

Q

- Q** 1. Ubiquinone. 2. Glutamine. 3. *Q* value. 4. Metabolic quotient. 5. Queuine. 6. Queuosine. 7. Coenzyme Q.
- Q₁₀** The ratio of the velocity of a reaction at a particular temperature to the velocity at a temperature that is lower by 10°C; the *Q*₁₀ is approximately 2 for chemical reactions.
- Qβ** See Q-beta.
- QAE-Sephadex** Quaternary aminoethyl Sephadex; diethyl-(2-hydroxypropyl) aminoethyl Sephadex, an anion exchanger. The ion exchanger contains the grouping $-\text{C}_2\text{H}_4\text{N}^+(\text{C}_2\text{H}_5)_2\text{CH}_2\text{CHOHCH}_3$ linked via ether bonds to the Sephadex.
- Q-beta** A small, tailless, icosahedral phage that contains single-stranded RNA and infects *E. coli*. *Abbr.* Qβ.
- Q-beta replicase** An RNA-dependent RNA polymerase of phage Qβ; a viral-encoded enzyme that is highly specific for the viral RNA. *Abbr.* Qβ replicase.
- QCD** Quantum chromodynamics.
- Q_{CO₂}** See metabolic quotient.
- Q cycle** Quinone cycle.
- Q-enzyme** The enzyme that catalyzes the formation of α(1 → 6) glycosidic bonds (branch linkages) in amylopectin.
- Q gas** A common gas mixture (1.3% isobutane in helium), used with Geiger-Mueller counters.
- QH₂** Reduced coenzyme Q; reduced ubiquinone.
- Q notation** A method used in the past to denote enzyme activity, especially that of respiratory enzymes. The *Q_s* value of an enzyme was taken to be the number of microliters, at standard temperature and pressure, of the substrate used up per hour per milligram of enzyme. For nongaseous substrates, 1 μmol of substrate was considered to be equivalent to 22.4 μL.
- Q_{O₂}** See metabolic quotient.
- quadri-** Combining form meaning four.
- quadrupole mass spectrometer** A nonmagnetic mass spectrometer which employs a combination of dc and radio frequency potentials as a mass filter; consists of four parallel rods, arranged symmetrically.
- Quaking mutation** An autosomal, recessive mutation in mice that produces a myelin-deficient animal.
- quantasome** The smallest structural unit of photosynthesis; a membrane-enclosed vesicle containing 230 chlorophyll molecules, cytochromes, copper, and iron. Quantasomes are particulate subunits of the thylakoid membrane in chloroplasts. *Var. sp.* quantosome.
- quantify** 1. QUANTITATE. 2. To transform a relation from a qualitative into a quantitative form.
- quantiles** A class of values of a statistical variable that divide the total frequency distribution of a population into a given number of equal proportions. Percentiles and deciles are two examples.
- quantitate** 1. To measure the quantity of an item. 2. To express a relation in quantitative terms.
- quantized** In the form of discrete units, or quanta; used in reference to energy.
- quantosome** Variant spelling of quantasome.
- quantum (pl. quanta)** The unit amount of energy that is released during the emission of radiation and that is taken up during the absorption of radiation; equal to $h\nu$, where h is Planck's constant, and ν is the frequency of the radiation in cycles per second.
- quantum chromodynamics** A modern field theory of the strong force of particle physics. See also elementary particles.
- quantum efficiency** QUANTUM YIELD.
- quantum flavordynamics** WEINBERG-SALAM THEORY.
- quantum mechanics** The description of atomic and molecular phenomena in terms of energy quanta and quantized energy states rather than in terms of classical Newtonian mechanics; achieved by Heisenberg by using matrices and linear operators, and achieved by Schrödinger by considering the wave aspects associated with subatomic particles. The Schrödinger approach was originally called wave mechanics, but the term is now used as a synonymous expression for quantum mechanics.
- quantum numbers** A set of four numbers that describe an electron in an atom. The principal quantum number is the number of the main energy level. The other three numbers are the angular momentum, magnetic, and spin quantum numbers.
- quantum requirement** The reciprocal of the quantum yield.
- quantum theory** The theory that energy can be radiated and absorbed only in discrete packets, called quanta, the energy of which is

proportional to the frequency of the radiation.

quantum yield The number of molecules that react chemically in a photochemical reaction, divided by the number of photons absorbed; the number of moles that react chemically in a photochemical reaction, divided by the number of einsteins absorbed.

quark See elementary particles.

quartet A quadruple peak, such as a nuclear magnetic resonance peak that has split into four peaks.

quartile A set of quantiles; specifically, the quartiles Q_1 , Q_2 , and Q_3 are values at or below which lie, respectively, the lowest 25%, 50% and 75% of a set of data.

quartz A glassy silicon dioxide that is used for the production of cuvettes that are utilized in absorbance measurements of ultraviolet light.

quasar Quasi-stellar radio source; a compact radio source with a star-like optical object; a "radio star."

quat Quaternary ammonium compound; one of a group of cationic detergents used as anti-septics and disinfectants. The compound cetyltrimethylammonium bromide (CTAB, cetavlon) is an example.

quaternary ammonium compound See quat.

quaternary nitrogen A positively charged nitrogen atom that is linked to other atoms or groups by means of four covalent bonds.

quaternary structure The structure of a protein that results from the interaction between individual polypeptide chains to yield larger aggregates; the arrangement in space of the subunits of a protein and the intersubunit contacts and interactions without regard to the internal structure of the subunits.

que Queuine.

queen substance Originally a term for the entire mandibular gland secretion of the queen bee which contains about 30 different substances; now a trivial name for the compound 9-oxo-*trans*-2-decenoic acid which serves as a pheromone for maintaining the division of labor in the beehive.

Quellung reaction The precipitin reaction that occurs between polysaccharides of bacterial capsules and antibodies to these polysaccharides; it results in an apparent swelling of the capsule.

quench correction curve A plot of counting efficiency versus the ratio of counts in two channels; used to correct the observed counts in liquid scintillation for quenching.

quenching 1. The process whereby secondary and subsequent ionizations in an ionization detector are stopped so that the detector becomes again sensitive to new, incoming ionizing radiation. 2. A decrease in the counting efficiency in liquid scintillation. 3. The de-

crease in fluorescence that results from an absorption of some or all of the emission energy. See also fluorescence quenching.

quetelet index A measure of obesity defined as the weight in kilograms divided by the square of the height in meters.

queuine A modified guanine found in tRNA. It differs from other modified (minor, rare) bases in that it is synthesized first as a base and then incorporated into mature tRNA by an enzyme-catalyzed exchange reaction in which guanine is removed from the tRNA and replaced by queuine. *Abbr* Q.

queuosine The ribonucleoside of queuine. *Abbr* Q; Quo.

quick-stop mutant A mutant of *E. coli* that immediately stops replication when the temperature is raised to 42°C.

quinacrine An acridine dye derivative that is a fluorochrome and that is used in the treatment of malaria and cancer.

quinary structure The group of macromolecular interactions between proteins that are transient in vivo.

quinine An alkaloid drug used in the treatment of malaria; a cinchona alkaloid.

quinoline alkaloids A group of alkaloids that contain the quinoline structure. They include the cinchona alkaloids, derived from the bark of tropical trees, especially *Cinchona succiruba*. The main alkaloid of the bark of *Cinchona* is quinine, a drug used for the treatment of malaria.

quinolizidine alkaloids See alkaloids.

quinone *p*-Dioxybenzene or a derivative of *p*-dioxybenzene. A particular quinone (coenzyme Q) serves as an electron carrier in the electron transport system.

quinone cycle A postulated mechanism for proton translocation according to the chemiosmotic coupling hypothesis; involves respiratory complex III and the participation of a semi-quinone radical. A cyclic set of reactions in which coenzyme Q undergoes a two-stage reduction with the semiquinone as a stable intermediate.

quinoprotein One of a group of dehydrogenases that have the complex organic compound pyrrolo quinoline quinone (PQQ; methoxatin; 4,5-dihydro-4,5-dioxo-1*H*-pyrrolo-[2,3*f*]chinoxaline-2,7,9-tricarboxylic acid) as a prosthetic group. The latter serves as a coenzyme for the dehydrogenases that occur in methylotrophic and other types of bacteria.

quo Queuosine.

Q value The total energy per atom that is released in a nuclear reaction in which a nuclide is transformed into another, and ground-state, nuclide.

R

- r** 1. Ribo-, as in ribothymidine monophosphate (rTMP). 2. Ribosomal, as in ribosomal RNA (rRNA). 3. Roentgen 4. Correlation coefficient. 5. A rapid lysis mutant.
- R** 1. R group. 2. Gas constant. 3. R configuration. 4. Purine nucleoside. 5. Arginine. 6. Bacterial colony of rough morphology. 7. Resistance of a bacterial strain to an inhibitor or a phage. 8. Relaxed conformational form of an allosteric enzyme. 9. Roentgen. 10. A drug-resistant plasmid. 11. *See* RS system.
- Ra** Radium.
- rabbit aorta contracting substance** A substance, originally detected in the effluent from the lungs of anaphylactic guinea pigs, that is now known to consist primarily of a powerful vasoconstrictive thromboxane (TXA₂). *Abbr* RCS.
- Rabin model** A model, proposed by B.R. Rabin, according to which cooperative interactions can be ascribed to kinetic considerations. Specifically, the model applies to a single substrate enzyme reaction in which the enzyme can exist in two different conformational states, both of which can combine with the substrate.
- racemase** An enzyme that catalyzes the interconversion between two optical isomers, each of which has more than one asymmetric center. *See also* epimerase.
- racemate** RACEMIC MIXTURE.
- racemic mixture** An equimolar and optically inactive mixture of the two enantiomers of an optically active compound.
- racemization** The conversion of an optically active compound to a racemic mixture.
- rachitic** Of, or pertaining to, rickets.
- rachitis** RICKETS.
- Racker band** An absorption band that is produced by the binding of NAD⁺ to a dehydrogenase and that is thought to be due to the formation of a charge transfer complex.
- rack mechanism** Originally, a version of enzyme catalysis according to which the enzyme literally tore its substrate apart by a rack mechanism. The term is now used in conjunction with the modern strain theory of catalysis. According to the latter, when the substrate binds to the enzyme, certain bonds in the substrate are distorted, resulting in an activated transition state.
- rad** Radiation absorbed dose.
- radial chromatography** CIRCULAR CHROMATOGRAPHY.
- radial dilution** The dilution of sedimenting components that is produced in the analytical ultracentrifuge due to the sectorial shape of the centrifuge cell and to the variation of the centrifugal force with distance from the center of rotation. *Aka* square dilution law.
- radian** The angle subtended by an arc that is equal in length to the radius of the circle.
- radiation** 1. The emission and propagation of waves of electromagnetic energy such as visible light, x rays, or gamma rays. 2. The emission and propagation of corpuscles such as alpha particles, beta particles, or electrons.
- radiation absorbed dose** The quantity of ionizing radiation that results in the absorption of 100 erg/g of irradiated material. *Abbr* rad. *See also* exposure dose.
- radiation biochemistry** An area of biochemistry that deals with the effects of radiation on biochemical compounds and biochemical systems.
- radiation chimera** A chimera produced experimentally by first irradiating an organism so as to destroy its antibody-producing cells, and then injecting it with antibody-producing cells from a different organism.
- radiation curing** *See* curing.
- radiation dose** The amount of radiation to which a specified tissue area or an entire organism is exposed.
- radiationless transition** A transition, involving an excited atom or molecule, in which no visible or ultraviolet radiation is emitted.
- radiation sickness** A pathological condition that results from exposure to x rays or other ionizing radiations; characterized in its mild form by nausea, vomiting, and weakness, and in its severe form by damage to blood-forming tissues and by loss of red and white blood cells.
- radical** A univalent group of atoms that acts as a unit in chemical reactions. *See also* carbon radical; free radical.
- radical amino acid replacement** RADICAL SUBSTITUTION.
- radical anion** An anion that is also a free radical.
- radical cation** A cation that is also a free radical.
- radical ion** An ion that is also a free radical.

radical scavenger A chemical compound that reacts readily with free radicals and that, when added to a biological system, provides protection against the indirect effects of radiation.

radical substitution The replacement in a protein of one amino acid by another, chemically different, amino acid such as the replacement of a polar amino acid by a nonpolar one or vice versa. A radical substitution is generally expected to lead to significant changes in the properties of the protein. *See also* conservative substitution.

radio- 1. Combining form meaning radiation. 2. Combining form meaning radioactive radiation.

radioactivation analysis ACTIVATION ANALYSIS.

radioactive antibody test A test that permits the identification of a bacterial colony that secretes a specific protein; involves pressing a plate, containing antibodies to the protein, onto bacterial colonies spread on an agar surface. If the protein is present, it will bind to the antibodies and stick to the plate. The latter is then placed in a solution containing labeled antibodies which will bind to the given protein and can then be located by autoradiography. *See also* colony hybridization.

radioactive contamination The deposition of radioactive material in preparations and/or in places where it was not intended to be deposited.

radioactive decay The changes occurring in the nucleus of a radioactive atom that lead to transformation of the nucleus into a different one and to the emission of ionizing radiation.

radioactive disintegration RADIOACTIVE DECAY.

radioactive half-life *See* half-life (1).

radioactive isotope An unstable isotope that undergoes radioactive decay.

radioactive radiation The electromagnetic or the corpuscular radiation emitted by radioactive isotopes.

radioactive series A succession of radioactive nuclides, each one decaying to the next by radioactive disintegration until a stable nuclide is formed.

radioactive suicide *See* suicide.

radioactive tracer *See* tracer (1).

radioactivity The spontaneous disintegration of certain unstable nuclides that is caused by changes in the atomic nucleus and that results in a transformation of the nucleus into a different one and in the emission of one or more types of ionizing radiation, such as alpha particles, beta particles, or gamma rays.

radioassay An assay in which radioactive isotopes are employed.

radioautograph *See* autoradiograph.

radioautographic efficiency *See* autoradiographic efficiency.

radioautography *See* autoradiography.

radiobiology A branch of biology that deals with the effects of radiation on biological systems.

radiocarbon dating A method for establishing the age of archeological, geological, or biological remains by determining the relative amounts of ^{12}C and ^{14}C in the specimen and by calculating its age from the known natural abundance and the known half-life of ^{14}C .

radiochemical 1. *n* A chemical that is labeled with a radioactive isotope. 2. *adj* Of, or pertaining to, radiochemistry.

radiochemical purity The degree of contamination of a radioactively labeled compound with other radioactive substances.

radiochemistry A branch of chemistry that deals with the chemistry of radioactive isotopes and their compounds, and with the applications of radioactive isotopes in other areas of chemistry.

radiochromatogram A chromatogram that contains substances labeled with radioactive isotopes.

radiochromatography Any chromatographic technique in which substances, labeled with radioactive isotopes, are separated.

radiocolloid An aggregate formed in solution by the clumping of molecules that contain radioactive isotopes.

radiodating The determination of the age of an object by measuring the extent of radioactive decay of a particular isotope contained within the object. *See also* radiocarbon dating.

radiogenic Produced by radioactivity, such as an element that is formed from another element by radioactive decay.

radiogram RADIOGRAPH.

radiograph The photographic record obtained in radiography.

radiography A photographic technique in which radiation other than light is passed through an object and a photograph is obtained that reflects the selective absorption of the radiation by various parts of the object.

radioimmunoassay The measurement of either antigen or antibody concentration that is based on the competitive inhibition of labeled antigens on the binding of unlabeled antigens, or vice versa, to specific antibodies. *Abbr* RIA. *Aka* displacement analysis; saturation analysis; competitive radioassay; competitive radioligand assay.

radioimmunochemistry The use of immunochemical techniques in which one or more of the components are radioactively labeled.

radioimmuno-electrophoresis Immuno-electro-

phoresis in which either the antigens or the antibodies used are radioactively labeled.

radioisotope RADIOACTIVE ISOTOPE.

radioisotopic enzyme assay An enzyme assay based on the measurement of radioactivity in a product of the enzyme-catalyzed reaction when one of the reactants is radioactively labeled.

radiolysis A chemical decomposition that is caused by radiation; the self-decomposition of aged tritium- or ^{14}C -labeled compounds are examples.

radiometer An instrument for measuring the intensity of radiation.

radiometric analysis The determination of an unknown compound by either reacting the unlabeled, unknown compound with a labeled reagent, or reacting the labeled, unknown compound with an unlabeled reagent; in either case, a radioactively labeled product formed in the reaction is then isolated and determined.

radiomimetic drug A chemical immunosuppressive agent, such as an alkylating agent, the effect of which on nucleic acids resembles that of ionizing radiation.

radionuclide A radioactive nuclide; a radioactive isotope.

radiopaque Describing material that does not transmit radioactive radiation.

radiophosphorus decay The radioactive disintegration of ^{32}P , particularly that in ^{32}P -labeled phage nucleic acid. The disintegrations lead to breaks in the sugar-phosphate backbone of the nucleic acid. Single-stranded nucleic acid is inactivated when a chain break occurs, but double-stranded nucleic acid is inactivated only when a break occurs in both strands.

radioresistance The relative resistance of cells, tissues, organs, or organisms to the harmful effects of radiation.

radiorespirometry The measurement of the kinetics of oxygen uptake and/or carbon dioxide evolution in a tissue or in an organism by means of radioactive isotopes.

radiosensitivity The relative sensitivity of cells, tissues, organs, or organisms to the harmful effects of radiation.

radiotherapy Therapy by means of x rays or other radioactive radiations.

radiotoxemia RADIATION SICKNESS.

radiotracer RADIOACTIVE TRACER.

radius of exclusion The distance of closest approach of a bound ion to a protein; equal to the sum of the radii of the protein and the bound ion.

radius of gyration A measure of the spatial extension of a polymer that is related to the distribution of mass in the polymer and to the

shape of the polymer. For a molecule that consists of an assembly of mass elements m_i , each located at a distance r_i from the center of mass, the radius of gyration R is given by $R^2 = \sum m_i r_i^2 / \sum m_i$. See also average radius of gyration.

radwaste Radioactive waste.

raffinose A nonreducing trisaccharide, composed of D-galactose, D-glucose, and D-fructose, that occurs in higher plants. *Aka* melitose.

RAIS Reflection-absorption infrared spectroscopy.

RAM Acronym for random access memory; the temporary memory in a computer that consists of specific instructions and data for a specific program and that can easily be altered. *Aka* read/write memory.

Ramachandran plot A plot of the degrees of rotation about the bond between the alpha carbon and the carbonyl carbon in the peptide bond versus the degrees of rotation about the bond between the alpha carbon and the nitrogen atom; constructed on the basis of van der Waals contact distances and the bond angles of the peptide bond, and used for indicating allowed and forbidden conformations of proteins.

Raman effect The light scattering that is produced when incident light leads to rotational and vibrational transitions of molecules; the scattered light has different frequencies from those of the incident light. *Aka* Raman scattering.

Raman optical activity A spectroscopic method for measuring the difference in the intensity of scattered right and left circularly polarized ultraviolet light by chiral compounds. *Abbr* ROA.

Raman spectrum The spectrum of the light that is emitted in the Raman effect.

Ramon method A method for determining the equivalence zone of a precipitin reaction by mixing a constant amount of antigen with varying dilutions of antibodies, and taking the tube in which precipitation occurs most rapidly to be indicative of the equivalence zone. See also Dean and Webb method; method of optimal proportions.

rancidity The development of unpleasant odors and tastes from fats and oils by the oxidation of the unsaturated fatty acid components and/or the hydrolysis of the triglycerides to diglycerides, monoglycerides, glycerol, and free fatty acids.

random coil A linear polymer in a relatively compact, irregular conformation in which there is little interaction between the side chains of the polymer. A random coil exhibits little resistance to rotation about single bonds

and is continually contorted by impact of the solvent molecules. A random coil has no unique three-dimensional structure, only average dimensions, and its time-average shape is spherical.

random error INDETERMINATE ERROR.

random flight chain FREELY JOINTED CHAIN.

random genetic drift See genetic drift.

randomization The process in which a compound, labeled at a given position, gives rise to a product in which half of the molecules are labeled in one position, while the other half are labeled in another, symmetrical position.

randomly labeled GENERALLY LABELED.

random mechanism The mechanism of an enzymatic reaction in which two or more substrates participate, such that each substrate can readily undergo an association-dissociation reaction with the enzyme to form a binary complex prior to the formation of the ternary complex in which both substrates are associated with the enzyme.

random order RANDOM MECHANISM.

random primer A randomly polymerized oligodeoxyribonucleotide that may hydrogen bond to a complementary deoxyribonucleotide sequence in the template nucleic acid and then serve as a primer for the enzyme reverse transcriptase.

random process STOCHASTIC PROCESS.

random sample A sample of items that are selected from a population in such a fashion that all the items in the population have an equal chance of being included in the sample.

random variable VARIATE.

random walk The path in space taken by a molecule in which each step is uncorrelated with the preceding one; each step is being determined by chance, either in regard to direction or in regard to magnitude, or both. The path traced by a molecule in solution due to Brownian motion is an example; the conformation of an ideal, freely jointed random coil can likewise be treated as if the segments represented the random walk of a molecule.

random walk chain FREELY JOINTED CHAIN.

Raney nickel A preparation of finely divided nickel used as a catalyst for hydrogenation reactions and as a reactant for the desulfurization of sulfhydryl compounds.

range 1. The thickness of absorber required to absorb all of the radiation of a particular type.
2. The highest and lowest values for a set of results.

rank electrode A commonly used variation of the Clark electrode for measuring oxygen concentrations.

R antigen See rough strain.

Raoult's law The law that the lowering of the vapor pressure of the solvent by the solute is

proportional to the mole fraction of the solute in the solution.

raphidosome One of a group of rod-shaped, intracellular particles found in bacteria and algae and believed to be associated with the nuclear region of the cell.

rapid equilibrium approximation PRE-EQUILIBRIUM APPROXIMATION.

rapid flow kinetics The kinetics of a chemical reaction that are determined by means of rapid flow techniques.

rapid flow technique A technique for studying fast chemical reactions in which the reactants are forced out of two syringes into a mixing chamber and the mixture is then allowed to flow through a tube for spectroscopic, or other, analysis. The distance along the tube is proportional to the reaction time. See also stopped flow technique.

rapidly labeled RNA PULSE-LABELED RNA.

rapidly reannealing DNA REPETITIVE DNA.

rapidly reassociating DNA REPETITIVE DNA.

rapid lysis mutant A phage mutant that does not show lysis inhibition; such mutants (designated r) form larger plaques than those produced by wild-type phage particles.

rapid mixing technique RAPID FLOW TECHNIQUE.

rapid reaction See fast reaction.

rapid start complex OPEN PROMOTER COMPLEX.

rare amino acid An amino acid that occurs in only a few proteins, such as hydroxylysine or hydroxyproline, which are found in collagen and gelatin.

rare base MINOR BASE.

rare earth An element belonging to a group of 15 metals (atomic numbers 57 to 71) that have very similar properties.

ras genes Rat sarcoma genes; a ubiquitous eukaryotic gene family, first discovered as the transforming principle in retroviruses causing rat sarcomas.

RAST Acronym for radioallergosorbent test; an isotopic technique for the demonstration of reagins directed against specific allergens.

rat antidiuresis assay A bioassay for the activity of neurohypophyseal hormones in which the reduction of urine formation is measured in hydrated rats.

rat antispectacle eye factor INOSITOL.

rate See reaction rate.

rate constant A proportionality constant between the velocity of a chemical reaction and the concentrations of the reacting species; denoted k_{+n} for the forward, and k_{-n} for the reverse, reaction at the n th step of a reaction sequence. Aka rate coefficient.

rate-determining step The slowest step in a sequence of reactions; the step with the smallest rate constant. Aka rate-limiting step.

rate equation A mathematical expression for

the rate of a chemical reaction in terms of the rate constant of the various steps and the concentrations of the reactants and the products.

rate-limiting step RATE-DETERMINING STEP.

ratemeter A radiation detector that indicates the rate of emission of radioactive radiation.

rate-of-change method A method of amplifying the ion current produced in an ionization chamber when high sensitivity is required.

rate of shear The variation in the velocity of flow of a liquid flowing through a tube with the radial distance from the center of the tube; the velocity gradient, perpendicular to the direction of flow.

rate zonal centrifugation DENSITY GRADIENT CENTRIFUGATION.

ratio The supply of a nutrient to a tissue divided by the requirement of the tissue for the nutrient.

Rauscher leukemia virus A mouse leukemia virus that belongs to the leukovirus group.

raw data Data obtained directly from measurements (as opposed to those derived by calculations) and/or data that have not been subjected to statistical treatments (grouping, coding, etc.).

Rayleigh fringe An interference fringe obtained with a Rayleigh interferometer.

Rayleigh interferometer An interferometer in which constructive and destructive interference of light that has passed through one primary and two secondary vertical slits results in a series of light and dark fringes of fixed thickness.

Rayleigh quotient RAYLEIGH RATIO.

Rayleigh ratio A measure of the intensities of incident and scattered light in Rayleigh scattering; specifically, $R = (i_\theta/I_0)r^2$, where R is the Rayleigh ratio, i_θ is the scattered light intensity at angle θ , I_0 is the incident light intensity, and r is the distance from the observer to the source of the scattered light.

Rayleigh scattering The light scattering that is produced by solutes in dilute solutions when the solute particles can be considered to be independent scatterers, when they are small compared to the wavelength of the incident light, and when the scattering is due to elastic collisions between photons and orbital electrons. The greatest dimension of the scattering particles must be less than about 0.05 times the wavelength of the incident light, and the scattered light is of the same frequency as that of the incident light.

Rb Ribosome.

RBC Red blood cell.

RBE Relative biological effectiveness.

RBP Retinol-binding protein.

R1,5BP Ribulose-1,5-bisphosphate.

RBS Rutherford backscattering.

RCF Relative centrifugal force.

R configuration See RS system.

RCS Rabbit aorta contracting substance.

RDA Recommended dietary (daily) allowance.

RDE Receptor destroying enzyme.

r-determinant See R plasmid.

rDNA 1. In general, any DNA segment that codes for rRNA; ribosomal DNA. 2. Specifically, a group of adjacent eukaryotic genes that code for rRNA and that differ sufficiently in their base composition from the bulk DNA to permit their easy separation from it.

rDNA amplification The preferential replication of the genes that code for rRNA; occurs during oogenesis in amphibia and insects and also in the macronuclei of protozoa.

R-DNA polymerase DNA POLYMERASE III.

R1,5DP Ribulose-1,5-diphosphate; now designated as ribulose-1,5-bisphosphate (R1,5BP).

RDS Respiratory distress syndrome.

RE Retinol equivalent.

reactancy The number of kinetically significant substrates or products in the Cleland convention. The reactancy is indicated by the syllables uni, bi, ter, and quad.

reactant An atom, an ion, or a molecule that enters into a chemical reaction.

reaction center The photochemically active complex that absorbs the excitation energy in photosynthesis from the antenna molecules. The complex consists of a few special chlorophyll and/or other pigment molecules that are bound to a few protein molecules and that becomes excited and initiate the reactions of the two photosystems.

reaction coordinate The abscissa that represents the progress of a reaction as measured by some quantity indicated on the ordinate.

reaction kinetics The rate behavior of a reaction.

reaction mixture The mixture composed of sample material and reagents that is allowed to undergo a reaction under controlled conditions.

reaction of identity The complete fusion of two precipitin bands in either two-dimensional double immunodiffusion or immunoelectrophoresis; obtained when two indistinguishable antigens react with an antibody in an adjacent field.

reaction of nonidentity The complete crossing of two precipitin bands in either two-dimensional double immunodiffusion or immunoelectrophoresis; obtained when two unrelated antigens react with an antibody in an adjacent field.

reaction of partial identity The partial fusion of, and spur formation by, two precipitin bands in either two-dimensional double immunodiffusion or immunoelectrophoresis;

obtained when two cross-reacting antigens react with an antibody in an adjacent field.

reaction order The sum of the powers of the reactant concentrations to which the reaction rate is proportional. *See also* reaction rate; order with respect to concentration; order with respect to time.

reaction paper chromatography A chromatographic technique for determining the number of various functional groups in a molecule, chiefly in an aromatic compound, on the basis of the chromatographic behavior of the unreacted molecule and of the molecule after it has reacted with appropriate reagents.

reaction rate The rate at which either a product is formed or a reactant is used up in a chemical reaction; for the first-order reaction $A \rightarrow B$, the rate is given by $v = -d[A]/dt = d[B]/dt = k[A]$, where brackets indicate molar concentrations, and k is the rate constant. For the second-order reaction $A + B \rightarrow C$, the rate is given by $v = k[A][B]$. *Aka* reaction velocity.

reactivation 1. The restoration of activity to cells or viruses that have suffered photochemical damage; photoreactivation, thermal reactivation, and multiplicity reactivation are examples. 2. The restoration of activity to an inactivated poxvirus, the protein coat of which has been denatured but the DNA of which has not been damaged; achieved by the presence of an infectious poxvirus, the enzymes of which lead to an uncoating of the inactivated virus. 3. The restoration of activity to an inhibited enzyme by removal of the inhibitor through a chemical reaction. The process has sometimes been termed reversible inhibition. *See also* irreversible inhibitor; reversible inhibitor.

reactive enzyme centrifugation *See* active enzyme centrifugation.

reactive hemolysis The reactive lysis of red blood cells.

reactive lysis The lysis of an unsensitized cell produced by the binding of complement to the cell surface.

reactive residue An amino acid residue in a protein that is accessible to and can undergo a reaction with a specific reagent.

reactor *See* nuclear reactor.

reading The process whereby the sequence information in one polymer is used to produce a defined sequence in another polymer; replication, transcription, and translation are examples of processes that entail reading.

reading frame The manner in which nucleotides in mRNA are grouped into codons for translation. The reading frame is one of three ways for translating a given nucleotide sequence, defined by the location of the ini-

tiation codon AUG. Thus, the possible reading frames of the mRNA sequence 5'-GCUAGCCUG...-3' are (a) 5'-(GCU)(AGC)...; (b) 5'-(CUA)(GCC)...; and (c) 5'-(UAG)(CCU)...; which sequence is used depends on the location of the initiation codon. Fixation of the starting point determines which groups of 3 bases in the mRNA sequence are interpreted as codons.

reading frameshift The shift in reading produced by a frameshift mutation.

reading mistake MISTRANSLATION.

readout The act of reading out. *See also* reading.

read-through 1. The transcription of DNA that proceeds past the normal termination signal in the DNA; may result from failure of RNA polymerase to recognize a terminator, temporary dissociation of a termination factor (such as rho in bacteria) from the terminator sequence, or the lack of attenuation by an attenuator. 2. The translation of mRNA that proceeds past the normal termination codon in the mRNA; may result from suppression of a termination codon by a nonsense suppressor tRNA.

read-through protein A protein that is produced as a result of a failure in the termination of translation of a polycistronic mRNA; such a protein consists of the regular amino acid sequence specified by its cistron plus a sequence of amino acids that corresponds to a translated intercistronic region.

reagent 1. A substance that participates in a chemical reaction. 2. A substance used for the detection or determination of another substance.

reagin A homocytotropic antibody of the IgE immunoglobulin class that is formed in response to an allergen and that, upon combination with the allergen, causes the release of histamine and other vasoactive agents of immediate-type hypersensitivity.

reaginic antibody REAGIN.

reannealing The renaturation of DNA; the joining of dissociated (denatured), complementary single strands to form duplex molecules. In reannealing, the single strands are from the same source while in annealing the single strands are from different sources, resulting in the formation of hybrid duplex molecules. *See also* annealing; reassociation.

rearrangement reaction A chemical reaction in which there is an alteration in the distribution of the atoms in a molecule.

reassociation The pairing of complementary DNA strands, or parts of DNA strands, that results in the formation of a duplex or sections of a duplex.

reassociation kinetics A technique for measur-

ing the rate of reassociation of complementary DNA strands derived from the same source (as opposed to hybridization). The technique involves shearing the DNA into small fragments, denaturing these fragments by heating to form single-strand segments, and then allowing the latter to form double-stranded segments by slow cooling (annealing). The extent of reassociation is commonly followed by nuclease digestion, hypochromicity measurements, or hydroxyapatite chromatography. The data are analyzed by means of a cot curve. The DNA segments are usually classified into four categories: unique, slightly repetitive, middle repetitive, and highly repetitive DNA. *See also* cot curve; repetitive DNA.

reassortant virus A synthetically produced hybrid virus that contains DNA and protein from different species.

reassortment An exchange of genome segments as that which occurs with myxoviruses.

RECA RecA protein.

recapitulation theory The theory that an organism during its development passes through and recapitulates the stages that have occurred in the development of the species. *Aka* ontogeny recapitulates phylogeny.

RecA protein A protein (MW 38,000) that has several enzymatic activities, including a DNA-dependent ATPase activity. It plays a central role in genetic recombination and in SOS repair. *Aka* RecA protease. *See also* SOS repair.

recBCD enzyme EXONUCLEASE V.

receptor 1. A target site at the molecular level to which a substance becomes bound as a result of a specific interaction. As an example, the site may be on the cell wall, on the cell membrane, or on an intracellular enzyme, and the substance bound may be a virus, an antigen, a hormone, or a drug. The binding interaction might trigger a physiological or a pharmacological response. 2. A site in an organism that responds to specific stimuli such as a chemoreceptor, an osmoreceptor, or a photoreceptor.

receptor destroying enzyme NEURAMINIDASE.

receptor down regulation *See* down regulation.

receptor element *See* controlling element.

receptor gradient An arrangement of viruses in a series based on their reaction with, and their destruction of, receptor sites on red blood cells; any virus in the series will react with its own receptor sites and with those specific for viruses that precede it in the gradient, but will not react with receptor sites for viruses that follow it in the gradient.

receptor internalization *See* coated pit; receptorosome.

receptor-mediated endocytosis LIGAND-INDUCED ENDOCYTOSIS.

receptorosome A vesicular structure in animal cells formed during the down regulation by polypeptide hormones. It consists of a coated pit that has budded off from the cytoplasmic membrane and has entrapped receptor-ligand (hormone) complexes. Receptorosomes are also formed in receptor-mediated endocytosis of other ligands such as low-density lipoproteins and lysosomal enzymes; they are probably identical to endosomes. *See also* coated pit.

recessive 1. RECESSIVE GENE. 2. The trait produced by a recessive gene in the homozygous state.

recessive gene A gene the expression of which is either partially or entirely suppressed when the dominant allelic gene is present. *Aka* recessive allele.

recessive lethal An allele that leads to the death of the cell or the organism that is either homozygous or heterozygous for the allele.

reciprocal activation The cyclic set of reactions in the intrinsic pathway of blood clotting whereby activated Factor XII converts prekallikrein to kallikrein which, in turn, generates more activated Factor XII.

reciprocal genes COMPLEMENTARY GENES.

reciprocal ion-atmosphere radius The term κ of the Debye-Hueckel theory that is equal to the reciprocal of the thickness of the ion atmosphere; the reciprocal of the distance from the surface of the central ion to the outer edge of the ion atmosphere.

reciprocal lattice The three-dimensional crystal lattice deduced from a two-dimensional x-ray diffraction pattern; used to obtain the dimensions of the unit cell in the real crystal lattice and so called because the positions of the spots in the x-ray diffraction pattern are an inverse measure of the spacings in the real crystal. *Aka* reciprocal space.

reciprocal plot *See* single reciprocal plot; double reciprocal plot.

reciprocal recombination Recombination that involves a symmetrical exchange of genetic material by crossing over.

reciprocating shaker *See* shaker.

reciprocity The condition that exists when the product of dose rate, specifically that of radiation, and time of exposure is constant; thus, $(\text{dose rate})_1 \times \text{time}_1 = (\text{dose rate})_2 \times \text{time}_2$. *Aka* Bunsen-Roscoe law.

rec⁻ mutant Recombination-deficient mutant.

recognition A specific binding interaction occurring between macromolecules, as that between a tRNA molecule and an aminoacyl-tRNA synthetase, or that between an immunocyte and an antigen.

recognition site 1. tRNA SYNTHETASE RECOGNI-

TION SITE. 2. AMINOACYL SITE. 3. RECEPTOR.

recoil energy The energy of an atom after ejecting a subatomic particle; typically, the energy of the cation after the atom has lost a high-energy beta particle.

recombinant One of the progeny formed as a result of genetic recombination.

recombinant DNA technology The techniques by which genetic recombination is carried out in vitro. It entails the breakage and rejoining of DNA molecules from different organisms and the production and isolation of the modified DNA or fragments thereof. Thus, when a human gene, coding for insulin, is inserted into the DNA of a bacterial plasmid and the latter is cloned to produce many identical copies of the inserted gene, the methodology involved is referred to as recombinant DNA technology. The modified plasmid DNA is called a recombinant DNA molecule. Recombinant DNA technology generally involves the following: (a) using restriction enzymes to produce DNA fragments; (b) joining these DNA fragments (passengers) to other DNA molecules (vectors) by various techniques of ligation (splicing); (c) inserting the resultant recombinant DNA molecules into host cells where they self-replicate to produce multiple copies per cell of the inserted DNA fragments (cloning). *Aka* plasmid engineering; gene cloning; DNA cloning. *See also* cloning; genetic engineering; biotechnology; gene therapy.

recombinant joint The region of a heteroduplex that represents the linkage between two recombining DNA molecules.

recombinant RNA technology The techniques by which RNA molecules, from the same or from different species, are spliced together.

recombinase An enzyme functioning in genetic recombination; the *recA* protein is an example.

recombination The production of progeny that derives some of its genes from one parent and some from another, genetically different, parent; as a result, the combination of genes in the progeny is different from that of either of the parents. In higher organisms, recombination occurs by way of independent assortment or crossing over; in lower organisms, it occurs by way of transformation, conjugation, or transduction. *See also* general recombination; site-specific recombination; illegitimate recombination.

recombination-deficient mutant A mutant that is unable to produce recombinants. *Abbr* rec^- mutant.

recombination frequency *See* frequency of recombination.

recombinationless mutant RECOMBINATION-DEFICIENT MUTANT.

recombination nodule A protein-containing assembly, occurring at intervals on the synaptonemal complex, that is believed to play a role in crossing over.

recombination repair A postreplicative repair mechanism of DNA that involves an exchange of good for bad segments between two damaged, homologous, duplex molecules; the exchange is known as sister-strand exchange. Recombination repair is a dark (requiring no light) repair mechanism that serves to remove and repair lesions containing thymine dimers.

recombination value FREQUENCY OF RECOMBINATION.

recombinogenic Promoting recombination.

recommended dietary allowance A recommended quantity for the daily intake of calories, a food, or a vitamin that has been established by the Food and Nutrition Board of the National Research Council; recommended for a normal individual engaged in average activity and living in a temperate climate. *Abbr* RDA. *Aka* recommended daily allowance.

recon The unit of genetic recombination; the smallest section of a chromosome, which may be as small as a single nucleotide, that is capable of recombination and that cannot be divided by recombination.

reconstitute To reassemble a particle from its fragments or to reassemble a system from its fractions, as in the assembly of viruses, ribosomes, and protein-synthesizing systems.

reconstituted ghost An erythrocyte ghost that has been loaded with specific substances, and the membrane of which has been allowed to shrink back to its normal size and to return to its normal state of permeability.

recording spectrophotometer A spectrophotometer with an attached recorder for graphical representation of the data obtained.

recovery YIELD (2).

recovery heat The heat produced by a muscle that relaxes after a single contraction.

recovery time COINCIDENCE TIME.

recruitment factor A factor, believed to be involved in the regulation of mRNA translation in sea urchin eggs. *See also* masked mRNA.

recycling chromatography A column chromatographic technique in which resolution is improved by passing the column effluent back onto the same column; fractions may be collected and fresh solvent may be added during this process.

red cell agglutination HEMAGGLUTINATION.

red cell lysis HEMOLYSIS.

red drop The decrease in photosynthetic efficiency (the quantum yield) of chloroplasts that occurs at wavelengths longer than 680 nm.

red muscle A dark skeletal muscle that has a

relatively high content of myoglobin and cytochromes. It is rich in mitochondria, obtains most of its ATP through oxidative phosphorylation, and is capable of prolonged activity. *Aka* slow-twitch muscle.

redox Oxidation-reduction.

redox carrier ELECTRON CARRIER.

redox complex See complexes I-IV.

redox couple The electron donor and the electron acceptor species of a given half-reaction. *Aka* redox pair.

redox lipid A lipid, such as ubiquinone or tocopherol, that undergoes oxidation-reduction reactions and that contains polyisoprenoid chains.

redox loop mechanism A set of reactions, proposed as part of the chemiosmotic coupling hypothesis, according to which redox centers are arranged in the mitochondrial membrane in such a fashion that each center can simultaneously accept an electron and a proton from the matrix side of the membrane.

redox pair REDOX COUPLE.

redox potential OXIDATION-REDUCTION POTENTIAL.

red plaque A plaque that, in the plaque assay, is stained excessively with neutral red due to the increased binding of the dye by the lysosomes present in the virus-infected cells.

red shift BATHOCHROMIC SHIFT.

reduced hemoglobin Hemoglobin containing iron in the ferrous (+2) state.

reduced mean residue rotation The mean residue rotation corrected to that in a medium of unit refractive index; specifically, $[m'] = 3[m]/(n^2 + 2)$, where $[m']$ is the reduced mean residue rotation, $[m]$ is the mean residue rotation, and n is the refractive index of the medium.

reduced osmotic pressure The osmotic pressure (π) divided by the concentration of the solution (c); the term π/c .

reduced scattered light intensity RAYLEIGH RATIO.

reduced substrate concentration The substrate concentration $[S]$ divided by the Michaelis constant K_m ; the term $[S]/K_m$. Designated as $[S']$, σ , or α .

reduced viscosity The ratio of the specific viscosity of a solution to either the solute concentration or the volume fraction of the solute. *Aka* reduced specific viscosity.

reducing agent REDUCTANT.

reducing atmosphere An atmosphere that is rich in gases that are readily oxidized; a reducing atmosphere consisting of water, hydrogen, ammonia, nitrogen, methane, and hydrogen sulfide is believed by some to have been the primitive atmosphere of the earth about 4.5 billion years ago.

reducing end The end of an oligo- or a polysaccharide that carries the hemiacetal or the hemiketal grouping.

reducing equivalent A measure of reducing power equal to either one electron or one hydrogen atom.

reducing power The capacity of a substance to function as a reducing agent, that is, to provide hydrogen and/or electrons.

reducing sugar A sugar that will reduce certain inorganic ions in solution, such as the cupric ions of Fehling's or Benedict's reagent; the reducing property of the sugar is due to its aldehyde or potential aldehyde group.

reductant The electron donor species of a given half-reaction; the species that undergoes oxidation in an oxidation-reduction reaction.

reductase A dehydrogenase for which the transfer of hydrogen from the donor molecule is not readily demonstrated.

reduction The change in an atom, a group of atoms, or a molecule that involves one or more of the following: (a) loss of oxygen; (b) gain of hydrogen; (c) gain of electrons.

reduction division MEIOSIS.

reductionism The doctrine that a higher level of organization can be understood from a knowledge of lower levels. Thus, an organism or a natural phenomenon can be understood from a knowledge of the component parts; the entirety is equal to the sum of the parts. See *also* holism.

reduction phase The second stage of the Calvin cycle in which 3-phosphoglyceric acid is converted to glyceraldehyde-3-phosphate by means of ATP and NADPH.

reduction potential The electrode potential that is used in biochemistry and that measures the tendency of an oxidation-reduction half-reaction to occur by way of a gain of electrons. *Sym* E. See *also* electrode potential; standard electrode potential.

reductive carboxylic acid cycle A cyclic set of reactions that is essentially a reversal of the citric acid cycle and that involves the fixation of four molecules of carbon dioxide and the synthesis of one molecule of oxaloacetate per one turn of the cycle. The reactions occur in some photosynthetic bacteria. *Aka* reductive tricarboxylic acid cycle.

reductive pentose cycle CALVIN CYCLE.

reductive pentose phosphate cycle CALVIN CYCLE.

reductive tricarboxylic acid cycle REDUCTIVE CARBOXYLIC ACID CYCLE.

redundancy DEGENERACY (1). See *also* terminal redundancy; repetitive DNA.

redundant DEGENERATE.

redundant cistron A cistron that is present in multiple copies on the same chromosome.

redundant DNA REPETITIVE DNA.

reentrant surface The interior surface of a protein molecule, consisting of two or more atoms which are simultaneously in contact with a given probe.

reference BLANK.

reference electrode An electrode against which the potential of another electrode is being measured. *Aka* reference half-cell.

reflection The partial or complete return of light waves or other types of radiation from a surface.

reflection-absorption infrared spectroscopy A technique for the study of surfaces in which infrared radiation, reflected from a surface, is used to measure the infrared spectrum of a surface component. *Abbr* RAIS.

reflection symmetry The symmetry of a body that exists if an identical structure of the body is produced when it is rotated about an axis and reflected through a plane perpendicular to that axis; the order in which these two processes are carried out is not significant. The rotation-reflection axis is denoted S_n , indicating that identical structures are produced by a rotation of $360^\circ/n$.

refolding RENATURATION.

refractile Capable of refracting light.

refraction The change in the velocity and in the direction of light waves that pass obliquely from one medium into another.

refractive increment REFRACTIVE INDEX INCREMENT.

refractive index (n) (n_D refractive indices) A measure of the light-retarding property of a medium, equal to the ratio of the velocity of light in a vacuum to that in the medium; also equal to the ratio of the sine of the angle of incidence to the sine of the angle of refraction for light passing obliquely from a vacuum into the medium. *Sym* n . *Aka* index of refraction.

refractive index increment The rate of change of the refractive index of a solution with the concentration of the solution. *See also* specific refractive index increment.

refractometer An instrument for measuring refractive indices.

refractoriness DESENSITIZATION (3).

refractory Resistant to a given treatment or cure.

refractory period The period after the passage of an action potential during which a nerve axon or a muscle fiber is resistant to stimulation.

