for a phosphorus-containing protein that is not a nucleoprotein.

pseudophotoaffinity labeling See photoaffinity labeling.

pseudoreversion The restoration of biological activity, lost as a result of a mutation, by means of a second mutation of the mutated base which leads to the formation of a codon that differs from the normal codon of the wild-type organism but constitutes an acceptable missense codon.

pseudo-U loop See arm.

pseudounimolecular reaction A bimolecular reaction in which A reacts with B but B is present in great excess so that its concentration effectively does not change during the reaction; as a result, the velocity of the reaction appears to be proportional only to the concentration of A.

pseudouridine An unusual nucleoside, occurring in tRNA, in which the normal base uracil is linked to ribose through carbon atom 5 of the uracil. *Sym* ψ ; ψ U; ψ rd.

pseudouridylic acid The nucleotide formed from pseudouridine.

pseudoverification The deacylation of a correctly acylated, but noncognate, transfer RNA molecule by an aminoacyl-tRNA synthetase; can be brought about under special conditions in a mixed solvent.

pseudovirion An artificially prepared virus in which the DNA is derived from one virus and the protein coat from another virus.

pseudovitamin A compound, such as lipoic acid, that resembles a vitamin in its coenzyme function but does not constitute a dietary requirement.

psi The Greek letter ψ ; *See* pseudouridine.

psi angle (ψ) The torsion angle that denotes the rotation about the C $^{\alpha}$ -C $^{\beta}$ bond of the peptide backbone in proteins.

psicofuranine A nucleoside antibiotic, produced by *Streptomyces hygroscopicus*, that has antitumor activity; it inhibits the last step in guanosine monophosphate (GMP) biosynthesis.

psi factor A protein believed to be responsible for the initiation of rRNA synthesis in bacteria. *Sym* ψ .

psilocin *See* psilocybin.

psilocybin A naturally occurring hallucinogenic drug that is an indolealkylamine; 4-phosphoryloxy-*N,N*-dimethyltryptamine. Psilocybin, and the related compound psilocin (4-hydroxy-*N,N*-dimethyltryptamine) occur in the fruiting body of the Mexican hallucinogenic fungus teonanacatl (*Psilocybe mexicana*). Both compounds are naturally occurring hallucinogenic drugs.

P site 1. PEPTIDYL SITE. 2. A cell surface receptor site on rat mast cells for adenosine and related compounds. The site is involved in the immunological release of adenylyl cyclase and has an obligatory requirement for an intact purine ring. *See also* R site.

psoralen One of a group of photosensitive reagents that can cross-link base-paired regions in DNA.

PSP test Phenolsulfonphthalein test.

PSTV Potato spindle tuber viroid.

32 P suicide *See* suicide.

psychedelic drug HALLUCINOGENIC DRUG.

psycholeptic drug HALLUCINOGENIC DRUG.

psychosine A generic descriptor for 1-monoglycosylsphingoids; a glycosphingolipid containing one monosaccharide unit.

psychotomimetic drug HALLUCINOGENIC DRUG.

psychotropic agents Compounds that affect the human psyche; narcotic drugs and hallucinogenic drugs.

nogenic drugs.

psychrophile An organism that grows at low temperatures in the range of 0 to 25°C, and that has an optimum growth temperature in the range of 20 to 25°C.

psychrophilic Of, or pertaining to, psychrophiles; preferring low temperatures.

PTA Plasma thromboplastin antecedent.

PTC 1. Phenylthiocarbamyl group. 2. Plasma thromboplastin component.

PTC-amino acid Phenylthiocarbamyl amino acid.

pteridine A nitrogen-containing compound that consists of two fused, six-membered rings, and that is a structural component of biotin, folic acid, and riboflavin.

pterin One of a group of widely distributed derivatives of the parent compound, 2-amino-4-hydroxypteridine which is structurally similar to guanine.

pteroic acid A structural component of folic acid that consists of a pterin attached to *p*-aminobenzoic acid.

pteroylglutamic acid FOLIC ACID.

PTH 1. Parathyroid hormone. 2. Phenylthiohydantoin.

PTH-amino acid Phenylthiohydantoin amino acid.

ptomaine A group of toxic substances, specifically amines, that are formed by microbial decomposition of proteins.

PTS Phosphotransferase system.