Refsum's disease A genetically inherited metabolic defect in humans, involving serious neurological problems (such as tremors, unsteady gait, and poor night vision), that is characterized by a large accumulation of phytanic acid in tissues and serum; due to a

deficiency of the enzyme phytanate α -hydroxylase.

regeneration 1. The repair and replacement of damaged or lost tissue, as in the formation of liver tissue following partial hepatectomy. 2. The restoration of an ion-exchange resin to its original ionic form.

regeneration phase The third stage of the Calvin cycle in which ribulose-1,5 biphosphate is regenerated by a series of reactions, beginning with glyceraldehyde-3-phosphate.

regiospecific Descriptive of a chemical reaction that proceeds in only one of two possible ways, such as a reaction that involves an addition to a double bond.

regression 1. A decrease in the size of a tumor or in the manifestations of a disease. 2. The relation between two statistical variables. *See* regression line.

regression coefficient A parameter that describes the rate of change of a dependent variable with respect to an independent variable; any coefficient in a regression equation, such as the parameters α and β in the linear regression equation $Y = \alpha + \beta X$.

regression curve *See* regression line.

regression line A plot of the average of a dependent variable Y as a function of an independent variable X ; a plot of \bar{Y}_x versus X . The line defines the amount of change of one variable per unit change in the other; if the plot does not yield a straight line, it is referred to as a regression curve.

regulated secretory cell A cell, such as an endocrine cell or a neuron, that secretes large amounts of a protein at a rate that is much higher than that at which the protein is synthesized inside the cell. Such cells store large amounts of protein in secretory vesicles until the cell receives an appropriate stimulus for secretion. *See also* constitutive secretory cell.

regulator-constitutive mutant A mutant that results from a constitutive mutation in which the regulator gene has been mutated in such a way as to prevent the formation of a repressor or to produce a defective repressor; as a result, a previously inducible enzyme becomes a constitutive one.

regulator element *See* controlling element.

regulator gene A gene that is responsible for the synthesis of a repressor that, in turn, controls an operator. The regulator gene need not be adjacent to the operator. *Abbr* R gene. *Aka* regulatory gene. *See also* enzyme induction; enzyme repression.

regulatory enzyme An enzyme that has a regulatory function in metabolism and that has the capacity of having its catalytic activity modified. A regulatory enzyme is frequently the first enzyme in a reaction sequence or the

enzyme at a branch point of metabolic pathways. Regulatory enzymes are of two kinds, allosteric enzymes or covalently modified enzymes. The activity of the former is modified through the binding of allosteric effectors to regulatory (allosteric) sites on the enzyme; the activity of the latter is modified as a result of a chemical alteration of the enzyme which, in turn, is catalyzed by other enzymes. *See also* allosteric enzymes; covalently modified enzymes.

regulatory factor HYPOTHALAMIC HORMONE.

regulatory hormone HYPOTHALAMIC HORMONE.

regulatory protein 1. ALLOSTERIC PROTEIN. 2. Any protein that has a regulatory function such as a protein that is produced by a regulatory gene, or the protein that functions in the bacterial phosphotransferase system (RPr).

regulatory sequence A segment of DNA that functions in regulating the expression of structural genes in an operon; operators, promoters, and attenuators are examples.

regulatory site A site on an allosteric enzyme to which an effector binds, as distinct from a catalytic site to which the substrate binds. *Aka* allosteric site.

regulatory subunit The subunit of the regulatory enzyme aspartate transcarbamylase that has no enzymatic activity but binds the negative effector CTP. *See also* catalytic subunit.

regulatory T cells *See* helper T cells; suppressor T cells.

regulon A set of nonadjacent structural genes that are under the control of a common regulatory gene. As opposed to an operon, in which different structural genes are adjacent, the different structural genes of a regulon are located at different sites on a chromosome, or are scattered over several chromosomes. Three examples of regulons are the HTP, Pho, and SOS regulons.

Reichert-Meissl number A measure of the volatile fatty acids in a fat; equal to the number of milliliters of 0.1 N alkali required to neutralize the volatile, water-soluble fatty acids in 5 g of fat. *Aka* Reichert-Meissl value.

Reichstein's compound A designation for some steroids; Reichstein's compounds H, F, and M refer, respectively, to corticosterone, cortisone, and cortisol.

Reid factor HIGH MOLECULAR WEIGHT KININOGEN.

reiterated DNA sequences REPETITIVE DNA.

reiterated genes *See* gene reiteration.

rejection *See* immunological rejection.

relative biological effectiveness The ratio of the biological effect produced by one ionizing radiation to that produced by an identical dose of a different ionizing radiation; also

equal to the ratio of the doses of two different ionizing radiations that produce the same biological effect. For such calculations, the biological effect produced by x rays, gamma rays, or beta particles is generally assigned a value of unity. *Abbr* RBE.

relative centrifugal force The magnitude of the centrifugal force compared to the gravitational force; expressed in terms of multiples of g , as in $100,000 \times g$, where g is the gravitational acceleration. The relative centrifugal force (in multiples of g) is equal to $(1.12 \times 10^{-5})r(\text{rpm})^2$, where r is the distance from the center of rotation in centimeters, and rpm is the speed of the rotor in revolutions per minute. *Abbr* RCF.

relative configuration 1. The comparative spatial arrangement of the atoms about two or more asymmetric carbon atoms in one molecule. 2. The arrangement of the atoms in one molecule compared to that of the atoms in a different molecule.

relative counting The counting of radiation such that only a fraction of the actual radioactive disintegrations that occur in the sample are detected; consequently, the results are expressed as counts per minute rather than as disintegrations per minute.

relative deviation A deviation expressed in relative terms such as a percentage average deviation.

relative error 1. An error expressed in relative terms, such as in percentages. Thus, if a measurement has the value of 24.60 and the mean is 24.00, then the relative error is $(0.60/24.00)100 = 2.5\%$ 2. The number of standard deviations in the error.

relative infectivity The fraction of the initial infectivity of a virus preparation that remains when a virus is neutralized with antiviral antibodies and the reaction mixture is sampled as a function of time.

relative migration distance *See* retardation coefficient.

relative plating efficiency The percentage of cells that give rise to colonies when plated on a nutrient medium, compared to a control for which the absolute plating efficiency is arbitrarily taken as 100%.

relative retention The retention volume of a component that is separated by gas chromatography relative to the retention volume of a standard.

relative specific activity The ratio of the specific activity of the sample to that of a reference substance.

relative standard deviation COEFFICIENT OF VARIATION.

relative substrate concentration REDUCED SUB-

STRATE CONCENTRATION.

relative variance The square of the coefficient of variation.

relative viscosity The ratio of the viscosity of a solution to that of the solvent. *Sym* η_r .

relaxation 1. The transition of a system from a suddenly disturbed equilibrium position to a new equilibrium position. 2. The return of a muscle from its contracted to its resting state. 3. The conversion of a superhelical DNA molecule to one that has fewer, or no, superhelical turns.

relaxation complex An aggregate formed between some supercoiled DNA of *E. coli* plasmids and three tightly bound proteins. When the complex is heated, or treated with alkali, proteolytic enzymes, or detergents, one of these proteins (which is a nuclease) makes a site-specific nick in the DNA, thereby relaxing the supercoil to the nicked circular form. The nicking is believed to play a role in the transfer of the plasmid during conjugation by establishing the transfer origin.

relaxation effect The retardation of the electrophoretic mobility of a charged particle that results from the electric field set up by the differential movement of the charged particle and its ion atmosphere.

relaxation kinetics The kinetics of a system that undergoes relaxation.

relaxation protein SINGLE-STRAND BINDING PROTEIN.

relaxation technique A technique for studying either a rapid reaction or the intermediate steps in a complex reaction by means of relaxation; performed by allowing the system to come to equilibrium and then disturbing the system suddenly by means of a rapid change in one variable, following which the system is allowed to come to a new equilibrium position. Depending on the variable that is being altered, the technique is referred to as temperature jump, pressure jump, concentration jump, pH jump, etc.

relaxation time 1. A measure of relaxation that is equal to the time interval between the disturbance of the original equilibrium of the system and the achievement of the new equilibrium position. 2. A measure of relaxation that is equal to the time required for a system to change from its original equilibrium position to $1/e$ of this equilibrium value (e is the base of natural logarithms). *See also* rotational relaxation time. 3. The reciprocal of the rate constant for a relaxation experiment.

relaxed circle A double-stranded, circular DNA molecule in which supercoiling has been removed either by a single-strand break (nick)

or by the action of a topoisomerase. *Aka* relaxed DNA.

relaxed conformation *See* concerted model.

relaxed control 1. The continued synthesis of RNA that occurs in some bacterial mutants after removal of an essential amino acid from the medium. *See also* stringent control. 2. Plasmid replication that greatly exceeds that of the chromosome and that results in the production of 20 or more plasmids per cell.

relaxed DNA RELAXED CIRCLE.

relaxed helix A nontwisted helix; a helix that is not a superhelix; a relaxed circle.

relaxed muscle A muscle that has returned to its resting state following a contraction.

relaxed plasmid *See* copy number.

relaxed strain A bacterial strain that shows relaxed control.

relaxin A polypeptide hormone, produced by the corpus luteum, that causes relaxation of the symphyseal ligaments in mice and guinea pigs. Relaxin has been found in the blood of pregnant females of many species, including humans, but its role in the human female is unknown.

relaxing enzyme DNA-RELAXING ENZYME; *See* topoisomerase.

relaxing factor The calcium pump of the sarcoplasmic reticulum of muscle.

relaxing protein The complex formed between troponin and tropomyosin B.

release factor 1. One of a group of protein factors that function in the release of the polypeptide chain from the ribosome at the termination stage of translation. Release factors respond, in part, to termination codons. There are two such factors in *E. coli* and one in eukaryotes. Prokaryotic and eukaryotic release factors are designated RF and eRF, respectively. 2. RELEASING HORMONE.

releasing hormone A hormone that causes the release of another hormone. *Aka* releasing factor. *See also* hypothalamic hormone.

reliability The degree to which experimental data, or methods leading to such data, reflect both accuracy and precision.

relic model A model for the evolution of the genetic code according to which the early development of the code resulted from mechanistic processes while the later development resulted from stochastic processes.

REM 1. Roentgen equivalent man. 2. Roentgen equivalent mammal.

remission A temporary decrease in the size of a tumor or in the manifestations of a disease.

remodeling The continuous synthesis (formation) and degradation (resorption) of bone that proceeds throughout life; the steady state of bone.

renal Of, or pertaining to, the kidneys.

renal clearance See clearance.

renal compensation One of a number of mechanisms whereby the kidneys counteract the effects of either acidosis or alkalosis.

renal diabetes RENAL GLUCOSURIA.

renal glucosuria A pathological condition that is characterized by the recurrent excretion of glucose in the urine while the plasma concentration of glucose is either normal or slightly elevated; due to impaired reabsorption of glucose by the renal tubules.

renal hypertension Hypertension resulting from kidney disease or failure.

renal threshold See threshold.

renal tubular acidosis A systemic acidosis with an inappropriately high urinary pH as a result of congenital or acquired disorders of renal function.

renaturation The reformation of all, or part of, the native conformation of either a protein or a nucleic acid molecule after the molecule has undergone denaturation; a reversal of denaturation. See also annealing (1).

renatured Having undergone renaturation.

renin A proteolytic enzyme produced by the kidney that has hormone-like properties and catalyzes the conversion of angiotensinogen to angiotensin I.

renin substrate ANGIOTENSINOGEN.

rennet enzyme CHYMOSIN.

rennin CHYMOSIN.

renotropic Having a tendency or capacity to increase the activity of the kidneys.

reovirus A naked, icosahedral animal virus that contains double-stranded RNA. Reoviruses occur in the enteric and respiratory tracts but are not commonly associated with disease. Thus, as agents of disease, they are orphans, and hence the term reovirus (a contraction of respiratory enteric orphan virus). The virion of reoviruses consists of 10 double-stranded, linear RNA molecules.

REP Roentgen equivalent physical.

repair See DNA repair.

repair enzyme A DNA-dependent DNA polymerase that catalyzes the replacement of damaged and excised segments of single strands in double-stranded DNA. The enzyme uses the undamaged strand as a template and the repair is completed by a ligase that catalyzes the joining of the newly synthesized segments to the existing strand.

repaosome The complex of enzymes and other components that functions in the repair of DNA, damaged by ultraviolet light.

repair polymerase DNA POLYMERASE I.

repair replication The synthesis, by means of a repair enzyme, of single-stranded DNA segments to replace damaged segments that have

been excised from double-stranded DNA; in this process, the undamaged strand serves as a template. See also repair enzyme; cut and patch repair; patch and cut repair.

repair synthesis The enzymatic filling of a gap in a DNA strand at a site at which a damaged segment (such as a thymine dimer) is excised.

reparase REPAIR ENZYME.

rep DNA Repetitive DNA.

repeated DNA sequences REPETITIVE DNA.

repeated gene family MULTIGENE FAMILY.

repeating polymer A polymer that consists of identical repeating units.

repeating unit The structural unit of a polymer, a large number of which are linked together to form the polymer; repeating units may be either identical or similar.

repeat pipet AUTOMATIC PIPET.

repeats Small tandem duplications. See tandem duplication.

repeat unit A major periodicity in molecular structure as deduced from x-ray diffraction patterns.

repetition frequency The number of copies of a given DNA sequence in the haploid genome. Aka repetition number.

repetition number REPETITION FREQUENCY.

repetitious DNA REPETITIVE DNA.

repetitive DNA A DNA that constitutes a significant fraction of the total DNA of eukaryotic cells and that is characterized by its content of a large number of copies of different nucleotide sequences. It is subdivided into slightly repetitive DNA (1 to 10 copies per haploid genome), middle (moderately) repetitive DNA (10 to several thousand copies per haploid genome), and highly repetitive DNA (several thousand to several million copies per haploid genome). Middle repetitive DNA contains the genes transcribed into rRNA, tRNA, and histones. Highly repetitive DNA frequently occurs as spacer DNA between structural genes. Aka repetitious DNA. See also reassociation kinetics; unique DNA.

repetitive genes MULTIGENE FAMILY.

replacement See amino acid replacement; conservative substitution; radical substitution.

replacement site A position in a gene at which a point mutation leads to an amino acid replacement in the protein coded for by the gene.

replacement vector See lambda cloning vector.

replica plating A method for producing a large number of identical patterns of bacterial colonies by pressing a cylinder, covered with sterile velvet, first against the bacterial colonies in a petri dish and then against a number of plain agar surfaces in other petri dishes.

replicase An RNA-dependent RNA polymerase that catalyzes the synthesis of RNA

from the ribonucleoside-5'-triphosphates, using RNA as a template.

replicating fork The Y-shaped region of a replicating DNA molecule in which strand separation and synthesis of new strands takes place.

replicating form See replicative form.

replicating unit REPLICON.

replication 1. The process whereby a new daughter DNA molecule is synthesized from a parent DNA molecule which serves as a template for the synthesis; one or two daughter molecules will be synthesized depending on whether the parental DNA molecule was single- or double-stranded. 2. The process whereby a new daughter molecules is synthesized from either a parent DNA or a parent RNA molecule, with the parent molecule serving as a template for the synthesis. 3. A technique used in electron microscopy in which either a plastic or a carbon film is spread over the surface of the specimen, after which the specimen is removed and the remaining surface is subjected to shadow-casting. See also DNA replication.

replication bubble 1. EYE STRUCTURE. 2. D-LOOP.

replication-defective virus A virus that cannot complete its infective cycle due to the presence of one or more defective viral genes.

replication eye REPLICATION BUBBLE.

replication fork See replicating fork.

replication fragments OKAZAKI FRAGMENTS.

replication of DNA See DNA replication.

replication order The number of replicating Y-forks per DNA molecule that is undergoing replication.

replication origin A unique base sequence in double-stranded DNA at which replication begins. Aka Ori site.

replication polymerase DNA POLYMERASE III.

replication units Clusters of 20–80 replication origins in mammalian DNA that appear to be activated as a unit; within such units, each replication origin is spaced at intervals of 30–300 kbp from the next one.

replicative form A double-stranded intermediate that is formed during the replication of single-stranded DNA or RNA viruses; consists of the original viral nucleic acid strand which is hydrogen-bonded to a complementary strand. Abbr RF.

replicator A chromosome locus that forms part of the replicon and that, when acted upon by an initiator, initiates the replication of the DNA attached to it.

replicator locus See replicon.

replicon A functional unit of replication, analogous to the operon which is a functional unit of transcription. The replicon is a genetic element, of either DNA or RNA, that behaves

as an autonomous unit during replication. In bacteria, plasmids, and viruses, the entire chromosome functions as a single replicon; in eukaryotes, each chromosome consists of many replicons. Each replicon contains two loci, an initiator locus and a replicator locus. For DNA replication, the initiator locus represents the site to which RNA polymerase binds and the replicator locus is the site at which DNA replication begins. The RNA primer synthesized by RNA polymerase is known as initiator.

replication The formation of a replicative functional plasmid in the recipient cell following plasmid transfer.

replicon fusion The linking together of two replicons, mediated by a transposon. If the two replicons are plasmids, the process is known as plasmid fusion. Aka cointegrate formation.

replicon misfiring Proposed term to describe an extra round of replication within any given chromosomal domain; an extra initiation at an origin of replication during one cell cycle. The probability for replicon misfiring is very low. See also fire.

replisome The large, multimolecular complex, consisting of DNA polymerase III, other enzymes, and proteins, that is assembled at the replicating fork of a bacterial chromosome and that carries out the various reactions in DNA replication. Commonly refers to all of the components except DNA polymerase I and DNA ligase.

replot SECONDARY PLOT.

reporter group A group of atoms or a molecule that can be introduced into a protein and that has a characteristic property, such as pK value, ultraviolet absorbance, or fluorescence, which is sensitive to changes in the polarity of the medium. The changes that occur in this characteristic property when the reporter group is attached to the protein are used to explore the nature of the immediate environment of the reporter group in the protein molecule.

rep protein The helicase that functions in DNA replication in *E. coli*.

representation ABUNDANCE.

repressible enzyme An enzyme, the synthesis of which is decreased when the intracellular concentration of specific metabolites reaches a certain level. Aka repressed enzyme. See also enzyme repression.

repressible system The regulatory system consisting of the components that function in enzyme repression. See also enzyme repression.

repressing metabolite COREPRESSOR.

repression See enzyme repression.

repressor 1. A protein molecule produced by a regulatory gene that either by itself, or in

- conjunction with a corepressor, prevents the synthesis of an enzyme by inhibiting the operator of the enzyme. *Aka* aporepressor. *See also* enzyme repression. 2. IMMUNITY SUBSTANCE.
- reproducibility** The degree to which an experimental measurement or result may be obtained repeatedly.
- reproductive death** The death of a cell that results from a failure of a DNA molecule to replicate.
- reproductive mycelium** AERIAL MYCELIUM.
- reptation** A "reptile-like," end-on, mode of migration, thought to account for the fact that large molecules exhibit nearly size-independent mobilities in high-voltage gel electrophoresis. Under these conditions, the sieving capacity of the gel becomes unimportant, and the molecules (typically, DNA molecules) are pulled through the gel like a train through a tunnel; all of the molecules migrate at the same velocity, independent of their size. *See also* field inversion gel electrophoresis.
- repulsion** 1. The repelling electrostatic force between two like charges. 2. The tendency of linked genes to be inherited separately on different chromosomes.
- RER** Rough endoplasmic reticulum.
- RES** Reticuloendothelial system.
- resealed ghost** RECONSTITUTED GHOST.
- reserpine** An alkaloid of the plant *Rauwolfia* that inhibits the packaging of norepinephrine in presynaptic vesicles; a drug that causes sedation and that is used in psychiatry.
- residence time** The average length of time that two molecules are close enough together to lead to a measurable result of their interaction. Thus, the residence time is the average length of time that a substrate and an enzyme must interact so that a product will be formed.
- residual air** The volume of air in the lungs that cannot be expelled voluntarily.
- residual body** The vacuole, with its contents, that remains in the lysosome after a primary lysosome has completed the digestion of a food vacuole.
- residual index** A measure of the agreement between a calculated structure and one obtained from x-ray diffraction data; essentially a measure of the difference between calculated structural factors and corresponding observed values.
- residual relative infectivity** The fraction of the initial infectivity of a virus preparation that remains after the neutralization reaction of the virus with antiviral antibodies has reached its equilibrium value.
- residual variance** In the analysis of variance, that part of the variability of the dependent variable that is attributable to chance or experimental error.
- residue** That portion of a monomer that is present in a polymer; the monomer minus the atoms removed from it in the process of polymerization. *See also* amino acid residue.
- resilin** An elastic protein in the exoskeleton of insects; resembles elastin in its properties and is rich in glycine and devoid of cysteine.
- resin** 1. A polymerized support used in chromatography. *See also* ion-exchange resin; electron-exchange resin. 2. A water-insoluble, heterogeneous plant material.
- resin acid** One of a group of acid constituents of natural resins; chemically, a resin acid is an aromatic diterpene.
- resinate** A salt or an ester of a resin acid.
- resinoid** 1. *n* A resin-like substance. 2. *adj* Resin-like.
- resinous** Of, or pertaining to, a resin.
- resin soap** An alkali metal salt of a resin acid.
- resistance** 1. The capacity of bacteria to resist infection by phage particles; results from the inability of the phage particles to adsorb to, and to inject their DNA into, the bacterial cells. 2. DRUG RESISTANCE.
- resistance factor** A bacterial episome that endows a recipient bacterium with resistance to an antibiotic; consists of a resistance-transfer factor (RTF) together with the genes for drug resistance (*r*-genes). *Abbr* R factor; RF. *Aka* R-plasmid. *See also* R-plasmid.
- resistance-transfer factor** *See* resistance factor.
- resolution** 1. The separation of enantiomers from a racemic mixture. 2. The minimum distance between two points in a microscopic specimen or in an x-ray diffraction pattern at which the points are seen as two distinct spots; resolution in which the minimum distance is small is referred to as high resolution, and resolution in which the minimum distance is large is referred to as low resolution. 3. The degree of separation between two components in a mixture as achieved by chromatographic, electrophoretic, or other separation techniques. 4. The cutting process that separates the two participating DNA molecules during genetic recombination, as in the Holliday model, the asymmetric transfer model, and replicon fusion.
- resolvase** An enzyme responsible for separation of the cointegrate structure into donor and recipient units.
- resolve** To achieve resolution
- resolving gel** *See* disc gel electrophoresis.
- resolving power** 1. The capacity of a magnifying system to reveal detail. *See also* resolution (2). 2. The capacity of a fractionating system to separate components. *See also* resolution (3).

resolving time COINCIDENCE TIME.

resolving time loss COINCIDENCE LOSS.

resonance 1. The phenomenon that a compound that can be represented by two or more equivalent, or nearly equivalent, electronic formulas has in reality a structure that is a composite of all the possible electronic formulas and that is more stable than any of the separate structures. 2. The phenomenon in which a system, subjected to impulses (such as sound or electromagnetic radiation) having the same frequency as one of the natural frequencies of the system, responds with this natural frequency or a multiple thereof.

resonance energy transfer The stepwise and radiationless excitation of chromophores located near each other; light excites one chromophore which then excites an adjacent one with similar electronic properties, and so on. The transmission of the excitation energy by the antenna molecules in photosynthesis is an example.

resonance hybrid The true structure of a compound for which resonance structures may be formulated; the composite of all the possible resonance structures of a compound.

resonance Raman spectroscopy A form of Raman scattering in which one uses a laser beam of a wavelength that is absorbed in an electronic transition.

resonance stabilization The stabilization of a compound as a result of resonance; due to the fact that in resonance the pi electrons of the compound are less localized and hence have a lower potential energy level than in the absence of resonance.

resorcinol test SELIWANOFF TEST.

resorption See remodeling.

respiration 1. The cellular oxidative reactions of metabolism, particularly the terminal steps, by which nutrients are broken down; the reactions, which require oxygen as the terminal electron acceptor, produce carbon dioxide as a waste product, and yield utilizable energy. The major pathway of respiration consists of (a) the formation of acetyl coenzyme A from carbohydrate, fatty acid, and amino acid metabolism, (b) the citric acid cycle, and (c) the electron transport system. 2. The physical and chemical processes by which an organism transports oxygen to the tissues and removes carbon dioxide from them. 3. The act of breathing; inhaling and exhaling; inspiration and expiration.

respiratory acidosis A primary acidosis that is caused by a decrease in respiration which leads to an increase in the carbon dioxide and carbonic acid concentrations of the plasma.

respiratory alkalosis A primary alkalosis that is caused by an increase in respiration which

leads to a decrease in the carbon dioxide and carbonic acid concentrations of the plasma.

respiratory assembly A self-contained unit in the inner mitochondrial membrane that consists of fixed numbers of molecules of the various electron carriers; the unit has been fractionated into four respiratory complexes designated complexes I-IV. See also complexes I-IV.

respiratory burst An increase in the consumption of oxygen, with formation of hydrogen peroxide and superoxide anions, that accompanies (a) the engulfment of bacteria and other foreign objects by leukocytes, and (b) the destruction of tumor cells by macrophages.

respiratory chain An electron transport system that functions in respiration; the mitochondrial electron transport system in which molecular oxygen is the terminal electron acceptor.

respiratory chain phosphorylation OXIDATIVE PHOSPHORYLATION.

respiratory complex See complexes I-IV.

respiratory control ACCEPTOR CONTROL.

respiratory-control index ACCEPTOR-CONTROL RATIO.

respiratory distress syndrome A pathological condition, characterized by rapid and shallow breathing and by cyanosis, that results from a deficiency of lung surfactant and that is a major cause of death in premature babies. *Abbr* RDS.

respiratory enteric orphan virus REOVIRUS.

respiratory enzyme 1. An enzyme that functions in cellular respiration. 2. CYTOCHROME OXIDASE.

respiratory enzyme complex See complexes I-IV.

respiratory inhibitor Any substance that inhibits the flow of electrons along the electron transport system and/or the synthesis of ATP in oxidative phosphorylation.

respiratory pigment A protein pigment that functions in the reactions of cellular respiration; hemoglobin, myoglobin, and hemerythrin are examples.

respiratory poison RESPIRATORY INHIBITOR.

respiratory protein RESPIRATORY PIGMENT.

respiratory quotient The number of moles of carbon dioxide produced by a tissue or an organism divided by the number of moles of oxygen consumed during the same time. *Abbr* RQ.

respiratory reduction 1. NITRATE RESPIRATION. 2. SULFATE RESPIRATION.

respiratory repression The regulation of the synthesis of an enzyme by an exogenous electron acceptor that is independent of either specific or catabolite repression.

respiratory syncytial virus A virus belonging to the group of paramyxoviruses that, in humans, gives rise to localized diseases of the respiratory tract. *Abbr* RSV.

respiratory virus A virus that infects the respiratory system.

respirometer An instrument for measuring and/or recording respiratory movements.

respirometry The measurement of the kinetics of oxygen uptake and carbon dioxide evolution during respiration.

responder An animal that produces an immune response when challenged with a given antigen.

resting cell A metabolically active cell that is not in the process of dividing.

resting heat The heat produced by a resting muscle.

resting muscle A muscle that is not in the process of contracting or relaxing.

resting nucleus A metabolically active nucleus that is not in the process of dividing.

resting potential The membrane potential of an unstimulated membrane.

restitutive protection The protection of biomolecules against damage from an ionizing radiation by chemical substances that aid in the restoration of primary lesions to their original condition, but do not alter the number of these lesions. *See also* competitive protection.

restraining autacoid *See* autacoid.

restricted diffusion Diffusion through a porous medium in contrast to free diffusion which occurs in the gas phase or in solution.

restricted diffusion chromatography GEL FILTRATION CHROMATOGRAPHY.

restricted DNA A DNA from one cell that is prevented from replicating in a related, but not identical, cell because it is degraded by endogenous endonucleases of the related cell.

restricted rotation The limited rotation about a bond that can be attained by an atom or a group of atoms in a molecule; the rotation about a double bond and the rotation about the bond in a ring structure are examples.

restricted transduction SPECIALIZED TRANSDUCTION.

restricted virus A virus, the host range of which is limited as a result of a host-induced modification.

restriction The ability of a bacterial strain to degrade the DNA from a related, but not identical, strain. *See also* restricted DNA; restriction enzyme.

restriction allele *See* restriction gene.

restriction endonuclease RESTRICTION ENZYME.

restriction enzyme An endonuclease of prokaryotes that catalyzes the degradation of

foreign DNA such as that of a different bacterium or a phage. Restriction enzymes recognize specific base sequences in DNA (generally palindromes or inverted repeats) and hence cut a DNA molecule into a relatively small number of fragments (restriction fragments). There are three major types of restriction enzymes. Type I (or class I) enzymes recognize specific base sequences but make cuts elsewhere in the DNA (at about 1000 bp from the recognition site); type II (or class II) enzymes recognize specific base sequences and make cuts only within or next to these sequences. A type II enzyme makes two single-strand breaks, one in each strand, at the recognition site. If the two breaks occur at the center of symmetry, the resulting strand ends are referred to as flush or blunt ends; if the two breaks are equidistant from, and on opposite sides of, the center of symmetry, the resulting single-strand ends are known as cohesive or sticky ends. Type III (or class III) enzymes recognize specific base sequences and make cuts at about 25 bp from the recognition site. Type I and III enzymes carry both endonuclease and methylase activity on a single protein molecule; type II enzymes have only endonuclease activity. *Aka* restriction endonuclease. *See also* isoschizomer; isocaudamer.

restriction fragment A segment of DNA produced from a larger DNA molecule by the action of a restriction enzyme. *See* restriction enzyme.

restriction fragment length polymorphism The variations that occur in the pattern of restriction fragments, produced by the same restriction enzyme, from the DNA of different individuals of the same species. Such variations will be observed if one or more mutations have occurred in the DNA of an individual, thereby either creating or abolishing restriction sites for the specific restriction enzyme. The analysis of restriction fragments is, therefore, useful in screening for mutations and genetic diseases. *Abbr* RFLP. *Aka* restriction polymorphism.

restriction gene A gene, the product of which is a restriction enzyme.

restriction map A diagrammatic representation of a linear or circular DNA molecule which shows the positions at which one or more restriction enzymes would make cuts.

restriction-modification system A system for the selective degradation of foreign DNA in prokaryotic cells that is based on the presence of two groups of enzymes, restriction enzymes (restriction endonucleases) and DNA methylases (modification methylases). The latter methylate the host DNA at restriction sites and thereby protect the host DNA against

- degradation by the host restriction enzymes. Foreign DNA, such as phage DNA, that enters the prokaryotic cell, is not protected by methylation at the same restriction sites and is, therefore, degraded by the host restriction enzymes.
- restriction mutant** A mutant that carries a restriction gene.
- restriction point** A point of no return in the G_1 phase of the cell cycle. Once this point has been passed, the cell will complete the rest of the cycle (S, G_2 , and M phases) regardless of the external conditions. *Abbr* R point.
- restriction polymorphism** RESTRICTION FRAGMENT LENGTH POLYMORPHISM.
- restriction site** A site in DNA that contains a specific base sequence and that can be cleaved by a particular restriction enzyme.
- restrictive cell** A cell in which a conditional lethal mutant cannot grow.
- restrictive conditions** Conditions (such as the temperature or the type of host) under which a conditional mutant cannot either grow or express its mutant phenotype.
- restrictive transduction** SPECIALIZED TRANSDUCTION.
- resultant spin** The algebraic sum of the spin quantum numbers of all the electrons of the atom or the molecule; the resultant spin is zero if all of the electrons are paired.
- retardation coefficient** The slope of the line that is obtained when the relative migration distance of a protein in gel electrophoresis is plotted as a function of the reciprocal of the gel concentration. The relative migration distance is the ratio of the migration distance at a given gel concentration to that at a standard gel concentration.
- retentate** The material retained by a semi-permeable membrane.
- retention index** *See* Kovats retention index system.
- retention of configuration** The maintenance of a given enantiomeric configuration about an asymmetric carbon atom in the course of a chemical reaction.
- retention time** The time between the injection of a sample into a gas chromatographic column and the appearance of the peak maximum.
- retention volume** The volume of gas in gas chromatography that is required to elute the compound of interest. *See also* holdup volume.
- reticulate evolution** An evolutionary pattern that, when diagrammed, resembles a net; such patterns are characteristic of the evolution of plant species.
- reticulocyte** An immature red blood cell that actively synthesizes hemoglobin and that pos-
- sesses functioning pathways of glycolysis, the hexose monophosphate shunt, and the citric acid cycle.
- reticuloendothelial system** Collectively, the cells in spleen, liver, bone marrow, and other tissues that are involved primarily in phagocytosis and in the metabolism of hemoglobin. *Abbr* RES.
- reticuloendothelium** RETICULOENDOTHELIAL SYSTEM.
- retinal** The aldehyde form of vitamin A; retinal₁ is the aldehyde form of vitamin A₁ and retinal₂ is the aldehyde form of vitamin A₂. *See also* 11-*cis*-retinal; all-*trans*-retinal.
- 11-*cis*-retinal** An isomeric form of retinal that is converted by the action of light to the all-*trans* isomer.
- retinaldehyde** RETINAL.
- retinene** RETINAL.
- retinoid** Collective term for vitamin A and its analogues.
- retinol** *See* vitamin A.
- retinol-binding protein** A plasma protein that binds and transports vitamin A, in the form of *trans*-retinol from the liver to extrahepatic tissues. The binding of vitamin A to the protein serves to solubilize vitamin A and to protect it against oxidation. *Abbr* RBP.
- retinol equivalent** A measure of vitamin A activity in foodstuffs equal to 1 μ g of retinol or 6 μ g of β -carotene.
- retinyl ester** An ester of all-*trans*-retinol.
- retrovirus** Variant spelling of retrovirus.
- retroconversion** A biohydrogenation reaction, observed in liver and testes, whereby unsaturated fatty acids are converted to saturated ones.
- retrogene** PROCESSED GENE.
- retrogradation** The formation of microcrystals and precipitates that occurs in starch gels and in starch solutions upon standing; caused by the separation of amylose molecules that become aligned and hydrogen bonded.
- retroinhibition** FEEDBACK INHIBITION.
- retroposition** The RNA-mediated movement of genetic information from one locus to another; the movement of an RNA mobile genetic element; transposition that is RNA-mediated.
- retroposon** A mobile genetic element that transposes via an RNA intermediate; an RNA transposon. A retrovirus is a retroposon. *Aka* retrotransposon.
- retroregulation** The regulation of mRNA translation by DNA segments that lie downstream from the segment that codes for the mRNA.
- retrosteroid** A synthetic steroid that has a structure at carbon atoms 9 and 10 which is opposite to that in progesterone. Retroster-

oids are made from lumisterols and are extremely active as progestogens.

retrotranscript A DNA segment formed via reverse transcription.

retrotransposon RETROPOSON.

retrovirus An RNA virus that contains the enzyme reverse transcriptase which allows the viral RNA genome to be transcribed into viral DNA. The name retrovirus refers to this "backward" transcription. The transcribed viral DNA is then integrated in, and replicated with, the host chromosome. Some retroviruses contain oncogenes and their infection of a host results in transformation of normal cells to cancer cells. Retroviruses contain two identical, single-stranded RNA molecules, held together by hydrogen bonding near their capped 5'-ends. *See also* oncornavirus.

reversal The change of cancer cells to normal cells or to benign tumor cells.

reverse bend BETA BEND.

reverse burst titration A titration procedure for the active site of an enzyme; based on measuring the decrease in absorbance resulting from the binding to the active site of a chromogenic compound that is not acted upon further by the enzyme. *See also* burst titration.

reverse dialysis A method for concentrating a solution of macromolecules. The sample is placed in a dialysis bag and the latter is packed in a dry, water-soluble, nondialyzable polymer such as polyethylene glycol. Water will leave the dialysis bag to equilibrate with the dry external phase and thus produce a more concentrated sample solution inside the bag. Sucrose can be used similarly but, since it is dialyzable, it must subsequently be removed from the bag by ordinary dialysis.

reversed micelle *See* micelle.

reversed phase chromatography Partition chromatography in which the mobile phase is more polar than the stationary phase. *Abbr* RPC. *Aka* reversed phase partition chromatography.

reverse electron transport The reduction of NAD^+ to NADH by mitochondria in the presence of ATP. *Aka* reverse electron flow.

reverse flow chromatography A column chromatographic technique in which the flow of solvent is reversed, proceeding from the bottom of the column to the top. This minimizes the decrease in flow rates that frequently occurs with conventional chromatography as a result of the packing of the stationary phase at the lower end of the column.

reverse isotope dilution analysis INVERSE ISOTOPE DILUTION ANALYSIS.

reverse isotopic trapping A technique for determining whether more than one metabolic

pathway leads to the synthesis of compound A; performed by continuously administering a labeled precursor X, isolating compound A, and determining the specific activity of compound A. By comparing the specific activity of compound A with that of the administered precursor X, it is possible to decide whether A is synthesized solely from X, or also from other precursors by way of different pathways.

reverse mutation REVERSION (1).

reverse osmosis The movement of water or another solvent from a more concentrated to a more dilute solution across a semipermeable membrane; the desalination process in which seawater is forced across a semipermeable membrane is an example.

reverse passive anaphylaxis The anaphylactic reaction produced in an animal by injecting it first with an antigen that is itself an immunoglobulin and, following a latent period, by injecting it with an antiserum that is specific for the immunoglobulin used as an antigen.

reverse phase chromatography *See* reversed phase chromatography.

reverse transcriptase An RNA-dependent DNA polymerase that catalyzes the synthesis of DNA from deoxyribonucleoside-5'-triphosphates, using RNA as a template. The enzyme has been found in retroviruses and in some other viruses. The reaction catalyzed by the enzyme is in contradiction to the flow of genetic information described by the original central dogma of molecular biology: $\text{DNA} \rightarrow$

$\text{RNA} \rightarrow \text{protein}$. The enzyme actually has three enzymatic activities: It copies a single-stranded RNA molecule to yield a double-stranded DNA-RNA hybrid; it copies a single-stranded DNA molecule to yield a double-stranded DNA molecule; and it degrades the RNA in a DNA-RNA hybrid (this is called its ribonuclease H, RNAase H, activity). In view of our current knowledge of this enzyme and of RNA replication, the original central dogma of molecular biology must now be represented as: $\text{DNA} \rightleftharpoons \text{RNA} \rightarrow \text{protein}$.

Abbr RT. *See also* retrovirus.

reverse transcription The reaction catalyzed by the enzyme reverse transcriptase.

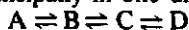
reverse turn BETA BEND.

reversible boundary spreading test A test applied in moving boundary electrophoresis to assess the homogeneity of the sample. A boundary is first allowed to migrate for some distance and the electric field is then reversed; any sharpening of the boundary that occurs upon reversal of the electric field reflects heterogeneity in the sample and cannot be attributed to diffusion. The test can also be

applied to zone electrophoresis.

reversible inhibitor An inhibitor that binds to an enzyme in an equilibrium reaction so that the inhibition can be reversed by removal of the inhibitor from the enzyme by such processes as dialysis or ultrafiltration. *See also* irreversible inhibitor; reactivation.

reversible metabolic pathway A metabolic pathway in which the equilibrium constants of the individual reactions are such that products can be converted to the reactants in significant amounts. The pathway is called directly reversible if the reaction sequence can be traversed in both directions: $A \rightleftharpoons B \rightleftharpoons C \rightleftharpoons D$; and is called indirectly reversible if it is traversed principally in one direction:



reversible process A process in equilibrium thermodynamics in which the system goes from an initial to a final equilibrium state through a succession of equilibrium states. Thus, the system is always close to equilibrium and the direction of the process can be reversed by an infinitesimal change. The net entropy change for the system plus its surroundings is zero for such a process.

reversible reaction A chemical reaction that (a) establishes an equilibrium and can be made to proceed in either direction by a change in the conditions, or (b) has an equilibrium constant of the order of 1.0, or (c) proceeds equally well in both directions because of other factors.

reversion 1. The change of a mutant gene to its state prior to mutation; a reverse mutation. Also referred to as true reversion as distinct from restoration of the genetic function by a suppressor mutation. 2. DEADAPTATION.

reversion index The mutation index for a reverse mutation.

reversion spectroscopy A spectroscopy that allows the formation of two spectra alongside each other, with the wavelength changing in one direction for one spectrum and in the opposite direction for the other spectrum.

revertant 1. A cell, a virus, or an organism that carries a gene that has undergone reversion. 2. A gene that has undergone reversion.

Reynold's number A quantity that characterizes the flow of a liquid through a cylindrical tube; equal to $2\rho u a / \eta$, where u is the average velocity, a is the radius of the tube, ρ is the density, and η is the viscosity.

RF 1. Replicative form. 2. Resistance factor.

R factor 1. Resistance factor. 2. Release factor.

RFLP Restriction fragment length polymorphism.

R_f value The ratio of the distance traveled by a compound in flat-bed chromatography to that traveled by the solvent.

R_G Average radius of gyration.

RGD The tripeptide arginine-glycine-aspartic acid that occurs in many adhesive proteins, present in the extracellular matrix, such as fibronectin, collagen, and fibrinogen. The RGD sequence of the adhesive proteins is recognized by at least one member of a family of structurally related receptors, called integrins, and this interaction is believed to play a major role in cell adhesion, cell migration, and cell differentiation.

R gene 1. Regulator gene. 2. Drug resistance gene; *see* resistance factor.

R group 1. That portion of an organic molecule that does not contain the functional group of interest; an organic radical. 2. The side chain of an amino acid.

R_g value A value that is somewhat like an R_f value and that is used in the chromatography of carbohydrates; it is equal to the ratio of the distance traveled by a given carbohydrate to that traveled by glucose.

Rha Rhamnose.

rhabdovirus An enveloped, helical animal virus that contains single-stranded RNA. Rhabdoviruses contain lipoproteins in their envelope and include the causal agents of rabies and vesicular stomatitis.

rhamnose A deoxysugar that occurs in some bacterial cell walls. *Abbr* Rha.

rhamsan gum A water-soluble, heteropolysaccharide, produced by fermentation of some species of *Alcaligenes*, that yields solutions that have high viscosities at low concentrations.

rhapidosome A rod-shaped or tubular nucleoprotein structure that occurs intracellularly in some bacterial species and that is believed to be derived from the cell membranes as the bacteria undergo lysis.

Rh blood group system A human blood group system in which the Rh factor is the antigen and individuals are either Rh positive or Rh negative; so called since it was first discovered in the Rhesus monkey. An Rh positive baby of an Rh negative mother may be born with a hemolytic disease called erythroblastosis fetalis.

rheology The science that deals with the deformation and flow of matter.

rheostat A variable resistor.

Rhesus factor Rh factor.

rheumatoid factor A specific serum γ -globulin, found in individuals afflicted with rheumatoid arthritis.

Rh factor The antigen of the Rh blood group system.

rhinovirus A virus that belongs to a subgroup of picornaviruses and that causes respiratory infections.

Rhizobium A genus of gram-negative, aerobic, nitrogen-fixing bacteria that live as symbionts in the root nodules of leguminous plants. *Aka* nodule bacteria.

rhizopterin SLR FACTOR.

rhodanese The enzyme thiosulfate sulfur transferase that catalyzes the displacement of sulfur from thiosulfate by cyanide and thereby serves to detoxify cyanide.

rhodoplast A photosynthetic organelle of red algae; a red plastid that contains biliproteins.

rhodopsin A visual pigment, consisting of rod opsin plus retinal₁, that occurs in mammals and other vertebrates and that has an absorption maximum at 500 nm.

rhodopsin cycle VISUAL CYCLE.

Rhodospirillum rubrum A photosynthetic bacterium used for studies of photosynthesis.

rho factor A protein that is required for the correct termination of transcription. The *E. coli* protein is a hexamer of identical, 419 residue, subunits. The rho factor is an enzyme that catalyzes the unwinding of RNA-DNA and RNA-RNA double helices. *Sym* ρ.

rho-independent terminator A base sequence, in the DNA of *E. coli*, that signals the termination of transcription and that is recognized by DNA-dependent RNA polymerase in the absence of the rho factor.