PTTH Prothoracicotropic hormone.

ptyalin Salivary alpha amylase.

Pu Purine.

PU Pregnancy urine; the urine of pregnant individuals that is used as a source of hormones.

public antigen A blood group antigen that occurs in a great number of individuals.

puckered conformation The conformation of ribose or deoxyribose in which 4 of the 5 atoms of the furanose ring lie in a plane, while the fifth atom (C-2' or C-3') protrudes out of the plane. The sugar ring conformation is denoted as endo if the protruding atom lies above the ring (on the same side as C-5') and is denoted as exo if the protruding atom lies below the ring (on the opposite side of C-5').

PUFA Polyunsaturated fatty acids.

puff *See* chromosome puff.

pulmonary Of, or pertaining to, the lungs.

pulsatile flow A flow that occurs in pulses rather than at a continuous pressure; sometimes used for perfusion of organs to more closely resemble the type of flow produced by the heart.

pulsating ribosome A model for the ribosome during protein synthesis according to which the two ribosomal subunits move apart and come together repeatedly as the amino acids

are being polymerized.

pulse 1. A brief exposure to a radioactive isotope, as that used to label mRNA in bacterial cultures. 2. The amount of radioactive isotope used for the labeling of a substance by means of a brief exposure to the isotope. 3. The energy of the discharge in an ionization chamber. 4. The electric current produced by a discharge in an ionization chamber or by scintillations in a scintillation counter.

pulse-chase experiment An experiment in which a system is exposed very briefly to a radioactive substance and then to a large amount of the same, but unlabeled substance. *See also* pulse (1,2); chase; pulse-label experiment.

pulsed-field gel electrophoresis A gel electrophoretic method used for the separation of DNA molecules which can vary in size from several kilobase pairs to at least 4000 kbp. Involves changing the direction of the electric field repeatedly. This forces the molecules to change their direction of migration and to choose new pores in the gel. As a result both large and small DNA molecules can be made to move through the gel as a function of their size; small molecules migrate faster than larger ones. The technique eliminates the problem of reptation. *Abbr* PFG; PFGE. *See also* field inversion gel electrophoresis.

pulse discriminator *See* discriminator.

pulsed laser interferometry An optical technique that can be used in conjunction with the analytical ultracentrifuge, and in which intermittent laser illumination is used to produce interference patterns. *Abbr* PLI.

pulse height The intensity of the electric current produced in a scintillation counter.

pulse-height analyzer A device, consisting of two discriminators, that accepts pulses that have intensities that lie between the setting of the two discriminators. *See also* differential counting.

pulse-height shift method CHANNELS RATIO METHOD.

pulse-labeled RNA An RNA that is labeled by means of a brief exposure to a radioactive isotope and that is considered to represent largely, if not entirely, messenger RNA that has a short half-life.

pulse-label experiment An experiment in which a system is exposed very briefly to a radioactive isotope and then subjected to analysis. *See also* pulse-chase experiment; pulse (1,2).

pump The structure and/or the mechanism that mediates the primary active transport of a given substance across a biological membrane. *See also* active transport.

punctuation The elements of the genetic code that serve as initiation and termination signals

of the messages, and that do not code for amino acids.

Puo Purine nucleoside.

Pur Purine.

pure Containing no contaminating material. *See also* purification; purity.

pure culture 1. A culture containing microorganisms from only one species. 2. A culture derived from a single cell.

pure line A strain of organisms that is homozygous as a result of continued inbreeding.

purging The replacement of one type of a gaseous environment by another; the flushing out of one atmosphere by another.

purification 1. The process whereby a preparation is freed of certain types of molecules to yield a sample that is enriched in, or consists solely of, molecules of a single type; the process whereby a specific enzyme, a nucleic acid, etc. is being isolated. 2. The ratio of the specific activity at a given step in the isolation of a substance divided by the specific activity at a reference step; applicable to the isolation of enzymes and other macromolecules, the activity of which can be measured. *See also* purity.

purified diet SYNTHETIC DIET.

purified parathyroid extract PARATHORMONE.

purified protein derivative A protein fraction obtained by ammonium sulfate precipitation of a culture of the tubercle bacillus, *Mycobacterium tuberculosis*, that had been grown in a synthetic medium. *Abbr* PPD.