RHP cytochrome A cytochrome that contains two hemes per molecule and that is considered to be a variant of cytochrome *c*; the heme groups are considered to be bound through thioether linkages as in cytochrome *c*, but to lack hemochrome linkages to extraplanar ligands of the protein at physiological pH.

rH scale A scale for evaluating oxidation-reduction reactions that is based on rH values rather than on electrode potentials. The rH value is the negative logarithm of the hydrogen pressure in atmospheres, and runs from zero for a hydrogen pressure of 1 atm to 41 for an oxygen pressure 1 atm. The rH value of a reaction is obtained by relating the reaction to the hydrogen half-reaction; rH values for most biochemical systems fall in the range of 0 to 25.

RIA Radioimmunoassay.

Rib Ribose.

α-ribazole The compound 1-α-D-ribofuranosyl-5,6-dimethylbenzimidazole, that forms part of the structure of vitamin B₁₂ and that has a nucleoside structure in which an uncommon nitrogenous base is linked to the sugar by means of an α-glycosidic bond.

ribitol A five-carbon sugar alcohol that forms

part of the structure of riboflavin, FMN, and FAD.

ribodeoxyvirus RETROVIRUS.

riboflavin Vitamin B₂; a vitamin that is widely distributed in nature and the coenzyme forms of which are FMN and FAD.

riboflavin mononucleotide FLAVIN MONONUCLEOTIDE.

riboflavin phosphate FLAVIN MONONUCLEOTIDE.

riboflavin-5'-phosphate FLAVIN MONONUCLEOTIDE.

ribofuranose Ribose that has a 5-membered ring structure resembling that of the compound furan.

ribonuclease An endonuclease that catalyzes the hydrolysis of RNA; it cleaves 3',5'-phosphodiester bonds in RNA.

ribonuclease III A ribonuclease that specifically hydrolyzes double-stranded RNA.

ribonuclease A A ribonuclease that leads to the production of mono- and oligonucleotides consisting of, or terminating in, a 3'-pyrimidine nucleotide. *Aka* pancreatic ribonuclease.

ribonuclease D A ribonuclease that removes a number of nucleotides from precursor tRNA thereby producing the 3'-terminus of mature tRNA.

ribonuclease H A ribonuclease that specifically degrades RNA in DNA-RNA hybrids. It is associated with reverse transcriptase and has also been isolated from other sources.

ribonuclease P A bacterial ribonuclease that cleaves an oligonucleotide from precursor tRNA, thereby producing the 5'-terminus of mature tRNA. The enzyme is unusual in that it contains 86% RNA and only 14% protein by weight. Moreover, the RNA possesses the catalytic activity, the protein does not. The protein merely serves to maintain the proper folding of the RNA to maximize its catalytic activity. Ribonuclease P is a ribozyme.

ribonuclease protection 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. The ribonucleoprotein complex (such as a tRNA molecule and its cognate aminoacyl-tRNA synthetase) is then treated with various endonucleases that digest away most of the RNA outside the regions protected by the bound protein. The remaining oligonucleotide fragments, representing the RNA regions that were in intimate contact with the protein, are then identified.

ribonuclease S An association of the two fragments (S peptide and S protein) that are formed from ribonuclease A by specific cleavage with subtilisin between amino acid residues 20 and 21. The two fragments are link-

ed noncovalently and produce a fully active ribonuclease.

ribonuclease T1 A ribonuclease that leads to the production of mono- and oligonucleotides consisting of, or terminating in, a 3'-guanine nucleotide.

ribonuclease T2 A ribonuclease that leads to the production of mono- and oligonucleotides consisting of, or terminating in, a 3'-adenine nucleotide.

ribonuclease U₂A(U₂B) See isoforms.

ribonucleic acid The nucleic acid (*abbr* RNA) that occurs in three major forms as ribosomal, transfer, and messenger ribonucleic acid, all of which function in the biosynthesis of proteins. RNA is a polynucleotide that is characterized by its content of D-ribose and the pyrimidines uracil and cytosine.

ribonucleoprotein A conjugated protein that contains RNA as the nonprotein portion. *Abbr* RNP.

ribonucleoside A nucleoside of D-ribose.

ribonucleotide A nucleotide of D-ribose.

ribonucleotide reductase An enzyme that catalyzes the conversion of ribonucleoside diphosphates to deoxyribonucleoside diphosphates.

ribophorin One of a number of glycoproteins that are an integral part of the membrane of the rough endoplasmic reticulum and that serve as binding sites for ribosomes. See also signal hypothesis.

ribose The five-carbon aldose that is the carbohydrate component of ribonucleic acid. *Abbr* Rib.

ribose nucleic acid See ribonucleic acid.

riboside A glycoside of ribose.

ribosoid Collective term for ribonucleic acid and ribonucleoprotein.

ribosomal Of, or pertaining to, ribosomes.

ribosomal DNA See rDNA.

ribosomal particle A ribosome or any of its complete subunits.

ribosomal precursor RNA PRECURSOR RIBOSOMAL RNA.

ribosomal protein A protein that forms part of the ribosome. Ribosomal proteins are linked noncovalently to the ribosomal RNA and, together with the ribosomal RNA, form the two subunits of the ribosome. In bacterial ribosomes, there are 52 different ribosomal proteins per ribosome. The proteins of the large ribosomal subunit are designated by the letter L; those of the small subunit are designated by the letter S. *Abbr* r-protein.

ribosomal RNA The RNA that is linked noncovalently to the ribosomal proteins in the two ribosomal subunits and that constitutes about 80% of the total cellular RNA. Three types of ribosomal RNA have been identified, having

sedimentation coefficients of about 5S, 16 to 19S, and 23 to 29S, depending on the source of the ribosomes. *Abbr* rRNA.

ribosomal sieve See double-sieve mechanism.

ribosomal stalling See attenuation.

ribosomal subparticle 1. A ribosomal subunit, such as the 30S or the 50S particle of bacterial ribosomes. 2. A particle that either is a precursor of a ribosome, or is prepared from a ribosome by the removal of some ribosomal proteins. See also intersome.

ribosomal subunit One of the two ribonucleoprotein particles that make up the complete ribosome; the 30S or the 50S particle in bacteria, the 40S or the 60S particle in plant and animal cells.

ribosomal subunit exchange See subunit exchange.

ribosome 1. One of a large number of subcellular, nucleoprotein particles that are composed of approximately equal amounts of RNA and protein and that are the sites of protein synthesis in the cell. Each ribosome is roughly spherical in shape, has a diameter of about 200 Å, and consists of two unequal subunits linked together noncovalently by means of magnesium ions and other bonds. Ribosomes occur free in the cytoplasm and attached to the endoplasmic reticulum. Four classes of ribosomes have been identified (bacterial, plant, animal, and mitochondrial) and they can be characterized by the sedimentation coefficients of the monomers, of the subunits, and of the ribosomal RNA. The bacterial ribosome contains 52 different protein molecules and 3 different RNA molecules; the smaller subunit contains 21 protein molecules and 1 RNA molecule; the larger one contains 31 protein molecules and 2 RNA molecules. The ribosome has two binding sites for transfer RNA (A site, P site) and can attach to messenger RNA as well. *Abbr* Rb. 2. RIBOSOMAL SUBUNIT.

ribosome binding site SHINE-DALGARNO SEQUENCE.

ribosome binding technique See binding assay (2).

ribosome crystal An aggregate of ribosomes, packed in a regular array, that has been observed in several eukaryotic organisms.

ribosome cycle The set of reactions whereby ribosomal subunits combine to form the intact ribosome during the initiation of translation, travel along the messenger RNA as intact ribosomes, and dissociate back to the subunits during the termination of translation. See also subunit exchange.

ribosome dimer An aggregate of two ribosomes, consisting of two small and two large ribosomal subunits.

ribosome dissociating factor A factor that promotes the dissociation of the ribosome monomers into the two subunits during the termination of translation.

ribosome editing The hypothesis that errors in protein synthesis, resulting from the transfer of a peptide to an inappropriate aminoacyl-tRNA (thus producing an inappropriate peptidyl-tRNA), are detected by the ribosome; this detection then leads to the preferential dissociation of the inappropriate peptidyl-tRNA from the ribosome.

ribosome epicycle The steps through which the ribosome passes upon the addition of each amino acid during the elongation phase of protein synthesis; includes aminoacyl-tRNA binding to the ribosome, peptide bond formation, (transpeptidation), and translocation.

ribosome exchange SUBUNIT EXCHANGE.

ribosome monomer A complete ribosome that is composed of one small and one large subunit.

ribosome read-through See read-through.

ribosome receptor A receptor in the membrane of the rough endoplasmic reticulum to which a ribosome becomes bound during protein synthesis according to the signal hypothesis. The receptor is believed to be adjacent to a membrane pore and the ribosome becomes bound to the receptor after the signal sequence has become detached from the signal recognition protein.

ribosome runoff The loss from polysomes of ribosomes that have not completed the synthesis of the polypeptide chain.

ribosubstitution The replacement of some of the deoxyribonucleotides in a DNA by ribonucleotides; achieved by the *in vitro* synthesis of DNA under conditions that allow the incorporation of ribonucleotides from a mixture of ribo- and deoxyribonucleoside-5'-triphosphates. Ribosubstituted DNA can be used as an aid in the determination of the base sequence of the DNA.

ribosylthymine RIBOTHYIMIDINE.

5-ribosyluracil PSEUDOURIDINE.

ribothymidine The ribonucleoside of thymine; an unusual nucleoside that does not, as a rule, occur in RNA. *Sym* Thd.

ribothymidylic acid The ribonucleotide of thymine.

ribotide A ribonucleotide.

ribotype The ribonucleoprotein complement of a cell.

ribovirus RNA VIRUS.

ribozyme A catalytic RNA segment that has the ability to break and form covalent bonds. Ribonuclease P and the intron in the rRNA precursor molecule of *Tetrahymena thermophila* are two examples.

ribulose A five-carbon ketose that is an intermediate in the hexose monophosphate shunt. *Abbr* Rul.

ribulose-1,5-bisphosphate A five-carbon ketose that is the acceptor of carbon dioxide in the Calvin cycle. Previously known as ribulose-1,5-diphosphate. *Abbr* R1,5BP; R1,5DP.

ribulose-1,5-bisphosphate carboxylase The enzyme that catalyzes the fixation of carbon dioxide by ribulose-1,5-bisphosphate in the Calvin cycle. *Abbr* Rubisco, RuBPCase; RuBP carboxylase.

ribulose diphosphate carboxydismutase RIBULOSE-1,5-BISPHOSPHATE CARBOXYLASE.

Rice test INDIRECT COMPLEMENT FIXATION TEST.

Richard's box A simple arrangement for constructing a model of a protein of known amino acid sequence from the electron density map of the protein; involves a half-silvered mirror which is used to superimpose a wire model of the structure onto a pile of lucite sections where the electron density map is plotted.

ricin A plant protein in the seeds of castor beans (*Ricinus communis*) that is toxic to animals and humans, inhibits protein synthesis, and has antitumor activity; a lectin that agglutinates red blood cells.

ricinin A toxic pyridine alkaloid from the seeds of castor beans (*Ricinus communis*); it is biosynthesized from nicotinic acid.

rickets A disease of children that is characterized by a softening and bending of the bones and that is caused by a deficiency of vitamin D. In rickets, as opposed to osteoporosis, the bone matrix remains intact and continues to be synthesized but formation of bone mineral is impaired. There is, therefore, a change in the ratio of bone mineral to bone matrix.

Rieske protein An iron-sulfur protein, containing a 2 Fe/S center, that occurs in association with cytochromes *b* and *c*₁ in complex III of the electron transport system.

rifampicin A semisynthetic antibiotic; the most commonly used form of the rifamycins.

rifamycins A group of antibiotics, produced by *Streptomyces mediterranei*, that inhibit the initiation of transcription (DNA-dependent RNA synthesis) in prokaryotes by binding to DNA-dependent RNA polymerase (RNA polymerase).

right splicing junction See splicing junctions.

rigor mortis The irreversible contraction of muscles upon the death of an animal.

rimorphin An opioid peptide, derived from prodynorphin.

ring A chain of atoms in which the ends of the chain are linked together covalently; a cyclic compound.

ring current The electric current set up in an aromatic ring when the latter is oriented per-

pendicularly to a strong magnetic field. Under these conditions, the π (π) electrons circulate around the ring in a direction such that they induce a small local magnetic field which opposes the applied field in the middle of the ring but reinforces it outside the ring. The effect is important in nuclear magnetic resonance where it leads to a deshielding of aryl protons; the latter experience a magnetic field that is greater than the applied field and thus come into resonance at a lower applied field (downfield).

Ringer's solution A salt solution that is approximately isotonic to the blood and to the lymph of mammals; used for the temporary maintenance of living cells. As first proposed, it consisted of sodium chloride, potassium chloride, calcium chloride, and sodium bicarbonate; various modifications of this solution are now in use.

ring-flip The interconversion of chair conformations of cyclohexane rings that results in the interchange of axial and equatorial positions.

ring pucker See puckered conformation.

ring test A rapid and simple precipitin test in which a solution of antigen is layered over a solution of antibodies in either a test tube or in a capillary, and the presence or absence of a precipitate at the interface is determined.

RISA Acronym for radioimmunosorbent assay; an isotopic technique for the demonstration of minute amounts of immunoglobulins of the IgE type.

rise curve The increase in color intensity of a sample as a function of time; used in reference to determinations with an autoanalyzer.

rise period The time interval during which the extracellular titer of a phage multiplication cycle increases to a maximum.

ristocetin A glycopeptide antibiotic, produced by certain *Actinomycetes*, that prevents peptidoglycan synthesis.

R locus The position on a chromosome of a regulator gene.

rII locus A segment of the chromosome of T4 phage to which fine structure genetic mapping was first applied.

R-loop mapping An electron microscopic technique for visualizing complementary regions in DNA and the corresponding eukaryotic mRNA. The mRNA is hybridized with the DNA under certain annealing conditions (R-looping conditions) at which the DNA-RNA hybrid is more stable than the DNA-DNA duplex. As a result, the mRNA hybridizes with the DNA sense strand and this DNA-RNA hybrid displaces a segment of the DNA antisense strand which forms a loop (R-loop). One intron, present in the DNA but not in

the mature mRNA, leads to formation of two R-loops, two introns yield three R-loops, and so on.

R-meter A radiation meter that is calibrated to indicate roentgens.

r mutant RAPID LYSIS MUTANT.

R mutant A bacterial mutant that gives rise to a rough colony. See also rough strain.

R_m value A chromatographic term that is related to the R_f value of a compound. It is defined in the literature both as $R_m = (1 - R_f)/R_f$ and as $R_m = \log [(1 - R_f)/R_f]$.

Rn Radon.

RNA Ribonucleic acid.

RNA-11 A double-helical conformation of RNA that resembles that of A-DNA. It has 11 base pairs per helical turn and has the base pairs inclined to the helical axis by about 14° . Aka A-RNA.

RNAase Ribonuclease.

RNA coding triplet CODON.

RNA-dependent (directed) DNA polymerase REVERSE TRANSCRIPTASE.

RNA-dependent (directed) RNA polymerase REPLICASE.

RNA dot blot See dot blot assay.

RNA-driven hybridization A DNA-RNA hybridization technique in which excess RNA is used so that all complementary sequences in the single-stranded DNA will form DNA-RNA hybrids. See also playback experiment.

RNA gene A segment of DNA that has the information for the synthesis of an RNA molecule other than mRNA. DNA segments that code for ribosomal or transfer RNA are examples.

RNA ligase An enzyme that catalyzes the formation of a phosphodiester bond in RNA between a 3'-hydroxyl group and a 5'-phosphate group, which may or may not be on the same polynucleotide strand. RNA ligases are involved in the splicing of RNA.

RNA maturation SPLICING (2).

RNA modification PROCESSING (1).

RNA nucleotidyltransferase RNA POLYMERASE.

RNA phage An RNA-containing phage.

RNA polymerase An enzyme that functions in the transcription of DNA and that catalyzes the synthesis of RNA from the ribonucleoside-5'-triphosphates using DNA as a template; referred to as DNA-dependent (directed) RNA polymerase to distinguish it from RNA-dependent (directed) RNA polymerase. See also RNA polymerase classes.

RNA polymerase classes Multiple forms of DNA-dependent RNA polymerase that occur in eukaryotes. All are high molecular weight proteins and all are found in the nucleus. Each form is responsible for the synthesis of a

particular type of RNA and the various enzymes can be distinguished by their sensitivity to inhibition by α -amanitin; RNA pol I makes rRNA and is resistant to amanitin; RNA pol II makes mRNA and is highly sensitive to amanitin; RNA pol III makes tRNA and the 5S RNA of ribosomes and is somewhat sensitive to amanitin.

RNA primer A short RNA fragment onto which are added deoxyribonucleotides by DNA polymerase III during DNA replication. *See also* primer.

RNA processing PROCESSING (1).

RNA puff *See* chromosome puff.

RNA replicase *See* replicase.

RNase Ribonuclease.

RNA sequencing *See* Maxam-Gilbert method.

RNasin An inhibitor of ribonuclease.

RNA splicing The process whereby nontranslatable RNA sequences (introns) in the primary transcript of a split gene are excised, and the remaining translatable sequences (exons) are joined together to yield the functional gene product.

RNA synthesizer An automated setup for the chemical synthesis of oligonucleotide segments of RNA.

RNA synthetase RNA-DEPENDENT RNA POLYMERASE.

RNA virus An RNA-containing virus. *See also* oncornavirus.

RNP Ribonucleoprotein.

ROA Raman optical activity.

road map FLOW CHART.

Robertson model UNIT MEMBRANE HYPOTHESIS.

Robison ester Glucose-6-phosphate.

Rochelle salt Potassium sodium tartrate.

rocket electrophoresis A modification of immunoelectrophoresis in which varying amounts of antigen are placed in sample wells and electrophoresed into an agarose gel which contains antibodies. As the antigen moves into the gel it encounters antibody but does not precipitate out until the antigen and antibody concentrations are equivalent. The resulting precipitate pattern resembles a rocket and the distance traveled by the tip of the rocket is proportional to the amount of antigen in the sample well. *Aka* electroimmuno-diffusion.

rod A light receptor in the retina of vertebrates that functions in night vision.

rodenticide A chemical that kills rodents.

rod threshold The lowest light intensity that the fully dark-adapted eye can detect.

roentgen A quantity of ionizing radiation that results in the formation of 2.083×10^9 ion pairs (one electrostatic unit of charge of either sign) per cubic centimeter of dry air at 0°C and 760 mm Hg. *Sym* r; R.

roentgen equivalent man The product of the radiation absorbed dose (rad) and the relative biological effectiveness (RBE); the quantity of radiation that, when absorbed by man, produces an effect equivalent to the absorption of 1 R of x or gamma radiation. *Abbr* REM. *Aka* roentgen equivalent mammal.

roentgen equivalent physical The amount of ionizing radiation capable of producing 1.615×10^{12} ion pairs per gram of tissue; the amount of ionizing radiation that will result in the absorption by tissue of 93 erg/g of tissue. *Abbr* REP.

roentgen rays X-RAYS.

rohferment A crude enzyme preparation from almonds that is rich in glycosidases, particularly in β -D-glucosidase and β -D-galactosidase.

Rohrschneider constant A constant for relating the gas chromatographic retention behavior of a compound to the polarity of the liquid stationary phase.

rolling circle replication A model for the replication of duplex circular DNA. According to this model, a nuclease nick in one strand is followed by the addition of nucleotides to the 3'-end of the nicked strand, a reaction catalyzed by DNA polymerase. At the same time, the 5'-end of the strand is rolled out as a free tail of increasing length, resulting in intermediates larger than the original duplex. Small fragments are then synthesized complementary to the free tail and are eventually joined together through the action of a ligase. *Aka* sigma replication.

ROM Acronym for read only memory; the permanent memory in a computer that consists of basic instructions for processing information. This memory cannot be altered.

Romanowsky dyes A group of composite dyes used to stain blood cells and blood parasites. *Aka* Romanowsky stains.

Roman square LATIN SQUARE.

root-mean-square end-to-end distance A measure of the spatial extension of a polymer; equal to the square root of the average of the squares of the distances between the ends of the polymer, carried out over all possible conformations of the polymer.

Roseman hypothesis The hypothesis that cell adhesion is due to the noncovalent interaction of surface located glycosyl transferases of one cell with glycoproteins or glycolipids located on the surface of a second cell.

rosette technique IMMUNOCYTE ADHERENCE.

Rossman fold A characteristic mononucleotide binding domain in proteins for such compounds as ATP, ADP, AMP, and FMN. More complex dinucleotides, such as NAD⁺, NADP⁺, and FAD, may be bound to the protein by means of two Rossman folds.

Thus, in pyridine-linked dehydrogenases, the coenzyme binding site consists of two mononucleotide binding domains; one binds the AMP portion of NAD^+ , the other binds the nicotinamide portion. *Aka* mononucleotide binding domain.

rotamer A rotational isomer; a conformational isomer resulting from a rotation about single bonds.

rotary *See* rotational.

rotary evaporator FLASH EVAPORATOR.

rotary shaker *See* shaker.

rotating crystal method A method for the analysis of a single crystal by means of x-ray diffraction. The crystal is mounted and rotated about an axis, thereby producing a large number of diffraction spots; rotation of the crystal about all of its axes produces the maximum number of diffraction spots.

rotation The turning about an axis.

rotational base substitution The process whereby a base in one DNA strand exchanges position with its complementary base in the second strand. This may occur if the glycosidic bonds between the bases and their sugar molecules are broken by irradiation, and the hydrogen-bonded base pair is then rotated prior to being reinserted into the strands.

rotational diffusion The rotation of molecules about their axes that results in their achieving a random orientation. *See also* rotational relaxation.

rotational diffusion coefficient A measure of rotational diffusion that depends on the size and shape of the diffusing particle; specifically, $\theta = RT/N\zeta$, where θ is the rotational diffusion coefficient, ζ is the rotational frictional coefficient, N is Avogadro's number, R is the gas constant, and T is the absolute temperature.

rotational frictional coefficient A measure of the frictional resistance experienced by a particle in solution that is equal to the frictional force divided by the angular velocity of the particle. *See also* rotational diffusion coefficient.

rotational relaxation The relaxation that takes place when a field that leads to the orientation of molecules, otherwise randomly oriented due to Brownian motion, is suddenly turned off. The return of the molecules to their random orientation is characterized by the rotational diffusion coefficient.

rotational relaxation time The time required, during rotational relaxation, for the average value of $\cos \theta$ for all the solute molecules to fall to $1/e$ of its original value; e is the base of natural logarithms and θ is the angle through which the molecule has rotated away from its original direction of orientation.

rotational strength A quantity that is used in calculations of circular dichroism and that is related to the integrated value, over an absorption band, of the difference between the extinction coefficients for left and right circularly polarized light.

rotational symmetry The symmetry of a body that exists when identical structures are produced as the body is rotated about an axis. For a body containing subunits, all of the subunit centers can be set at the vertices of a regular polyhedron. *Aka* cyclic symmetry. *See also* axis of rotational symmetry.

rotational transition The transition of a molecule in which it rotates about an axis; rotational transitions require relatively small amounts of energy and are induced by infrared radiations of long wavelength.

rotation angle TORSION ANGLE.

rotation axis AXIS OF ROTATIONAL SYMMETRY.

rotation diagram An x-ray diffraction pattern obtained by the rotating crystal method. *Aka* rotation photograph.

rotation-reflection axis *See* reflection symmetry; rotoreflexional symmetry.

rotation technique *See* photographic rotation technique.

rotatory Of, or pertaining to, optical rotation.

rotatory dispersion *See* optical rotatory dispersion.

rotatory power SPECIFIC ROTATION.

rotenone An insecticide, extracted from the roots of some tropical plants, that inhibits the electron transport system between the flavoproteins and coenzyme Q.

Rothera's test A qualitative test for ketone bodies in urine that is based on the production of a blue-purple color upon treatment of urine with sodium nitroprusside and ammonium hydroxide.

rotometer A device for measuring the rate of gas flow; used in gas chromatography.

rotor The container that is rotated in a centrifuge and that holds the tubes filled with the solution which is subjected to centrifugation. *Aka* head.

rotoreflexional symmetry The symmetry of a body that exists when identical structures are produced by a rotation about an axis, followed by a reflection through a mirror plane.

R_{0t} value A quantity used in RNA-driven hybridizations that is analogous to the C_{0t} value in DNA-driven hybridizations; equal to the product of the initial concentration of single-stranded RNA and the time allowed for reassociation. *See also* cot curve.

roughage DIETARY FIBER.

rough endoplasmic reticulum That portion of the endoplasmic reticulum to which a large number of ribosomes are attached; the site of

- membrane protein and lipid synthesis. *Abbr* RER. *Aka* rough-surfaced endoplasmic reticulum.
- rough microsomes** *See* microsomes.
- rough-smooth variation** *See* rough strain; smooth strain.
- rough strain** A bacterial strain, such as *Pneumococcus* (*Streptococcus pneumoniae*), that grows in the form of a colony that appears rough (has jagged edges). In some species, rough strains are nonvirulent or less virulent than the corresponding smooth strains, and they lack O antigens in the cell wall lipopolysaccharide; they have, instead, an R cell surface antigen. *Abbr* R strain.
- round of replication** A single transit of the replication system along a DNA molecule.
- rounds of mating** The number of matings in the line of ancestry of an average phage particle in the phage population.
- Rous sarcoma** A virus-induced malignant tumor in chickens.
- Rous sarcoma virus** A virus that contains single-stranded RNA and causes cancer in chickens; belongs to the group of leukoviruses. *Abbr* RSV.
- routine** A set of coded instructions that causes a computer to perform the various operations necessary for solving a given problem.
- routine test dilution** 1. The greatest dilution of virus particles that can produce confluent lysis of cells in monolayers. 2. The greatest dilution of phage particles that can produce confluent lysis of cells in a bacterial lawn. *Abbr* RTD.
- rowboat model** The current version of the sliding filament model of muscle contraction. According to this model, the myosin molecule "walks" along an actin filament, a process driven by ATP hydrolysis. Briefly, the model postulates the following: ATP binds to the head of a myosin molecule which leads to detachment of the myosin from an actin (thin) filament. The bound ATP is then hydrolyzed and the myosin head, carrying the products of ATP hydrolysis (ADP + P_i), moves close to a neighboring subunit on the actin filament; this occurs by diffusion and is made possible by the flexibility of the hinge regions in the myosin molecule. Next the myosin binds to the actin filament, releasing the ADP and P_i. This binding causes the myosin head to tilt or rotate and thereby exerts a pull on the rest of the myosin (thick) filament. At the end of this power stroke, a fresh molecule of ATP binds to the head and the cycle is repeated. *Aka* Huxley-Simmons model.
- royal jelly** A liquid nutrient produced by worker bees which, when fed to female larvae, leads to the production of queens.
- R5P** Ribose-5-phosphate.
- RPC** Reversed phase chromatography.
- R plasmid** A plasmid that carries drug resistance genes and that confers on the bacterial host resistance to one or more antibiotics. Most R plasmids consist of two contiguous DNA segments, known as resistance transfer factor (RTF) and r-determinant. The former carries genes for DNA replication and is required for transfer of the plasmid between bacteria; the latter carries genes for antibiotic resistance. *Aka* resistance factor.
- rpm** Revolutions per minute.
- R point** Restriction point.
- RPP** Reductive pentosephosphate cycle.
- RPr** A regulatory protein that functions in the bacterial phosphotransferase system.
- r-protein** Ribosomal protein.
- RQ** Respiratory quotient.
- rRNA** Ribosomal RNA.
- rRNA transcription unit** *See* Miller tree.
- R_s** A useful parameter for comparing regulatory enzymes; equal to the ratio of the substrate (or ligand) concentration at 0.9 of the maximum velocity to the substrate (or ligand) concentration at 0.1 of the maximum velocity. For an enzyme that follows Michaelis-Menten kinetics, $R_s = 81$; for an enzyme that yields a sigmoidal curve when the velocity is plotted as a function of the substrate concentration, R_s has different values. If $R_s < 81$, the enzyme shows positive cooperativity; if $R_s > 81$, the enzyme shows negative cooperativity.
- RSD** Relative standard deviation.
- R site** 1. 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 ribose moiety. *See also* P site. 2. Recognition site.
- RS system** A system for naming each of several chiral centers in a molecule in an absolute manner; based on ranking the substituents around each asymmetric (chiral) carbon atom in the order of decreasing atomic number. The molecule is viewed with the lowest ranking group pointing directly away from the viewer. If the sequence of the substituents in decreasing rank order is seen to be clockwise, the configuration around this chiral center is denoted R (Latin rectus, "right"); if the decreasing rank order is counterclockwise, the configuration is denoted S (Latin sinister, "left"). *Aka* Cahn-Ingold-Prelog sequence rules.
- R strain** Rough strain.
- r-strand** CRICK STRAND.
- RSV** 1. Rous sarcoma virus. 2. Respiratory syncytial virus.
- RT** Reverse transcriptase.
- RTA** Renal tubular acidosis.

- RTD** Routine test dilution.
- RTF** Resistance transfer factor.
- rTU** rRNA transcription unit.
- rubber** A natural high molecular weight polymer of isoprene units; a polyterpene.
- rubella virus** The virus that causes German measles and that belong to the paramyxovirus group.
- Rubisco** Ribulose-1,5-bisphosphate carboxylase.
- Rubner's law** The principle that the heat produced by the metabolism of animals is proportional to the surface area of the animals; the principle has been shown to be approximately correct.
- RuBP** Ribulose-1,5-bisphosphate.
- RuBP carboxylase** Ribulose-1,5-bisphosphate carboxylase.
- RuBPCase** Ribulose-1,5-bisphosphate carboxylase.
- rubredoxin** IRON-SULFUR PROTEIN (a).
- Ruff degradation** A degradative technique for aldonic acids whereby a carbon atom is removed by treatment with hydrogen peroxide in the presence of ferrous ions, and the sugar is converted to the next lower aldose.
- ruffled edges** Extensive cellular projections that function in the adhesion of eukaryotic cells to solid surfaces. *Aka* lamellipodia.
- Ruhemann's purple** An intensely blue-purple compound that is formed by the reaction of ninhydrin with amino acids; it consists of two ninhydrin moieties, linked via the nitrogen derived from the amino acid.
- Rul** Ribulose.
- rule of mutual exclusion** The principle that, for molecules with a center of symmetry, vibrational transitions that are allowed in the infrared are forbidden in the Raman effect, and vice versa.
- rule of the ring** The concept that apparently all viral DNAs are circular, or are converted into circles before replication, or appear to have been formed from circular molecules originally.
- rumposome** A structure consisting of two membrane-bound sheets that is frequently seen to connect the nuclear region with the dictyosome region in flagellated fungi.
- running gel** *See* disc gel electrophoresis.
- run-off ribosome** *See* ribosome runoff.
- runt disease** GRAFT-VERSUS-HOST REACTION
- runting syndrome** GRAFT-VERSUS-HOST REACTION.
- Rutaceae alkaloids** *See* alkaloids.
- rutherford** The amount of radioactive substance that undergoes 10^6 disintegrations per second.
- Rutherford backscattering** A technique for the study of surfaces in which a high-energy beam of ions is directed at a surface. Measurements of the "shadows" cast by the surface atoms permit a pinpointing of the positions of surface atoms with great accuracy. *Abbr* RBS.
- Rutherford scattering** The scattering of radiation that results from elastic collisions of alpha or beta particles with atomic nuclei.
- R value** The fraction of the solute, in partition chromatography, that is present in the mobile phase.

S

- s** 1. Sedimentation coefficient. 2. Second. 3. Standard deviation.
- $s_{20,w}^0$** Standard sedimentation coefficient.
- S** 1. Substrate. 2. Svedberg unit. 3. Sulfur. 4. Entropy. 5. Bacterial colony of smooth morphology. 6. Period of DNA synthesis in the cell cycle. 7. S configuration. 8. Sensitivity of a bacterial strain to a phage or an inhibitor (used as a superscript). 9. Serine. 10. Thiouridine. 11. Sphingomyelin. 12. *See* RS system. 13. Designating a ribosomal protein from the small ribosomal subunit.
- ^{35}S** A radioactive isotope of sulfur that emits a weak beta particle and has a half-life of 87.2 days.
- $[\text{S}]_{0.5}$** The substrate concentration at which an allosteric enzyme catalyzes a reaction at one-half the maximum velocity. *See also* K_m .
- $[\text{S}']$** REDUCED SUBSTRATE CONCENTRATION.
- SA** Specific activity.
- Sabin vaccine** A poliomyelitis vaccine that is given orally and that consists of live, attenuated, poliovirus preparations.
- saccharase** SUCRASE.
- saccharic acid** ALDARIC ACID.
- saccharide** CARBOHYDRATE.
- saccharifying amylase** ALPHA AMYLASE.
- saccharimeter** An instrument, such as a polarimeter, or a device, such as a fermentation tube, for determining the amount of sugar in a solution. *Var sp* saccharometer.
- saccharin** *o*-Sulfobenzimide; an artificial sweetener.
- saccharogenic amylase** BETA AMYLASE.
- saccharogenic method** An assay of the enzyme amylase that is based on a determination of the amount of product formed.
- Saccharomyces cerevisiae** A species of yeast that includes the strains of baker's and brewer's yeast.
- saccharopine** The compound ϵ -*N*-(L-glutaryl-2)-L-lysine; an intermediate in the biosynthesis and degradation of lysine. The name derives from the fact that the compound functions in lysine synthesis in *Saccharomyces*. Hydrolytic and oxidation-reduction reactions convert saccharopine to lysine and α -ketoglutarate.
- saccharopinuria** A genetically inherited metabolic defect in humans, characterized by mental retardation, that is due to a deficiency of the enzyme saccharopine dehydrogenase.
- saccharose** SUCROSE.
- sacculus** The sack-like peptidoglycan structure of the bacterial cell wall.
- sacrifice** Euphemism for "to kill"; used in reference to experiments with animals.
- Sagavac** Trademark for a group of agarose gels used in gel filtration chromatography.
- SAIDS** Simian acquired immune deficiency syndrome.
- Sakaguchi reaction** A colorimetric reaction for arginine that is based on the production of a red color upon treatment of the sample with α -naphthol and sodium hypochlorite.
- salimeter** A hydrometer that is calibrated for the determination of either the specific gravity of a saline solution or the concentration of sodium chloride in the solution. *Aka* salinometer.
- saline** 1. *n* An aqueous solution of sodium chloride. 2. PHYSIOLOGICAL SALINE. 3. *adj* Of, or pertaining to, salt.
- salivary juice** The digestive juice, consisting of the saliva, that is secreted by the salivary glands into the mouth and that contains the enzyme ptyalin. *Aka* salivary fluid.
- Salkowski reaction** A modification of the Liebermann-Burchard reaction for cholesterol in which acetic anhydride is omitted.
- Salk vaccine** A poliomyelitis vaccine that is given by injection and that consists of formalin-killed poliovirus preparations.
- salmine** A protamine of 32 amino acids isolated from salmon sperm.
- Salmonella** A genus of gram-negative enteric bacteria that are widely used for genetic studies.
- Salmonella test** *See* Ames test.
- saltatory conduction** Descriptive of the conduction of a nerve impulse in myelinated axons. These axons are heavily insulated by the myelin sheath except for small bare regions (called Nodes of Ranvier), spaced about 1–2 mm apart. As a result, the nerve impulse effectively jumps from node to node; conduction is saltatory (dance-like). This type of conduction is much faster than that along unmyelinated axons and conserves metabolic energy since active excitation is confined to the small nodal regions.
- saltatory motion** Descriptive of the motion of lysosomes and other small vesicles that serves to move them from one place to another in a saltatory (dance-like) manner.
- saltatory replication** Descriptive of the lateral

replication of DNA during gene amplification in which large numbers of copies of a given segment of DNA are produced.

salt fractionation The fractional precipitation of proteins by means of inorganic salt solutions, frequently those of ammonium sulfate.

salt-gene theory A theory of hypertension according to which blood pressure is related to both salt intake and genetic background. The theory predicts that individuals, who are genetically susceptible, will develop high blood pressure on a high-salt diet.

salting in The increase in the solubility of a protein that is produced in solutions of low ionic strength by an increase of the concentrations of neutral salts; due to a stabilization of the charged groups on the protein as a result of a decrease in the activity coefficients of these groups.

salting out The decrease in the solubility of a protein that is produced in solutions of high ionic strength by an increase of the concentrations of neutral salts; due to a partial dehydration of the protein as a result of the competition between the protein and the salt ions for solvating water molecules.

salting-out chromatography A chromatographic technique in which water-soluble organic compounds are separated by ion-exchange chromatography using an aqueous salt solution for elution.

salting-out constant A constant characteristic of the solubility behavior of a protein; specifically, $\log S = \log S_0 - KI$, where S is the actual solubility of the protein, S_0 is the solubility in pure water, I is the ionic strength, and K is the salting-out constant.

salt link IONIC BOND.

salt precipitation SALT FRACTIONATION.

salt respiration ANION RESPIRATION.

salvage pathway A pathway that utilizes compounds formed in catabolism for biosynthetic purposes, even though these compounds are not true intermediates of the corresponding normal biosynthetic pathway. Thus, free purines may be salvaged from the hydrolysis of nucleotides and then used for the biosynthesis of nucleotides; likewise, free choline may be salvaged from the degradation of phosphatidyl choline and then used for the biosynthesis of phosphoglycerides.

SAM S-Adenosyl-L-methionine.

samesense mutation A mutational change in DNA in which a codon, coding for a given amino acid, is converted into a synonym codon for the same amino acid. As a result, the corresponding mRNA still directs the incorporation of the same amino acid into the protein; the protein is unchanged and the mutation is a silent one.

sample ampholyte An ampholyte of the mixture that is fractionated by isoelectric focusing, as distinct from a carrier ampholyte that is used to form the pH gradient.

sample gel See disc gel electrophoresis.

sampling error An error due to the method of obtaining samples, to the inadequacy of the number of samples, or to the inadequacy of the size of the sample.

Sandhoff's disease A genetically inherited metabolic defect in humans that is a rare form of Tay-Sachs disease and in which there is a deficiency of both hexosaminidase A and B.

sandwich technique INDIRECT FLUORESCENT ANTI-BODY TECHNIQUE.

Sanfilippo's syndrome A mucopolysaccharidosis due to a deficiency of the enzyme heparan-*N*-sulfatase (syndrome of type A) or *N*-acetyl- α -glucosaminidase (syndrome of type B).

Sanger-Coulson method An enzymatic method of sequencing DNA. The method entails synthesis of radioactively labeled (^{32}P) fragments of various sizes using the DNA to be sequenced as a template. Further fragments are produced in a second (two-part) enzymatic stage in which either a single deoxyribonucleotide is present (plus system) or the same deoxyribonucleotide is lacking and only the remaining three deoxyribonucleotides are present (minus system). The two-part experiment is performed 4 times, with a specific deoxyribonucleotide present (or lacking) each time. Alternatively, 2',3'-dideoxyribonucleoside triphosphates can be used as specific terminators of DNA synthesis in place of the minus system. The fragments are then separated by polyacrylamide gel electrophoresis and detected by autoradiography. *Aka* Sanger dideoxy method; plus-minus method.

Sanger reaction The reaction of the Sanger reagent, 1-fluoro-2,4-dinitrobenzene, with the free alpha amino group of amino acids, peptides, or proteins; the reaction yields a dinitrophenyl derivative that is useful for the chromatographic detection and quantitative estimation of amino acids, peptides, and proteins, as well as for endgroup analysis of N-terminal amino acids in peptides and proteins. The Sanger reagent reacts similarly with a number of other functional groups of the amino acids.

Sanger reagent See Sanger reaction.

S antigen Soluble antigen; an incomplete and noninfectious virus form that appears early in the course of certain viral infections.

sapogenin A steroid that occurs in plants in the form of glycosides known as saponins; the aglycone moiety of steroid saponins.

saponifiable fraction The fraction of total lipid

that, after saponification, is soluble in water and insoluble in ether.

saponifiable lipid A lipid that can be hydrolyzed with alkali to yield soap as one of the products; glycerolipids and sphingolipids are two major types of saponifiable lipids.

saponification The alkaline hydrolysis of a lipid, particularly a glyceride, that yields soap as one of the products.

saponification equivalent The number of grams of fat saponified by one mole of potassium hydroxide. *Abbr* SE.

saponification number A measure of the average chain length of the fatty acids in a fat; equal to the number of milligrams of potassium hydroxide required to saponify 1 g of fat. The greater the saponification number, the shorter the average chain length of the fatty acids in the fat. *Aka* saponification value.

saponin A water-soluble surface-active plant substance that forms soapy solutions even at high dilutions; saponins are powerful hemolytic agents that are glycosides and are classified according to the nature of the aglycone (also called genin) as steroid, triterpene, or steroid-alkaloid saponins.

saprophytic nutrition A mode of nutrition of "plant-like" organisms (such as bacteria and fungi) in which the organism derives its nutrients from dead or decaying plant or animal matter in the form of organic compounds in solution.

Sa protease A proteolytic enzyme, isolated from *Staphylococcus aureus*, that cleaves peptide bonds in which the carbonyl group is donated by aspartic or glutamic acid.

saprozoic nutrition A mode of nutrition of "animal-like" organisms (such as protozoa) in which the organism derives its nutrients from dead or decaying plant or animal matter in the form of organic compounds in solution.

sarcolemma The membrane surrounding the fiber of a striated muscle.

sarcoma A malignant tumor that arises from connective tissue.

sarcomere The longitudinal repeat unit of a myofibril; the segment that extends from one Z line to the next.

sarcoplasm The intracellular fluid that bathes the myofibrils of a muscle cell.

sarcoplasmic reticulum The smooth endoplasmic reticulum of a muscle cell.

sarcosine *N*-Methylglycine; an amino acid that is an intermediate in the metabolism of one-carbon fragments and that forms part of the structure of the antibiotic actinomycin D.

sarcosome A mitochondrion from a striated muscle.

sarcotubule A transverse tubule of the T-system of muscle.

sardinine A protamine isolated from sardines.

Sarkosyl Trademark for the detergent sodium *N*-lauryl sarcosinate.

Sarkosyl M-band technique A method for producing DNA-membrane complexes from bacterial lysates; based on the selective adsorption of membrane components to crystals of magnesium sarkosyl. These complexes can be recovered as discrete bands (M bands) by sucrose density gradient centrifugation. DNA is present in these bands by virtue of being bound to the cell membrane; it does not itself adhere to crystals of magnesium sarkosyl.

sat DNA Satellite DNA.

Satellite DNA A eukaryotic DNA fraction that differs sufficiently in its base composition from that of the bulk DNA (main band DNA) so that it can be separated from the latter by density gradient sedimentation equilibrium, using a cesium chloride gradient. Satellite DNAs are usually highly repetitive DNAs.

satellite DNA of mouse See mouse satellite DNA.

satellite phenomenon CROSS-FEEDING.

satellite RNA An RNA that has a sedimentation coefficient of 5 to 8S, small amounts of which are found in association with plant 26S ribosomal RNA.

satellite virus A small virus that occurs in association with another virus, such as the tobacco necrosis satellite virus or the adenovirus associated virus.

satellitism CROSS-FEEDING.

saturated fatty acid A fatty acid that contains a saturated alkyl chain. Most naturally occurring saturated fatty acids have an even number of carbon atoms. Even-numbered saturated fatty acids having less than 10 carbon atoms are liquid at room temperature; longer chain fatty acids are solids.

saturated solution See saturation (3).

saturation substrate concentration A substrate concentration that is, numerically, much larger than the Michaelis constant of the enzyme so that the velocity of the reaction is essentially equal to the maximum velocity.

saturation 1. The state of an organic compound in which it contains only single bonds between the carbon atoms. 2. The conversion of an unsaturated organic compound to a saturated one. 3. The state of a solution in which it contains the maximum amount of solute that can be dissolved permanently in that volume of solvent under specified conditions. 4. The state of a macromolecule in which it has bound the maximum number of ligands of a given type, as in the saturation of hemoglobin or myoglobin with oxygen, or in the saturation of an enzyme with its substrate.

saturation analysis RADIOIMMUNOASSAY.

saturation backscattering The maximum increase in counting rate that is observed when increasing thicknesses of backing material are placed under a radioactive sample.

saturation-backscattering thickness The thickness of backing material required to achieve saturation backscattering.

saturation current The current produced in an ionization chamber when the potential is of sufficient magnitude to permit the collection of all the ions; the saturation current is independent of the applied voltage.

saturation curve See oxygen saturation curve.

saturation fraction FRACTIONAL SATURATION.

saturation hybridization An *in vitro* hybridization experiment involving two types of polynucleotides, of which one is present in excess, so that all of the complementary sections of the other polynucleotide form hybrid duplex structures. See also DNA-driven hybridization; RNA-driven hybridization.

saturation kinetics The kinetics of a reaction in which the rate of the reaction levels off with increasing concentrations of a component, as is the case for a simple enzymatic reaction and for mediated transport.

saturation thickness The thickness of a radioactive sample such that any additional increase in its thickness will not increase the observed counts any further.

sawhorse projection A representation of the arrangement of the atoms in a molecule that provides a three-dimensional view of the molecule and resembles a sawhorse in outline.