purine 1. A basic, heterocyclic, nitrogen-containing compound that occurs in nucleic acids; common purines are adenine and guanine. *Abbr* Pu; Pur. *Aka* base; nitrogenous base. 2. The parent compound of adenine, guanine, and related compounds.

purine alkaloids The N-methylated xanthines: caffeine, theobromine, and theophylline.

purine antibiotics Structurally modified purines that have antibiotic activity; includes nucleosides, peptide-linked purines, and free bases.

purine cycle GLYCINE-ALLANTOIN CYCLE.

purine nucleotide cycle The group of reaction whereby AMP is deaminated to IMP and the latter is reaminated to form AMP.

purinergic nerves Motor neurons, innervating visceral organs of vertebrates, that use adenosine triphosphate (ATP) as a neurotransmitter.

purine salvage *See* salvage metabolic pathway.

purity 1. The state of a preparation in which all the molecules are those of a single type, as in a preparation containing only palmitic acid molecules. 2. The state of a preparation in which all the macromolecules are those of a single type, as in a preparation containing buf-

fer ions and small molecules, but containing ribonuclease molecules as the sole macromolecules. 3. The degree to which a preparation consists of macromolecules of a single type. *See also* purification.

puromycin An antibiotic, produced by *Streptomyces alboniger*, the structure of which resembles the terminal grouping of the amino acid joined to adenosine in an aminoacyl-tRNA molecule. Because of this structural similarity, puromycin acts as an analogue of aminoacyl transfer RNA and inhibits protein synthesis in both prokaryotes and eukaryotes by binding to the growing polypeptide chain and causing its premature release from the ribosome in the form of peptidyl puromycin. *Abbr* PM.

purple membrane A specialized section of the cell membrane of the halophile *Halobacterium halobium* that converts energy from visible light into stored energy by pumping protons across the membrane. The purple membrane consists of lipid and a single kind of protein, bacteriorhodopsin, which functions as a light-driven transmembrane proton pump. *See also* bacteriorhodopsin.

purple sulfur bacteria A family of photosynthetic bacteria that can oxidize elemental sulfur to sulfate.

putrefaction The formation of foul-smelling products by microbial decomposition of high-protein materials such as meat and eggs.

putrescine A low molecular weight polyamine (1,4-diaminobutane) that contains two amino groups; it is formed by decarboxylation of ornithine and is found predominantly in prokaryotes.

putrescine cycle A proposed set of reactions in animal cells that involves the synthesis of spermine and spermidine, their conversion to *N*-acetyl derivatives, and oxidation of the latter to putrescine or to spermidine and monoacetylpropionaldehyde.

p value Probability value.

p50 value A measure of the affinity of hemoglobin or myoglobin for oxygen; defined as the partial pressure of oxygen at which 50% of the sites on the protein are oxygenated.

PVC Polyvinylcarbonate; a plastic.

PVN Phosvitin.

Py Pyrimidine.

pycnometer A small glass vessel that has a definite volume and that is used for the weighing of different liquids to determine specific gravities and densities. *Var sp* pycnometer.

pynosis The shrinkage and condensation of the cell nucleus into a compact, densely staining structure that occurs when the cell dies.

pyocins Bacteriocins produced by strains of *Pseudomonas aeruginosa*.

Pyd Pyrimidine nucleoside.

pycnometer Variant spelling of pycnometer.

pyknosis Variant spelling of pynosis.

Pyr Pyrimidine.

pyran A heterocyclic compound, the structure of which resembles the ring structure of the pyranoses.

pyranose A monosaccharide having a six-membered ring structure.

pyranoside A glycoside of a pyranose.

pyrenoid A proteinaceous granule around which starch may accumulate in chromatophores.

pyrenoid starch Starch that accumulates around pyrenoids in chromatophores.

pyridine alkaloids A group of alkaloids containing the pyridine ring system; nicotiana alkaloids, such as nicotine, are an example. Pyridine alkaloids occur in plants and as metabolic products of microorganisms.

pyridine-linked dehydrogenase A dehydrogenase that requires a pyridine nucleotide, NAD^+ or $NADP^+$, as a coenzyme.

pyridine nucleotide Any one of the oxidized or reduced forms of nicotinamide adenine dinucleotide or nicotinamide adenine dinucleotide phosphate; $NAD^+(NADH)$ or $NADP^+(NADPH)$.