SBP 1. Serum blocking power. 2. Sex steroid binding plasma protein.

sc 1. *adj* Subcutaneous. 2. *adv* Subcutaneously.

scaffold Chromosomal material whose exact nature and function are unclear; believed to consist of nonhistone proteins and RNA and to play a role in the compacting of the chromosome.

scalar 1. *n* A nondirectional quantity. 2. *adj* Of, or pertaining to, a nondirectional quantity.

scalar reaction A reaction that is nondirectional in which the components either are free to move at random or are fixed in a random order; an overall reaction in solution, but not the individual molecular event, is generally a scalar reaction.

scale method LAMM SCALE DISPLACEMENT METHOD.

scaler An electronic recording device that produces one output pulse for a given number of input pulses.

scanner 1. An instrument for measuring the distribution of either color intensity or radioactivity on a chromatogram or on an

electropherogram. 2. A photoelectric scanning attachment for the analytical ultracentrifuge that provides a plot of absorbance versus radial distance and that is used in conjunction with the ultraviolet absorption optical system.

scanning Any measurement performed systematically across an experimental pattern, such as the measurement of either color intensity or radioactivity as a function of distance across a radiochromatogram.

scanning electron microscope An electron microscope in which a three-dimensional view of the specimen is produced by the deflection of primary and secondary electrons and by the use of an electron beam to scan the specimen. *Abbr* SEM.

scanning hypothesis A hypothesis proposed to explain the initiation of translation in eukaryotic systems. According to this hypothesis, a 40S ribosomal subunit attaches at or near the 5'-cap of mRNA and then drifts along the mRNA, in the 3' direction, until it encounters an AUG initiation codon. At that point, the 40S subunit is joined by a 60S subunit to form an active 80S ribosome, and translation commences. The 80S ribosome dissociates into the two subunits upon reaching a termination codon.

scanning tunneling microscope A powerful microscope that produces high resolution, three-dimensional images of surfaces; it enables one to "see" surfaces, atom by atom, and it can resolve features that are a fraction of the size of an atom. The main difference between this and all other microscopes is that it uses no free particles of radiation and, hence, does not require special lenses and special light and electron sources. Instead, the bound electrons already existing in the sample under investigation serve as the exclusive source of radiation. Some of these electrons leak out from the sample's surface and form an electron cloud around the sample. The cloud is a result of the indeterminacy of the electron's location and the density of the cloud decreases with increasing distance from the surface. Since the electrons appear to be digging tunnels beyond the surface, the effect is known as tunneling. A scanning needle tip is swept across the sample surface and a voltage induced flow of electrons through the electron cloud (tunneling current) is measured. In this fashion, the tip follows the contours of the surface. The motion of the tip is then processed by a computer and displayed on a plotter. *Abbr* STM. See also field ion microscope.

scarce mRNA COMPLEX RNA.

Scatchard plot A graphical representation of binding data for the determination of intrinsic

association constants and of the number of noninteracting binding sites per molecule; based on the Hill equation for the case of $n_H = 1$, and consists of a plot of $r/[S]$ versus r . See also Hill equation.

scatter diagram A plot of data as points in a plane rectangular coordinate system that is made to determine whether there is a correlation between the two variables indicated on the axes.

scattering The dispersion of radiation by matter in directions other than that of the incident beam as a result of collisions and/or interactions.

scDNA Single-copy DNA; see unique DNA.

Schardinger dextrin A group of oligosaccharides that are formed by the action on starch of amylase from *Bacillus macerans*; includes α -dextrins, which contain six glucose residues per molecule, and β -dextrins, which contain seven glucose residues per molecule.

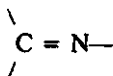
Schardinger enzyme XANTHINE OXIDASE.

Schardinger reaction A test for oxidase activity in milk that is based on the incubation of milk with formaldehyde and methylene blue; the blue color of the solution disappears as the methylene blue is reduced in the process of serving as a hydrogen acceptor for the oxidation of formaldehyde.

schemochrome STRUCTURAL COLOR.

Scheraga-Mandelkern equation An expression for a function, denoted β , that is based on various physical parameters and that is used as an aid in determining the shape of a macromolecule in solution. For calculated values of β greater than 2.12×10^6 , the molecule is best approximated by a prolate ellipsoid of revolution; for calculated values of β approximately equal to 2.12×10^6 , the molecule is best approximated by an oblate ellipsoid of revolution.

Schiff base The condensation product formed between a primary amine and either an aldehyde or a ketone; a compound containing a carbon-nitrogen double bond (an imine group):



Schiff's reagent A reagent for the detection of aldehydes that consists of fuchsin, bleached with sulfurous acid; produces a red color upon reaction with an aldehyde.

Schiff's test 1. A test for uric acid that is based on the reduction of silver ions to metallic silver. 2. A test for urea that is based on the formation of a purple color upon treatment of the sample with furfural and hydrochloric acid. 3. A test for aldehydes that is based

on the reaction of aldehydes with Schiff's reagent.

Schilling test A test for measuring the rate of absorption of vitamin B₁₂ from the intestine by administering vitamin B₁₂, labeled with radioactive cobalt, to an individual.

schistosome A parasitic worm in the blood vessels of birds and mammals.

schlepper A compound that, by combining with a weakly antigenic or nonantigenic substance, enhances the antigenicity of the latter.

schlieren optical system An optical system that focuses ultraviolet light passing through a solution in such a fashion that a photograph is obtained that represents a plot of refractive index gradient as a function of distance in the solution. A boundary in the solution appears as a peak on the photographic plate and measurements are made on this plate with a microcomparator. The optical system is used in the analytical ultracentrifuge and in the Tiselius electrophoresis apparatus.

Schmidt-Thannhauser procedure A procedure for the extraction of nucleic acids from tissue by digestion of the tissue with dilute alkali; DNA and RNA are obtained as separate fractions by this procedure, since the alkali hydrolyzes RNA but not DNA.

Schneider procedure A procedure for the extraction of nucleic acids from tissue by treatment of the tissue with either trichloroacetic acid or perchloric acid; DNA and RNA are not obtained as separate fractions by this procedure.

Schuetz-Borrisow rule An empirical rule that states that the velocity of an enzymatic reaction is proportional to the square root of the enzyme concentration; the rule was developed for pepsin and applies, under limited conditions, to pepsin and other proteolytic enzymes.

Schultz-Dale reaction An anaphylactic response that is produced in a sensitized animal by the introduction of antigens into its uterus.

Schwann cell The cell surrounding a myelinated nerve axon.

scintillation The emission of flashes of light by fluorescent substances subsequent to their excitation by means of radioactive or other radiation.

scintillation autoradiography A modification of radioautography in which the labeled material is placed in a solution containing a scintillator, and the scintillations produced by the radioactive disintegrations expose a photographic film.

scintillation cocktail COCKTAIL (2).

scintillation counter A radiation counter in which incident ionizing particles or incident

- photons are counted by means of the scintillations that they induce in a fluor.
- scintillation detector** A solid or liquid fluor together with the electronic circuitry that converts the light flashes of the fluor to electrical pulses. *See also* external-sample scintillation counter; internal-sample scintillation counter.
- scintillation spectrometer** A scintillation counter designed to permit the measurement of the energy distribution of radiation.
- scintillator** fluor.
- scintillon** A subcellular, crystal-like structure that emits a flash of light upon acidification in the presence of oxygen; the structure has been isolated from some algae (dinoflagellates).
- scissile** Capable of being cut or broken; a scissile chemical bond, for example, is one that is readily cleaved.
- scission** The introduction of a break into a biopolymer, particularly a nucleic acid, which may be enzymatic or nonenzymatic.
- SCK** Serum creatine kinase.
- scleroprotein** A simple and generally fibrous protein that is insoluble in aqueous solvents and that serves as a structural component of tissues. Collagen and keratin, which occur in cartilage, connective tissue, hair, nails, and the like, are two examples.
- sclerosis** The pathological hardening of tissues.
- S configuration** *See* RS system.
- scorbatic** Of, or pertaining to, scurvy.
- scotophobin** A polypeptide of 15 amino acids which accumulates in the brains of rats trained to avoid darkness; claimed to be a memory-directing peptide which elicits a similar response in untrained individuals.
- scotopic vision** Vision in dim light in which the rods of the retina serve as light receptors.
- scotopsin** RHODOPSIN.
- SCP** Single-cell protein.
- scrapie** A transmissible, degenerative disease of the nervous system of sheep and goats. The disease has a long incubation period (months or years). The stricken animals develop an intense itch which is associated with emaciation and weakness until death ensues. The disease is believed to be caused by an infectious particle known as prion.
- scrapie agent** The agent causing scrapie, now believed to be identical to prion.
- screw axis of symmetry** An axis of symmetry such that a rotation about it, plus a translation parallel to the rotation axis, yields a structure that is identical to that before rotation. The screw axis is called an n -fold axis if the rotation involves $1/n$ of a turn, or $360^\circ/n$.
- screw symmetry** The symmetry of a body that results from helical motion about an axis of symmetry.
- scRNA** Small cytoplasmic RNA.
- scRNP** Small cytoplasmic ribonucleoproteins; *see* small cytoplasmic RNA.
- scurvy** The disease caused by a deficiency of vitamin C.
- SCYRP** Small cytoplasmic ribonucleoproteins; *see* small cytoplasmic RNA.
- SD** Standard deviation.
- SDA** Specific dynamic action.
- SDH** Succinate dehydrogenase.
- SDS** Sodium dodecyl sulfate.
- SD sequence** Shine-Dalgarno sequence.
- SDS gel electrophoresis** *See* SDS-PAGE.
- SDS-PAGE** Sodium dodecyl sulfate polyacrylamide gel electrophoresis; an electrophoretic technique useful for the determination of the molecular weight of individual polypeptide chains. Based on the dissociation of oligomeric proteins with sodium dodecyl sulfate at neutral pH (to minimize the net charge of the protein) and in the presence of mercaptoethanol (to break disulfide bonds in the protein). The polypeptide chains form random coils and bind sodium dodecyl sulfate, yielding complexes that have essentially the same charge/mass ratios. These complexes are, therefore, separated by the sieving effect of the gel as a function of their molecular weight.
- se** Secretor gene.
- SE** 1. Standard error. 2. Saponification equivalent.
- sebaceous gland** A cutaneous gland that secretes sebum into a hair follicle.
- sebum** The oily secretion of a sebaceous gland that softens and lubricates the hair and the skin.
- sec** 1. n Second. 2. *adj* Secondary.
- secondary acidosis** COMPENSATED ACIDOSIS.
- secondary active transport** *See* active transport.
- secondary alkalosis** COMPENSATED ALKALOSIS.
- secondary bile acids** *See* bile acids.
- secondary bonds** WEAK INTERACTIONS.
- secondary charge effect** The charge effect in a solution of charged macromolecules that is due to the differential movement of the positive and the negative ions of the supporting electrolyte. The secondary charge effect may lead either to an increase or to a decrease in the sedimentation rate and in the diffusion rate of the charged macromolecule.
- secondary culture** A culture started from a primary culture.
- secondary deficiency** 1. The disorder that is caused by the inadequate intake of an essential nutrient in the diet, even though the dietary level of the nutrient is known to be adequate under normal conditions. Such exceptional conditions arise when there is an extra demand for the nutrient as may be the case

during a disease or during pregnancy. *See also* conditioned vitamin deficiency. 2. A decreased hormone level that results from insufficient stimulation by the pituitary gland of the endocrine gland that produces the hormone. Thus, failure of the pituitary to secrete a trophic hormone (for example, as a result of a pituitary tumor) leads to a secondary deficiency of thyroid, adrenal, or gonadal hormones.

secondary derived protein *See* derived protein.

secondary electron An electron ejected from an atom or a molecule by collision with a charged particle or with a photon.

secondary filament ACTIN FILAMENT.

secondary fluor A fluor, such as POPOP, that is used in a scintillation counter to shift the wavelength of the light emitted by the primary fluor to longer wavelengths, to which the photomultiplier tube is more sensitive.

secondary hydration shell The layer of water molecules around an ion that is beyond the primary hydration shell, and that is not as firmly held as the primary hydration shell.

secondary immune response *See* secondary response.

secondary ionization The ionization of matter that is produced by the fragments that have resulted from a primary ionization.

secondary ion mass spectrometry A mass spectrometric technique that does not require heating of the sample for its desorption and ionization. Instead, accelerated ion beams (argon, xenon, or cesium) bombard the sample, which is placed onto a metal, with or without a matrix material (such as glycerol). The technique is useful for desorption and ionization of nonvolatile biomolecules without prior derivatization. *Abbr* SIMS.

secondary isotope effect An isotope effect in which the isotope itself does not participate in bond cleavage; the bond to the isotope, though not broken, has a different energy during the transition state than it does in the ground state.

secondary lysosome *See* lysosome.

secondary malnutrition Malnutrition that results from diseases such as food allergies, ulcers, diabetes, or pernicious anemia; not a direct result of inadequate food intake.

secondary messenger *See* second messenger.

secondary metabolite *See* metabolite.

secondary plant constituents Nonnutritive components of plants such as indoles, flavones, and isothiocyanates. *See also* antipromoter.

secondary plot A plot of derived enzyme kinetics data that are obtained from a primary plot; a plot of intercepts (intercept replot) and a plot of slopes (slope replot) that are obtained from primary plots are examples.

Aka secondary kinetic plot.

secondary protein derivative SECONDARY DERIVED PROTEIN.

secondary response 1. The enhanced immune response of an animal organism to a second administration of the same antigen. 2. The delayed activation of some genes brought about by the gene products formed in the primary response to a steroid hormone.

secondary solvent The solvent used in scintillation counting for solubilizing a sample that is insoluble in the primary solvent.

secondary standard 1. A solution, the concentration of which is determined by means of titration against either a known weight of a primary standard, or a known volume of a standard solution of a primary standard. 2. A standard, such as a source of radiation, that has been calibrated against a primary standard.

secondary structure The regular folding of a polypeptide chain or of a polynucleotide strand along one axis of the molecule, as in a helix, that is due to the formation of intramolecular hydrogen bonds along the length of the chain or strand; the local spatial arrangement of segments of the polypeptide chain or of the polynucleotide strand without regard to the conformation of side chains or to the relation of one segment to other segments.

secondary tumor A tumor that is formed through metastasis of a primary tumor.

secondary valence bond VAN DER WAALS INTERACTION.

second critical concentration The concentration above the critical micelle concentration at which spherical micelles begin to undergo the structural changes that lead to the formation of liquid crystals.

second law of cancer biochemistry The principle that hormonal regulation of glycolysis at the initial hexokinase stage constitutes a major control mechanism of metabolism and of growth in both normal and malignant mammalian cells.

second law of photochemistry The law that absorbed light does not necessarily result in a photochemical reaction, and when it does, then only one photon is required for each molecule affected. *Aka* Stark-Einstein Law.

second law of thermodynamics The principle relating to the direction in which a process proceeds; all processes tend to proceed in such a direction that the entropy of the system plus its surroundings increases until an equilibrium is reached at which the entropy is at a maximum. The essence of this law lies in the definition of entropy and the prediction of the directionality of a process. Thus, the law can be stated in two parts: (a) The change in

entropy of a system is equal to the heat absorbed or evolved by the system in a reversible process, divided by the absolute temperature at which the process occurs; (b) the change in entropy of the system and its surroundings is always positive for a spontaneous process. There are other, alternative formulations of this law. *See also* thermodynamics.

second messenger A substance that is released from a specific receptor in a target cell upon arrival of a chemical messenger such as a hormone, a neurotransmitter, or a prostaglandin; the compound 3',5'-cyclic adenylic acid (cyclic AMP, cAMP) is an example of a second messenger. *See also* first messenger.

second moment The position in a sedimentation boundary that must be used for precise calculations; in the case of a symmetrical boundary, the second moment corresponds to a position that is farther away from the center of rotation than the position of the peak.

second-order reaction A chemical reaction in which the velocity of the reaction is proportional either to the product of the concentrations of two reactants, or to the square of the concentration of one reactant.

second-set rejection The accelerated sequence of events that leads to the rejection of an allograft by an individual who has already rejected a previous allograft at the same site. *Aka* second-set reaction.

second-site mutation SUPPRESSOR MUTATION.

second-site reversion SUPPRESSION.

secosteroid A steroid-like molecule; a modified steroid in which a ring has been broken. The D vitamins are secosteroids.

secretagogue One of a group of large polypeptides and other compounds that stimulate the secretion of gastric and pancreatic juices.

secretin A polypeptide hormone of 27 amino acids that is secreted by the duodenum and that stimulates the release of pancreatic juice. *Aka* nature's antacid.

secretion The movement of material, synthesized within a cell, across the cell membrane to the outside.

secretor An individual who secretes water-soluble forms of the blood group substances into his body fluids.

secretor gene A human gene that controls the secretion of water-soluble forms of A and B antigens of the ABO blood groups system into the saliva and other body fluids.

secretory component An additional polypeptide chain carried by a dimer of IgA molecules and found in secretions. The secretory component aids in the transport of IgA across epithelial cells and may also serve to protect

IgA against digestion by proteolytic enzymes in the secretions. *Aka* secretory piece.

secretory granule *See* vacuole.

secretory piece SECRETORY COMPONENT.

secretory protein A protein that is secreted from a cell to the outside.

secretory vesicle *See* vacuole.

secretosome A membranous, nerve-end preparation from the posterior lobe of the pituitary gland that secretes hormones. *Aka* neurosecretosome.

SECSY Spin-echo correlated spectroscopy; a two-dimensional nuclear magnetic resonance technique.

sector cell The standard cell used in the analytical ultracentrifuge that is designed in the shape of a sector to eliminate convection in the solution. Commonly used cells contain either a single or a double sector; the double-sector cell permits the simultaneous sedimentation of two samples or of a sample and a reference solution.

secular equilibrium The equilibrium that is established for a radioactive decay reaction if the half-life of the parent isotope is much greater than that of the daughter isotope.

sedation The calming and quieting of the nerves.

sediment 1. *n* The material removed from a solution by sedimentation. 2. *v* To subject a solution to sedimentation; to cause solute molecules of the solution to move by sedimentation.

sedimentation 1. The movement of molecules in solution under the influence of a centrifugal field and away from the center of rotation 2. The settling out of molecules from a solution under the influence of a gravitational field.

sedimentation coefficient A measure of the rate of sedimentation of a macromolecule that is equal to the velocity per unit centrifugal field; specifically $s = (dx/dt)/w^2x$, where s is the sedimentation coefficient, dx/dt is the velocity, w is the angular velocity, and x is the distance from the center of rotation. *Sym* s . *Aka* sedimentation constant. *See also* standard sedimentation coefficient.

sedimentation equilibrium Sedimentation, generally performed in an analytical ultracentrifuge, in which the centrifuge rotor is driven at relatively low speeds and for relatively long times so that an equilibrium is established in the solution between sedimentation and diffusion. No boundaries are formed in the solution during the sedimentation, and the photographic plate does not show peaks but only a curvature of the gradient curve. Sedimentation equilibrium is used for calculations of molecular weights. *See also* approach to sedimentation equilibrium;

density gradient sedimentation equilibrium; meniscus depletion sedimentation equilibrium; short column sedimentation equilibrium.

sedimentation equilibrium in a density gradient DENSITY GRADIENT SEDIMENTATION EQUILIBRIUM.

sedimentation field flow fractionation A separation technique, useful for the isolation and purification of macromolecules. In this technique, a sample is injected into, and moved along by, a flowing stream of carrier liquid. The latter flows through a thin, open, ribbon-like channel and a centrifugal force is applied at right angles to the direction of flow. The centrifugal force pushes the macromolecules to the walls of the channel where they elute in order of increasing molecular weight. With appropriate detectors, the movement of the particle can be recorded as a "fractogram," which looks something like a chromatogram. *Abbr* SFFF; *See also* field flow fractionation.

sedimentation partition chromatography A technique for studying interactions between macromolecules. Involves a gradient that contains a narrow zone of one macromolecule. A layer of the second macromolecule is then placed on top of the gradient and the entire assembly is centrifuged.

sedimentation potential The electrical potential produced by the sedimentation of particles through a liquid as a result of gravity or the application of a centrifugal force.

sedimentation velocity Sedimentation, generally performed in an analytical ultracentrifuge, in which the centrifuge rotor is driven at high speeds and for relatively short times so that sedimentation exceeds diffusion and the macromolecules sediment through the cell. Boundaries are formed in the solution during the sedimentation and the photographic plate shows peaks. Sedimentation coefficients can be calculated from the movement of these peaks as a function of time. Sedimentation velocity is useful for studies of purity, homogeneity, association-dissociation equilibria, reaction kinetics, and other properties of macromolecules.

sedoheptulose A seven-carbon ketose that is an intermediate in the hexose monophosphate shunt.

segmented genome A viral genome that consists of two or more nonidentical nucleic acid molecules, each carrying separate genetic information. The genomes of influenza virus and of alfalfa mosaic virus are two examples. In the case of influenza virus, all the nucleic acid fragments are present in a single virion; such a virus is called isocapsidic. Alfalfa mosaic virus, on the other hand, contains 4

different RNA molecules, each packaged separately into a virion; such a virus is called heterocapsidic. Successful infection with alfalfa mosaic virus requires that a least one RNA molecule of each type enters the cell. A plant virus with a segmented genome is known as a multiple-component virus or a covirus.

segment long spacing An artificially prepared assembly of collagen molecules, aggregated side by side, in which the segments have the same length as the collagen molecule (2900 Å) and show a characteristic pattern of more than 40 cross-striations when examined with the electron microscope; produced from acidic solutions of collagen in the presence of polyanions such as ATP or chondroitin sulfate. *Abbr* SLS. *See also* fibrils long spacing.

segregation The separation of the two members of a pair of alleles during meiosis so that each gamete receives one of the alleles of the pair.

selected ion monitoring A mass spectrometric technique in which an ion current at a selected mass per charge value is used; a highly selective technique that permits the study of one, or a few, types of ions. *Abbr* SIM.

selected marker The desired gene, selected by means of the experimental conditions used in bacterial conjugation.

selection 1. The fourth stage in a multistage mechanism of carcinogenesis in which drug- and hormone-resistant cells are selected from a population of autonomous cancer cells. 2. The relative ability of different genotypes to survive and reproduce in the course of evolution. 3. The relative ability of different cells to survive and grow under experimental conditions, as in the selection of mutants for resistance to an antibiotic.

selection rules A set of quantum mechanical rules and formulas that are used to determine which transitions between energy states of a molecule are allowed and which are forbidden.

selective marker A marker, such as drug resistance or nutritional independence, that permits the selection of recombinants over the parental types.

selective medium A medium designed to allow the preferential growth of some organisms over that of others.

selective plating A method for isolating recombinants by plating two auxotrophic mutants on a minimal medium; only those recombinants that receive the normal allele of each mutant can grow under such conditions.

selective system Any experimental method designed to aid in the detection and isolation of a specific genotype.

selective theory 1. A theory of antibody forma-

tion according to which the information for antibody synthesis is genetically determined; the antigen is considered to react selectively with certain cells, receptors, or other biosynthetic units and to stimulate them to synthesize antibodies which they already were synthesizing at low levels or were potentially capable of synthesizing prior to immunization. *See also* instructive theory. 2. A theory according to which the evolution of the genetic code is due to natural selection, such that a large number of codes is theoretically possible, but one code has been selected over others because of its value for the survival of the organism; the code may, for example, be such as to minimize the effects of mutation or minimize the errors during translation. *See also* mechanistic theory.

selective toxicity The variable degree of harmfulness of a chemical such that it is toxic, at a given concentration, to one organism but not to another. A chemotherapeutic agent must show selective toxicity with respect to the host and the invading microorganism.

selective variant A mutated organism that can exist under conditions that are lethal to all like organisms not possessing the specific mutation.

selenium A element that is essential to humans and animals. Symbol, Se; atomic number, 34; atomic weight, 78.96; oxidation states, -2, +4, +6; most abundant isotope, ^{80}Se ; a radioactive isotope, ^{75}Se , half-life, 120.4 days, radiation emitted, gamma rays. *See also* anti-promoter.

self- An immunological term used in reference to the antigens and antibodies involved in autoimmunity.

self-absorption The absorption of radiation, particularly of radioactive radiation, by the material emitting the radiation.

self-assembly The spontaneous formation of a supramolecular structure from its component molecules or subunits, as in the assembly of ribosomes, viruses, membranes, or multienzyme systems; occurs without additional energy sources.

selfish DNA A segment of DNA that has no known function except to replicate itself. Spacer DNA and satellite DNA may be examples. *Aka* junk DNA.

self-marker theory A theory proposed by Burnet and Fenner in 1949 to explain an organism's capacity to distinguish between "self" and "nonself." According to this theory, all the antigens in an organism carry characteristic self-markers that can be recognized by the immunocompetent cells of that organism so that formation of antibodies to these antigens is prevented.

self-priming Not requiring a primer. The synthesis of RNA by DNA-dependent RNA polymerase is a self-priming reaction as opposed to the synthesis of DNA by DNA-dependent DNA polymerase which requires the 3'-OH end of a primer.

self-quenching INTERNAL QUENCHING.

self-recognition AUTOIMMUNITY.

self-scattering The scattering of radiation, particularly of radioactive radiation, by the material emitting the radiation.

self-transmissible plasmid A plasmid that is capable of transferring itself from one cell to another; a plasmid that is both conjugative and mobilizable.

Seliwanoff's test A colorimetric test for ketohexoses that is based on the production of a red color upon treatment of the sample with resorcinol and hydrochloric acid.

SEM 1. Scanning electron microscope. 2. Standard error of the mean.

semialdehyde A compound formed by the conversion of one of two carboxyl groups in a molecule to an aldehyde; the aldehydes formed from aspartic and glutamic acid are examples.

semiconservative replication A mode of replication for double-stranded DNA in which the parental strands separate and each daughter molecule consists of one parental strand and one newly synthesized strand. The usual model of DNA replication in which each parental strand serves as a template for the synthesis of a new, complementary strand. *See also* DNA replication.

semiconstitutive mutant A mutant that synthesizes an inducible enzyme at a greater rate than does the uninduced wild-type organism, and that can be induced to synthesize the enzyme at a level that is characteristic of the fully constitutive strain.

semidiscontinuous replication The overall synthesis of DNA according to the currently accepted mechanism in which one strand (leading strand) is synthesized essentially continuously while the other strand (lagging strand) is synthesized discontinuously. *See also* DNA replication.

semilethal mutation A mutation that results in the death of more than 50 but less than 100% of the mutants.

semilogarithmic paper Graph paper in which one axis has been scaled in terms of logarithms so that a plot of an exponential function will yield a straight line.

semiochemistry The study of substances that mediate interactions between organisms.

semipermeable membrane A membrane that allows the passage of only certain solutes but that is freely permeable to water.

semipolar bond COORDINATE COVALENT BOND.

semiquinone The half-reduced form of a quinone; the benzene ring carries one >C=O and one >CH-OH group.

semisynthetic Descriptive of a compound of which part of the structure has been isolated from natural sources and part of it has been synthesized. Semisynthetic penicillins and cephalosporins are examples of such synthetically modified antibiotics.

Semliki forest virus A virus that contains single-stranded RNA and that has a spherical nucleocapsid; it belongs to the group of arboviruses.

Sendai virus A virus that contains single-stranded RNA and that belongs to the paramyxovirus group of myxoviruses; used for cell fusion studies, since it modifies the surface of cells in such a manner that they tend to fuse.

senescence 1. The state of growing old; aging. 2. The phase of plant growth that extends from full maturity to death.

senility pigment AGE PIGMENT.

sense codon A normal, amino acid-specifying codon.

sense strand ANTICODING STRAND.

sensitive strain A bacterial strain that can be lysed by a temperate phage or by a lysogenic culture produced with that phage.

sensitive volume 1. That volume of a biological specimen in which an ionization must occur to produce a particular effect. 2. That volume of an ionization chamber through which the radiation must pass to be detected.

sensitivity The degree of responsiveness of an interconvertible enzyme to modification that is brought about by changes in the concentration of a given effector.

sensitivity spectrum The types of antimicrobial drugs that are effective against a given microorganism. *See also* antimicrobial spectrum.

sensitization The conditioning of an animal by administration of an allergen so that a second administration of the allergen will trigger an anaphylactic response. The sensitization may be active or passive depending on the type of anaphylaxis induced. *See also* active anaphylaxis; passive anaphylaxis.

sensitized erythrocyte An antibody-coated erythrocyte that is used in the detection of complement.

sensitized fluorescence The fluorescence that occurs when a photon excites a molecule, which then excites a second molecule by means of an energy transfer, and the second molecule dissipates the excitation energy by fluorescence.

sensitized phosphorescence The phosphorescence that occurs when a photon excites a

molecule, which then excites a second molecule by means of an energy transfer, and the second molecule dissipates the excitation energy by phosphorescence.

sensitizer 1. PHOTOSENSITIZER. 2. ALLERGEN.

sensitizing agent SENSITIZER.

sensitizing injection The initial and harmless injection of an allergen into an animal which, if followed by a second injection, will trigger an anaphylactic response.

sensor gene *See* Britten-Davidson model.

sensor protein *See* Britten-Davidson model.

sentinel antibody An antibody-like receptor site on an antibody-producing cell by which the antigen is believed to stimulate the cell to produce antibodies.

separated plasma Plasma, obtained from whole blood, that is equilibrated with carbon dioxide at a given partial pressure.

separate package hypothesis The hypothesis according to which photosystems I and II of chloroplasts are two separate systems such that energy transfer is possible only between the pigments within each system, but not between the pigments from one system to those of the other. *See also* spillover hypothesis.

separation cell An analytical ultracentrifuge cell that allows for the separation and recovery from a mixture of the component having the smallest sedimentation coefficient.

separation factor The ratio of the retention times, or the ratio of the retention volumes, of two compounds that are separated by gas chromatography.

separation gel *See* disc gel electrophoresis.

separators Amphoteric substances that are added, in large amounts, to carrier ampholytes normally used in isoelectric focusing for the purpose of producing a relatively flat region in the pH gradient and thereby improving the separation of components.

Sephadex Trademark for a group of cross-linked dextran gels used in gel filtration.

Sepharose Trademark for a group of agarose gels used in gel filtration.

sepsis The presence of pathogenic microorganisms or their toxins in the blood or in the tissues.

septanose A monosaccharide that has a seven-membered ring structure.

septanoside A glycoside of a septanose.

septate junction An impermeable cell junction that is similar to a tight junction but occurs only in invertebrates; it differs from a tight junction in that the junctional proteins are arranged in a more regular fashion and that they form a seal without actually bringing the two plasma membranes into direct contact. *See also* cell junction.

septic Of, or pertaining to, sepsis.

septicemia The presence of pathogenic microorganisms in the blood.

septum (*pl* septa; septums) A wall or a membrane that divides a cavity.

Sequenase Trademark for an enzyme preparation used in DNA sequencing. The enzyme is derived from bacteriophage T7 DNA polymerase and has been modified to improve its properties for sequencing.

sequenator An instrument for the automatic determination of amino acid sequences in a polypeptide chain; operation of the instrument is based on the repetitive application of the Edman degradation. *Aka* sequencer.

sequence 1. The linear order in which monomers occur in a polymer; the order of amino acids in a polypeptide chain, and the order of nucleotides in a polynucleotide strand are examples. 2. METABOLIC PATHWAY.

sequence complexity *See* complexity.

sequence gap A segment, consisting of one or more amino acids, that appears to be missing from a polypeptide chain when this chain is compared with others of the same protein but isolated from different sources, and when the chains are matched up so as to provide a maximum of sequence homology.

sequence homology The identity in sequence of either the amino acids in segments of two or more proteins, or the nucleotides in segments of two or more nucleic acids.

sequence hypothesis The hypothesis that the sequence of nucleotides in a nucleic acid specifies the sequence of amino acids in a protein.

sequence isomer One of two or more polymeric isomers that differ from each other in the sequence of the monomers in the chain.

sequence polymer A synthetic polypeptide consisting of identical repeating units, each of which is composed of more than one type of amino acid; the polymer (gly-ala-ser-val)_n is an example. *See also* polyamino acid.

sequencer SEQUENATOR.

sequence rules RS SYSTEM.

sequence specificity The selectivity of a nuclease that accounts for its reaction being limited to specific base sequence in the nucleic acid.

sequencing The determination of the order of amino acids in a peptide, polypeptide chain, or protein, or the determination of the order of bases (nucleotides) in a nucleotide, polynucleotide strand, or nucleic acid.

sequencing gel A long, thin polyacrylamide gel slab used for nucleic acid sequencing.

sequential feedback inhibition The inhibition that is produced when one or more end products inhibit an enzyme in a metabolic pathway and the metabolite that accumulates as a

result of this inhibition then inhibits the first enzyme in the sequence and thereby shuts off the entire pathway.

sequential induction Enzyme induction in which a single inducer brings about the synthesis of a number of inducible enzymes; the first enzyme induced acts on the inducer, thereby transforming it into an inducer for the second enzyme, which in turn acts on the second inducer, and so on. *See also* coordinate induction.

sequential mechanism The mechanism of an enzymatic reaction in which two or more substrates participate in such a fashion that all the substrates must become bound to the enzyme before any products can be released. The mechanism is ordered if the substrates add to, and the products leave, the enzyme in an obligatory sequence; the mechanism is random if the substrates add to, and the products leave, the enzyme in a nonobligatory sequence.

sequential model A model for allosteric enzymes, proposed by Koshland, Nemethy, and Filmer, according to which the enzyme undergoes a series of conformational changes as the various ligands become bound to the enzyme. Different types of site interactions may occur of which symmetry preservation, as in the concerted model, may be a special case. In general, however, the symmetry of the enzyme molecule is not conserved, since a subunit changes its conformation as a ligand becomes bound to it. The capacity of the enzyme to bind substrate, positive effectors, and negative effectors is altered by the conformational changes which the subunits undergo. *Abbr* KNF model.

sequential reactions CONSECUTIVE REACTIONS.

sequester To form a chelate.

sequestering agent CHELATING AGENT.

sequestration CHELATION.

sequestrene ETHYLENEDINITROLOTETRAACETIC ACID.

sequon An obligatory sequence of amino acids that is required for a specific reaction. The term has been used to describe the tripeptide asn-x-thr or asn-x-ser that must occur in a protein for the asparagine (asn) to be able to act as a site of attachment for a carbohydrate moiety, thereby giving rise to a glycoprotein. *Var sp* sequon.

Ser 1. Serine. 2. Seryl.

SER Smooth endoplasmic reticulum.

serendipity The gift for discovering valuable or useful things not specifically sought but recognized in the process of dealing with other things.

serial dilution The systematic and progressive dilution that is frequently used in immuno-

logy, serology, and microbiology. A fixed volume of diluent is placed into a number of tubes and a given volume of sample, say 1.0 mL, is then added to the first tube. After mixing, 1.0 mL of solution is transferred to the second tube and, after mixing, 1.0 mL from this tube is transferred to the third tube, and so on.

serial passage 1. The repeated transfer of a pathogen (usually a virus) using a succession of animals, tissue cultures, or growth media with viral replication taking place after each transfer. Frequently used to attenuate the pathogen. 2. The transfer of an inoculum in tissue culture to a fresh medium; preparation of a subculture.

serial symbiosis theory The theory that eukaryotic cells developed by symbiotic associations with prokaryotic cells. Thus, mitochondria and microtubule organizing systems, present in modern eukaryotic cells, are believed to have evolved from various bacteria that lived as symbionts with primitive eukaryotic cells.

seriate In a series or a succession; serially.

seriatim In a series; serially.

sericate Of, or pertaining to, silk; silky.

sericin One of a group of proteins found in silk; silk gelatin.

sericulture The raising of silkworms (*Bombyx mori*) for the production of silk.

serine An aliphatic, polar alpha amino acid that contains an alcoholic hydroxyl group and that frequently occurs at or near the active site of an enzyme. *Abbr* Ser; S.

serine convention A method for assigning configurations to compounds by a comparison with the configuration of serine; thus (+) tartaric acid is designated as L_G when compared to glyceraldehyde, and as D_S when compared to serine.

serine esterase SERINE PROTEASE.

serine protease One of a group of proteolytic enzymes, including trypsin and chymotrypsin, that are similar in their three-dimensional structures and that contain a serine residue in the active site. Also called serine esterases because the mechanism of action involves formation of an ester between the hydroxyl group of the catalytically active serine and the carboxyl group of the cleaved peptide bond.

serologic Of, or pertaining to, serology. *Aka* serological.

serologic adhesion IMMUNE ADHERENCE.

serological pipet A measuring pipet in which the graduation marks extend to the tip of the pipet.

serology The science that deals with serums, particularly immune serums, and with the reactions and properties of antigens, haptens,

antibodies, and complement.

serophyte Variant spelling of xerophyte.

serotonin 5-Hydroxytryptamine; a pharmacologically active mediator of immediate-type hypersensitivity. Serotonin is formed from tryptophan and is released from mast cells during the allergic response. Serotonin is a neurotransmitter that has hormone-like properties and causes vasodilation, increased capillary permeability, and contraction of smooth muscle.

serotonin hypothesis The hypothesis that schizophrenia is caused by an abnormality in the metabolism of serotonin in the brain, and that most hallucinogens act by either antagonizing or mimicking the functions of serotonin.

serotype A subdivision of a species or of a subspecies that is identifiable by serologic methods and that is distinguished by its antigenic character.

serotype transformation ANTIGENIC CONVERSION (2).

serous Of, or pertaining to, serum.

serous fluid A fluid resembling serum.

serous membrane One of various thin membranes that secrete a serous fluid, line cavities, or enclose the organs within them, and form the inner layer of a blood vessel.

SERS Surface-enhanced Raman spectroscopy.

serum (*pl* serums; sera). The fluid obtained from blood after it has been allowed to clot; plasma without fibrinogen.

serum Ac globulin ACCELERIN.

serum albumin The major protein in serum, the main function of which is the regulation of osmotic pressure.

serum blocking power The capacity of an immunoadsorbent to adsorb antibodies from a serum and to decrease the antibody titer of the serum. *Abbr* SBP.

serum converting enzyme The peptidase that catalyzes the conversion of angiotensin I to angiotensin II.

serum folate N⁵-Methyltetrahydrofolic acid; a stable derivative of folic acid that is a major storage form of folate coenzymes in higher organisms and is the methyl group donor for the biosynthesis of methionine.

serum hepatitis *See* hepatitis.

serum L. casei factor SERUM FOLATE.

serum proteins The proteins present in blood serum. *See also* plasma proteins.

serum prothrombin conversion accelerator PRO-CONVERTIN.

serum prothrombin converting factor PROCONVERTIN.

serum sickness A disease, characterized by fever and by local swelling at the injection site, that in humans may follow the injection of an immune serum prepared in an animal,

and in animals may be initiated by the injection of large amounts of foreign protein. *Aka* serum disease.

serum sulfation factor SOMATOMEDIN.

serum thymic factor A nonapeptide in serum that has biological activity similar to that of thymic humoral factor.

servomechanism An automatic device for controlling the operation of a mechanism by having the output of the mechanism compared with its input, so that the error between the two quantities can be controlled in a prescribed manner.

sessile Attached directly to a base without a stalk; nonmotile; sedentary.

Sevag method A procedure for the deproteinization of nucleoprotein in which the protein is denatured by shaking a solution of the nucleoprotein with chloroform and isoamyl alcohol.

SEXAFS Surface-extended x-ray absorption fine structure spectroscopy.

sex chromatin BARR BODY.

sex chromosome A chromosome that is specifically connected with the determination of sex. *See also* X chromosome; Y chromosome.

sexduction The process whereby a segment of genetic material is transferred from one bacterium to another by attachment to the fertility factor; the formation of F' strains.

sex factor FERTILITY FACTOR.

sex hormone One of a group of hormones that are responsible for the development of secondary sex characteristics and that are capable of stimulating the development of accessory reproductive organs. Sex hormones are secreted principally by the gonads and consist of androgens, estrogens, and gestagens.

sex hormone binding globulin TESTOSTERONE-ESTRADIOL BINDING GLOBULIN.

sex linkage The linkage of genes located on a sex chromosome.

sex-linked gene A gene located on a sex chromosome.

sex pilus F-PILUS.

sex plasmid FERTILITY FACTOR.

sex steroid binding plasma protein TESTOSTERONE-ESTRADIOL BINDING GLOBULIN.

sexual conjugation CONJUGATION (3).

s_f Flotation coefficient.

s_f^0 Standard flotation coefficient.

SFC Supercritical fluid chromatography.

SFFF Sedimentation field flow fractionation.

SF₁ fragment One of two fragments of the head, or globular part, of the myosin molecule; produced when myosin is treated with the enzyme papain. *Aka* S1 fragment.

S-100 fraction A cell-free preparation obtained from a suspension of broken cells by first removing intact cells and cell debris by low-

speed centrifugation at $30,000 \times g$ (yielding an S-30 fraction), and then removing ribosomes by centrifugation at $100,000 \times g$. The fraction contains transfer RNA and amino acyl-tRNA synthetases, and is used in studies of cell-free amino acid incorporation. *See also* pH 5 fraction.

S1 fragment *See* SF₁ fragment.

SGF Skeletal growth factor.

SGOT Serum glutamate-oxaloacetate transaminase.

SGPT Serum glutamate-pyruvate transaminase.

SH Somatotropin.

shadowcasting A technique for preparing specimens for electron microscopy in which the specimen is covered by metal atoms deposited onto it at a fixed angle. Areas around particles on the far side of the metal source remain free of deposited metal atoms and form shadows that provide information about the size and the shape of the particle. *Aka* shadowing.

shake flask An Erlenmeyer flask, containing a liquid medium and a bacterial inoculum, that is placed on a shaker (or incubator-shaker) for aeration and growth.

shaker A laboratory device for the mechanical shaking of samples for purposes of mixing and aeration; the shaking action may involve circular motion (rotary shaker) or a back and forth motion (reciprocating shaker).

shallow groove MINOR GROOVE.

SH-antigen HEPATITIS B ANTIGEN.

shape factor *See* Oncley equation.

Sharples centrifuge An efficient, continuous, high-speed flow centrifuge. The rotor consists of a long, narrow cylinder which is rotated in an upright position, with slurry being fed in at the bottom and the supernatant flowing out at the top.

SHBG Sex hormone binding globulin.

shear The deformation experienced by a liquid as a result of the variations in the velocity of flow of different layers. Shear is associated with the flow of a liquid through a capillary, with the forcing of a liquid through a pipet, and with the homogenization of a suspension. *See also* rate of shear.

shear dichroism FLOW DICHOISM.

shear gradient RATE OF SHEAR.

shearing The process whereby particulate matter is degraded as a result of shear; the breaking up of DNA into fragments by treatment in a blender is an example.

shear stress The force per unit area resulting from solution flow.

sheath 1. A tubular structure that is formed around a chain of cells in some bacterial species. 2. The cell wall of bacteria belonging to

- the *Spirochetes*. See also capsule. 3. The covering of an axon; see myelin sheath.
- sheath microfilaments** See microfilaments.
- Shemin cycle** A complex set of reactions whereby the tetrapyrroles are synthesized from glycine and succinyl coenzyme A.
- SH-enzyme** An enzyme whose activity depends on the presence of one or more SH groups; an enzyme that has at least one cysteine residue at or near its active site.
- SH group** Sulfhydryl group.
- shield** A solid barrier for the protection of individuals from radiation or from potentially explosive laboratory setups.
- shielded nucleus** An atomic nucleus in a molecule that is surrounded by a relatively greater electron density than another nucleus. In nuclear magnetic resonance, such a nucleus will absorb radio frequencies of higher energy (up-field) than the second nucleus.
- shift** A chromosomal aberration in which a chromosome segment is removed from its normal place and is inserted elsewhere in the chromosome, with the original nucleotide sequence in the segment either maintained or reversed.
- shift down** A shift experiment in which the change in the medium leads to a decrease in the rate of growth of the cells.
- shift experiment** An interference with the balanced growth of cells in a culture by a precisely timed and defined change in the medium. See also shift down; shift up.
- shift up** A shift experiment in which the change in the medium leads to an increase in the rate of growth of the cells.
- Shigella** A bacterial genus that includes the causal agent of dysentery (*Shigella dysenteriae*). The latter is attacked by many *E. coli* phages.
- shikimic acid** A hydroxylated, unsaturated, acid derivative of cyclohexane that serves as a key intermediate in the biosynthesis of the aromatic amino acids.
- shikimic acid pathway** A pathway for the synthesis of shikimic acid in bacteria and for its conversion to tyrosine, tryptophan, and phenylalanine.
- Shine-Dalgarno sequence** A segment of 4–7 nucleotides that occurs in the leader section of mRNA. It base pairs with 16S rRNA and thereby places the AUG initiation codon of the mRNA in the proper orientation relative to the ribosome for initiation of translation to take place. The Shine-Dalgarno sequence is part or all of the following sequence: 5'-AGGAGGU-3'; it is named after the individuals who first recognized its significance. *Abbr.* SD sequence.
- shock** A circulatory failure due to loss of blood from the vascular compartment by either hemorrhage or increased capillary permeability.
- shocking dose** The second injection of allergen that triggers the anaphylactic response in an animal.
- shock-sensitive permeases** PERIPLASMIC PERMEASES.
- Shope papilloma virus** A virus that produces papillomas in rabbits. See papilloma virus.
- short column cell** An analytical ultracentrifuge cell in which the sample solution constitutes a very short liquid column (about 1 to 3 mm); used for molecular weight determinations by sedimentation equilibrium.
- short column sedimentation equilibrium** A variation of the sedimentation equilibrium method for the determination of molecular weights in which short column cells are used so that the time required to reach equilibrium is greatly decreased; the method is especially useful for the simultaneous analysis of a large number of different samples.
- short interspersed repeated sequences** A family of short (70–300 bp), repetitive, segments in mammalian DNA that often occur in over 100,000 copies per genome; almost all appear to be retroposons. The Alu sequences constitute one such family. *Abbr.* SINE.
- short patch pathway** A mechanism of DNA repair in both prokaryotes and eukaryotes in which the repaired DNA segments are relatively short.
- short period interspersion** A DNA structure characterized by relatively short segments of moderately repetitive DNA (about 300 bp each) alternating with relatively short segments of nonrepetitive DNA (about 1000 bp each).
- short-range hydration** The hydration by water molecules that are located in the primary hydration shell of an ion.
- short-range interactions** The attractive and repulsive forces between atoms and molecules that decrease rapidly with distance. See also weak interactions.
- short trough technique** An immunoelectrophoretic technique for the identification of a specific antigen in a mixture.
- shotgun experiment** The process of breaking up a large fraction of the DNA of an organism, collecting the fragments in a random manner, and cloning these DNA fragments in order to set up a clone library from which cloned fragments can later be selected.
- SHRH** See growth hormone regulatory hormone.
- SHRIH** See growth hormone regulatory hormone.
- shufflon** A clustered inversion; a section of

DNA in which multi-inversions of contiguous segments can occur.

shunt See metabolic shunt; hexose monophosphate shunt.

shuttle A mechanism whereby reducing equivalents are removed from cytoplasmic NADH and passed to the electron transport system in the mitochondrial membrane by way of intermediate compounds, since NADH itself cannot pass through the membrane.

shuttle vector A vector that can replicate in a number of different organisms (yeast and *E. coli*, for example).

Shwartzman reaction The production of an inflammatory lesion in an animal by the subcutaneous injection of an endotoxin from a gram-negative bacterium, followed by a second injection, about 24 h later, of the same endotoxin or of some other substance.

SHyp Mercaptopurine.

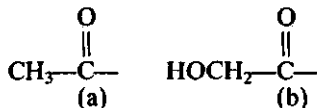
SI Silicon.

SI Système International d'Unités; an extension and a refinement of the metric system. The system is based on seven basic units from which other units are derived. The basic units (or base units), their symbols, and the quantities which they measure are meter, m, length; kilogram, kg, mass; second, s, time; ampere, A, electric current; Kelvin, K, thermodynamic temperature; candela, cd, luminous intensity; and mole, mol, amount of substance. Some derived units are the newton N for force, the joule J for energy, and the liter L for volume. *Aka* SI system.

Sia Sialic acid.

sial- See sialo-.

sialic acid *N*-Acylneuraminic acid or any of its esters or other derivatives of its alcoholic hydroxyl groups. Sialic acids are widely distributed in bacteria and animals; in most mammals, sialic acids occur in the form of *N*-acetyl (a) and *N*-glycolyl (b) derivatives of neuraminic acid:



sialidase NEURAMINIDASE.

sialidosis A genetically inherited metabolic defect in humans due to a deficiency of the enzyme *N*-acetylneuraminidase.

sialo- 1. Combining form meaning of, or related to, saliva or the salivary glands (also used as sial-). 2. Combining form meaning of, or related to, sialic acid.

sialoglycosphingolipid GANGLIOSIDE.

sialogogue An agent that stimulates the secretion of saliva. *Var sp.* sialagogue.

sialosyl group The radical resulting from removal of a hydroxyl group from the anomeric

carbon of neuraminic acid or sialic acid.

sialoyl group The radical resulting from removal of a hydroxyl group from the carboxyl group of neuraminic acid or sialic acid.

sickle cell An erythrocyte that has an abnormal crescent-like shape; such a cell is more fragile than the normal cell and tends to hemolyze in the blood capillaries.

sickle cell anemia A genetically inherited metabolic defect in humans that is characterized by the formation of an abnormal hemoglobin (sickle cell hemoglobin) which leads to sickling and hemolysis of erythrocytes. See also sickle cell disease; sickle cell trait.

sickle cell disease A condition in which an individual is homozygous (has 2 defective genes) for sickle cell anemia.

sickle cell hemoglobin The abnormal hemoglobin responsible for sickle cell anemia. It differs from normal adult hemoglobin in having valine in place of glutamic acid in the sixth position of the beta chain. *Sym* HbS. See also Murayama hypothesis.

sickle cell trait A condition in which an individual is heterozygous for sickle cell anemia.

sickleemia SICKLE CELL ANEMIA.

sickling The process whereby erythrocytes take on abnormal, crescent-shaped forms, as in sickle cell anemia.

side chain 1. A smaller chain attached laterally to a longer chain. 2. A chain attached to a ring. 3. AMINO ACID SIDE CHAIN.

side chain cleavage The removal of some or all of the carbon atoms from the aliphatic side chain attached to the steroid nucleus. Specifically, the set of enzymatic reactions whereby the aliphatic side chain of cholesterol is removed.

side chain theory EHRlich's RECEPTOR THEORY.

sidedness The vectorial character of either a molecule or a system.

sideramine See siderochrome.

side reaction A secondary reaction that occurs simultaneously with the major reaction.

siderochrome An early term for siderophore with the specific designations of sideramine and sideromycin applied to a siderophore that has growth supporting activity and antibiotic activity, respectively.

sideromycin See siderochrome.

siderophilin One of a group of nonheme, iron-binding, monomeric glycoproteins (MW about 80,000) that bind two Fe³⁺ ions per molecule concomitantly with two CO₃²⁻ (or HCO₃⁻) ions. They are classified on the basis of their occurrence as transferrin (vertebrate blood, the major iron transport protein of plasma); lactoferrin (mammalian milk and other body secretions); and ovotransferrin (avian blood and egg white).

siderophore One of a number of low molecular weight, microbial, iron-containing or iron-binding organic compounds. Siderophores have a very strong affinity for Fe^{3+} (which they chelate) and function in the solubilization and transport of iron. Some also act as growth or germination factors, and some are potent antibiotics. Siderophores are classified as belonging to (a) the phenol-catechol type (such as enterobactin and agrobactin), or (b) the hydroxamic acid type (such as ferrichrome and mycobactin).

siderosis HEMOSIDEROSIS.

siderosome An artificially induced, electron-dense structure that contains iron particles; a lysosomal body that forms in cultured animal cells upon administration of iron complexes.

sidescattering The scattering of radiation in directions other than those of forward or backward scattering.

sieve tube A leaf capillary.

sievorptive chromatography A chromatographic technique that combines gel filtration and adsorption chromatography; ion filtration chromatography and intervent dilution chromatography are two examples.

SIF See growth hormone regulatory hormone.

sigma 1. The symbol Σ that indicates the summation of all the quantities that follow it. 2. Standard deviation (σ).

sigma bond A chemical bond formed by the electrons in sigma orbitals; a covalent bond of circular cross section in which orbital overlap is concentrated along the axis joining the two atomic nuclei.

sigma cycle The set of reactions composed of (a) the attachment of the sigma factor to the core enzyme of RNA polymerase at the initiation site of transcription; (b) the release of the sigma factor from the core enzyme during chain elongation; and (c) the subsequent binding of the sigma factor to the same, or to another, core enzyme at an initiation site.

sigma factor A protein subunit of *E. coli* RNA polymerase that functions in the recognition of the promoter and the initiation of transcription. The sigma factor, by itself, has no catalytic activity; it binds to the core enzyme prior to transcription. *Sym* σ . See also sigma cycle.

sigma orbital A molecular orbital that is a localized bond orbital, spread over two bonding atoms.

sigma replication ROLLING CIRCLE REPLICATION.

sigma star orbital See antibonding orbital.

sigma structure 1. The DNA structure formed during the replication of double-stranded circular DNA according to the rolling circle model. *Aka* lariat form. 2. The RNA structure formed during the splicing of pre-mRNA in eukaryotes.

sigma virus A virus, belonging to the group of rhabdoviruses, that infects the fruit fly, *Drosophila melanogaster*. Infected flies are sensitive to carbon dioxide; a brief exposure to CO_2 leads to paralysis and death.

sigmoid kinetics The kinetics of an enzymatic reaction that yield a sigmoid curve for a plot of reaction velocity versus substrate concentration; the sigmoid, or S-shaped, curve is characteristic of many allosteric enzymes as well as of other systems showing cooperative-type interactions.

signal amplification The production of a large amount of modified or unmodified interconvertible enzyme by a small amount of converter enzyme.

signal codons See signal hypothesis.

signal hypothesis The currently accepted model for the mechanism whereby secretory proteins are selected by the rough endoplasmic reticulum (RER) and exported through it (vectorially discharged). Key aspects of the signal hypothesis are as follows: (a) The mRNA that codes for a secretory protein contains a specific sequence of codons immediately following the initiation codon; this sequence is called the signal codons. (b) The translation of this mRNA is initiated by free (not membrane-bound) ribosomes in the cytosol which synthesize a peptide corresponding to the signal codons; this peptide consists of 15–30 amino acids, many of which are hydrophobic, and is known as the signal sequence or signal peptide. It is located at the N-terminal of the secretory protein. (c) As the signal sequence emerges from the ribosome, it becomes bound to a specific receptor in the RER which results in the binding of the free ribosome, bearing the signal sequence, to the RER. At the same time, a transient pore (transmembrane pore) is formed around the signal sequence. (d) As translation continues, the nascent polypeptide chain is extruded through this pore across the membrane of the RER; the signal sequence is cleaved off by a specific protease, called signal peptidase, before the polypeptide chain is completed and before the nascent protein is generally glycosylated. (e) Translation is terminated by complete deposition of the protein into the lumen of the RER, dissolution of the transient pore, and dissociation of the ribosome from the membrane of the RER. (f) The finished protein is then transported via the Golgi apparatus and guided to its particular cellular destination; this may involve additional glycosylation. See also vectorial discharge; glycosylation; signal recognition protein.

signal peptidase See signal hypothesis.

signal peptide See signal hypothesis.

signal recognition protein A multisubunit protein, present in the cytosol, that binds to ribosomes shortly after they have synthesized the signal sequence and serves to bind the ribosomes to the RER. It halts further translation until the ribosome has become bound to the RER. The protein is believed to recognize both the N-terminal of the nascent polypeptide chain and a receptor on the RER (called SRP receptor or docking protein). *Abbr* SRP. *Aka* signal recognition particle. *See also* signal hypothesis.

signal sequence *See* signal hypothesis.

signal-to-noise ratio The ratio of the electrical response of an instrument during the measurement of a sample to the response from random background electrical fluctuations.

significance of results A measure of the deviation of results from the mean. If the probability value of a result is equal to, or less than, 0.05 but greater than 0.01, the result is considered to be significantly different from the mean; if the probability value is less than, or equal to, 0.01 but greater than 0.001, the result is considered to be highly significant; and if the probability value is equal to, or less than, 0.001, the result is considered to be very highly significant. A probability value of 0.05 means that there is a 5% chance that the result will differ from the mean by ± 2 standard deviations.

significance test A statistical test for accepting or rejecting a hypothesis. The test provides a criterion for deciding whether the difference between an assumed (expected) and an observed (measured) value of a parameter can reasonably be attributed to chance. If the difference is so small that it can be attributed to chance, then one has the option of accepting the hypothesis.

significant figures The digits in a number, the values of which are known with certainty, plus the first digit, the value of which is uncertain; the position of the decimal point is immaterial. Thus, the number 12.40 is considered to have four significant figures, and its true value lies between 12.395 and 12.405.

sign inversion mechanism A proposed mechanism for the action of DNA gyrase. It is based on changing a positive node in DNA to a negative one, thereby converting a positive superhelical segment to a negative one.

sign mutation FRAMESHIFT MUTATION.

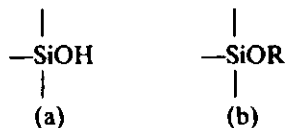
SIH *See* growth hormone regulatory hormone.

SILA Suppressible insulin-like activity.

silage An animal feed prepared by the controlled fermentation (involving primarily *Lactobacillus* and *Streptococcus*) of various plant materials, packed firmly into silos.

silanizing The treatment of a chromatographic

support, such as a diatomaceous earth, with trichloromethylsilane or a similar reagent that converts active silanol groups (a) to less polar silyl ethers (b), thereby changing the adsorptive properties of the support. Glass chromatographic columns can be treated similarly; this minimizes adsorption of sample material to the surface of the glass. *Aka* silanization.



silent allele *See* silent gene.

silent gene A gene that has no detectable product.

silent mutation A mutation that does not result in a detectable phenotypic effect. A silent mutation may be due to a transition or a transversion that leads to either a synonym codon or a codon which codes for an amino acid closely related to that coded for by the original codon. As a result, the polypeptide chain will be synthesized, either without a change in its amino acid sequence, or with replacement of an amino acid by a closely related one. In the latter case, the polypeptide, while altered, may still be fully functional so that the mutation produces no detectable effect. *See also* isocoding mutation.

silica gel An adsorbent used in column and thin-layer chromatography for the separation of nonionic organic compounds. *Aka* silica; silicic acid.

silicon An element that is essential to humans and several classes of animals and plants. Symbol, Si; atomic number, 14; atomic weight, 28.086; oxidation states, -4 , $+2$, $+4$; most abundant isotope, ^{28}Si ; a radioactive isotope, ^{31}Si , half-life, 2.6 h, radiation emitted, beta particles.

siliconization The inactivation of a surface by physically coating it with a thin film of silicone oil; this contrasts with the chemical reaction of silanization.

silk fibroin A fibrous protein of silk that has an antiparallel pleated sheet structure.

silk gelatin SERICIN.

silver nitrate chromatography ARGENTATION CHROMATOGRAPHY.

silver stain A sensitive stain used for detecting proteins separated by gel electrophoresis.

silylation The introduction of a trimethylsilyl group $\text{—Si}(\text{CH}_3)_3$ into an organic compound; used for making volatile derivatives for gas chromatography.

SIM Selected ion monitoring.

Simha equation One of two equations that re-

late the viscosity increment to the axial ratio of either a prolate or an oblate ellipsoid of revolution.

simian Of, or pertaining to, monkeys.

simian acquired immune deficiency syndrome An infectious disease in Rhesus monkey that is strikingly similar to human AIDS and is also caused by a retrovirus. *Abbr* SAIDS.

simian virus 40 A small, naked, icosahedral, and oncogenic virus that contains double-stranded DNA and belongs to the group of papovaviruses. *Abbr* SV-40.

7S immunoglobulin A basic structural unit of the immunoglobulins. The IgG and IgD immunoglobulins as well as the monomeric units of IgA and IgM immunoglobulins all have sedimentation coefficients of 7S; the IgE immunoglobulins, however, have a sedimentation coefficient of 8S.

19S immunoglobulin IgM.

simple anhydride See acid anhydride.

simple diffusion 1. The movement of a solute across a biological membrane that does not require the participation of transport agents; unmediated transport. *Aka* passive transport. 2. FREE DIFFUSION. 3. SINGLE DIFFUSION.

simple dispersion See simple optical rotatory dispersion.

simple enzyme 1. An enzyme that consists only of protein. 2. An enzyme that contains a non-protein component which does not participate in the catalytic process.

simple goiter A thyroid enlargement that is unaccompanied by either hyper- or hypothyroidism.

simple hapten A low molecular weight hapten that constitutes a separate part of a complete antigen but that does not give a visible precipitin reaction with the appropriate antibody.

simple lipid NEUTRAL LIPID.

simple microscope A microscope having one lens.

simple optical rotatory dispersion An optical rotatory dispersion that can be described by a one-term Drude equation.

simple protein A protein that is composed only of amino acids.

simple-sequence DNA SATELLITE DNA.

Simplexse Trademark for a low-calorie, cholesterol-free fat substitute that is made from milk and egg white proteins; involves a heating and blending process (called micro-particulation) that shapes the proteins into small spherical particles (0.1–2.0 μm in diameter). In this shape and size range, the particles roll smoothly over one another so that the tongue perceives them as fluid rather than as individual particles. This creates the sensation of smoothness, richness, and creaminess normally associated with fat.

simple sugar MONOSACCHARIDE.

simple triglyceride A triglyceride containing only one type of fatty acid.

SIMS Secondary ion mass spectrometry.

simultaneous reactions A mechanism in which one reactant can give rise to either of two different products by either of two different reactions.

SINE Short interspersed repeated sequences.

single-burst experiment A technique for studying viral multiplication by isolating single infected cells.

single carbon unit ONE-CARBON FRAGMENT.

single-cell protein Protein derived from single-cell organisms such as bacteria, yeasts, and fungi; of interest as a potential food for man and animals. *Abbr* SCP.

single-copy DNA UNIQUE DNA.

single-copy plasmid A plasmid having a copy number of one; a plasmid present in bacterial cells in the ratio of one plasmid per host chromosome.

single diffusion Immunodiffusion in which either the antigen diffuses through a gel containing antibody, or the antibody diffuses through a gel containing antigen.

single-displacement mechanism SEQUENTIAL MECHANISM.

single-event curve SINGLE-HIT SURVIVAL CURVE.

single-hit survival curve A survival curve in which the absorption of one photon leads to loss of viability of the active unit; such a survival curve reflects simple exponential inactivation kinetics.

single-ion monitoring MASS FRAGMENTOGRAPHY.

single reciprocal plot A plot of $1/Y$ or X/Y versus X , where X and Y are two variables; the Scatchard plot and the Eadie-Hofstee plot are two examples.

single-site mutation POINT MUTATION.

single-strand assimilation The displacement of one DNA strand in a duplex by the homologous strand, leading to formation of a D-loop. The reaction occurs during recombination, and formation of the heteroduplex involves the RecA protein.

single-strand binding protein One of a group of proteins that bind to the single strands of DNA at the Y-fork during DNA replication; they allow replication to proceed by preventing the unwound strands from coming back together and annealing. *Abbr* SSB. *Aka* unwinding protein.

single-strand break NICK.

single-stranded Descriptive of a nucleic acid molecule that consists of only one polynucleotide chain. *Abbr* ss.

single-stranded DNA binding protein See single-strand binding protein.

single-strand exchange The pairing of a DNA

strand from one duplex molecule with a complementary strand in another duplex DNA, thereby displacing the homologous strand from the second duplex.

single-substrate enzyme An enzyme that catalyzes a reaction involving only one substrate.

singlet A single peak, as that obtained in nuclear magnetic resonance.

single-tailed test ONE-SIDED TEST.

singlet state The electronic state of an atom or a molecule in which two single electrons in two orbitals (two unpaired electrons) have their spin in opposite directions and are spin-paired so that $S = 0$ and $2S + 1 = 1$, where S is the resultant spin and $2S + 1$ is the spin multiplicity. Such an atom or molecule has no net magnetic moment. *See also* triplet state.

Sino Thioinosine.

sintered Descriptive of porous material that is formed by the partial fusion of a substance by heat.

siphon An inverted U-shaped tube with legs of unequal length that is used for the delivery of liquid from one container to a second one at a lower level.

Sips distribution A frequency distribution that closely resembles a Gaussian distribution and that is used for the treatment of data from equilibrium dialysis measurements of the antigen-antibody reaction.

siroheme An iron tetrahydroporphyrin of the isobacteriochlorin type that is the prosthetic group of nitrite reductase from *Neurospora crassa* and of sulfite reductase from *E. coli*.

sirohydrochlorin A siroheme from which the iron has been removed.

sister chromatids The two identical nucleoprotein molecules held together by a centromere.

sister-strand exchange *See* recombination repair.

sistrand The translational unit of mRNA as opposed to the genetic unit, the cistron. The sistrand is that unit of RNA that lies between an initiation and a termination signal. The term is derived from single initiation single termination strand.

site 1. A specific region of a macromolecule at which a binding interaction with another molecule, or with an atom or an ion, takes place; the active site of an enzyme and the antigen binding site of an antibody are two examples. 2. The position of a mutation in a gene.

site heterogeneity The heterogeneity of antibodies that results from the antigen molecule possessing several antigenic determinants; consequently, one antigen leads to the production of several types of antibodies.

site-specific endonuclease RESTRICTION ENZYME.

site-specific inversion *See* inversion (2).

site-specific recombination Genetic recombination in which the exchange of genetic material takes place at specific sites at one or both of the participating DNA segments. The segments need not be homologous and the recombination results in an altered nucleotide sequence. The exchange is catalyzed by an enzyme (site-specific recombinase) that requires specific nucleotide sequences on one or both of the recombining DNA molecules. *Aka* site-specific exchange. *See also* general recombination.

skeletal band An infrared absorption band that is characteristic of the entire molecule rather than of a specific group in the molecule. *See also* group frequency band.

skeletal growth factor A large protein that stimulates the growth of bone cells. *Abbr* SGF.

skeletal muscle A striated muscle that is attached to, or that moves parts of, the skeleton.

skew conformation Any conformation partway between a staggered and an eclipsed conformation.

skewed distribution A distribution that is not symmetrical; it is known as a positively skewed distribution if the tail is to the right and the mean exceeds the median; it is known as a negatively skewed distribution if the tail is to the left and the mean is less than the median.

skin-sensitizing antibody REAGIN.

slant culture A bacterial culture grown in a tube that contains a solid nutrient medium which was solidified while the tube was kept in a slanted position.

slice technique *See* tissue slice.

sliding filament model A model proposed by Huxley and Hanson to explain the changes in the length of a striated muscle upon contraction and stretching. According to this model, thick and thin muscle filaments slide alongside each other, thereby leading to varying degrees of interpenetration without changes in the lengths of the filaments themselves. *See also* rowboat model.

sliding microtubule mechanism A proposed mechanism according to which the bending movements of cilia and flagella are brought about by the sliding of adjacent doublet microtubules past each other within the axoneme.

slightly repetitive DNA *See* repetitive DNA.

slime *See* capsule.

slope replot *See* secondary plot.

sloppy agar Semisolid agar.

slow-assembly end *See* actin filament.

slow component That fraction of DNA (usually unique DNA) that reassociates last in a re-

association kinetics experiment.

slow hemoglobin A hemoglobin which, after electrophoresis, is located closer toward the cathode than normal adult hemoglobin.

slow-reacting substance See SRS; SRS-A.

slow-reacting substance of anaphylaxis See SRS-A.

slow stop mutant A temperature-sensitive mutant of *E. coli* that can complete its round of replication when placed at the restrictive temperature but stops at that point; it cannot initiate another round of replication.

slow-twitch muscle RED MUSCLE.

slow virus See prion.

SLR factor N¹⁰-Formylpterico acid; a factor that stimulates the growth of *Streptococcus lactus* R; rhizopterin.

SLS Segment long spacing.

small-angle x-ray diffraction A method of x-ray diffraction in which the scattering of the x-rays is measured at small angles; used for the analysis of large molecular spacings, as those between monomeric groups in a polymer.

small calorie CALORIE.

small cytoplasmic ribonucleoproteins See small cytoplasmic RNA.

small cytoplasmic RNA A class of small RNA molecules, consisting of 100–300 nucleotides, that are located in the cytoplasm of eukaryotic cells. Their distinguishing feature is their association with specific protein molecules to form small cytoplasmic ribonucleoproteins (scRNP); little is known about the function of the latter. *Abbr* scRNA.

small lymphocyte A term used to describe both B cells and T cells.

small nuclear RNA A class of small RNA molecules, consisting of 100–300 nucleotides, that are located in the nucleus of eukaryotic cells. Their distinguishing feature is their association with specific protein molecules to form small nuclear ribonucleoproteins (snRNP or snurp); some of the latter participate in RNA processing. *Abbr* snRNA.

small nuclear ribonucleoprotein See small nuclear RNA.

smallpox virus VARIOLA VIRUS.

S1 mapping A technique for locating the 5'-end of mRNA in vivo by the use of S1 nuclease.

smectic liquid crystal See liquid crystal.

Smith degradation The degradation of a polysaccharide by means of periodate oxidation, followed by reduction with sodium borohydride and acid hydrolysis; the method yields fragments that indicate the mode of linkage of the monosaccharides in the original polysaccharide.

Smithie's theory A somatic recombination theory of antibody formation.

smooth endoplasmic reticulum That portion of the endoplasmic reticulum to which few or no ribosomes are attached; contains a variety of enzymes used to detoxify drugs and other toxic compounds. *Abbr* SER. *Aka* smooth-surfaced endoplasmic reticulum.

smooth microsomes See microsomes.

smooth muscle An involuntary muscle such as a muscle of an internal organ or a muscle of a blood vessel; so called because it does not appear striated.

smooth-rough variation See smooth strain; rough strain.

smooth strain A bacterial strain, such as pneumococcus (*Streptococcus pneumoniae*) that grows in the form of a colony that appears smooth (has no jagged edges). In some species, smooth strains are virulent and have complete cell wall lipopolysaccharides (O antigens). *Abbr* S strain.

SMP Submitochondrial particle.

S mutant A bacterial mutant that gives rise to a smooth colony. See also smooth strain.

sn Stereospecific numbering.

SN Steroid number.

snake venom A mixture of toxins produced in the venom glands of poisonous snakes; consists of various toxic proteins (such as neurotoxins, cardiotoxins, and protease inhibitors) and a number of enzymes (such as hyaluronidase, acetylcholinesterase, and L-amino acid oxidase).

snapback The rapid renaturation of heat-denatured double-stranded DNA or RNA that occurs when the nucleic acid contains a short segment in which the nucleotide pairs are intact, with the base pairing in perfect register. The minimum size of this segment varies with the composition of the nucleic acid; the segment generally consists of between 12 and 20 nucleotide pairs. See also minimal stable length.

snapback DNA FOLDBACK DNA.

sneak synthesis BACKGROUND CONSTITUTIVE SYNTHESIS.

Snell's law The law governing the refraction of light as it passes from medium 1 to medium 2; specifically, $n_1 \sin i_1 = n_2 \sin i_2$, where n is the index of refraction, i_1 is the angle of incidence, and i_2 is the angle of refraction.

S_N1 mechanism A unimolecular, nucleophilic substitution mechanism that can be formulated as $RX \rightarrow R^+ + X^-$; $N^- + R^+ \rightarrow RN$; $v = k[RX]$; v is the velocity of the reaction, and k is the rate constant. Also designated SN₁ mechanism.

S_N2 mechanism A bimolecular, nucleophilic substitution mechanism that proceeds with an inversion of configuration and that can be formulated as $N^- + RX \rightarrow NR + X^-$; $v =$

$k[N][RS]$; v is the velocity of the reaction, and k is the rate constant. Also designated SN_2 mechanism.

Sno Thioinosine.

snRNA Small nuclear RNA.

snRNP Small nuclear ribonucleoprotein.

S1 nuclease An endonuclease, from *Aspergillus oryzae*, that catalyzes the hydrolysis of single-stranded DNA or single-stranded regions in double stranded DNA, to yield 5'-phosphoryl mono- and oligonucleotides.

snurp Small nuclear ribonucleoprotein.

soap The salt of a long-chain fatty acid; commonly refers to either the sodium or the potassium salt.

soap bubble meter A device for measuring low rates of gas flow that is used in gas chromatography.

SOD Superoxide dismutase.

sodium An element that is essential to humans and several classes of animals and plants. Symbol, Na; atomic number, 11; atomic weight, 22.9898; oxidation state, +1; most abundant isotope, ^{23}Na ; a radioactive isotope, ^{22}Na , half-life, 2.60 years, radiation emitted, positrons and gamma rays.

sodium azide See azide.

sodium dodecyl sulfate A detergent used in the solubilization of membrane fractions. *Abbr* SDS; *Aka* sodium lauryl sulfate.

sodium dodecyl sulfate polyacrylamide gel electrophoresis See SDS-PAGE.

sodium error The apparent decrease in the pH of a solution that is measured with most glass electrodes when they are used at high pH values; the effect is due to the fact that most glasses that are responsive to protons are also somewhat responsive to sodium ions.

sodium lauryl sulfate SODIUM DODECYL SULFATE.

sodium pentobarbital See Nembutal.

sodium pump The structure and/or the mechanism that mediates the active transport of sodium and potassium ions across a biological membrane in higher animals; the operation of the pump requires cellular ATP and an ATPase. See also Na^+, K^+ -ATPase.

sofa conformation A half-chair conformation.

soft center An electrophilic center in a molecule which, when attacked by a nucleophile, leads to a transition state that involves the formation of an unusual bond. See also hard center.

soft clot The blood clot formed by the aggregation of fibrin molecules in the absence of calcium ions and fibrin stabilizing factor.

soft ice Water that is oriented, bound, and frequently compressed by polar interactions, as distinct from water that is in the form of icebergs, in which the water is stabilized by

nonpolar interactions.

soft ligand A large atom, or group of atoms, of high polarizability; sulfur and iodine atoms are examples. See also hard ligand.

soft soap A potassium salt of a long-chain fatty acid; soft soaps are more water-soluble than hard soaps.

software The procedural specifications required for the operation of computers; includes programs, routines, translators, assemblers, etc.

soft water Water that either contains low concentrations of calcium, magnesium, and iron ions, or is devoid of these ions; as a result, the surface-active action of ordinary soap molecules is not appreciably interfered with.

soft x rays Low-frequency x rays that have long wavelengths and small penetrating power.

sol A liquid colloidal dispersion.

solution The transition from a gel to a sol.

solenoid structure A supercoiled form of DNA that is formed during condensation of the chromosomes in the nuclei of eukaryotic cells.

solid medium A gel that contains nutrients.

solid phase synthesis An automated technique for the synthesis of polypeptides in which the chain grows while it is attached to a solid support, and excess reagents as well as by-products are washed away. The chain grows from the C-terminal to the N-terminal, and the process is initiated by attaching the C-terminal amino acid through its carboxyl group to an insoluble resin. This amino acid is then reacted with the next amino acid, the amino group of which has been blocked. After peptide bond formation, the amino-blocking group is removed and the dipeptide is then reacted with the next amino acid, and so on.

solid scintillation counter An external-sample scintillation counter in which a solid fluor is used as a detector.

solid scintillation fluorography A method for visualizing labeled compounds in a specimen by covering the specimen with solid fluors and allowing the photons, which are emitted by the scintillating fluors, to expose a photographic emulsion; used to locate labeled compounds in a chromatogram.

solid substrate room temperature phosphorescence An analytical technique based on the enhancement of phosphorescence of analytes adsorbed on solid substrates such as cellulose, inorganic crystals, polymer salts, or other matrix materials. The technique permits a determination of analyte concentration in a sample in the subnanogram range and is frequently carried out in the presence of heavy metal atoms; particularly useful for single-

component analysis in a mixture without prior separation. *Abbr* SS RTP. *Aka* solid surface (matrix) room temperature phosphorescence.

soliton A solitary wave; the collective amide I vibrations of successive peptide groups in a polypeptide chain which propagate themselves in wave-like fashion along the chain.

solubility The amount of a substance that will dissolve in a given volume of solvent under specified conditions.

solubility curve A plot of the amount of solute in solution as a function of the amount of solute added.

solubility product The product of the concentrations of the ions of a sparingly soluble electrolyte in a saturated solution of the electrolyte; the concentration of each ion is raised to a power equal to the number of ions of that type per molecule of electrolyte. When the solubility product is exceeded, some of the electrolyte is precipitated out.

solubilization chromatography A chromatographic technique in which compounds of insufficient solubility in water are separated by ion-exchange chromatography by using an aqueous solution of an organic solvent for elution.

solubilize To disperse in a solution; used to describe both the dispersion of membranes by treatment with detergents, and the release of an enzyme from particulate matter.

soluble Capable of going into solution; capable of dissolving.

soluble antigen An antigen that is not present on a cell, a virus, or some other particle in contrast to a particulate antigen.

soluble enzyme An enzyme that exists in the free state in the cytoplasm (in contrast to a particulate enzyme), is readily extracted from cells, and can be purified by the general methods of protein fractionation.

soluble fibrin SOFT CLOT.

soluble fraction A subcellular fraction that contains material of the intracellular fluids but that is devoid of cellular or intracellular particulate structures.

soluble RNA TRANSFER RNA.

soluble starch A partially hydrolyzed starch.

solute That component of a solution, consisting of two components, that is present in the smaller amount; for ordinary solutions of solids in liquids, it is the solid.

solution A homogeneous mixture of two or more substances; ordinary solutions are mixtures of one or more solutes and a solvent.

solution hybridization LIQUID HYBRIDIZATION.

solvated electron An electron surrounded by solvent molecules, commonly one surrounded by water molecules (hydrated electron). A hydrated electron is a strong reductant that is

unstable in aqueous media but may be stabilized in nonaqueous media. Hydrated electrons can be produced by pulse radiolysis, that is, by brief irradiation of aqueous solutions with high-energy electrons or gamma rays.

solvation The process whereby solvent molecules surround, and bind to, solute ions and molecules. Solvation may enhance or diminish the asymmetry of the solute particles in solution.

solvent That component of a solution, consisting of two components, that is present in the greater amount; for ordinary solutions of solids in liquids, it is the liquid.

solvent demixing The separation of a solvent system into its constituent components.

solvent drag The increased rate of movement of a solute over that attributable to simple diffusion, and caused by the flow of the solvent; the transfer of solutes across membranes by water which moves in response to an osmotic gradient is an example.

solvent extraction The removal of a wanted or an unwanted substance from a liquid by mixing the liquid with an immiscible, or a partially miscible, solvent, and by separating the phases.

solvent fermentation ACETONE-BUTANOL FERMENTATION.

solvent front The line of advancing solvent in chromatography.

solvent perturbation A technique for studying the stereochemistry and the location of chromophoric groups in a protein by measuring the changes in a property of the protein, such as absorbance or fluorescence, upon the addition of perturbing solutes to a solution of the protein. A chromophore on the surface of the protein molecule is expected to be sensitive to added perturbing solutes, while a chromophore in the interior of the molecule is expected to be insensitive to them; a chromophore in a crevice is expected to be sensitive to perturbing solutes of low molecular weight but not to those of high molecular weight.

solvent regain See water regain.

solvolysis A generalized concept for the reaction between a solvent and a solute by which new substances are formed. In most cases the solvent donates a proton to, and/or accepts a proton from, the solute. When the solvent is water, the reaction is referred to as hydrolysis.

soma The totality of the somatic cells of an organism.

somatic Of, or pertaining to, soma.

somatic antigen 1. An antigen of a somatic cell in higher organisms. 2. A cell surface antigen of bacteria as distinct from flagellar or capsu-

lar antigens.

somatic cell Any cell of a multicellular organism other than the mature gametes and the germ cells from which they develop.

somatic cell genetic engineering The modification of somatic cells to correct for genetic defects; such corrections are not hereditary. The insertion of genes for insulin production into defective pancreatic cells is an example.

somatic cell hybrid A hybrid cell produced by fusion of two somatic cells.

somatic crossing over MITOTIC RECOMBINATION.

somatic mutation A mutation occurring in a cell that is not destined to become a germ cell.

somatic mutation theory 1. A selective theory of antibody formation according to which antibody formation is based either on the hypermutation of specific genes or on the preferential expansion of clones in which advantageous mutations have occurred. *See also* somatic theory. 2. A theory of carcinogenesis according to which a tumor results from either a spontaneous or an induced mutation, or mutations, of the somatic cells of an organism.

somatic recombination theory A selective theory of antibody formation according to which antibody formation is based on somatic recombinations that occur between genes that are responsible for the synthesis of antibodies. *See also* somatic theory.

somatic theory A theory of the origin of the genes that code for the variable regions of antibody molecules and hence allow for the great diversity of antibodies. According to this theory, these genes have arisen through modifications of a smaller number of germline genes. Such modifications involve mutations as in the somatic mutation theory, or recombinations as in the somatic recombination theory.

somatocrinin SOMATOTROPIN-RELEASING HORMONE.

somatollberin SOMATOTROPIN-RELEASING HORMONE.

somatomedin One of a group of low molecular weight polypeptides (MW 7000–10,000) that mediate the action of growth hormone on skeletal tissue and produce insulin-like effects in various target tissues. Somatomedins are released by the liver and/or the kidneys by the action of growth hormone. They lead to increased incorporation of sulfate into cartilage and, hence, are also known as sulfation factor. Several of the somatomedins are known as insulin-like growth factors.

somatostatin GROWTH HORMONE RELEASE-INHIBITING HORMONE.

somatotrophin Variant spelling of somatotropin.

somatotropin GROWTH HORMONE.

somatotropin regulatory factor SOMATOTROPIN REGULATORY HORMONE.

somatotropin regulatory hormone GROWTH HORMONE REGULATORY HORMONE.

somatotropin release-inhibiting hormone GROWTH HORMONE RELEASE-INHIBITING HORMONE.

somatotropin releasing hormone GROWTH HORMONE RELEASING HORMONE.

Somogyi–Nelson method An analytical procedure for the determination of glucose in blood in which proteins are precipitated with zinc sulfate and barium hydroxide, and a blue color is produced by treatment of the protein-free filtrate with copper sulfate and an arsenomolybdate reagent.

Somogyi unit The quantity of amylase that liberates sugars with a reducing value equivalent to 1 mg of glucose during the course of a 30-min reaction at 40°C and at a pH of 6.9 to 7.0.

sonication ULTRASONICATION.

sonicator An instrument for the generation of ultrasonic sound waves and for the rupture of cells by means of these sound waves.

sonic oscillation ULTRASONICATION.

sonic oscillator SONICATOR.

sonification ULTRASONICATION.

sonifier SONICATOR.

sorbate 1. ABSORBATE 2. ADSORBATE. 3. The anion of sorbic acid.

sorbent 1. ABSORBENT (1). 2. ADSORBENT.

sorbic acid The compound $\text{CH}_3(\text{CH})_4\text{COOH}$; it is inhibitory to fungi and some bacteria and, hence, is used as a food preservative.

sorbitol A sugar alcohol derived from glucose; a 6-carbon sugar in which each carbon carries a hydroxyl group.

sorbose A 2-ketohexose that is biosynthesized from sorbitol; an intermediate in the commercial synthesis of ascorbic acid (vitamin C).

Sørensen buffer 1. A phosphate buffer prepared by mixing x mL of $M/15 \text{ KH}_2\text{PO}_4$ and $(100 - x)$ mL of $M/15 \text{ Na}_2\text{HPO}_4$; pH range 5.0 to 8.2. 2. A glycine buffer prepared by mixing x mL of 0.1 M glycine in 0.1 M NaCl and $(100 - x)$ mL of either 0.1 N HCl or 0.1 N NaOH; pH range 1.2 to 3.6 or 8.4 to 13.0. 3. A citrate buffer prepared by mixing x mL of 0.1 M disodium citrate and $(100 - x)$ mL of either 0.1 N HCl or 0.1 N NaOH; pH range 2.2 to 4.8 or 5.0 to 6.8.

Sørensen titration FORMOL TITRATION.

Soret band A characteristic absorption band of the cytochromes around 400 nm.

sorption 1. ABSORPTION (1). 2. ADSORPTION (1).

SOS box One of several operator sequences in *E. coli* (about 20 nucleotides long) to which the LexA repressor binds. An SOS box

occurs, for example, adjacent to the *lexA* and *recA* genes.

SOS functions SOS RESPONSE.

SOS regulon The regulon responsible for SOS repair; includes over 10 genes, among them those coding for the *recA* protein and the *lexA* repressor. *See also* SOS repair.

SOS repair An error-prone repair mechanism of DNA in *E. coli* that is induced as a result of damage to the DNA; DNA strands are formed even though they contain incorrect bases. The frequency of replication errors is allowed to increase when necessary; survival with mutation is apparently better than no survival at all. SOS repair appears to be the major cause of UV-induced mutations, such as the formation of thymine dimers. The repair mechanism involves the coordinate induction of several enzymes, the key one being an enzyme called *RecA* protein (*RecA* protease; *RECA*). The *RecA* protein is formed in sufficient amounts only after damage to the DNA has occurred. It then cleaves a protein called the *LexA* repressor (*LexA* protein). Cleavage of this repressor results in the activation of many genes involved in the repair. *Aka* error-prone repair; mutagenic repair. *See also* transdimer synthesis.

SOS response A complex group of inducible responses in *E. coli* to conditions that damage DNA or inhibit DNA replication. Includes the induction of synthesis of large amounts of *RecA* protein, enhanced DNA repair capacity, induced mutagenesis, prophage induction, and UV reactivation. *Aka* SOS functions; SOS system. *See also* SOS repair.

source The material that emits the radiation.

Southern blotting A blotting technique, developed by E.M. Southern, for the transfer of DNA fragments, separated by agarose gel electrophoresis, to a sheet of nitrocellulose. The DNA fragments in the gel are denatured by soaking with NaOH. The gel is then placed on a sheet of nitrocellulose and a weight is placed on the gel to squeeze out the liquid. The denatured, single-stranded, DNA fragments bind to the nitrocellulose sheet and are then located by hybridization with a radioactively labeled DNA or RNA probe. *Aka* Southern transfer; Southern hybridization. *See also* blotting.

Sowden-Fischer synthesis A reaction whereby a one-carbon fragment is added to a carbonyl group by means of nitromethane, as in the extension of a monosaccharide from a pentose to a hexose.

Soxhlet extractor A device that is interposed between a flask of boiling solvent and a condenser and that allows for the continuous extraction of a specimen with the solvent.

soybean trypsin inhibitor A protein, isolated from soybeans, that is an inhibitor of the enzyme trypsin; the Kunitz and the Bowman-Birk inhibitors are two such proteins. *Abbr* STI.

SP 1. Split proteins. 2. Secretory piece. 3. Substance P.

space-filling model A compact molecular model that shows the full bulk of each atom and the effective shape of the molecule. In this model, the bond angles are correct and the distances between the atoms are to scale based on their van der Waals radii.

space group A symmetry class to which objects may belong by virtue of possessing elements of symmetry over and above those of a point group; the additional elements of symmetry may be symmetry operations such as rotation and translation.

spacer A chemical grouping inserted between the ligand and the polymer matrix in affinity chromatography. The spacer ensures that the ligand is far enough removed from the column matrix so that the specific binding of protein to ligand can proceed without steric hindrance. *Aka* spacer arm.

spacer DNA 1. Untranscribed sections of DNA, located between structural genes. It occurs in eukaryotic and in some viral genomes and usually consists of highly repetitive DNA. 2. LINKER DNA.

spacer gel *See* disc gel electrophoresis.

spacing *See* nucleosome spacing.

spare receptors Receptors that are unoccupied by bound ligand under conditions where the ligand produces a full biological response. These receptors are not really "spare" or "superfluous" since they serve to increase cellular sensitivity to low concentrations of the ligand.

sparing effect The decrease in dietary requirement of one substance that is occasioned by the presence of a metabolically related substance in the diet; tyrosine, for example, exerts a sparing effect on phenylalanine. *See also* brain sparing.

sparkling The phenomenon that a catalytic amount of a certain di- or tricarboxylic acid, such as oxaloacetic acid, must be present for initiation of the beta oxidation of fatty acids. The acid is oxidized, thereby yielding ATP which is required for fatty acid activation; the acid also combines with the acetyl coenzyme A formed during beta oxidation.

sparsomycin An antibiotic, produced by *Streptomyces sparsogenes*, that inhibits protein synthesis in eukaryotes by preventing peptide bond formation.