pyridine nucleotide coenzymes The compounds NAD^+ and $NADP^+$, and their reduced forms. *Aka* pyridine coenzymes.

pyridine nucleotide cycle A salvage pathway in which nicotinamide, derived from the catabolism of NAD^+ , is reused for the biosynthesis of NAD^+ .

pyridoxal The aldehyde form of pyridoxine; a form of vitamin B_6 . *Abbr* PL.

pyridoxal phosphate The coenzyme form of vitamin B_6 that functions in the metabolism of amino acids, as in the transamination reaction. *Abbr* PLP; PAL; PALP.

pyridoxamine The amine form of pyridoxine; a form of vitamin B_6 . *Abbr* PM.

pyridoxine The alcohol form of vitamin B_6 . *Abbr* PN.

pyridoxol PYRIDOXINE.

pyrimidine 1. A basic, heterocyclic, nitrogen-containing compound that occurs in nucleic acids; common pyrimidines are cytosine, thymine, and uracil. *Abbr* Py; Pyr. *Aka* base; nitrogenous base. 2. The parent compound of cytosine, uracil, thymine, and related compounds.

pyrimidine analogue ANTIPYRIMIDINE.

pyrimidine antibiotics Structurally modified pyrimidines that have antibiotic activity; includes nucleosides, peptide-linked pyrimidines, and free bases.

pyrimidine dimer The dimer formed by the linking of two adjacent pyrimidines, such as

two thymines, in a nucleic acid strand as a result of ultraviolet irradiation.

pyrimidineless mutant *See* -less mutant.

pyrocondensation The condensation of molecules that is brought about by heat.

pyrogen Any fever-inducing substance.

pyroglutamic acid An internal lactam of glutamic acid formed by condensation of the α -amino group with the γ -carboxyl group; occurs in thyrotropin releasing hormone and in relaxin. *Aka* 5-oxoproline.

pyroglutamic aciduria OXOPROLINURIA.

pyrolysis The transformation of one substance into another that is brought about by heat alone; includes such processes as thermal decomposition, isomerization, and synthesis.

pyronin Y A basic dye used in cytochemistry for the staining of RNA.

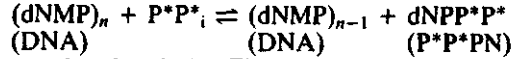
pyrophosphatase The enzyme that catalyzes the hydrolysis of inorganic pyrophosphate to two molecules of orthophosphate.

pyrophosphate *See* inorganic pyrophosphate.

pyrophosphate cleavage The hydrolytic removal of a pyrophosphate group from either a nucleoside diphosphate or a nucleoside triphosphate.

pyrophosphate exchange A reaction, catalyzed by DNA polymerase, in which a DNA strand is shortened by one nucleotide in the presence of inorganic pyrophosphate; the nucleotide is cleaved off as a nucleoside triphosphate. The reaction may be represented as shown below. It involves phosphodiester bond formation in one direction and pyrophosphorolysis in the

other direction. A similar reaction can also occur with RNA.



pyrophosphorolysis The reaction catalyzed by pyrophosphorylase.

pyrophosphorylase 1. The enzyme that catalyzes the formation of a nucleoside-5'-diphosphate sugar and pyrophosphate from a sugar-1-phosphate and a nucleoside-5'-triphosphate 2. A nucleotidyl transferase.

pyrrole A five-membered, heterocyclic, nitrogen-containing building block of porphyrins.

pyrrolidine alkaloids *See* alkaloids.

pyrrolizidine alkaloids *See* alkaloids.

pyrrolo quinoline quinone *See* quinoprotein.

pyruvate carboxylase The enzyme that catalyzes the anaplerotic reaction whereby pyruvic acid is carboxylated to oxaloacetic acid.

pyruvate dehydrogenase complex A multienzyme system, consisting of a large number of three different enzymes and five different coenzymes, that catalyzes the conversion of pyruvic acid to acetyl coenzyme A. *Abbr* PDH. *Aka* pyruvate dehydrogenase system.

pyruvate kinase The enzyme that catalyzes the phosphorylation of ADP to ATP by phosphoenolpyruvate.

pyruvate oxidation factor LIPOIC ACID.

pyruvic acid The three-carbon ketoacid that is the end product of glycolysis under aerobic conditions.

PZI Protamine zinc insulin.