SPCA Serum prothrombin conversion accelerator.

specialized transduction Transduction in which

only certain bacterial genes of the donor bacterium may become transduced, namely those genes close to the site of phage integration into the host chromosome. *Aka* restrictive transduction.

special structure The structural elements of the bacterial cell wall that are additional to the peptidoglycan framework and that include polysaccharides, teichoic acids, polypeptides, proteins lipopolysaccharides, and lipoproteins. The nature of the special structure varies greatly from organism to organism and contributes to the antigenic properties of the bacterial cells and to their acceptor specificity for viruses and bacteriocins.

speciation 1. DENDRITIC EVOLUTION. 2. The transformation of one species into another.

species (*pl* species) A taxon that forms a division of a genus and that consists of a group of individuals of common ancestry that closely resemble each other structurally and physiologically and that, in the case of sexual forms, are capable of interbreeding.

specific 1. Of, or pertaining to, species. 2. Designating a physical or a chemical property per unit amount of substance. 3. Of, or pertaining to, specificity. 4. Constituting or falling into a category.

specific acid-base catalysis The catalysis in solution in which the catalysts are free protons H^+ , H_3O^+ , and/or free hydroxyl ions; it is not affected by other acidic or basic species present. *See also* general acid-base catalysis.

specific activity The number of activity units per unit of mass; the number of enzyme units per milligram of protein, the number of katal per kilogram of protein, and the number of microcuries per micromole are examples. *Abbr* SA.

specific adsorption The adsorption of specific cations to a surface that results from the formation of coordination complexes between groups of atoms on the surface and the cations. *Aka* ion pairing.

specifically labeled Designating a compound in which one or more known atoms contain all of the label, not necessarily in an even distribution; the positions of the labeled atoms are included in the name of the compound.

specific dynamic action The extra heat, over and above that due to the basal metabolism, that is produced by an animal upon the ingestion of a food. The heat represents the extra energy released as a result of the metabolism of the food, and amounts to approximately 30% for proteins, 6% for carbohydrates, and 4% for lipids. *Abbr* SDA.

specific extinction coefficient The extinction coefficient that attains when the concentration of the solution is expressed in terms of grams

per liter (mg/mL).

specific gravity The ratio of the weight of a given volume of a substance to the weight of an equal volume of water.

specific growth rate The rate of growth of a bacterial population, either per cell or per unit mass of cells; equal to $(1/x)(dx/dt)$, where t is the time and x represents either the number or the mass of the cells.

specific heat The quantity of heat required to raise the temperature of 1 g of a substance by 1°C. *Aka* specific heat capacity.

specific immune suppression The loss of the ability of an organism to respond to a particular antigen after exposure to that antigen; the ability to respond to different antigens is not affected.

specific immunity The immunity that is due to the formation of antibodies in response to the recognition of specific antigens, as contrasted with nonspecific immunity which is due to nonimmunological mechanisms.

specific interaction theory A theory of the evolution of the genetic code according to which the code evolved as a result of specific physical-chemical relations between the amino acids and their codons or anticodons. Support for this theory comes from the finding that amino acid polarity, amino acid hydrophobicity, and bulkiness of amino acid side chains have all been shown to correlate with several properties of the corresponding amino acid anticodons.

specific ionization The number of ion pairs formed per unit distance along the path of an ionizing particle.

specificity 1. The degree of selectivity shown by an enzyme with respect to the number and types of substrates with which the enzyme combines, as well as with respect to the rates and the extents of these reactions. *See also* polyaffinity theory. 2. The degree of selectivity shown by an antibody with respect to the number and types of antigens with which the antibody combines, as well as with respect to the rates and the extents of these reactions. 3. The degree of selectivity shown by a membrane, or a membrane component, with respect to the type and the degree of permeability to substances transported across the membrane in mediated transport.

specificity constant A measure of the effectiveness of a substrate; defined as the ratio k_{cat}/K_m , where k_{cat} is the catalytic rate constant and K_m is the Michaelis constant.

specificity factor A protein that associates temporarily with the core component of RNA polymerase and thereby determines to which promoter the enzyme will bind and which genes will be transcribed. The sigma subunit

of the *E. coli* RNA polymerase is an example.

specific osmotic pressure REDUCED OSMOTIC PRESSURE.

specific radioactivity The specific activity of radioactive material, frequently expressed in terms of the number of microcuries per micromole.

specific rate constant RATE CONSTANT.

specific reaction rate RATE CONSTANT.

specific refractive index increment The contribution to the refractive index per gram of solute; equal to $(n - n_0)/c$, where n is the refractive index of the solution, n_0 is the refractive index of the solvent, and c is the concentration of the solution in grams per cubic centimeter. *Aka* specific refractive increment.

specific retention volume The volume of liquid, per gram of adsorbent, that passes through a column in displacement chromatography before a particular substance is eluted from the column.

specific rotation A measure of the optical rotation at a particular wavelength per unit amount of a substance; specifically, $[\alpha]_D^{25} = \alpha/dc$, where $[\alpha]_D^{25}$ is the specific rotation at a temperature of 25°C for the sodium D line, α is the observed rotation in degrees, d is the optical path length in decimeters, and c is the concentration in grams per milliliter.

specific rotatory power SPECIFIC ROTATION.

specific substrate concentration REDUCED SUBSTRATE CONCENTRATION.

specific viscosity A measure of the fractional change in viscosity that is produced by the solute; equal to the relative viscosity minus one. *Sym* η_{sp} .

specific volume The volume occupied by 1 g of material; the reciprocal of the density.

specimen screen A screen made of copper or gold and used as a support for samples to be examined with the electron microscope.

spectinomycin An antibiotic, produced by *Streptomyces spectabilis*, that inhibits protein synthesis but does not cause misreading of the genetic code; it acts on 30S ribosomes and the inhibition can be reversed by washing the ribosomes.

spectral Of, or pertaining to, a spectrum.

spectral bandpass *See* bandpass.

spectral shift The change of an absorption spectrum or an absorption band to either longer or shorter wavelengths.

spectrin A peripheral protein, located at the cytoplasmic side of the red blood cell membrane. Spectrin is a long, fibrous protein that occurs as a mixture of dimers and tetramers. These are arranged in a filamentous network, held together by actin and other protein molecules. The network is believed to be responsi-

ble for maintaining the biconcave shape of red blood cells.

spectrofluorometer A fluorometer in which the desired excitation and emission wavelengths are selected by means of a monochromator. Spectrofluorometers may be of a corrected or an uncorrected type depending on whether the intensity of the exciting light is controlled as a function of the wavelength, and whether the response of the detector is controlled as a function of the emission wavelength. *Var sp* spectrofluorimeter.

spectrogram The photographic record of a spectrum.

spectrograph An instrument for separating light into its component wavelengths and for obtaining a photographic record of the spectrum thus produced.

spectrometer 1. An instrument for measuring either the wavelengths or the frequencies of a spectrum. 2. A liquid scintillation assembly that includes a detector, scaler, sample changer, print out, and electronic circuitry.

spectrophotometer A photometer in which a monochromator, composed of prisms or diffraction gratings, is used for the isolation of narrow bandwidths. Spectrophotometers allow the measurement of the selective absorption of light; they are used for both qualitative and quantitative analysis of chemical substances, and cover the ultraviolet, visible, and infrared ranges of the electromagnetic spectrum. *See also* double beam in space spectrophotometer; double beam in time spectrophotometer; recording spectrophotometer.

spectropolarimeter An instrument that is a combined spectroscope and polarimeter and that is used for measurements of optical rotation as a function of wavelength.

spectroscope An instrument for separating light into its component wavelengths and for examining the spectrum thus produced.

spectroscopic splitting factor *g* VALUE.

spectroscopy The production and study of spectra.

spectrum (*pl* spectra; spectrums) 1. The variation of radiation intensity as a function of either wavelength or frequency that is generally represented in graphical form. 2. A range of either wavelengths or frequencies of a radiation. 3. ELECTROMAGNETIC SPECTRUM. 4. A specific type of radiation wavelengths or frequencies, such as an absorption or an emission spectrum.

S peptide A peptide formed by cleavage of ribonuclease with subtilisin; it consists of amino acid residues 1 through 20. The remaining, larger fragment (residues 21-124) is called S protein. Subtilisin hydrolyzes only this one

peptide bond in ribonuclease (between residues 20 and 21).

spermaceti A solid wax obtained from the sperm oil secreted in the jaw region of the sperm whale; used commercially as a basis for pharmaceutical and cosmetic creams.

spermatocyte A cell that develops into a mature sperm upon meiosis.

spermatogenesis The formation and development of spermatozoa.

spermatozoon (*pl* spermatozoa) The male reproductive cell of animals; the male gamete.

spermidine A low molecular weight polyamine (*N*-[3-aminopropyl]-1,4-butanediamine) that occurs in both prokaryotes and eukaryotes; contains two amino groups and one imino group and its synthesis involves *S*-adenosyl methionine.

spermine A low molecular weight polyamine (*N,N'*-bis[3-aminopropyl]-1,4-butanediamine) that occurs in eukaryotes but not in prokaryotes; contains two amino groups and two imino groups and its synthesis involves *S*-adenosyl methionine.

spherical phage *See* minute phage.

spherocyte A spherical red blood cell that has a smaller diameter than the normal erythrocyte.

spherocytosis A genetically inherited metabolic defect in humans, characterized by erythrocytes that look like bags rather than disks; due to a deficiency in the synthesis of one of the polypeptide chains in spectrin.

spheroplast A bacterial cell that is largely, but not entirely, freed of its cell wall. Spheroplasts are prepared artificially from gram-negative bacteria by either lysozyme digestion of the cells or by growing them in the presence of penicillin. Spheroplasts are osmotically sensitive but may, at times, convert to an L form. *See also* protoplast.

spherosome A lysosome-like organelle of plants. It is derived from the endoplasmic reticulum and serves as a major site of lipid storage.

spherule LIPOSOME.

sphinganine 2-Amino-1,3-octadecanediol; dihydrosphingosine.

4-sphingenine SPHINGOSINE.

sphingoid A generic descriptor for sphinganine, its homologues and stereoisomers, and the hydroxy and unsaturated derivatives of these compounds.

sphingolipid Any lipid containing a sphingoid; a lipid that contains either sphinganine, its homologue, its isomer, or its derivative, and that is especially predominant in brain and nervous tissue.

sphingolipidosis One of a number of genetically inherited metabolic defects in humans that

are characterized by the accumulation of various sphingolipids and that are due to deficiencies of lysosomal enzymes. Gaucher's disease, Tay-Sachs disease, Niemann-Pick disease, and Krabbe's disease are some examples.

sphingolipodystrophy SPHINGOLIPIDOSIS.

sphingomyelin A phosphosphingolipid that consists of sphingosine, a fatty acid, a phosphate group, and choline, and that is predominant in the myelin sheath of nerves; a ceramide-1-phosphocholine.

sphingomyelinosis NIEMANN-PICK DISEASE.

sphingophospholipid Any phospholipid derived from sphingosine or related compounds.

sphingosine A long-chain, unsaturated amino alcohol that is the parent compound of the sphingolipids; 2-amino-4-octadecene-1,3-diol; *trans*-4-sphingenine. *Aka* 4-sphingenine.

spike A characteristic protrusion on viral envelopes.

spike potential ACTION POTENTIAL.

spiking INTERNAL STANDARDIZATION.

spillover hypothesis The hypothesis according to which photosystems I and II of chloroplasts have specific points of contact between them so that energy transfer is possible not only between the pigments within each photosystem, but also between the pigments of one photosystem and those of the other. *See also* separate package hypothesis.

spin The rotation about an axis, as the rotation of an electron or an atomic nucleus.

spinach ferredoxin A ferredoxin that contains two iron atoms per molecule, has a molecular weight of about 12,000, has a standard reduction potential (E'_0) of -0.42 V, and serves as an early acceptor for electrons from the excited P_{700} pigment in photosystem I of chloroplasts.

spin adduct *See* spin trapping.

spin coupling *See* spin-spin coupling.

spin decoupling A technique used in nuclear magnetic resonance in which the effect of spin coupling with nucleus A on the spectrum of nucleus B is eliminated by irradiation with the resonance frequency of nucleus A. *Aka* double irradiation; spin-spin decoupling.

spindle A structure, composed of microtubules, which is responsible for eukaryotic chromosome alignment and movement during nuclear division.

spindle poison *See* colchicine.

spin flip The change, by an oriented nucleus in nuclear magnetic resonance, from a lower energy state to a higher energy state upon absorption of incident radiation.

spin imaging A nuclear magnetic resonance technique that involves the use of magnetic field gradients to provide information about

the spatial distribution of molecules within a sample; based on obtaining two- or three-dimensional images of the proton signals from water within animals and human beings.

spin labeling The introduction into a protein of a substituent, the electron paramagnetic resonance of which is sensitive to changes in the environment of the substituent. Measurements of the electron paramagnetic resonance of the substituent in the protein can be used to explore the environment of the substituent in the protein molecule. *See also* reporter group; spin probe.

spin-lattice relaxation A radiationless process whereby the energy of a nucleus in a high spin state is dissipated to the lattice of surrounding nuclei by means of oscillating magnetic fields.

spin multiplicity The term $2S + 1$, where S is the resultant spin.

spin probe A spin label that is bound noncovalently to a protein.

spin quantum number The value of either $+\frac{1}{2}$ or $-\frac{1}{2}$ that is arbitrarily assigned to one of the two directions of spin of an orbital electron.

spin-spin coupling The interaction between the magnetic moment of a proton, or some other nuclear dipole, and those of neighboring dipoles in nuclear magnetic resonance; this interaction leads to the splitting of a single peak into multiple peaks. *Aka* spin-spin interaction.

spin-spin decoupling *See* spin decoupling.

spin-spin relaxation A measure of the energy exchange between nuclei in nuclear magnetic resonance; a radiationless process in which the energy of one nucleus is transferred to another.

spin-spin splitting The production of multiple peaks from a single peak in nuclear magnetic resonance as a result of spin-spin coupling.

spin trapping A technique of electron paramagnetic resonance that permits the identification of transient free radicals; based on the ability of certain compounds (spin traps) to react with highly unstable radicals to yield long-lived, stable products, termed spin adducts. The latter yield electron spin resonance parameters that reflect the nature of the trapped free radicals.

spirillum (*pl* spirilla) A bacterium having a helically shaped cell; spirilla represent one of the three major forms of bacteria. *See also* coccus; bacillus.

spirometer An instrument for measuring the volume of air inhaled and exhaled; used in measurements of the basal metabolic rate.

SPK Synthase phosphorylase kinase.

spleen A large organ in the abdominal cavity that functions in the destruction of erythrocytes and in the production of antibodies.

splenectomy The surgical removal of the spleen.

splenomegaly An enlargement of the spleen.

spliceosome A multicomponent complex that carries out the splicing of RNA; evidence for, and characterization of, such a complex has been based on experiments involving both yeast and mammalian systems.

splice sites The cutting sites for removal of an intron; the 5'-splice site is adjacent to the GU-end of the donor junction, the 3'-splice site is adjacent to the AG-end of the acceptor junction. *See also* splicing junctions.

splicing 1. Gene splicing. The process whereby DNA fragments from different sources are joined covalently to form a recombinant DNA molecule. *See also* recombinant DNA technology. 2. RNA splicing. The process whereby introns are excised, and exons are joined, in the conversion of a primary RNA transcript to the finished (mature) mRNA molecule in eukaryotes.

splicing homeostasis *See* maturase.

splicing junctions Segments of nucleotides at the ends of introns that function in RNA splicing; the sequence at the 3'-end of an intron is called the acceptor (right) junction, and that at the 5'-end is called the donor (left) junction. *See also* GU-AG rule.

split gene A gene that occurs in pieces; it consists of DNA sequences that are transcribed and translated (exons) and of DNA sequences that are transcribed but not translated (introns). The latter are excised from the primary RNA transcript and the exons are then spliced together to yield the functional gene product.

split proteins The proteins that, when removed from ribosomes, leave behind core particles. Core particles and split proteins are inactive in protein synthesis but can be reassociated into functionally active ribosomes. *Abbr* SP.

splitter A device for decreasing the amount of sample that is introduced into a gas chromatographic column from the inlet.

splitting The separation, in terms of energy, between previously degenerate energy levels in an atom or a molecule.

spontaneous generation The doctrine that living things can come from nonliving matter; abiogenesis.

spontaneous hypersensitivity Hypersensitivity that is produced in an animal in the absence of any known contact of the animal with an antigen.

spontaneous induction The induction of a prophage that is caused by the random interaction between the immunity substance and the prophage.

spontaneous mutation A naturally occurring

- mutation for which there is no observable cause; a mutation that results from a chance exposure of an organism to a mutagen in the environment.
- spontaneous process** A process that is accompanied by an increase in entropy.
- spontaneous reaction** A chemical reaction that is accompanied by a negative free energy change; an exergonic reaction.
- spontaneous tumor** A tumor that arises without known exposure of the organism to a carcinogen, such as one formed in certain inbred strains of mice that are genetically prone to tumor development.
- sporangium** (*pl* sporangia) A special structure housing spores.
- spore** A dormant cellular form, derived from a bacterial, fungal or plant cell, that is devoid of metabolic activity and that can give rise to a vegetative cell upon germination; it is dehydrated and can survive for prolonged periods of time under drastic environmental conditions.
- spore coat** One of two outer layers that surround the spore cortex and that consist largely or entirely of cross-linked proteins having a high cystine content.
- spore core** The central body of a spore; the cytoplasm of a spore.
- spore cortex** A thick layer that contains glycopeptides and that is located between the spore coats and the spore membrane.
- spore membrane** The membrane that surrounds the spore core.
- spore peptide** The glycopeptide material released from germinating spores.
- spore tip mucilage** A naturally occurring strong adhesive that is stored in a dehydrated form in a specialized compartment at the apex of rice blast fungus spores (*Magnaporthe grisea*). Upon hydration of the spore, the adhesive is also hydrated and released; it then effects attachment of the phytopathogenic spores to the host plant. *Abbr* STM.
- spore wall** SPORE MEMBRANE.
- sporicide** An agent that kills spores.
- sporogenesis** The production of spores.
- sporont** A cell from which a spore may subsequently develop.
- sporophyte** The spore-producing, diploid individual in the life cycle of an organism exhibiting alternation of generations.
- sporulation** 1. The differentiation of a cell into a spore. 2. The discharge, or liberation, of spores.
- spot** 1. *n* The location of a separated and visualized component in either chromatography or electrophoresis. 2. *v* To apply material in small amounts to either a chromatographic or an electrophoretic support.
- spot desmosome** A cell junction that acts like a rivet holding epithelial cells together at specific points of contact. *See also* cell junction.
- spray-freezing** A modification of the freeze-fracturing technique in which the cooling rate is increased by spraying the sample into a liquid at very low temperatures; the frozen droplets are then collected, "glued" together with butyl benzene, and subjected to freeze-fracturing.
- spreading factor** HYALURONIDASE.
- spreading position effect** The phenomenon in which several genes, located near a chromosomal aberration of inversion or translocation, appear to be activated simultaneously.
- spreading reaction** The change in permeability and other properties of the cell membrane that occurs in a phage-infected cell in the vicinity of each bound phage particle.
- spread plate** A petri dish, containing solid medium, in which the inoculum has been spread over the entire surface.
- S-protein** A large peptide formed by cleavage of ribonuclease with subtilisin; it consists of amino acid residues 21-124. The other, smaller fragment (residues 1-20) is called S-peptide. Subtilisin hydrolyzes only this one peptide bond in ribonuclease (between residues 20 and 21).
- S-100 protein** 1. An acidic, brain-specific protein that has been implicated in neurophysiological functions and in the process of learning; the protein has a molecular weight of 20,000 and is rich in aspartic and glutamic acids. 2. One of a group of low molecular weight, Ca^{2+} -binding, modulator proteins that function in cell cycle progression, cell differentiation, and cytoskeletal-membrane interactions.
- SP-Sephadex** Sulfopropyl Sephadex; a cation exchanger. The ion exchanger contains the grouping $-\text{C}_3\text{H}_6\text{SO}_3^-$, linked via ether bonds to the Sephadex.
- spur** The overlapping portion of two precipitin arcs in immunodiffusion; one such spur is formed in a reaction of partial identity, and two such spurs are formed in a reaction of nonidentity.
- spurious counts** Counts of radioactivity that are not caused by the sample but that result from outside factors, such as malfunctioning of the apparatus.
- squalene** A terpenoid that serves as the immediate precursor of sterols in their biosynthesis; it gives rise to lanosterol which is then converted to cholesterol.
- square bacteria** Halophilic bacteria that are found in hypersaline environments and that have square structures with a cell wall comprised of regularly arranged subunits.

square dilution law RADIAL DILUTION.

square wave polarography A polarographic technique in which a square-wave alternating potential is superimposed on the normal dc applied potential and the alternating component of the current is measured.

squiggle The symbol ~ used to designate a high-energy bond, specifically one involving the phosphate group.

⁹⁰Sr Strontium-90.

src gene An oncogene of Rous sarcoma virus; its product (src protein) is a protein kinase that can modify a large number of proteins. *See also* c-src gene.

Srd Thiouridine.

S region EXTRA ARM.

SRF *See* growth hormone regulatory hormone.

SRH *See* growth hormone regulatory hormone.

SRIF *See* growth hormone regulatory hormone.

SRIH *See* growth hormone regulatory hormone.

SR mutant Smooth-rough mutant; *see* smooth strain; rough strain.

sRNA Soluble RNA.

4S RNA TRANSFER RNA.

5S RNA An RNA molecule that has a sedimentation coefficient of 5S and that forms part of the ribosomal RNA in both prokaryotes and eukaryotes; it is similar to transfer RNA in its base composition and sedimentation coefficient, but it does not contain minor bases.

5.8S RNA An RNA molecule that has a sedimentation coefficient of 5.8S and that forms part of the ribosomal RNA in eukaryotes.

SRP Signal recognition protein.

SRP receptor DOCKING PROTEIN.

S-rRNA RNA of the small ribosomal subunit.

SRS Slow-reacting substance; a substance that causes slow contractions of bronchial smooth muscles.

SRS-A Slow-reacting substance of anaphylaxis. A substance that causes slow contractions of bronchial smooth muscles and that is released upon exposure to specific antigens. SRS-A consists of a mixture of leukotrienes LTC₄ and LTD₄; the ratio of these two leukotrienes varies with the source of the SRS-A, the stimulus, and the time elapsed after stimulation.

SRS technique Separation-reaction-separation technique; a separation technique for steroids in which the steroids are first separated in one dimension by thin-layer chromatography, are then exposed to radiation or are reacted with chemical reagents, and are then separated in the second dimension by thin-layer chromatography with the same solvent used for the first dimension.

S → R variation Smooth-rough variation.

ss single-stranded.

SSA test Sulfosalicylic acid test.

SSB Single-strand binding protein.

SSC Standard saline citrate.

ssDNA Single-stranded DNA.

S-shaped curve *See* sigmoid kinetics.

ssRNA Single-stranded RNA.

SSRTP Solid substrate room temperature phosphorescence.

SSS Steady-state stacking.

S strain Smooth strain.

stab culture A bacterial culture made by plunging an inoculating needle into a solid medium.

stability constant FORMATION CONSTANT.

stabilizer EMULSIFYING AGENT.

stable factor PROCONVERTIN.

stable isotope An isotope that is not radioactive.

stacking 1. BASE STACKING. 2. ISOTACHOPHORESIS.

stacking energy The free energy of the stacking interactions between two base pairs in a double-helical nucleic acid structure.

stacking gel *See* disc gel electrophoresis.

stacking interactions The hydrophobic interactions between the base pairs that are arranged in parallel planes in the interior of a double-helical nucleic acid structure.

staggered conformation The conformation of a molecule in which, in a Newman projection, few atoms are either partially or fully concealed from view by other atoms. In such a conformation, interatomic distances are relatively great and interatomic interactions are minimized; as a result, staggered conformations are more stable than eclipsed ones.

staggered cuts Two cuts in duplex DNA, one in each strand, that are removed from each other by one or more base pairs; the type of cuts carried out by many restriction enzymes.

stains all A complex cationic carbocyanine dye that stains most macromolecules. It stains RNA blue-purple, DNA blue, protein red, phosphoproteins blue, and mucopolysaccharides blue to purple.

staircase reaction A stepwise chemical reaction; the hydrolysis of starch, which proceeds through the formation of intermediate dextrans and oligosaccharides to the formation of glucose, is an example.

staircase response The gradual increase in steroid excretion upon the administration of adrenocorticotrophic hormone that occurs in individuals who suffer from adrenal insufficiency as a result of either pituitary or hypothalamic dysfunction.

stalk *See* supermolecule.

standard *See* standard solution.

standard amino acids The 20 amino acids that occur in proteins as distinct from other amino acids (nonprotein amino acids) that function only in various areas of metabolism. *Aka* primary amino acids; normal amino acids; standard set.

standard conditions *See* standard temperature and pressure.

standard curve A plot of a physical property, commonly absorbance, of a compound or of its derivative as a function of the concentration of the compound; used for the determination of unknown concentrations of the compound from measurements of the physical property.

standard deviation A measure of the scatter of values about the mean of a set of measurements; for a normal distribution curve, it is the range about the mean within which 68.27% of all the measurements will fall. The standard deviation is equal to $[\Sigma(X - \bar{X})^2 / (N - 1)]^{1/2}$, where N is the number of measurements, and $\Sigma(X - \bar{X})^2$ is the sum of the squared deviations from the mean \bar{X} . It is denoted s for a sample and σ (sigma) for a population; it is equal to the positive square root of the variance. *Abbr* SD.

standard deviation of the mean STANDARD ERROR.

standard diffusion coefficient The value of a translational diffusion coefficient that is calculated from data which have been extrapolated to zero concentration, and that is corrected to a diffusion coefficient under standard conditions which are taken as the diffusion in a medium of water at 20°C. *Sym* $D_{20,w}$.

standard electrode potential The electrode potential for a half reaction at 25°C and 1 atm of pressure in which all reactants and products are present in their standard states; denoted E^0 . It is usually approximated as the midpoint potential for a system in which all reactants and products are present at 1 M concentrations and is then denoted E_0 . The biochemical standard electrode potential is a reduction potential for a half-reaction at 25°C and 1 atm of pressure in which all reactants and products are present at 1 M concentrations except protons which, unless otherwise specified, are present at a concentration of 10^{-7} M (pH 7.0); this potential is measured as a midpoint potential and is denoted E_0' .

standard enthalpy change *See* standard state.

standard entropy change *See* standard state.

standard error A measure of the reliability of the mean, expressed as $SE = \sigma/\sqrt{N}$, where SE is the standard error, σ is the standard deviation, and N is the number of individual results. *Abbr* SE.

standard error of estimate The square root of

the residual variance in regression analysis; the standard deviation of the differences between the observed and the calculated values. It is equal to $[\Sigma(Y - \hat{Y})^2 / (n - 2)]^{1/2}$ where Y is the observed value of Y for a given value of X , \hat{Y} is the calculated value of Y (using a regression equation) for a given value of X , and n is the total number of observations.

standard error of the mean STANDARD ERROR.

standard flotation coefficient The value of a flotation coefficient that is calculated from data that have been extrapolated to zero concentration, and that is corrected to a flotation coefficient under standard conditions which, for many lipoproteins, are taken as the flotation in a sodium chloride solution having a density of 1.063 g/mL at 26°C. *Sym* s_f^0 .

standard free energy change The free energy change of a reaction at 25°C and 1 atm of pressure in which all reactants and products are present in their standard states; denoted ΔG^0 . The biochemical standard free energy change is the free energy change of a reaction at 25°C and 1 atm of pressure in which all reactants and products are present in their standard states except protons which, unless otherwise specified, are present at a concentration of 10^{-7} M (pH 7.0); this free energy change is denoted as $\Delta G^{0'}$.

standardization The determination of the concentration of a solution by titration against either a primary or a secondary standard.

standard oxidation potential The standard electrode potential for an oxidation half-reaction.

standard potential *See* standard electrode potential.

standard reaction conditions The theoretical thermodynamic standard reaction conditions are a temperature of 25°C, a pressure of 1 atm, and a chemical composition in which all components are in their defined standard states; that is all reactants and products have an activity of 1.0. In practical terms, for general chemical reactions, the latter requirement is taken to mean that all reactants and products are present at a 1.0 M concentration. For biochemical systems, the theoretical conditions are as above, but, in practical terms, the chemical composition aspect is modified as follows: (a) the proton concentration is 10^{-7} M (pH 7.0); (b) the total concentration of all species (ionized forms, metal chelates, etc.) of a given compound is 1.0 M; that is, the sum of the concentrations of all forms for each reactant and product is 1.0 M. *See also* standard state.

standard reduction potential The standard electrode potential for a reduction half-reaction.

standard saline citrate A buffer composed of

0.15 M sodium chloride and 0.015 M trisodium citrate, pH 7.0; used in studies of DNA in solution. *Abbr* SSC.

standard sedimentation coefficient The value of a sedimentation coefficient that is calculated from data that have been extrapolated to zero concentration, and that is corrected to a sedimentation coefficient under standard conditions which are taken as the sedimentation in a medium of water at 20°C. *Sym* $s_{20,w}^0$.

standard set The group of amino acids that commonly occur in proteins. *Aka* standard amino acids.

standard solution A solution of known concentration.

standard state A thermodynamic reference state in which the temperature is 25°C, the pressure is 1 atm, and the composition is such that all components are present in their defined reference states. The standard state of pure substances is the state of the pure liquid or solid at 25°C and 1 atm of pressure. The standard state for components in solution is usually taken as that in which the activities of both solutes and solvent are equal to unity; for solutes, an activity of one is approximated by a 1 M concentration. In biochemical systems, the standard state of hydrogen ions is taken to be the hydrogen ion concentration which corresponds to pH 7.0. *See also* standard reaction conditions.

standard temperature and pressure A temperature of 0°C and a pressure of 1 atm (760 mm Hg). *Abbr* STP.

Staphylococcus A genus of gram-positive bacteria that occur commonly as parasites and pathogens of humans and animals; includes *Staphylococcus aureus*, the causal agent of staph infections.

staphylokinase The enzyme that is present in filtrates of *Staphylococcus* cultures and that promotes the lysis of human blood clots by catalyzing the activation of plasminogen to plasmin.

star *See* star gazing.

starch The major form of storage carbohydrates in plants. It is a homopolysaccharide, composed of D-glucose units, that occurs in two forms; amylose, which consists of straight chains, and in which the glucose residues are linked by means of $\alpha(1 \rightarrow 4)$ glycosidic bonds; and amylopectin, which consists of branched chains, and in which the glucose residues are linked by means of both $\alpha(1 \rightarrow 4)$ and $\alpha(1 \rightarrow 6)$ glycosidic bonds.

starch gel electrophoresis A zone electrophoretic technique of high resolving power in which a gel of partially hydrolyzed starch is used as the supporting medium.

starch granule A storage particle of starch that

occurs in the cytoplasm of plant cells and that also contains proteins and enzymes that function in the synthesis and breakdown of starch. The granules vary in size and shape, and may be used to classify the plants from which they are derived.

starch indicator A starch solution used as an indicator in iodometric titrations; starch gives a dark blue color with iodine.

starch phosphorylase The enzyme that catalyzes the successive hydrolytic removal of glucose residues in the form of glucose-1-phosphate from the nonreducing end of starch; this reaction is the first step for the utilization of starch in glycolysis. *See also* phosphorylase.

starch synthase The enzyme that catalyzes the synthesis of straight chains of starch (amylose) from ADP-glucose.

star gazing A technique for studying the radioactive decay of phosphorus in nucleic acids by labeling DNA or a virus with radioactive phosphorus (^{32}P) and then embedding it in a sensitive photographic emulsion. Star-shaped patterns of beta particle tracks result from the decay of the radioactive phosphorus atoms and a count of these tracks can be used to calculate the molecular weight of the nucleic acid.

Stark effect The change in the absorption spectrum of a pigment that is placed in a strong electric field.

Stark-Einstein law SECOND LAW OF PHOTOCHEMISTRY.

Starling's hypothesis The hypothesis that the rate of exchange of fluid between the plasma in the blood capillaries and the interstitial fluid is governed by a balance of hydrostatic pressure and osmotic pressure, primarily the hydrostatic pressure due to the blood and the osmotic pressure due to the plasma proteins.

start codon INITIATION CODON.

starter 1. PRIMER. 2. INOCULUM.

starter tRNA INITIATOR TRANSFER RNA.

starting potential The potential in that portion of the characteristic curve of a Geiger Mueller counter that precedes the plateau and at which there is a sharp rise in the curve.

startpoint The base pair in DNA that codes for the first nucleotide incorporated into the RNA molecule (primary RNA transcript), synthesized by RNA polymerase. *Aka* start-site.

starvation 1. An extreme case of undernutrition due to severe and prolonged inadequate intake of most of the required nutrients. 2. Undernutrition with respect to one or more nutrients, as in the withholding of an amino acid from a growing bacterial culture.

starvation diabetes A condition of temporary

- carbohydrate intolerance that is characterized by glucosuria; follows the ingestion of carbohydrate after prolonged starvation and is due to either the decreased output of insulin or the decreased ability to synthesize glycogen.
- stat** Combining form meaning constant. *See also* cryostat; pH stat; thermostat.
- state function** Any one of the four thermodynamic parameters: internal energy, enthalpy, entropy, and free energy. The values of these parameters for a given process depend on the initial and the final state of the system and not on the path taken to proceed from the initial to the final state.
- state of a system** The description of a system in terms of the thermodynamic state functions. The state before a process occurs is known as the initial state, and the state after the process has occurred is known as the final state.
- static osmometer** An osmometer in which osmosis is allowed to take place so that a pressure difference develops.
- static quenching** Quenching in which the fluorophore is in the ground state.
- statin** A release-inhibiting hormone; *see* regulatory hormone.
- stationary electrolysis** ISOELECTRIC FOCUSING.
- stationary phase** 1. The phase of growth of a bacterial culture that follows the exponential phase and in which there is little or no growth. 2. The liquid, solid, or solid plus adsorbed liquid that serves as a support in chromatography.
- stationary state** STEADY STATE.
- stationary-state approximation** STEADY-STATE APPROXIMATION.
- stationary substrate** STATIONARY PHASE (2).
- statistic** A quantity (such as a mean or a standard deviation) that is calculated from a sample of measurements. *See also* parameter.
- statistical** Of, or pertaining to, statistics.
- statistical error** An error in the counting of radioactive materials that is due to the random nature of radioactive decay.
- statistical factor** The ratio between the binding (association) constant for the first ligand and the binding (association) constant for the second ligand for a macromolecule that has two binding sites for a given ligand and that exhibits independent binding. For such systems, the statistical factor is equal to 4.
- statistical mechanics** A description of the equilibrium properties of macroscopic systems that is based on the application of statistics to atomic and molecular energy states.
- statistical segment** A theoretical building block of a real polymer chain. The latter is approximated as a polymer of freely jointed statistical segments, each of which is randomly oriented with respect to all other segments. The segment is chosen to be long enough to assure its random orientation.
- statistics** The science that deals with the collection, analysis, interpretation, and presentation of masses of numerical data.
- status quo hormone** ALLATUM HORMONE.
- Staudinger equation** An equation relating intrinsic viscosity $[\eta]$ to molecular weight M by means of two empirical constants, A and α , such that $[\eta] = AM^\alpha$.
- Staudinger index** INTRINSIC VISCOSITY.
- steady state** 1. The nonequilibrium state of a system in which matter flows in and out at equal rates so that all of the components remain at constant concentrations. In a chemical reaction sequence, a component is in a steady state if the rate at which the component is being synthesized (produced) is equal to the rate at which it is being degraded (used) 2. The maximum color intensity of a sample that is obtained as a function of time; used in reference to determinations with an autoanalyzer.
- steady-state 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 steady-state conditions. The steady-state approximation is used in the Briggs-Haldane treatment of enzyme kinetics. *Aka* stationary-state approximation.
- steady-state electrolysis** ISOELECTRIC FOCUSING.
- steady-state kinetics** The kinetics of an enzymatic reaction proceeding under steady-state conditions; essentially the kinetics of the rate-determining step of the reaction.
- steady-state stacking** ISOTACHOPHORESIS.
- steapsin** The lipase present in the pancreatic juice.
- stearic acid** A saturated fatty acid that contains 18 carbon atoms and that occurs in animal fat.
- steatolysis** The hydrolysis and the emulsification of fats during digestion.
- steatorrhea** Failure to digest and/or absorb lipid through the intestinal wall and consequent excretion of these lipids with the stool.
- steatosis** 1. ADIPOSIS. 2. FATTY DEGENERATION.
- stefin** *See* cystatin.
- stem** 1. A structural part of transfer RNA; *see* arm. 2. STALK. 3. The base paired region of single-stranded DNA, folded back upon itself in a hairpin structure.
- stem-and-loop DNA** *See* foldback DNA.
- stem cell** An undifferentiated cell from which specialized cells are subsequently derived.
- step-down** A decrease in a metabolic pathway or in the growth of an organism that is

brought about by a decrease in the concentration of nutrients.

step-growth polymer A polymer formed by the linking of monomers with the elimination of either water molecules or other small molecules. *Aka* condensation polymer.

ST-EPR Saturation transfer electron paramagnetic resonance; *see* electron-electron double resonance.

stepwise development A chromatographic technique, used particularly with paper and thin-layer chromatography, in which the sample is developed repeatedly with different solvents.

stepwise elution The chromatographic elution in which two or more solutions that differ in composition are added to a chromatographic column by abruptly changing from one solution to the next.

sterane GONANE.

stereo carbon *See* stereogenicity.

stereochemical Pertaining to the three-dimensional arrangement of atoms in a molecule.

stereochemical theory A theory according to which the evolution of the genetic code is due to a stereochemical relation between an amino acid and either its codons or its anticodons.

stereochemistry The branch of chemistry that deals with the spatial arrangement of atoms in a molecule.

stereoelectronic Pertaining to the spatial aspects of atomic and molecular orbitals.

stereogenicity The characteristic that, in a chiral molecule, the transposition of two bonded atoms produces a new stereoisomer. An atom that displays this property is termed a stereogenic atom or a stereocenter. Thus, in the compound CHBrClF , only the carbon atom is stereogenic (a stereo carbon). Stereogenicity deals with stereoisomerism as opposed to chirotopicity which deals with the local geometry of compounds.

stereoisomer One of two or more isomers that have the same molecular composition and the same atom-to-atom sequence, but that differ from each other in the spatial arrangement of the atoms in the molecule; stereoisomers cannot be distinguished on the basis of their two-dimensional structures. *See also* structural isomer.

stereology A body of mathematical methods that relates three-dimensional parameters of a structure to two-dimensional measurements obtainable from sections of the structure. The sampling of the sections is statistical and measurements of the sections may involve electron microscopy.

stereomer STEREOISOMER.

stereomutation The conversion of one stereo-

isomer into another; particularly the interconversion of geometrical isomers, as in the conversion of oleic acid (cis) to elaidic acid (trans).

stereopopulation control The concept that the combined effect of the multipoint attachment of the substrate to, and its precise fit into, the active site of an enzyme would tend to restrict the rotational freedom of the substrate and "freeze" it into a unique conformation, suitable for entering the transition state.

stereoselective reaction A chemical reaction in which one stereoisomer is generated or destroyed preferentially over another. Enzymes are stereoselective; as an example, an L-amino acid oxidase will catalyze a reaction with an L-amino acid but not with a D-amino acid. *See also* stereospecific reaction.

stereospecific numbering A system for numbering derivatives of symmetrical compounds, such as glycerol, that is based on representing the parent molecule always in one specific stereochemical configuration. *Sym sn*.

stereospecific reaction A chemical reaction in which there is a relation between the configurations of the reactants and those of the products. Enzymes are stereospecific; as an example, pyridine-linked dehydrogenases catalyze the addition of a hydrogen atom to, or its removal from, a particular side of the pyridine ring in the coenzyme part of these enzymes. *See also* stereoselective reaction.

steric STEREOCHEMICAL.

steric contour diagram RAMACHANDRAN PLOT.

steric factor A mathematical factor, used in the collision theory of chemical kinetics, that allows for the fact that collisions of sufficient energy may take place between molecules without leading to a chemical reaction because of an improper steric orientation of the colliding molecules.

steric hindrance The prevention of a molecule from undergoing a chemical reaction or from achieving a particular conformation or configuration that is ascribed to the stereochemical arrangement of the atoms and groups of atoms in the molecule; bulky substituents in the molecule exercise steric hindrance by tending to compress reactive groups and forcing them too close to their unbonded neighbors.

steric strain A strain in a ring structure that is due to two nonbonded groups repelling each other if they approach too closely and attempt to occupy the same point in space.

sterile Free from viable microorganisms.

sterilization The complete destruction of all viable microorganisms in a material by physical and/or chemical means.

sterilizer AUTOCLAVE.

Stern potential The potential across the double layer of a molecule or a particle; consists of a layer of fixed surface charges plus a layer of immobile counterions. The large diffuse layer, consisting mostly of mobile counterions, that extends beyond the Stern potential represents the zeta potential.

Stern-Volmer equation An equation that permits the calculation of the ratio for the efficiency of fluorescence in the absence and presence of a quencher. *Aka* Stern-Volmer relation.

steroid A cyclic compound of animal or plant origin, the basic nucleus of which consists of three 6-membered rings and one 5-membered ring, fused together to yield perhydrocyclopentanophenanthrene. The steroids represent a wide variety of compounds, including sterols, bile acids, adrenocortical hormones, and sex hormones.

steroid alkaloids A group of nitrogen-containing steroids that occur in plants, often in the form of carbohydrate-linked compounds (glycoalkaloids).

steroid alkaloid saponin *See* saponin.

steroid conjugate A steroid breakdown product that is conjugated to either glucuronic acid or sulfuric acid and that is excreted in this form.

steroid diabetes A condition produced by the prolonged administration of glucocorticoids and characterized by glucose production in the liver and by suppression of the action of insulin.

steroid glycoside A carbohydrate derivative of a steroid, such as a cardiac glycoside or a saponin.

steroid hormone A collective term for androgens, estrogens, and corticoids.

steroid number A number assigned to a steroid on the basis of the number of carbon atoms and the types of functional groups that it contains; specifically, $SN = S + F_1 + F_2 + \dots + F_n$, where SN is the steroid number, S is the number of carbon atoms in the parent steroid, and F_1, F_2, \dots, F_n are arbitrary values, characteristic of the functional groups of the steroid.

steroidogenesis The biosynthesis of steroids.

steroid receptor One of a group of cytoplasmic proteins that bind to specific steroid hormones. After activation of the hormone-receptor complex, the latter moves into the cell nucleus where it binds to a particular site on the DNA to regulate the expression of specific genes.

steroid saponin *See* saponin.

sterol A steroid in which an alcoholic hydroxyl group is attached to position 3, and an aliphatic side chain of eight or more carbon atoms is attached to position 17 of the steroid nucleus;

a steroid alcohol.

sterol carrier protein One of a group of cytoplasmic proteins that bind to specific sterols and transport them from one endoplasmic reticulum bound enzyme to another in the course of metabolism.

Sterzl theory XYZ CELL THEORY.

STH somatotropic hormone.

STI Soybean trypsin inhibitor.

Stickland reaction The coupled decomposition of two amino acids such that one amino acid is oxidized while the other is reduced. The reaction occurs in some species of the genus *Clostridium*, which cannot degrade single amino acids but can degrade suitable pairs of amino acids.

sticky end COHESIVE END.

sticky region A region in a nucleic acid molecule that is rich in guanine and cytosine.

stilbestrol 1. 4,4'-Dihydroxystilbene. 2. Diethylstilbestrol.

still An apparatus for the purification of liquids by distillation.

stimulant amine *See* antidepressant.

stimulin INSULIN-LIKE ACTIVITY.

STM 1. Scanning tunneling microscope. 2. Spore tip mucilage.

stochastic Referring to the presence of a random variable. Thus, stochastic variation is a variation in which at least one of the elements is a random variable (variate), and a stochastic process is one that incorporates an element of randomness.

stochastic process 1. A process of problem solving that provides a solution that is close to the best; the steps in the process are based on an uncertainty which is indicated by the laws of probability and the movement at each step is random. Conjecture and speculation are used to select a possible solution which is then tested against known evidence, observation, and measurement. 2. A process of problem solving that consists of random trial and error steps. *See also* algorithm; heuristic process; stochastic.

stochastic variable VARIATE.

stoichiometric amount The amount of a substance that is used in a chemical reaction either as a reactant or as a product.

stoichiometric model The representation of an enzymatic reaction in a manner that is analogous to that of a typical chemical reaction. Thus, the formulation $E + S \rightleftharpoons ES \rightleftharpoons E + P$ represents the simplest stoichiometric model of an enzymatic reaction. *Aka* stoichiometric reaction scheme.

stoichiometry The quantitative relations between the elements in a compound or between the reactants and the products in a chemical reaction.

stoke A unit of kinematic viscosity; one-hundredth of this unit is the centistoke. The dimensions of stoke are cm^2s^{-1} .

Stokes-Einstein equation An equation that relates the diffusion coefficient (D) to the radius (r) of a spherical particle. Specifically, $D = kT/6\pi\eta r$ where k is the Boltzmann constant, η is the viscosity of the solution, and T is the absolute temperature.

Stokes' law An expression for the frictional coefficient of a sphere; specifically, $f = 6\pi\eta r$, where f is the frictional coefficient, π is a constant equal to 3.1416... , η is the viscosity of the solvent, and r is the radius of the sphere (Stokes' radius).

Stokes' radius The radius of a perfect anhydrous sphere that has the same rate of passage through a gel filtration column as the protein under study. The Stokes radius is formally defined by Stokes' law.

Stokes-Raman scattering A type of Raman scattering in which a vibrating molecule gains a quantum of energy; in anti-Stokes-Raman scattering, the molecule loses a quantum of energy.

Stokes' reagent A solution of ferrous sulfate, tartaric acid, and ammonia that is used in testing for hemoglobin.

Stokes' shift The change in the wavelength of light in fluorescence from that of the exciting light to that of the emitted light. The emitted light is usually of longer wavelength than the exciting light, and the change in wavelength is attributable to energy lost as vibrational energy.

stoma (*pl* stomata) A minute opening in a leaf through which gases pass; a "breathing tube" of leaves.

stone CALCULUS.

stop codon TERMINATION CODON.

stopped flow technique A technique for studying fast chemical reactions in which the reactants are forced out of two syringes into a mixing chamber, and the mixture is then allowed to flow into an observation cell where the flow is halted abruptly and the mixture is analyzed spectroscopically or by other means. *See also* rapid flow technique.

storage disease *See* glycogen storage disease; lipid storage disease.

storage mRNA MASKED MRNA.

STP Standard temperature and pressure.

straggling The variation in the range of particles of a specific radiation in which initially all of the particles had the same energy.

straight chain OPEN CHAIN.

strain 1. *n* A subdivision of a species that possesses distinguishing characteristics. 2. *n* A deformation in a molecule. 3. *v* To pass through a coarse filter such as cheesecloth. *See also*

cell strain.

strand 1. A polynucleotide chain. 2. A polypeptide chain.

strand displacement The synthesis of a new strand (or segment) of duplex DNA that proceeds while an old strand (or segment) is being pushed out of the way. The *in vitro* activity of DNA polymerase I proceeds with strand displacement.

strand exchange BRANCH MIGRATION.

strand polarity *See* polarity (3).

strand selection The ability of DNA-dependent RNA polymerases to choose one strand (the transcribed strand) over the other for transcription.

streak 1. To apply material as a strip to either a chromatographic or an electrophoretic support, usually for preparative purposes. 2. To apply a bacterial inoculum as a strip to the surface of a solid nutrient medium.

streak plating A method for isolating bacterial strains by drawing an inoculation needle, containing a culture, lightly over the surface of a solid nutrient medium.

stream birefringence FLOW BIREFRINGENCE.

streamer sedimentation DROPLET SEDIMENTATION.

streaming birefringence FLOW BIREFRINGENCE.

streaming current The electrical current produced by the movement of an electrolyte through a tube.

streaming potential The electrical potential produced by the movement of a conducting liquid through a porous medium as a result of hydrostatic pressure; an electrokinetic phenomenon that is the reverse of electroosmosis.

streamline flow LAMINAR FLOW.

stream potential STREAMING POTENTIAL.

Strecker synthesis The synthesis of amino acids from aldehydes, ammonia, and hydrogen cyanide; proposed as a possible mechanism for the synthesis of amino acids under conditions existing on the primitive earth.

street virus A virus obtained from a naturally infected animal. *See also* fixed virus.

streptococcal fibrinolysin STREPTOKINASE.

Streptococcus A genus of gram-positive bacteria that includes the causal agents of pneumonia (*Streptococcus pneumoniae* or *pneumococcus*) and strep throat (*Streptococcus pyogenes*).

streptodornase One of a number of extracellular nucleases produced by species of the genus *Streptococcus*.

streptogenin peptides A group of natural products, such as liver extracts or partial hydrolysates of proteins, or of synthetic peptides that stimulate the growth of microorganisms, especially that of lactic acid bacteria. The unknown growth stimulant is called strep-

togenin.

streptokinase A protein, produced by β -hemolytic *Streptococci*, that is devoid of protease activity but is a potent activator of plasminogen and thereby promotes the lysis of human blood clots. Streptokinase binds tightly to plasminogen, alters the conformation of plasminogen in this complex, and thereby renders it catalytically active.

streptolydigin One of a group of antibiotics that bind to bacterial RNA polymerase and prevent RNA elongation during transcription.

streptolysin A toxin, produced by the genus *Streptococcus*, that causes hemolysis. Streptolysin-S is a leucocidin.

Streptomyces A genus of gram-positive, aerobic soil bacteria, many species of which produce antibiotics.

streptomycin An aminoglycoside antibiotic, produced by *Streptomyces griseus*, that inhibits proteins synthesis by binding to the 30S ribosomal subunit, and that causes misreading of the genetic code.

streptomycin suppression The suppression of the effects of streptomycin (inhibition of protein synthesis and misreading of the genetic code) that is shown by some mutants having an altered ribosomal protein of the small ribosomal subunit (S12). Such mutants can initiate protein synthesis in the presence of streptomycin and show decreased misreading of the genetic code.

streptonigrin An antibiotic, produced by *Streptomyces flocculus*, that leads to chromosome breaks.

streptovaricin One of a group of antibiotics, produced by species of *Streptomyces*, that are closely related to the rifamycins in both mechanism of action and antimicrobial spectrum.

stress fibers Bundles of actin filaments and associated proteins that are attached to the plasma membrane of nonmuscle cells, underlie some coated pits, and are characteristic of the cytoskeleton of eukaryotic cells in tissue culture; they function in cell motility.

stress metabolites See phytoalexins.

stress proteins HEAT SHOCK PROTEINS.

stretched muscle A muscle that has been lengthened by stretching.

stretching vibration A vibration in a molecule that results in a lengthening of an interatomic bond distance.

striated muscle A muscle, such as a skeletal or a cardiac muscle, that is characterized by transverse striations.

strict aerobe OBLIGATE AEROBE.

strict anaerobe 1. OBLIGATE ANAEROBE. 2. An organism or a cell that cannot tolerate oxygen and is inhibited or killed by oxygen or by

oxidized components of the medium.

striction The decrease in the volume of a solution, compared to the sum of the volumes of the separate solute and solvent, as a result of solute-solvent interactions. See also covolume; electrostriction.

stringent control 1. The control of the rate of RNA synthesis by ppG_{pp} and $pppG_{pp}$ (magic spots) in the stringent response. 2. Plasmid replication that is synchronized with that of the chromosome; that is, the plasmid:chromosome ratio remains constant (usually, 1:1). See also superinfection immunity.

stringent factor The enzyme that catalyzes the synthesis of ppG_{pp} and $pppG_{pp}$ (magic spots); the latter are the factors whose concentration regulates the rate of RNA synthesis in the stringent response. Synthesis of the magic spots involves pyrophosphate transfer from ATP to GDP or GTP. The enzyme is located exclusively in the 50S ribosome but only in about 1 in 200 ribosomes. It is activated only when two conditions are met: (a) the 50S subunit is part of a 70S ribosome that is bound to mRNA and engaged in translation; (b) the A site of the ribosome is occupied by an uncharged tRNA molecule.

stringent plasmid See copy number.

stringent response The decrease of RNA synthesis that occurs normally in wild-type bacteria after removal of an essential amino acid from the medium. See also relaxed control.

stringent strain A bacterial strain that shows stringent control.

stripped particle CORE PARTICLE.

stripped transfer RNA An aminoacyl transfer RNA molecule from which the amino acid has been detached by hydrolysis.

stripping 1. The hydrolytic removal of an amino acid from an aminoacyl-tRNA molecule. 2. The removal of ribosomal proteins from ribosomes, resulting in the production of ribosomal subparticles.

stroke A sudden neurological affliction caused by a loss of blood to the brain as a result of embolus formation, thrombus formation, or cerebrovascular hemorrhage. A stroke may lead to paralysis, weakness, speech defects, or death.

stroma 1. The matrix material between grana in a chloroplast. 2. The connective tissue framework of a gland or an organ as distinct from the parenchyma.

stroma starch The starch of chromatophores that is not clustered around pyrenoids.

stromatin A structural protein in the cell membrane of erythrocytes.

stromatolite A macroscopic structure composed of fossilized bacterial mats; colonies of

bacteria embedded with minerals.

strong electrolyte An electrolyte that is completely dissociated into ions in water.

strong interactions The attractive forces between atoms and molecules that result in the formation of covalent and ionic bonds, and the repulsive forces of ion-ion interactions.

strong promoter HIGH-LEVEL PROMOTER.

strontium An element that is essential to a few species of organisms. Symbol, Sr; atomic number, 38; atomic weight, 87.62; oxidation state, +2; most abundant isotope, ⁸⁸Sr; a radioactive isotope, ⁸⁵Sr, half-life, 64.7 days, radiation emitted, gamma rays.

strontium-90 The heavy radioactive isotope of strontium that occurs in the fallout from the explosion of nuclear weapons; it has a half-life of 25 years and is incorporated into biological systems.

strophantidin OUABAIN.

strophantin G OUABAIN.

strucron A proposed palindromic DNA sequence in the promoter region of the rRNA cistron that is believed to function in switching on the synthesis of rRNA.

structural color A color created by optical effects (interference, refraction, etc.) resulting from the physical nature of surfaces.

structural formula A two-dimensional representation of the structure of a molecule in which the atoms are connected by one or more lines, with each line indicating a pair of shared electrons.

structural gene 1. A gene, the nucleotide sequence of which determines the amino acid sequence of a polypeptide chain; a cistron. 2. A gene, the nucleotide sequence of which determines the nucleotide sequence of a polynucleotide strand.

structural isomer One of two or more isomers that have the same molecular compositions but that differ from each other in their atom-to-atom sequence; they can be distinguished on the basis of their two-dimensional structures. *See also* stereoisomer.

structural protein 1. A protein that functions primarily as a structural component of cells and tissues. 2. A noncatalytic protein of mitochondrial membranes, the existence of which is in doubt. 3. SCLEROPROTEIN.

structural unit The monomer of the viral capsomer that consists of one or more polypeptide chains. *See also* capsid; capsomer.

structured smectic *See* liquid crystal.

strychnine An indole alkaloid from tropical plants of the genus *Strychnos*; a highly toxic compound (a neurotoxin) used as a rodent poison.

Stuart factor The first factor that is common to both the intrinsic and the extrinsic pathways

of blood clotting. The Stuart factor is activated by the Christmas factor in the intrinsic pathway and by proconvertin in the extrinsic pathway. *Aka* Stuart-Prower factor.

Student's *t* test A statistical test for evaluating the difference between two sample means; that is, the same measurement is made on two separate groups (frequently a control and a test group) and the means of the two groups are compared. The one-sample *t* test is a test of the null hypothesis that a random sample comes from a normal population; the two-sample *t* test is a test concerning the difference between the means of two normal populations having the same standard deviation; the paired sample *t* test is an application of the one-sample *t* test to the difference between paired data.

sturine A protamine isolated from sturgeon.

SU Thiouridine.

sub- 1. Prefix meaning below or under. 2.

Prefix meaning fraction of or less than.

subacute test PROLONGED TEST.

subcellular fraction A preparation containing either one or more specific components of the cell, or a portion of the total cellular material; a preparation of an enzyme, or of mitochondria, or of cell membranes, etc.

subcloning A variation of the molecular cloning technique in which a DNA segment is cloned, isolated, and then cut into successively smaller fragments by the use of several restriction enzymes. A specific fragment is then recloned in a suitable plasmid.

subculture A culture that is produced by transferring a portion of a stock culture to fresh medium.

subcutaneous injection An injection under the skin. *Abbr* sc.

subfragment 1 SF₁ FRAGMENT.

sublethal gene A gene that, when mutated, gives rise to a subvital mutation.

sublimation The transition of a solid to a vapor without passage through the intermediate liquid state.

submitochondrial particles INSIDE-OUT PARTICLES.

subnatant The liquid below another liquid or below solid material.

subribosomal particle RIBOSOMAL SUBPARTICLE.

subribosome RIBOSOMAL SUBPARTICLE.

subroutine A portion of a complete computer routine, consisting of a set of instructions that cause a computer to carry out well-defined mathematical or logical operations.

substance P A peptide neurotransmitter found in brain and in the digestive tract. It consists of 11 amino acids, is a powerful promoter of muscular contractions in the intestinal tract, and is a potent vasodilator. *Abbr* SP.

substituent An atom or a group of atoms that is introduced into a molecule by replacement of another atom or group of atoms.

substituent constant See Hammett equation.

substituted enzyme 1. The modified enzyme that is produced by the reaction of the original enzyme molecule with the first substrate in a ping-pong mechanism. 2. ENZYME-SUBSTRATE INTERMEDIATE.

substitution See base substitution; conservative substitution; radical substitution; substitution reaction.

substitution loop The loop formed by two non-complementary DNA segments when two, otherwise complementary, DNA strands are hybridized; a region of noncomplementarity in both strands. See also deletion loop.

substitution reaction A chemical reaction in which an atom or a group of atoms attached to a carbon atom is removed and replaced by another atom or group of atoms.

substitution vector See lambda cloning vector.

substrate The compound acted upon by an enzyme; the molecule or structure, the transformation of which is catalyzed by an enzyme. *Sym S.*

substrate anchoring The concept that substrates, confined to the active site of an enzyme, have relatively long residence time compared to the time interval that the same substrates would be within striking distance of each other if they were in random motion in solution.

substrate-assisted catalysis An approach to the engineering of enzyme specificity. The method involves removal of part of the catalytic structure of the enzyme (for example, by site-directed mutagenesis). The enzyme activity is then partially restored by supplying the missing functionality from a bound substrate. In this way substrates are distinguished primarily by their ability to actively participate in the catalytic mechanism, thereby permitting the design of extremely specific enzymes.

substrate-binding site ACTIVE SITE.

substrate-bridge complex See bridge complex.

substrate constant The equilibrium (dissociation) constant of the reaction $ES \rightleftharpoons E + S$, where E is the enzyme and S is the substrate. *Sym K_s.*

substrate cycle The combination of a forward reaction, catalyzed by one enzyme, with the reverse reaction, catalyzed by a different enzyme. When these two reactions occur at comparable rates, they may result in a futile cycle.

substrate elution chromatography A type of column affinity chromatography in which an enzyme is bound nonspecifically to a polymer and the binding is then specifically overcome

by formation of an enzyme-substrate complex when the column is eluted with a solution containing the substrate of the enzyme. The method can also be used for other protein-ligand systems.

substrate inhibition The inhibition of the activity of an enzyme by the substrate of the enzyme; generally most pronounced at high substrate concentrations.

substrate phosphorylation The synthesis of ATP that is coupled to the exergonic hydrolysis of a high-energy compound and that is not linked to an electron transport system; the synthesis of ATP in glycolysis is an example. *Aka* substrate level phosphorylation.

substrate synergism The acceleration by a substrate, or substrates, of a reaction undergone by other substrates of a multisubstrate enzyme system.

subtilin A peptide antibiotic produced by *Bacillus subtilis* that consists of 32 amino acids.

subtilisin A nonspecific proteolytic enzyme derived from *Bacillus subtilis*. See also S peptide; S protein.

subtractive Edman degradation A modification of the Edman degradation in which the N-terminal amino acid, removed as the phenylthiocarbonyl derivative, is identified by determining the amino acid composition of the peptide before and after treatment with the reagent.

subunit 1. The smallest covalent unit of a protein; it may consist of one polypeptide chain or of several chains linked together covalently, as by means of disulfide bonds. 2. The functional unit of an oligomeric protein, such as the structure in hemoglobin that consist of one alpha and one beta chain. 3. A definite substructure of a macromolecule such as the 30S or the 50S unit of the 70S bacterial ribosome. See also monomer; protomer.

subunit exchange The association of the small ribosomal subunit from one ribosome with the large subunit from a different ribosome, and vice versa, as a result of the operation of the ribosome cycle.

subunit model See concerted model; sequential model.

subvital mutation A mutation that decreases viability but results in the death of less than 50% of the organisms carrying the mutation.

succinate-coenzyme Q reductase COMPLEX II.

succinate-glycine cycle SHEMIN CYCLE.

succinate pathway A catabolic pathway whereby methionine, isoleucine, and valine are converted to succinic acid which then enters the citric acid cycle.

succinate:ubiquinone oxidoreductase COMPLEX II.

succinic acid A symmetrical, four-carbon, dicarboxylic acid that is an intermediate in the citric acid cycle where it is formed from α -ketoglutaric acid.

succinylation The modification of a protein by reaction with succinic anhydride; introduction of a 3-carboxypropionyl group ($-\text{COCH}_2\text{CH}_2\text{CO}_2^-$) into a protein. Succinylation involves primarily the amino groups (α and ϵ) of amino acids but may also involve the phenolic group of tyrosine. *Aka* 3-carboxypropionylation.

succinyl-coenzyme A A high-energy compound that is an intermediate in the citric acid cycle.

succotash A mixture of corn (low in lysine) and beans (low in tryptophan) that provides a nutritionally adequate supply of the essential amino acids and that was used by New World Indians.

sucrase The enzyme that catalyzes the hydrolysis of sucrose to glucose and fructose.

sucrose A disaccharide of glucose and fructose that is abundant in the plant world and that is the sugar used in the home.

sucrose density gradient A density gradient prepared by using sucrose solutions of different concentrations, frequently covering a range of 5 to 25% (w/w).

sucrose gradient centrifugation Density gradient sedimentation velocity in which a sucrose density gradient is used.

sucrose intolerance A genetically inherited metabolic defect in humans due to a deficiency of either sucrase or isomaltase.

sucrose polyester One of a group of synthetic compounds, consisting of polyacylated sucrose in which the acyl groups are those of long-chain fatty acids. These esters resemble cooking oils but are not digestible; they have been used in experimental diets.

Sudan black B A lysochrome.

sugar CARBOHYDRATE.

sugar acid An acid derivative of a mono- or an oligosaccharide.

sugar alcohol An alcohol derivative of a mono- or an oligosaccharide.

sugar nucleotide NUCLEOSIDE DIPHOSPHATE SUGAR.

sugar pucker *See* puckered conformation.

suicide The loss of infectivity or other biological activity by either a molecule or a particle as a result of radioactive decay of an incorporated radioisotope. *See also* radiophosphorus decay; star gazing; suicide substrate.

suicide inhibition *See* suicide substrate.

suicide substrate A substrate that normally does not become linked covalently to an enzyme but is so altered that a reactive group is generated which then reacts with a nearby group on the enzyme, thereby linking the sub-

strate covalently to the enzyme and inactivating the latter.

sulfa drug One of a class of antibacterial drugs that are derivatives of sulfonamide RSO_2NH_2 and that inhibit the growth of many bacteria. Sulfa drugs function by being competitive inhibitors of *p*-aminobenzoic acid, which is required by these bacteria for the synthesis of folic acid. Their toxicity to humans is relatively low.

sulfanilamide Benzene sulfonamide; a sulfa drug.

sulfate assimilation The reduction of sulfate, carried out by plants and bacteria, that leads to the biosynthesis of cysteine.

sulfate dissimilation *See* dissimilatory reduction; sulfate respiration.

sulfate reduction *See* sulfate assimilation.

sulfate respiration The dissimilatory reduction of sulfate in the course of cellular respiration in which sulfate replaces oxygen as the terminal electron acceptor; the sulfate is reduced to hydrogen sulfide which is excreted.

sulfatide A glycosphingolipid containing a sulfate group; a sulfoglycosylsphingolipid; a ceramide monosaccharide sulfate.

sulfating agent ACTIVE SULFATE.

sulfation The incorporation of sulfate into a compound.

sulfation factor SOMATOMEDIN.

sulfhydryl group The radical $-\text{SH}$.

sulfhydryl reagents Reagents, such as iodoacetate and *p*-hydroxymercuribenzoate, that react specifically with the sulfhydryl group ($\text{SH}-$ group) of cysteine in peptides and proteins.

sulfite oxidase deficiency A genetically inherited metabolic defect in humans that is associated with mental retardation and that is due to a deficiency of the enzyme sulfite oxidase.

sulfitolysis The cleavage of a covalent bond by reaction with sulfite (SO_3^{2-}). In the case of peptides containing a disulfide bond ($\text{R}_1-\text{S}-\text{S}-\text{R}_2$), the latter can be broken by reaction with sulfite to yield two sulfonic acid molecules ($\text{R}_1-\text{S}-\text{SO}_3\text{H}$ and $\text{R}_2-\text{S}-\text{SO}_3\text{H}$).

sulfolipid 1. Any sulfur-containing lipid. 2. PLANT SULFOLIPID.

sulfonamide *See* sulfa drug.

sulfone One of a group of compounds that are antibacterial agents and appear to function much like the sulfa drugs but with greater toxicity. Sulfones have the structure R_2SO_2 . An example is 4,4'-diaminodiphenyl sulfone (DDS, dapsone) which is an important drug in the treatment of leprosy.

sulfonic acid An organic acid containing the radical $-\text{SO}_3\text{H}$.

sulfosalicylic acid test A test for protein in urine and in other biological fluids that is

based on the turbidity formed upon addition of sulfosalicylic acid to the sample. *Abbr* SSA test.

sulfur An element that is essential to all plants and animals. Symbol, S; atomic number, 16; atomic weight, 32.964; oxidation states, -2, +4, +6; most abundant isotope, ^{32}S ; a radioactive isotope, ^{35}S , half-life, 87.2 days, radiation emitted, beta particles.

sulfur amino acid An amino acid that contains sulfur, such as cysteine or methionine.

sulfur bacteria A group of bacteria that are chemolithotrophs and that use carbon dioxide as their carbon source, oxidation-reduction reactions as their energy source, and inorganic sulfur-containing compounds as electron donors.

sulfur dioxide The gas SO_2 , used as a food preservative. Its bactericidal and fungicidal properties are believed to be due to its ability to reduce the disulfide bonds of enzymes as it undergoes oxidation from SO_3^{2-} to SO_4^{2-} .

sulfur mustard Di(2-chloroethyl)sulfide; a chemical mutagen and alkylating agent that is structurally related to nitrogen mustards but contains sulfur instead of nitrogen. *See also* alkylating agent.

Sulkowitch test A test used for the semiquantitative determination of calcium in urine; based on measurements of the turbidity that is produced upon addition of oxalate, buffered with acetate, to urine.

Sullivan reaction A colorimetric reaction for cysteine that is based on the production of a red color upon treatment of the sample with sodium 1,2-naphthoquinone-4-sulfonate and sodium sulfite.

SUN Serum urea nitrogen; *see* blood urea nitrogen.

super- 1. Prefix meaning above or in the upper part of. 2. Prefix meaning excessive.

superacid catalysis Catalysis due to a positively charged ion, particularly a metal ion, that acts as a Lewis acid.

superagonist A compound that strongly mimics the positive biological activity of a naturally occurring molecule.

supercoil SUPERHELIX.

superconductor A substance that conducts electricity at greatly reduced resistance; ceramic copper oxide materials, for example, can conduct electricity without resistance at the temperature of liquid nitrogen.

supercool To cool a liquid below its freezing point without the separation of solid matter.

supercritical fluid chromatography A chromatographic technique in which compressed fluids, at temperatures slightly above their critical temperatures, are used as mobile phases; useful for the separation of substances that

are not readily separated by gas or liquid chromatography. *Abbr* SFC.

superficial Near the surface.

superfusion A technique in which blood, plasma, or some other fluid is allowed to drip onto, or to flow over, the surface of a perfused organ.

supergene A segment of linked genes that is protected from crossing-over and that is transmitted intact from one generation to another.

superhelix 1. The structure formed when double-stranded, circular DNA is further twisted; one such twist converts the circle into a figure eight; additional twists result in multiple figure eights, linked together. The superhelix can be formed by twisting the DNA in an opposite sense to that of the double helix. Such a superhelix is termed left-handed, negative, or underwound. All naturally occurring superhelical DNA shows negative supercoiling or underwinding. If the superhelix is formed by twisting the DNA in the same sense as that of the double helix, then the resulting superhelix is called right-handed, positive, or overwound. 2. A helix composed of two or more component chains and produced by the winding of two or more helical chains, either polynucleotide or polypeptide chains, about each other.

superhelix density The ratio of the writhing number (W) to the twisting number (T); that is, W/T . It has a value of about 0.05 for all naturally occurring superhelical DNA (negatively supercoiled DNA). In other words, there is one negative twist produced per 200 base pairs or 0.05 negative twists per turn of the double helix.

superinducible mutant A mutant that synthesizes an inducible enzyme at concentrations of inducer that are lower than those required by the wild-type organism.

superinfection 1. An extensive invasion of an organism by pathogenic microorganisms, as that which may arise from its infection by drug-resistant microorganisms. 2. A repeated phage infection of a bacterial culture that is already infected with phage. Such a culture is characterized by possessing bacterial cells that contain more than one phage particle per cell.

superinfection curing *See* curing.

superinfection exclusion The phenomenon that superinfection of a bacterial culture with phage at times leads to failure of the DNA of the superinfecting phage to enter the host cell; a change in cell permeability (a "sealing reaction") has been invoked to explain this phenomenon.

superinfection immunity The phenomenon that two identical, or very similar, plasmids cannot coexist in the same cell; this is usually the case

when plasmid replication is subject to stringent control.

superior Above, or higher than, a given structure.

supermolecule The polymeric protein system that functions as the energy transducing unit and constitutes the structural unit of the inner mitochondrial membrane according to the conformational coupling hypothesis. The supermolecule consists of seven complexes, four of which are electron transfer complexes, and the other three are the ATP synthetase, the transprotonase, and the transhydrogenase complexes. The supermolecule is in the shape of a knoblike structure composed of a basepiece, a stalk, and a headpiece; this structure is formed by arranging six of the complexes around a central unit referred to as a tripartite repeating unit (TRU). The headpiece of the TRU is the site for synthesis or hydrolysis of ATP; the stalk of the TRU, which connects the headpiece and the basepiece, is a regulatory device which determines whether ATP will be synthesized or hydrolyzed; and the basepiece of the TRU is the membrane-forming element that functions as a linkage system around which are arranged the four electron transfer complexes, the transhydrogenase, and the transprotonase. *Aka* elementary particle.

supernatant The liquid above sedimented material or above a precipitate. *Aka* supernate.

superoxide anion A very active radical (O_2^-) that is formed when a molecule of oxygen gains an electron. The radical reacts readily with protons, other superoxide anions, and hydrogen peroxide to produce a variety of reactive and toxic species.

superoxide dismutase The enzyme that catalyzes the reaction $O_2^- + O_2^- + 2H^+ = H_2O_2 + O_2$. The enzyme appears to be ubiquitous among aerobic organisms and protects the organism against action by the superoxide radical O_2^- , which is believed to be a mutagenic radical, produced in an organism by ionizing radiation. *Abbr* SOD.

superprecipitation The contraction of an actomyosin gel to a small plug that occurs in the presence of ATP; the process is used for in vitro studies of muscle contraction.

superrepressed mutant A mutant that synthesizes a repressible enzyme at a rate that is characteristic of the uninduced wild-type organism, regardless of the presence or absence of the inducer. The gene, responsible for synthesis of the enzyme, is in an uninducible state.

superrepressor A repressor that remains permanently bound to the operator.

supersaturated solution A solution that holds temporarily more solute than will be contained by an equal volume of a saturated solution under specified conditions.

super-secondary structure A recurring pattern of protein structure that is at a higher level than secondary structure but does not constitute an entire domain. Greek-key structure, beta barrel, and beta meander are some examples.

supersonic 1. ULTRASONIC. 2. Having a velocity exceeding that of sound.

supersonic oscillation ULTRASONICATION.

supersuppression A mutation that can partially or completely restore a number of genetic functions by suppressing the expression of several mutations (usually nonsense mutations) at several, different, sites on the chromosome.

supertwist SUPERHELIX.

supplemental air The volume of air that can be forcibly expired from the lungs after the normal tidal air has been expired.

supplementary action The increase in the biological value of two proteins when they are fed together, over the sum of their biological values when they are fed separately.

support 1. The solid material that either is or holds the stationary phase in chromatography. 2. The solid material in which electrophoresis is performed.

suppressible insulin-like activity Insulin-like activity that is present in the serum and that is lost upon treatment with anti-insulin antibodies. *Abbr* SILA.

suppressible mutation A mutation such that the genetic function, the loss of which is caused by the mutation, can be restored by means of either an intragenic or an intergenic suppressor mutation.

suppression The partial or complete restoration of a genetic function, lost as a result of a mutation, by means of a second mutation, occurring at a different site on the chromosome.

suppression test A clinical test for differentiating between hyperadrenalism due to adrenocortical hyperplasia and that due to an adrenal carcinoma. The test is based on the administration of a cortisol analogue which, in normal individuals but not in those with an adrenal carcinoma, has a feedback effect and decreases the pituitary output of adrenocorticotrophic hormone; this, in turn, leads to a suppression of the output of steroids by the adrenal glands.

suppressor 1. SUPPRESSOR GENE. 2. The product of a suppressor gene.

suppressor factors Protein regulatory factors isolated from suppressor T cells.

suppressor gene A gene that can partially or completely reverse the effect of a mutation in another gene.

suppressor mutation A mutation that partially or completely restores a genetic function, lost as a result of another mutation, and that is located at a site other than that which sustained the primary mutation. The suppressor mutation may occur either in the gene that was originally mutated (intragenic suppressor mutation) or in a different gene (intergenic suppressor mutation).

suppressor-sensitive mutant A conditional mutant that behaves normally when grown in some hosts but exhibits its mutant phenotype when grown in other hosts. Normal growth occurs in hosts having suppressor genes. The products of these genes either compensate for the defect in the mutant or enable the altered gene to produce a functional gene product. *Abbr* sus.

suppressor T cells A group of T cells that suppress the response of specific T or B lymphocytes to an antigen. *Aka* suppressor T lymphocytes.

suppressor transfer RNA An unusual tRNA molecule, produced by a suppressor gene, that brings about missense or nonsense suppression. The tRNA molecule leads to the incorporation of the correct amino acid that would have been specified by the codon prior to its being changed as a result of either a missense or a nonsense mutation. The term is usually applied specifically to a tRNA molecule that can pair with a nonsense (termination) codon.

supra- Prefix meaning above.

supramolecular complex 1. A complex composed of several or many molecules, such as a ribosome, a biological membrane, or a virus. 2. MULTIENZYME SYSTEM. 3. METABOLON (2).

suprarenal gland ADRENAL GLAND.

suprarenin EPINEPHRINE.

supravital staining The staining of living cells after their removal from the host.

Sur Thiouracil.

SURa Thiouracil.

surface-active agent A substance that alters the surface tension of a liquid, generally lowering it; detergents and soaps are typical examples.

surface activity The strong adsorption of surface-active agents at surfaces or interfaces of liquids in the form of oriented monomolecular layers.

surface antigen An antigen that is present on the surface of a cell, such as the H, O, or Vi antigen of bacteria.

surface balance An instrument for measuring surface pressure.

surface-enhanced Raman spectroscopy A tech-

nique for identifying molecules adsorbed on a surface by the enhancement of Raman scattering produced by these molecules. *Abbr* SERS.

surface enzyme An exoenzyme that remains attached to the cell surface.

surface extended x-ray absorption fine structure spectroscopy A technique for the study of surfaces in which an x-ray source, aimed at the surface, scans through a range of x-ray energies. At characteristic energies, associated with certain atomic transitions, the radiation is absorbed, causing the atoms in the sample to emit electrons. Measurements of x-ray absorption and of emitted Auger electrons provides information about the arrangement of atoms on the surface. *Abbr* SEXAFS.

surface factor HAGEMAN FACTOR.

surface membrane proteins Proteins that are associated with the hydrophilic surfaces of the lipid bilayer of biological membranes.

surface potential The difference between the electrical potential of the clean surface of a liquid and that of a monolayer on the surface of the same liquid. *Aka* surface film potential.

surface pressure The lowering of the surface tension of a liquid by a monolayer that is present on the surface of that liquid.

surface tension The tension exerted by the surface of a liquid as a result of the intermolecular attractive forces between the molecules of the liquid.

surfactant SURFACE-ACTIVE AGENT.

surfactant vesicle *See* vesicle.

surfactin An extracellular product of *Bacillus subtilis* that causes lysis of red blood cells (hemolysis) and lysis of some protoplasts. It consists of an oligopeptide linked to a fatty acid derivative and has, therefore, detergent-like properties.

surroundings That part of the universe, in the thermodynamic sense, that is not under study; the part of the universe that is being studied is known as the system.

survival curve A dose-response curve that indicates the surviving fraction of active units as a function of the radiation dose.

survival of the fittest *See* natural selection.

surviving slice TISSUE SLICE.

sus Suppressor-sensitive mutant.

suspension A colloidal dispersion in which the particles are so large that they will settle out of solution. *See also* colloidal dispersion; colloidal solution.

suspension culture A cell culture, used in virology, in which animal cells are kept in suspension in a medium that is low in divalent ions.

SUV Small unilamellar vesicle; *see* vesicle.

SV Satellite virus.

SV-40 Simian virus 40.

Svedberg A unit of the sedimentation coef-

ficient equal to 10^{-13} s. *Sym S.*

Svedberg equation An equation used for calculating molecular weights from sedimentation and diffusion data; specifically, $M = RTs/D(1 - \bar{v}\rho)$, where M is the molecular weight, T is the absolute temperature, s is the sedimentation coefficient, D is the diffusion coefficient, \bar{v} is the partial specific volume of the solute, and ρ is the density of the solution.

swelling The uptake of water by a gel or by a tissue.

swinging bucket rotor A centrifuge rotor used in a preparative analytical ultracentrifuge for density gradient centrifugation. During the centrifugation the buckets, which hold tubes filled with solution, swing out to a horizontal position that is at right angles to the axis of rotation; this eliminates the extensive convection produced by centrifugation in a fixed angle rotor.

switchgene A gene that causes an organism to follow a different developmental pathway.

switching sites Points in a chromosome at which breaks occur and at which gene segments combine during gene rearrangements.

switch regions The regions between the constant and the variable portions in both the light and the heavy immunoglobulin chains.

swivel A region in double-stranded DNA in which rotation of one strand around the other takes place.

swivelase See DNA gyrase; topoisomerase.

symbiont An organism that lives in symbiosis with another organism.

symbiosis The living together in close association, and for their mutual benefit, of two organisms from different species.

symbiotic Of, or pertaining to, symbiosis.

symbiotic nitrogen fixation The conversion of atmospheric nitrogen to ammonia by the combined action of plants and bacteria; applicable primarily to leguminous plants and to bacteria of the genus *Rhizobium*.

symmetrical Possessing symmetry. *Aka* symmetric.

symmetric transcription The synthesis of RNA from complementary segments of the two strands of DNA; this occurs, for example, when the core enzyme of RNA polymerase is used in vitro.

symmetry The geometrical regularity in the structure of a body such that the sizes, shapes, and relative positions of structural parts are distributed equally about dividing planes, axes, and centers in the body. See also specific types.

symmetry-breaking model SEQUENTIAL MODEL.

symmetry-conserving model CONCERTED MODEL.

symmetry model CONCERTED MODEL.

sympathoadrenal system The adrenal medulla

and the sympathetic nervous system which function in concert in response to stress.

sympathomimetic amine A substance that acts like epinephrine and that produces effects that are similar to those brought about by a stimulation of the sympathetic nervous system.

symplost The intracellular compartment of a plant consisting of the living cells (including the phloem tubes), linked via plasmodesmata, and bounded by the combined plasma membranes. See also apoplast.

symport The linked transport in the same direction of two substances across a membrane.

syn 1. Referring to a nucleoside conformation in which the base has been rotated around the sugar, using the C—N glycosidic bond as a pivot, so that the sugar is placed directly below the base. This represents a sterically more hindered conformation than the anti conformation; in polynucleotides, it leads to the bulky portions of the bases being pointed toward the sugar-phosphate backbone of the chain. 2. Referring to a cis configuration for certain compounds containing double bonds, such as the oximes which contain the grouping $>C=N-OH$. 3. Referring to the position occupied by two radicals of a stereoisomer in which the radicals are closer together as opposed to the anti position in which they are farther apart. See also anti.

synalbumin An insulin-inhibitory polypeptide in the blood of some diabetics; may be identical or similar to the B chain of insulin which binds to albumin under certain conditions and which acts as an inhibitor of insulin in that form.

synapse The area of functional contact between two nerve cells; consists of the nerve terminals, the specialized regions of the two nerve cells in the immediate vicinity of the nerve terminals, and the gap (synaptic cleft) between the two cells. A synapse is a communicating junction between two cells but the communication is indirect even though the cells are in physical contact. The "sending" cell (presynaptic cell) secretes a chemical (neurotransmitter) that diffuses across the synaptic cleft and signals the "receiving" cell (postsynaptic cell). The majority of synapses are such chemical synapses but some synapses are electrical; in the latter, the signal passes directly from one neuron to another through a gap junction. See also cell junction; gap junction.

synapsin A protein substrate of Ca^{2+} /calmodulin-dependent protein kinase.

synapsis The pairing of homologous chromosomes during meiosis.

synaptic cleft See synapse.

synaptic vesicle One of a group small vesicles, located in the presynaptic cell of a synapse, that store acetylcholine and play a role in the regulation of acetylcholine within the nerve cell.

synaptonemal complex A complex protein structure that forms between, and parallel to, the two paired homologous chromosomes during the early stages of meiosis.

synaptoneme A largely artificial structure that is produced by disruption of the nerve endings in a synapse. Typically formed by homogenization of brain or spinal cord which results in the snapping off of nerve terminals. The membranes of the latter then reseal to form artifactual, osmotically active organelles that are separable by centrifugation. These structures contain acetylcholine and acetylcholinesterase.

synarchy The working together of two inter-related intracellular messengers in regulating various biological functions. The coupling of the actions of cyclic AMP and calcium, that appears to be shared by nearly all differentiated cells of higher organisms, is an example. *Aka* synarchic regulation.

syncarcinogenesis Synergistic carcinogenesis.

syncatalytic process A process that is synchronous with the catalytic action of an enzyme. A substrate-dependent increase in the reactivity of a functional group of the enzyme or the inactivation of an enzyme by the product of the enzymatic reaction, are two examples.

synchronous growth Growth in which all of the cells are at the same stage in cell division at any given time. *Aka* synchronized growth.

synchronous muscle A muscle that yields a single contraction for every motor nerve impulse that it receives.

synchronous reaction CONCERTED REACTION.

synchrotron An accelerator designed to impart high kinetic energy to charged particles by means of a high-frequency electric field and a low-frequency magnetic field.

syncytium A group of cells, joined by cytoplasmic bridges and not separated by cell membranes; an aggregate that contains many nuclei and maintains cytoplasmic continuity.

syndein ANKYRIN.

syndesine An amino acid that has been isolated from cross-linked collagen chains and that represents the product of an aldol condensation between a molecule of hydroxyallysine and a molecule of allysine.

syndet Synthetic detergent.

syndiotactic polymer A polymer in which the R groups of the monomers alternate regularly on both sides of the plane that contains the main chain.

syndrome A group of symptoms that occur at the same time and that characterize a disease.

syneresis The shrinkage of a gel with the expulsion of liquid. *See also* clot retraction.

synergism The phenomenon in which two or more agents work together cooperatively such that their combined effect is greater than the sum of the effects when either agent is acting alone. *See also* substrate synergism.

synergistic Of, or pertaining to, synergism.

synergy 1. SYNTROPY. 2. SYNERGISM.

synexin A protein that occurs in several tissues and causes the Ca^{2+} -dependent aggregation of isolated chromaffin granules; believed to promote fusion of the granules with the plasma membrane during exocytosis.

syngeneic Referring to genetically identical individuals of the same species; used in reference to tissue transplants.

syn genes Mitochondrial genes of yeast that code for mitochondrial protein synthesizing machinery such as tRNA and rRNA.

syngraft A transplant from one individual to a genetically identical individual of the same species.

synhibin *See* calelectrin.

synomone *See* allomone.

synonym codon One of several codons that code for the same amino acid, such as the codons UUU and UUC, both of which code for the amino acid phenylalanine.

synovial fluid The fluid present at the joints of vertebrates.

syntenic genes Genes that are believed to be located on the same chromosome because of their behavior during cell hybridization.

synthase 1. LYASE. 2. An enzyme that is not a lyase but for which it is desirable to stress the synthetic aspects of the reaction.

synthase-phosphorylase kinase A converter enzyme that catalyzes the interconversion of the two allosteric forms of phosphorylase (a and b); it catalyzes the ATP-dependent phosphorylation of phosphorylase b to a. *Abbr* SPK.

synthesis The process whereby a more complex substance is produced from simpler substances by a reaction or a series of reactions; the simpler substances, or portions thereof, are combined to form the more complex substance.

synthetase 1. LIGASE. 2. An enzyme that is not a ligase and that catalyzes the formation of a compound by some other mechanism; an example is the enzyme thymidylate synthetase.

synthetic 1. Of, or pertaining to, synthesis. 2. Man-made; synthesized in vitro; prepared artificially as opposed to being isolated from natural sources.

synthetic auxin A synthetic organic compound

that has auxin activity.

synthetic boundary cell An analytical ultracentrifuge cell in which solvent or a less concentrated solution is layered at low rotor speeds over the sample solution, thereby establishing a "synthetic boundary." The cell is useful for measurements of small sedimentation coefficients and for determinations of apparent diffusion coefficients.

synthetic diet A diet composed only of known chemical ingredients.

synthetic linkers LINKER DNA (2).

synthetic medium A medium composed only of known chemical ingredients.

synthetic messenger RNA A synthetic polyribonucleotide that is used as messenger RNA in a cell-free amino acid incorporating system.

synthetic polyribonucleotide An RNA molecule made *in vitro* in the absence of a nucleic acid template; this may be accomplished either by using the enzyme polynucleotide phosphorylase or by chemical synthesis.

synthon A structural unit within a molecule that can be formed and/or assembled by known or conceivable synthetic operations; the intermediates prepared during the synthesis of genes or proteins are examples.

syntoxic Descriptive of a substance or a condition that leads an animal to live with and tolerate, rather than fight and resist, an irritation, a toxin, or similar factors.

syntrophy The nutritional and metabolic interactions between organisms that are placed

in the same environment. The phenomena of cross-feeding and of the nutritional interdependence of plants, animals, and microorganisms with respect to the carbon, oxygen, and other cycles are examples. *Aka* syntrophism.

synzyme A synthetic enzyme; a synthetic macromolecule that has enzymatic activity; a synthetic enzyme analogue.

Syp Mercaptopurine.

system 1. A set of subcellular components that perform one main function, such as an amino acid incorporating system or a transport system. 2. That part of the universe, in the thermodynamic sense, that is under study; the rest of the universe is known as the surroundings. 3. A set of organs performing one main function, such as the digestive system, the central nervous system, or the endocrine system.

systematic error DETERMINATE ERROR.

systematic name A name created on the basis of definite rules of nomenclature to distinguish clearly one item from related ones; the name of a compound based on its structure or the name of an enzyme based on the reaction that it catalyzes are examples.

systemic 1. Relating to a system. 2. Relating to the entire organism and not just to one of its parts.

Szilard-Chalmers reaction A reaction in which a chemical compound is altered by bombardment with neutrons in such a way as to allow chemical separation of the reaction products.

T

t Student's statistic; *See* Student's t test.

t_{1/2} Half-life.

T 1. Thymine. 2. Thymidine. 3. Tritium. 4. Transmittance. 5. Absolute temperature. 6. T-even phage. 7. T-odd phage. 8. Threonine. 9. Tensed conformational form of an allosteric enzyme. 10. Tera. 11. Tesla. 12. Tocopherol. 13. Ribothymidine. 14. Twisting number.

T₁; T₂; T₃ *See* glucose-6-phosphatase.

T₃ Triiodothyronine.

T₄ Thyroxine.

T_m Melting out temperature.

tachometer A device for measuring the angular velocity of a rotating shaft. *Var sp* tachymeter.

tachykinins A group of neuropeptides that includes substance P and substance K.

tachyphylaxis A pharmacological phenomenon in which the first, or the first few, doses of a drug produce a response and lead to establishment of resistance so that subsequent doses of the drug fail to elicit any further response.

tactile Of, or pertaining to, taxis.

tactoid A paracrystalline aggregate of molecules which resembles that in a crystal but is limited to one dimension; the resulting linear arrangements of molecules are packed parallel to each other. Descriptive, for example, of the aggregation of sickle cell hemoglobin in sickle cell anemia.

TAF Tumor angiogenesis factor.

tag LABEL.

tail 1. The long fibrous portion of the myosine molecule. 2. The 3'-hydroxyl end of an oligo- or a polynucleotide strand. 3. The elongated, cylindrical structure attached to the head of a T-even phage. 4. The passive portion of a condensing unit. 5. Poly(A) tail. *See also* terminal transferase. 6. The nonpolar, hydrocarbon portion of a fatty acid or a phospholipid molecule. 7. The region at the beginning and at the end of a statistical distribution. 8. The long narrow portion of a sperm that contains many mitochondria and a flagellum and that serves to propel the sperm to the egg.

tail growth *See* tailward growth.

tailing The chromatographic and electrophoretic phenomenon in which a peak appears lopsided and a band, or a spot, appears ill-defined; due to the fact that in the support the front edge of the region that contains the component is sharp while the back edge

is diffuse. *See also* leading; trailing.

tail-to-tail condensation The condensation of two molecules by way of their passive ends, as in the condensation of isoprene units to form carotenoids.

tailward growth A polymerization mechanism in which the activated head of a monomer adds to the passive tail of a chain, thereby making its own tail the receptor for the next addition of monomer. *See also* head-to-tail condensation; headward growth. *Aka* tail polymerization.

Taka amylase *See* Taka diastase.

Taka diastase Trademark for an amylase (diastase) preparation from the mold *Aspergillus oryzae*. The preparation contains an alpha amylase that consists of a single polypeptide chain (MW 50,000) and that has calcium as a cofactor; the preparation also contains an adenosine deaminase which converts adenosine to inosine and is not involved in the degradation of starch.

Tamm-Horsfall glycoprotein *See* uromodulin.

tandem One behind the other.

tandem duplication A chromosomal aberration in which two identical chromosomal segments lie one behind the other on the same chromosome; the order of genes is the same in both segments.

tandem mass spectrometry A technique in which two or more independently operable mass analyzers are used in sequence. As the ion beam traverses the instrument, it is subjected to a series of operations which involve changes in mass, charge, or reactivity of the ions. *Abbr* MS/MS.

tandem repeats 1. TANDEM DUPLICATION. 2. Multiple copies of a gene that lie on the same chromosome and are separated by spacers; components of repetitive DNA.

tangent 1. A straight line that touches a curve at only one point. 2. The ratio of the length of the side facing an acute angle in a right triangle to the length of the side facing the other acute angle.

Tangier disease A genetically inherited metabolic defect in humans that is characterized by an almost complete absence of plasma HDL as well as by excessive deposition of cholesterol esters in many tissues. *Aka* familial HDL deficiency.

tannic acid *See* tannins.

tannins A group of complex phenolic, non-nitrogenous compounds in the bark, fruits, and leaves of many plants. Tannins can be divided into two groups: (a) Hydrolyzable tannins consist of a sugar (usually glucose), esterified with one or more polyhydric phenols such as gallic acid (3,4,5-trihydroxybenzoic acid). Tannic acid is a hydrolyzable tannin; it has the empirical formula $C_{76}H_{52}O_{46}$. (b) Condensed (nonhydrolyzable) tannins are derivatives of bioflavonoids. Tannins can cross-link proteins, a property made use of in leather tanning; they also frequently have astringent properties.

Tanret's reagent A reagent that contains potassium iodide, mercuric chloride, and acetic acid, and that forms a white precipitate when added to urine containing albumin.

t antigen An antigen that is related to, but smaller than, the T antigen of SV-40 virus. The two proteins have the same N-terminal amino acid sequences but different C-terminal sequences. *Aka* little t.

T antigen 1. An antigen occurring in the nuclei of cells that are infected with, or transformed by, certain oncogenic viruses, such as polyoma virus or SV-40 virus; a virus-encoded protein that is required for viral DNA replication and that has several other functions. *Aka* big T. 2. An antigen that is present on normal human red blood cells but that is unreactive unless the cells are first treated with the enzyme neuraminidase.

tape An informational molecule that functions in replication, transcription, or translation; used specifically for mRNA.

tape theory The theory according to which replication, transcription, and translation proceed by the currently accepted template-type mechanisms.

TAPS Tris(hydroxymethyl) methylaminopropane sulfonic acid; used for the preparation of biological buffers in the pH range of 7.7 to 9.1. *See also* biological buffers.

TAPSO 3-[N-Tris(hydroxymethyl)methylamino]-2-hydroxypropane sulfonic acid; used for the preparation of biological buffers in the pH range of 7.0 to 8.2. *See also* biological buffers.

tare A counterweight for balancing a container during weighing.

target cell 1. A receptor cell that binds cytotoxic antibodies in anaphylaxis. 2. A receptor cell that is acted upon by a hormone.

targeted mutagenesis The production of mutations that is limited to the actual sites of damage in DNA. The mutations arising at the thymine dimer sites produced by ultraviolet irradiation are an example.

target molecular weight The molecular weight calculated from the dose of radiation that re-

sults in the survival of 37% of the irradiated units. *See also* thirty-seven percent survival dose.

target organ 1. The receptor organ that is acted upon by a hormone. 2. The organ, the cells of which are damaged by the multiplication of an infecting virus.

target sequence A short nucleotide sequence, in the recipient DNA molecule, that functions in transposition. As the transposon is being inserted into the recipient DNA, the target sequence is duplicated and the transposon is sandwiched in between two identical copies of the target sequence.

target theory The theory that a cell will be killed, or an enzyme molecule, virus particle, etc., will be inactivated if struck by radiation in a small, sensitive target volume in which one or more hits (ionizing events) will bring about the specific effect.

T arm *See* arm.

TATA box A nearly universal sequence of nucleotides in eukaryotic DNA, about 25 bp upstream from the site at which transcription of structural genes by RNA polymerase II starts. It has the consensus sequence TATAAAT and is believed to be a site to which transcription factors, rather than RNA polymerase II, bind; hence, it is not considered to be part of the promoter proper. *See also* Pribnow box.

tau *See* elementary particles.

tau particles Intracellular particles of phage-infected bacteria that have been detected by electron microscopy and that are believed to be phage precursors.

tau proteins Proteins that have molecular weights of about 60,000–70,000 and that are associated with, and enhance the polymerization of, microtubules. *See also* MAP.

taurine An aminosulfonic acid, derived from cysteine, that forms a bile salt when it is conjugated to a bile acid; it may also function as a general detoxifier and remover of xenobiotics.

taurocholic acid A compound formed by the conjugation of taurine and cholic acid; one of the bile salts.

tautomer One of the two isomers that exhibit tautomerism.

tautomeric shift A reversible change in the location of a hydrogen atom in a molecule that occurs in enol-keto tautomerism and that converts one tautomer into the other.

tautomerism A rapid equilibrium between two isomeric forms of a molecule that differ significantly in both the relative positions of the atoms and in the bonds between the atoms; the molecule may react in either of the two isomeric forms depending on the conditions.

taxis The movement of a cell or an organism in response to a stimulus such that the latter

controls the direction of movement. The movement may be toward, or away from, the stimulus and is then referred to as either positive or negative taxis.

taxon (*pl* taxa) A taxonomic group of any rank or size.

taxonomic Of, or pertaining to, taxonomy.

taxonomy The scientific classification of plants and animals that is based on their natural relationships; includes the systematic grouping, ordering, and naming of the organisms.

Tay-Sachs disease A genetically inherited metabolic defect in humans that is characterized by an accumulation of gangliosides in the brain and that leads to a progressive and fatal disease associated with blindness and brain deterioration; caused by a deficiency of the enzyme hexosaminidase A.

TBG Thyroxine-binding globulin.

t-Boc group Tertiary butyloxycarbonyl group; the grouping $(\text{CH}_3)_3\text{C}-\text{O}-\text{CO}-$, used as a blocking agent of the amino group of amino acids in solid phase protein synthesis.

TBPA Thyroxine-binding prealbumin.

TC Transcarboxylase.

TC₅₀ Median tissue culture dose.

TCA 1. Tricarboxylic acid. 2. Trichloroacetic acid.

TCA cycle Tricarboxylic acid cycle.

TψC arm *See* arm.

TCD₅₀ Median tissue culture dose.

TCDD *See* dioxin.

TC detector Thermal conductivity detector.

T cell A thymus-derived lymphocyte. In both mammals and birds, hemopoietic stem cells (bone marrow cells) migrate via the blood to the thymus where they differentiate into thymus lymphocytes. These then migrate to peripheral lymphoid tissues to become T cells. T cells function in cell-mediated immune responses against invading microorganisms, including fungi, parasites, intracellular viruses, cancer cells, and foreign tissues. *See also* cytotoxic T cells; regulatory T cells.

T cell growth factor INTERLEUKIN 2.

T cell helper *See* helper T cell.

T cell line A line of antigen-specific T cells that can be produced in tissue culture by activating T cells with a specific antigen and then having them proliferate indefinitely in the presence of interleukin 2.

TCID₅₀ Tissue culture infectious dose.

TψC loop *See* arm.

TCT Thyrocalcitonin.

t_D 1. Doubling time. 2. Thermal death time.

TD₅₀ Median toxic dose.

T-DNA *See* crown gall tumor.

TDP 1. Ribosylthymine diphosphate. 2. Ribosylthymine-5'-diphosphate.

TEAE-cellulose *O*-(Triethylaminoethyl)cellu-

lose; an anion exchanger.

TEBG Testosterone-estradiol-binding globulin.

Teflon Trademark for polytetrafluoroethylene; a plastic.

Teichmann's crystals Rhombic crystals, produced by heating hemoglobin in the presence of NaCl and glacial acetic acid; used for the microscopic detection of blood. *Aka* chlorhemin crystals.

teichoic acid An accessory polymer in the cell wall of gram-positive bacteria that consists of long chains of either glycerol or ribitol which are linked by means of phosphodiester bonds and which carry various substituents, including both amino acids and monosaccharide residues.

teichuronic acid A teichoic acid-type polymer that contains uronic acid substituents.

tektin SPECTRIN.

telecommunication The transmission of data between a computer and another computer, or a terminal, in a different location by telephone, radio, or other means.

teleology The doctrine that the occurrence of any structure or function in a living organism implies that the structure or function is valuable, has a purpose, and has conferred an advantage on the organism in the course of evolution. As originally formulated by Aristotle, the concept invoked a supernatural agent that has foreseen the final value of the structure or of the function. To circumvent this connotation, the term teleonomy has been introduced. *See also* teleonomy.

teleolysosome A cytoplasmic particle containing acid hydrolases.

teleonomy The doctrine that the occurrence of any structure or function in a living organism implies that the structure or function has conferred an advantage on the organism in the course of evolution; the genetic character of an organism is considered to have become adapted to its environment through the process of evolution rather than through theurgic forces. *See also* teleology.

telestability The degree to which the stability of one region of the DNA double helix is affected by an adjacent region; specifically the stabilization of a dA-dT segment by an adjacent dG-dC segment.

TELISA Thermometric enzyme linked immunosorbent assay; a variation of the ELISA technique. Involves measurement of heat formation, as a result of enzyme action, by means of an enzyme thermistor unit.

telomere One of the two terminal chromomeres of a chromosome; a DNA sequence required for the stability of the ends of eukaryotic chromosomes.

telopeptides Sequences of about 12–25 amino acids that occur at the N- and C-terminals of the tropocollagen molecule.

telophase The final stage in mitosis during which the two new nuclear membranes are formed and which is followed by cytokinesis to produce the two daughter cells.

TEM 1. Tetramine. 2. Transmission electron microscope.

TEMED *N,N,N,N*-Tetramethylethylenediamine; an initiator of acrylamide polymerization.

temperate cycle LYSOGENIC CYCLE.

temperate phage A phage that is incorporated as a prophage into the host chromosome and allows the host cell to survive in the form of a lysogenic bacterium; it generally does not cause lysis of the bacterial cell that it has infected but may cause lysis (undergo a lytic cycle) under certain conditions.

temperature The degree of hotness measured on one of several arbitrary scales; a measure of the kinetic energy of molecules. *See also* temperature scale.

temperature coefficient The rate of a reaction at one temperature divided by the rate at a second temperature; usually expressed as the Q_{10} value.

temperature jump method A relaxation technique in which temperature is the variable that disturbs the equilibrium of a system. *See also* relaxation technique.

temperature programming The controlled increase in temperature at a predetermined rate; used in the construction of thermal denaturation profiles and in the operation of gas chromatography columns.

temperature scale *See* absolute temperature scale; Celsius temperature scale; Fahrenheit temperature scale; Kelvin temperature scale.

temperature-sensitive mutant A conditional mutant that behaves normally at a lower (permissive) temperature range but displays its mutant phenotype at a higher (restrictive) temperature range. *Abbr* ts.

template A macromolecule that functions as a mold or pattern for the synthesis of another macromolecule. A template determines the composition of the product and directs its synthesis during the process of polymerization but does not have to be linked covalently to the product. In nucleic acid chemistry, a template is the polynucleotide strand whose base sequence determines the base sequence of the newly synthesized strand.

template chromatography A column chromatographic technique for the fractionation of oligonucleotides. Based on linking defined oligonucleotides covalently to soluble polymers and then fixing the complex onto a column

(such as DEAE-cellulose) in a noncovalent manner. This leaves the nucleotide groups on the column free for interaction with complementary oligonucleotides in the mobile phase. The complementary oligonucleotides become adsorbed by base pairing and can be eluted by means of a temperature gradient.

template-primer A macromolecule that functions as both a template and a primer. A double-stranded DNA molecule that is replicated in vitro with DNA polymerase I is an example; one strand functions as a template, the other is used as both a template and a primer.

template RNA MESSENGER RNA.

template switching The alternate replication of the two strands of DNA in the Kornberg mechanism; DNA polymerase I uses one strand as a template and then switches (jumps) to use the second, displaced strand as a template.

template theory *See* antigen template theory.

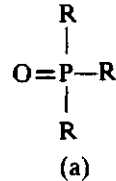
TEMPO 2,2,6,6-Tetramethylpiperidine-1-oxyl; used as a spin label.

tensed conformation *See* concerted model.

tensiometer An instrument for measuring surface and interfacial tensions.

tension The concentration of a gas in a solution; expressed in terms of the partial pressure of the gas which is in equilibrium with the solution.

TEPA Generic name for Tris(1-aziridinyl)phosphine oxide; triethylenephosphoramide; a phosphine oxide containing three aziridine (R) groups (a). An aziridine mutagen.



teprotide A nonapeptide that is an antagonist of serum converting enzyme which catalyzes the conversion of angiotensin I to angiotensin II.

ter- 1. Combining form meaning three or thrice. 2. Referring to three kinetically important substrates and/or products of an enzymatic reaction; thus a ter bi reaction is a reaction with three substrates and two products.

tera- Combining form meaning 10^{12} and used with metric units of measurement. *Sym* T.

teratogen An agent that causes birth defects.

teratology The origin and production of congenital malformations. *Aka* teratogenesis.

teratology The study of malformations and of the abnormal developments of organisms and parts of organisms.

teratoma A tumor derived from embryonic tissue and consisting of a disorganized mass of many tissue types. Many cells represent a variety of differentiated tissues; others are undifferentiated stem cells that continue to divide to generate yet more differentiated tissues.

ter cutting *See* terminase.

terminal 1. The end of a polymeric chain, such as the C- or N-terminal of a polypeptide chain, or the 3'- or 5'-terminal of a polynucleotide strand. *Aka* terminus. 2. A piece of equipment that has a keyboard for input and a device, such as a printer, for output; used for communicating with a computer.

3'-terminal That end of an oligo- or polynucleotide strand which carries either a free or a phosphorylated hydroxyl group at the 3'-position of the terminal ribose or deoxyribose.

5'-terminal That end of an oligo- or polynucleotide strand that carries either a free or a phosphorylated hydroxyl group at the 5'-position of the terminal ribose or deoxyribose.

terminal cisterna (*pl* terminal cisternae) A transverse, connecting channel of the sarcoplasmic reticulum.

terminal deletion A chromosomal aberration in which genetic material is lost from the end of a chromosome. A deletion occurring elsewhere on the chromosome is called an intercalary deletion.

terminal deoxynucleotidyl transferase TERMINAL TRANSFERASE.

terminal enzyme An enzyme that catalyzes the addition of nucleotides to the terminal of a nucleic acid strand in the absence of a template, with nucleoside triphosphates serving as substrates.

terminal redundancy The occurrence of identical sequences at both ends of a DNA molecule. *Aka* terminal repetition. *See also* long terminal repeat.

terminal repetition TERMINAL REDUNDANCY.

terminal transferase An enzyme that catalyzes the sequential addition of deoxyribonucleotides to the 3'-OH end of a DNA strand without any requirement for a template. The enzyme is used to add homopolymer tails. Any two populations of DNA fragments can be made complementary by appropriate homopolymer extension of their 3'-ends, followed by annealing and ligation; this procedure is used in recombinant DNA technology. *Aka* terminal deoxynucleotidyl transferase.

terminase An enzyme that functions in the rolling circle (*sigma*) replication of phage lambda. The enzyme cuts the phage DNA at *cos* sequences (*ter* cutting) and thereby initiates the packaging of the DNA chromosome into new capsids. *Aka* *ter* system.

termination 1. The final stage in protein synthesis during which the completed polypeptide chain is released from the ribosome, and the ribosome is released from the mRNA. 2. The third step in a chain reaction. 3. The final stage in the transcription of DNA by RNA polymerase.

termination codon A codon that codes for termination of the translation of an mRNA molecule; it signals the termination of a growing polypeptide chain. Termination codons do not code for amino acids and are the codons UAA, UAG, and UGA. *Aka* stop codon; nonsense codon.

termination factor RELEASE FACTOR.

terminator A sequence of nucleotides in DNA that provides a signal for the termination of transcription by RNA polymerase; it signals the termination of a growing RNA strand. *Aka* terminator sequence.

terminology NOMENCLATURE.

terminus (*pl* termini) TERMINAL.

termolecular reaction A chemical reaction in which three molecules (or other entities) of reactants interact to form products.

ternary Consisting of three parts.

ternary complex mechanism SEQUENTIAL MECHANISM.

ternary complex model MOBILE RECEPTOR MODEL.

terpene A hydrocarbon terpenoid. Terpenes are classified according to the number of isoprene units that they contain: hemiterpene (1); monoterpene (2); sesquiterpene (3); diterpene (4); triterpene (6); tetraterpene (8); pentaterpene (10); and polyterpene (large number).

terpene alkaloids *See* alkaloids.

terpeneless oil An essential oil from which less odorous terpenes have been removed by de-terpenation.

terpenoid A polyisoprenoid compound that may be linear or cyclic and in which the isoprene units are usually linked in a head-to-tail manner. *See also* terpene.

terramycin *See* tetracycline.

terreactant reaction A termolecular reaction in which three different reactants interact to form products.

ter system TERMINASE.

tert Tertiary.

tertiary base pairs A group of nine base pairs that occur in the folded cloverleaf structure (L type) of tRNA and that are responsible for maintaining the tRNA in its three-dimensional configuration. Eight of the base pairs are linked via tertiary hydrogen bonds; one is a standard Watson-Crick type base pair (a G-C base pair).

tertiary coiling *See* superhelix.

tertiary hydrogen bonds Unusual hydrogen bonds that are formed between various hydrogen bond donor and acceptor groups in the folded cloverleaf structure (L type) of tRNA. These are not the ordinary hydrogen bonds of base pairs in double-helical RNA segments; rather, these are bonds that serve to maintain the tRNA in its folded tertiary structure.

tertiary interactions See tertiary hydrogen bonds.

tertiary response The immune response to a third dose of antigen that is essentially similar in its characteristics to those of the secondary response.

tertiary structure The irregular three-dimensional folding of the polypeptide chain upon itself, as in a globular protein, that results from the interaction of amino acid side chains which are either close or far apart along the chain; the arrangement in space of all the atoms of a protein or of a subunit without regard to the relation of the atoms to neighboring molecules or subunits. The term may likewise be applied to the three-dimensional structure of a polynucleotide strand.

TES *N*-Tris(hydroxymethyl)methyl-2-aminoethanesulfonic acid; used for the preparation of biological buffers in the pH range of 6.8 to 8.2. See also biological buffers.

tesla A unit of magnetic field strength; one tesla equals 10^4 gauss. *Sym* T.

testectomy The surgical removal of a testis.

test meal A food that consists of one or more selected items and that, after it has been eaten, is followed by the removal of the gastric contents for analysis.

test of significance See significance of results.

testosterone A steroid hormone that is the major male sex hormone in humans; it is secreted by the testes and is responsible for the development of secondary male characteristics. Testosterone functions as a prohormone when it is converted to 17β -estradiol by the enzyme aromatase.

testosterone-estradiol-binding globulin A specific carrier for testosterone in the blood. *Abbr* TEBG. *Aka* sex hormone binding globulin (SHBG).

tetra- Combining form meaning four.

tetraantennary See high mannose oligosaccharides; complex oligosaccharides.

tetracyclines A group of broad-spectrum antibiotics obtained from various species of *Streptomyces*. Tetracyclines contain four, linearly fused, six-membered rings; they inhibit protein synthesis in prokaryotes by binding to the ribosomes and preventing the normal binding of aminoacyl-tRNA to the A site. Chlortetracycline (aureomycin) is produced by *Streptomyces aureofaciens*; oxytetracycline (ter-

ramycin) is produced by *Streptomyces rimosus*; and tetracycline (achromycin; tetracyclon) is obtained by reductive dehalogenation of chlortetracycline.

tetracyclon See tetracyclines.

tetrahedral intermediate A transition state in enzyme catalyzed reactions in which a specific carbon has the four bonds in their usual tetrahedral arrangement.

tetrahedron A polyhedron with four equal faces; a pyramid composed of four triangles. A tetrahedron is used for representation of the carbon atom, with the nucleus of the atom inside the pyramid, and with the four single bonds extending to the corners of the pyramid.

tetrahydrocannabinol The psychotropic principle of hashish and marijuana. A narcotic that occurs in several isomeric forms; Δ^1 -tetrahydrocannabinol is abbreviated as THC.

tetrahydrofolic acid The reduced form of the vitamin folic acid and the parent compound of the coenzyme forms of this vitamin; the coenzymes function in the metabolism of one-carbon fragments. *Abbr* FH₄; THFA; THF.

tetrahydropteroylglutamic acid TETRAHYDROFOLIC ACID.

tetrahymena A genus of ciliate protozoans widely used for genetic studies and found in a variety of freshwater habitats.

tetramer An oligomer that consists of four monomers.

tetramine An aziridine mutagen that contains three aziridine groups attached to the three carbon atoms in a 6-membered ring in which carbon and nitrogen alternate; triethylenemelamine; 2,4,6-tris (1-aziridinyl)-s-triazine. *Abbr* TEM.

tetranucleotide hypothesis An early hypothesis of the structure of DNA according to which DNA has a uniform structure that is produced by the polymerization of one basic repeating unit, namely a tetranucleotide containing one residue each of adenine, cytosine, guanine, and thymine.

tetrose A monosaccharide that has four carbon atoms.

T-even phage A large phage that infects the bacterium *E. coli* and that has a complex tadpole-like structure consisting of a head, tail, and tail fibers. The head is icosahedral and contains double-stranded DNA; to the head is attached the tail through which the DNA is ejected into the host cell. The tail terminates in tail fibers by means of which the phage adsorbs to the bacterium. The tail core, or tube, is surrounded by a sheath and is attached to the head by means of a collar and to the tail fibers by means of a plate. Tail pins are attached to the tail plate.

text 1. The sequence of nucleotides in a nucleic acid. 2. The sequence of amino acids in a protein.

TF Transfer factor.

T factor ELONGATION FACTOR T.

Tg Generation time.

TGF Transforming growth factor.

TGF- β Transforming growth factor β . A widely distributed peptide growth factor that can stimulate or inhibit the growth of cells in vitro. The specific physiological function of TGF- β is unknown but it appears to be involved in the development of mammary glands.

TGFA Triglyceride fatty acids.

TGN Trans-Golgi network.

TH Transhydrogenase.

thalassemia A heritable disorder characterized by a reduced rate of synthesis of one or more of the globin chains of hemoglobin. The imbalance in globin chain production leads to precipitation of the excess chains, lowered hemoglobin levels (anemia), and reduced red blood cell survival. In α or β thalassemia there is a deficiency of the α or β globin chains, respectively. Absence of a chain is designated as α^0 or β^0 , respectively; decreased synthesis of a chain is designated as α^+ or β^+ , respectively. Homozygotes, with α^0 thalassemia exhibit a syndrome called Hydrops fetalis in which death occurs prior to or shortly after birth. The homozygous condition is known as thalassemia major and the heterozygous condition is known as thalassemia minor. *Aka* Cooley's anemia.

thalidomide A drug (2,6-dioxo-3-phthalimido-piperidine), formerly used as a sedative but since withdrawn from the market since it led to fetal abnormalities.

thallus The undifferentiated growth of a plant body as that of a fungus or a mold.

THAM TRIS.

thanatochemistry The chemical reactions that occur in a tissue or an organism after death. *Aka* mortichemistry.

thaumatin A basic and carbohydrate-free protein, consisting of a single polypeptide chain of 207 amino acids. 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.

THC Tetrahydrocannabinol.

Thd Ribothymidine.

theine The name frequently given to the stimulatory substance in tea; it is chemically identical to the caffeine in coffee beans.

theobromine A methylated xanthine that occurs in tea and cacao beans. A purine alkaloid that acts as a diuretic, smooth muscle relaxant, cardiac stimulant, and vasodilator.

theophylline A methylated xanthine that is present in tea. A purine alkaloid that has a stimulatory effect and acts like caffeine; it also inhibits the phosphodiesterase that converts cyclic AMP to inactive 5'-AMP and thereby prolongs the adrenalin-producing effect of cyclic AMP.

Theorell-Chance mechanism An ordered sequential mechanism of an enzymatic reaction in which two substrates and two products participate and in which the steady-state concentration of the ternary complexes is very low. The two ternary complexes in this mechanism are the enzyme plus the two substrates, and the enzyme plus the two products.

theoretical plate The theoretical stage in countercurrent distribution at which perfect equilibrium is established between the two phases. The theoretical plate concept has been adapted for use in distillation and chromatographic columns where perfect equilibrium between the phases is not established, since the phases are constantly in motion relative to each other. Hence, it is customary to refer to the length of column over which the separation effected is equivalent to that of a theoretical plate; this length of column is known as a height equivalent to a theoretical plate (HETP). The shorter the HETP, the more efficient is the column. *Aka* theoretical stage.

theory A confirmed explanation of observed phenomena; a scientific doctrine; a hypothesis that has been tested and confirmed with facts not known when the hypothesis was first proposed.

theory of absolute reaction rates The theory of chemical kinetics according to which the velocity of a chemical reaction is proportional to the concentration of an activated complex that is formed from the reactants; the reactants must first be activated by means of an activation energy to form the activated complex before they can be converted into products. The activated complex is a transient phase; an unstable complex held together by weak bonds.

theory of antibody formation *See* clonal selection theory; Ehrlich's receptor theory; germ-line theory; instructive theory; selective theory; side chain theory; Smithie's theory; somatic mutation theory; somatic recombination theory.

theory of cancer *See* autocrine hypothesis; Busch theory; catabolic deletion hypothesis; chromosome theory of cancer; deletion hypothesis; feedback deletion hypothesis; Greenstein hypothesis; imbalance theory; Mason's theory; membron theory of cancer; multistep induction theory; oncogene theory;

polyetiological theory; provirus hypothesis; somatic mutation theory; virogene theory; Warburg theory. *See also* initiation (2); promotion.

therapeutic index A measure of the safety of a drug that is equal to the ratio of the median lethal dose to the median effective dose.

thermal Of, or pertaining to, either heat or temperature.

thermal chromatography A column chromatographic technique in which elution is carried out with one eluent but at increasing temperatures.

thermal conductivity detector A detector in which the basic component is a thermal conductivity cell of either the thermistor or the katharometer type; used in gas chromatography, primarily for detecting inorganic gases or large amounts of organic compounds. *Abbr* TC detector.

thermal death point The lowest temperature required for the sterilization of a standard suspension of bacteria in 10 min.

thermal death time The minimum time required for the sterilization of a standard suspension of bacteria at a given temperature. *Sym* t_D .

thermal denaturation The denaturation of macromolecules by heat, particularly the heat-induced breaking of the hydrogen bonds of the base pairs in double-helical nucleic acid segments which leads to the formation of random coils.

thermal denaturation profile The plot of a hydrodynamic property, such as viscosity, or of an optical property, such as absorbance, for a nucleic acid solution as a function of temperature. The curve describes the degree of separation between the two strands of double-stranded molecules, or between parts of the same strand of folded single-stranded molecules, that results from the breaking of hydrogen bonds as the temperature is increased. The temperature at which one-half of the maximum change in the measured property is observed is referred to as the melting out temperature and is denoted T_m .

thermal inactivation point The temperature at which a suspension of virus particles must be kept for 10 min to inactivate all of the virus particles; used specifically for plant viruses such as tobacco mosaic virus. *Abbr* TIP.

thermalite A subtransition in the thermal denaturation profile of DNA.

thermal neutron A neutron that has a kinetic energy that is equivalent to the energy of a gas molecule at room temperature.

thermal noise DARK CURRENT.

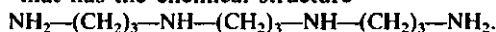
thermal polymer A high molecular weight compound produced by the heat-induced

polymerization of monomers.

thermal quenching CHEMICAL QUENCHING.

thermal reactivation The increase in the survival of ultraviolet-irradiated bacteria that is manifested if the bacteria are incubated at an elevated temperature immediately following their irradiation and are then allowed to grow at a lower temperature; this is in comparison to those bacteria that, following their irradiation, are allowed to grow only at the lower temperature.

thermine A polyamine, isolated from the extreme thermophile *Thermus thermophilus*, that has the chemical structure



thermistor A semiconductor device, the resistance of which changes with temperature; used for measuring temperatures.

thermo- Combining form meaning heat.

thermoacidophiles A group of archaeobacteria that grow in hot, acidic environments. They have been isolated from hot sulfur springs and smoldering piles of coal tailings. *See also* archaeobacteria.

thermobarometer A control manometer used in conjunction with the Warburg apparatus to correct for changes in room temperature and barometric pressure during the experiment.

thermochemistry A branch of thermodynamics that deals specifically with enthalpy changes of chemical reactions. Based on two statements that follow from the first law of thermodynamics and that are known as the laws of thermochemistry. (a) Law of Lavoisier and Laplace: The quantity of heat required to decompose a compound into its elements is equal to the quantity of heat evolved when the compound is formed from its elements. (b) Hess's law (law of constant heat summation): The total heat change of a chemical reaction, at either constant volume or constant pressure, is the same whether this reaction takes place in one or several steps.

thermochromism The reversible change of color by a compound as a function of temperature.

thermocouple A device for measuring temperatures by the production of an electromotive force between the two junctions of two different metals in a closed circuit; the electromotive force is proportional to the temperature difference between the two junctions.

thermoduric Heat-enduring; capable of surviving high temperatures.

thermodynamic property STATE FUNCTION.

thermodynamics The science that deals with the interconversion of different forms of energy and with the spontaneous direction of processes; involves the study of heat, work, and energy, their interconversions and the

changes that they bring about. Thermodynamics is based upon fundamental laws that are generalizations derived from human experience. These laws cannot be proven in an exact or direct way; their truth is ascertained by inference, that is, from the fact that, so far, all of the consequences derived from these laws, have been verified experimentally. Classical thermodynamics (also called energetics or equilibrium thermodynamics) deals with the bulk properties of macroscopic systems at equilibrium; it considers the initial and final states of a system and its surroundings. Statistical thermodynamics deals with individual atoms and molecules and sums up their collective behavior and properties. Irreversible thermodynamics deals with nonequilibrium systems and with rate processes. *See also* first law of thermodynamics; second law of thermodynamics; third law of thermodynamics; zeroth law of thermodynamics.

thermodynamics of irreversible processes *See* irreversible thermodynamics.

thermodynamic variable STATE FUNCTION.

thermogenic Heat-producing.

thermolabile Inactivated by treatment with heat; sensitive to high temperatures.

thermolysin A zinc-containing, heat-stable, proteolytic enzyme from the thermophilic bacterium *Bacillus thermoproteolyticus* that catalyzes the cleavage of peptide bonds in which the NH-group is contributed by one of several nonpolar amino acids. *Aka* thermophilic bacterial protease.

thermolysis PYROLYSIS.

thermometer A device for measuring temperatures; usually implies either a mercury-in-glass or an alcohol-in-glass device.

thermonuclear reaction A nuclear reaction that is induced by a thermal activation of the reacting nuclei.

thermophile An organism that grows at high temperatures in the range of 45 to 70°C (or higher temperatures) and that has an optimum growth temperature in the range of 50 to 55°C.

thermophilic Of, or pertaining to, thermophiles; preferring high temperatures.

thermopile An instrument for measuring the total amount of radiant energy irrespective of its wavelengths; based on the principle that a truly black surface absorbs all of the incident light energy and converts all of it into heat.

thermoplastic polymer A polymer that, when heated to its melting point, softens and flows and can be cooled and remelted many times without undergoing any change. *See also* thermosetting polymer.

thermosetting polymer A polymer that, when heated to its melting point, undergoes a

permanent change and sets to a solid which cannot be remelted. *See also* thermoplastic polymer.

thermostable Stable to treatment by heat; not inactivated by high temperatures.

thermostable enzyme An enzyme that has an unusually high optimum temperature.

thermostat A device for maintaining a constant temperature by means of the automatic regulation of the source of heat.

thermotolerance Resistance to heat; the ability of an organism to withstand high temperatures after exposure to lower, but still elevated, temperatures which induces the formation of heat-shock proteins.

thermotropic liquid crystal *See* liquid crystal.

theta replication The bidirectional replication of double-stranded, circular DNA; so called because the structure resembles the Greek letter theta (θ).

theta structure The DNA structure formed in circular double-stranded DNA, by two replicating forks moving in opposite directions (bidirectional replication). This is the case for bacterial DNA. *Aka* Cairns molecule.

THF 1. Thymic humoral factor. 2. Tetrahydrofolic acid.

THFA Tetrahydrofolic acid.

thiamine One of the B vitamins (vitamin B₁), the coenzyme form of which is thiamine pyrophosphate, and a deficiency of which causes beriberi. *Var sp* thiamin.

thiamine pyrophosphate The coenzyme form of the vitamin thiamine that functions in the decarboxylation of α -ketoacids. *Abbr* TPP; ThPP; DPT.

thiazole ring The ring structure occurring in thiamine and thiamine pyrophosphate.

thick filament MYOSIN FILAMENT.

thin filament ACTIN FILAMENT.

thin-layer chromatography A chromatographic technique in which the stationary phase is a thin layer of solid, such as silica gel, spread on a flat glass or plastic plate; the technique allows for rapid analysis of very small amounts of sample. *Abbr* TLC.

thin-layer electrophoresis An electrophoretic technique in which the supporting medium is a thin layer of silica gel, alumina, or other adsorbent spread on a flat glass or plastic plate; the technique allows for rapid analysis of very small amounts of sample. *Abbr* TLE.

thin-layer gel filtration A separation technique in which gel filtration is carried out on thin layers of gel spread on a flat glass or plastic plate.

thio- Combining form meaning sulfur.

thioalcohol THIOL.

thiochrome A blue, fluorescent compound that is produced by mild alkaline oxidation of

thiamine and that serves for the quantitative determination of thiamine.

thioclastic reaction A phosphoroclastic reaction in which lipoic acid participates. *Aka* thioclastic split.

thioctic acid LIPOIC ACID.

thioester A compound formed by the joining of a carboxyl group to a sulfhydryl group through the elimination of a molecule of water; a compound having the general formula $R-CO-S-R'$.

thioether A compound in which two radicals are linked by means of a sulfur atom; a compound of the general formula $R-S-R'$.

thioglycollic acid treatment A procedure for breaking disulfide bonds in proteins.

thiokinase The enzyme that catalyzes the formation of a fatty acyl coenzyme A ester from the fatty acid and coenzyme A in fatty acid activation. *Aka* acyl-CoA synthetase.

thiol A compound containing a sulfhydryl group; a compound of the general formula $R-SH$.

thiolase The enzyme that catalyzes the thiolytic cleavage reaction in beta oxidation.

thiolate The anion of a thiol; a nucleophile that has the structure $R-S^-$.

thiolation The introduction of a sulfhydryl group into an organic compound.

thiol enzyme SH-ENZYME.

thiol ester THIOESTER.

thiol ether THIOETHER.

thiol group SULFHYDRYL GROUP.

thiolysis THIOLYTIC CLEAVAGE.

thiolytic cleavage The last step, catalyzed by the enzyme thiolase, in the cyclic reaction sequence of beta oxidation; in this step, a fatty acyl coenzyme A derivative, in the presence of coenzyme A, is cleaved to produce acetyl coenzyme A and a fatty acyl coenzyme A of a fatty acid that contains two carbon atoms less than the fatty acid that entered the cycle.

thiomethylgalactoside *See* TMG.

thiophorase The enzyme that catalyzes the conversion of an acyl coenzyme A ester and a free fatty acid to the opposite pair of acyl coenzyme A ester and free fatty acid; this reaction represents an alternative reaction for fatty acid activation to that catalyzed by fatty acid thiokinase.

thioredoxin A heat-stable protein that can exist as a dithiol, thioredoxin-(SH)₂, or as a disulfide, thioredoxin-S₂, and that serves to reduce ribonucleoside diphosphates to deoxyribonucleoside diphosphates.

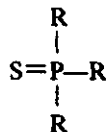
thioredoxin reductase The enzyme that catalyzes the reduction of thioredoxin-S₂ to thioredoxin-(SH)₂ with the simultaneous oxidation of NADPH to NADP⁺; the enzyme is

an FAD-containing flavoprotein.

thiostrepton An antibiotic that prevents protein synthesis in prokaryotes by inhibiting the enzyme translocase.

thiotemplate mechanism A mechanism for the synthesis of naturally occurring, but unusual, peptides (such as cyclic peptides, those containing D-amino acids or uncommon amino acids, or those containing covalent bonds other than peptide bonds). The synthesis involves activation of an amino acid by ATP, yielding an aminoacyl adenylate. The amino acid is then bound to an enzyme complex through the sulfhydryl group of the cofactor 4'-phosphopantetheine, rather than being linked to tRNA. Covalent linkage of the amino acid residues occurs on this enzyme complex and the sequence of the amino acids is determined by the enzyme.

Thio-TEPA Tradename for triethylenethiophosphoramidate; a mutagenic alkylating agent. The compound contains three aziridine groups (R) and has the structure



thioracil A minor base occurring in tRNA in which a sulfur atom has replaced an oxygen atom at position 2 or 4 in uracil.

third factor NATRIURETIC HORMONE.

third law of thermodynamics The principle relating to the magnitude of entropy: All substances have finite positive entropies and all simple, crystalline substances at a temperature of absolute zero have equal entropies which are assigned a value of zero. *See also* thermodynamics; principle of unattainability of absolute zero.

third-order reaction A chemical reaction in which the velocity is proportional to the product of three concentration terms involving one, two, or three different reactants.

thirty-seven percent survival dose The dose of radiation that results in 37% survival of the irradiated units. The 37% survival value corresponds to an average of one lethal hit per sensitive target and can be used for calculations of target molecular weights. The number 37 is based on exponential inactivation kinetics, since $e^{-1} = 0.37$.

thixotropy The property of some gels of undergoing a reversible, isothermal, gel-sol transformation upon agitation; the solid gel becomes a liquid sol as a result of the agitation.

ThPP Thiamine pyrophosphate.

Thr 1. Threonine. 2. Threonyl.

three-carbon plants *See* C₃ plants.

three-factor cross A series of genetic crosses, involving three nonallelic linked genes, that is used primarily for purposes of chromosomal mapping.

three-point attachment POLYAFFINITY THEORY.

three-point cross THREE-FACTOR CROSS.

three-point landing POLYAFFINITY THEORY.

threo configuration The configuration of a compound in which two asymmetric carbon atoms have identical substituents on opposite sides, as in the configuration of threose.

threonine An aliphatic, polar alpha amino acid that contains an alcoholic hydroxyl group. *Abbr* Thr;T.

threonine dehydratase An enzyme that catalyzes the deamination of threonine to α -ketobutyric acid; an inducible enzyme in the liver of higher organisms. *Aka* threonine dehydrase; threonine deaminase.

threshold 1. A measure of the ability of the kidney to absorb a substance from the blood. *See also* threshold of appearance; threshold of retention. 2. A measure of the sensitivity of the eye to light. *See also* cone threshold; rod threshold; visual threshold.

threshold dose The smallest dose of a radiation above which the radiation produces a detectable effect.

threshold limit value The airborne concentration of a chemical to which humans may be exposed day after day in their working environment without suffering adverse effects. *Abbr* TLV.

threshold of appearance The plasma concentration of a substance above which the substance cannot be fully absorbed by the kidney and appears in the urine. *Aka* threshold of excretion.

threshold of retention The plasma concentration of a substance when it is identical to the concentration of the substance in the urine; at higher plasma concentration values the urine will be more concentrated in the substance than the plasma, whereas at lower plasma concentration values the plasma will be more concentrated in the substance than the urine.

threshold potential That portion of the characteristic curve of a Geiger-Mueller counter that follows the starting potential and at which the curve begins to level off to a plateau.

threshold substance A substance that appears in the urine in substantial amounts only when its concentration in the plasma exceeds a certain value.

thrombin The proteolytic enzyme that functions in blood clotting by catalyzing the hydrolytic cleavage of fibrinopeptides A and B from fibrinogen, thereby converting fibrinogen to fibrin.

thrombocyte PLATELET.

thrombogen PROTHROMBIN.

thrombokinas THROMBOPLASTIN.

thromboplastin An accessory lipoprotein factor that is released from blood platelets in injured tissue and that is involved in initiating the sequence of reactions leading to the formation of a blood clot in the extrinsic pathway of blood clotting. *Aka* tissue thromboplastin.

thromboplastinogen ANTIHEMOPHILIC FACTOR.

thrombosis The occlusion of a blood vessel by formation of a blood clot (thrombus).

thrombosthenin A contractile protein in blood platelets that is similar to G-actin.

thromboxanes A group of substances, derived from arachidonic acid, that differ from prostaglandins in their ring structure; thromboxanes contain a 6-membered, cyclic ether (oxane ring). Thromboxanes were first isolated from thrombocytes (blood platelets) and stimulate platelet aggregation and smooth muscle contraction. These effects are opposite those produced by prostacyclin. *Abbr* TX.

thrombus (*pl* thrombi) A blood clot formed on site within a blood vessel or within the heart. *See also* embolus.

Thunberg technique A technique for the estimation of dehydrogenase activity by a photometric measurement of the reduction of methylene blue.

Thunberg tube A tube, used in the Thunberg technique, that can be evacuated and that has a side arm for the addition of reagents.

Thx Thyroxine.

Thy Thymine.

Thy-1-antigen A cell membrane antigen of thymus lymphocytes that can be used to distinguish them from other lymphocytes.

thylakentrin FOLLICLE-STIMULATING HORMONE.

thylakoid disk One of a large number of flattened vesicles that contain the photosynthetic pigments and the electron carriers of chloroplasts and that are stacked to form the grana of the chloroplasts.

thymectomy The surgical removal of the thymus.

thymic Of, or pertaining to, the thymus.

thymic humoral factor A heat-labile polypeptide from the thymus that may be a hormone; it restores several T-cell immunological responses in *in vivo* and *in vitro* assays. *Abbr* THF.

thymidine The deoxyribonucleoside of thymine. Thymidine mono-, di-, and triphosphate are abbreviated, respectively, as dTMP, dTDP, and dTTP. The abbreviations refer to the 5'-nucleoside phosphates unless otherwise indicated. *Abbr* Thd;T.

thymidine factor SOMATOMEDIN.

thymidine kinase The enzyme that catalyzes the phosphorylation of thymidine to thymi-

- dine monophosphate and that is believed to play a major role in the control of DNA synthesis. The level of the enzyme increases markedly during infection with certain viruses.
- thymidylate kinase** The enzyme that catalyzes the phosphorylation of thymidine monophosphate to thymidine diphosphate and the phosphorylation of thymidine diphosphate to thymidine triphosphate.
- thymidylate synthetase** The enzyme that catalyzes the methylation of deoxyuridine-5'-monophosphate (dUMP) to thymidine-5'-monophosphate (dTMP). *Aka* thymidylate synthase.
- thymidylic acid** The deoxyribonucleotide of thymine.
- thymine** THYMOSIN.
- thymine** The pyrimidine, 5-methyl-2,3-dioxy-pyrimidine, that occurs in DNA. *Abbr* T;Thy.
- thymine dimer** A pyrimidine dimer, produced by ultraviolet irradiation of DNA, in which two adjacent thymines in a DNA strand form a dimer and block the replication of the DNA at that point.
- thymineless death** The death of bacteria that results from a lack of thymine; the absence of thymine leads to breaks in single strands of DNA and thereby blocks the synthesis of DNA. Thymineless death can be produced by depriving a thymine auxotroph of thymine or by exposing a bacterial culture to 5-fluorouracil which prevents the synthesis of deoxythymidylic acid. *Abbr* TLD.
- thymineless mutant** *See* -less mutant.
- thymine starvation** *See* starvation (2).
- thymocyte** A lymphocyte that occurs within the thymus gland.
- thymol** A bactericidal compound; 5-methyl-2-isopropylphenol.
- thymol turbidity test** A liver function test that is based on the production of turbidity when serum from individuals with one of several forms of hepatitis is treated with a barbiturate buffer that contains thymol.
- thymonucleic acid** Obsolete term for DNA.
- thymopoietin** 1. A polypeptide of 49 amino acids that is a component of thymosin 2. THYMOSIN.
- thymosin** A heterogeneous group of mitogenic polypeptides that stimulate the growth and proliferation of T lymphocytes. *Aka* thymine; thymopoietin.
- thymus** A gland, located in the lower part of the neck, that produces lymphocytes; the thymus is large in young animals but atrophies after the animals attains sexual maturity.
- thymus nucleic acid** An early designation for DNA.
- thyrocalcitonin** That fraction of the hormone calcitonin that is secreted by the thyroid gland. *Abbr* TCT.
- thyroglobulin** A large, iodinated, glycoprotein that represents the form in which iodine is stored in the thyroid colloid and from which thyroxine and triiodothyronine are formed by proteolysis.
- thyroid colloid** The gelatinous material in the follicles of the thyroid gland in which the iodine is stored, principally in the form of thyroglobulin.
- thyroid crisis** THYROID STORM.
- thyroidectomy** The surgical removal of the thyroid gland.
- thyroid gland** An endocrine gland, located in the neck, that produces the hormones thyroxine and triiodothyronine.
- thyroid hormones** The hormones thyroxine and triiodothyronine.
- thyroid hyperfunction** HYPERTHYROIDISM.
- thyroid hypofunction** HYPOTHYROIDISM.
- thyroid-stimulating hormone** THYROTROPIN.
- thyroid-stimulating hormone releasing hormone** THYROTROPIN RELEASING HORMONE.
- thyroid storm** A severe clinical state due to overactivity of the thyroid gland and excessive secretion of thyroid hormones into the blood stream. A thyroid storm may occur spontaneously or be precipitated by infection or stress; it is characterized by high fever, rapid pulse, and acute respiratory distress. *Aka* thyroid crisis.
- thyroliberin** THYROTROPIN RELEASING HORMONE.
- thyrototoxic effect** A toxic condition produced by certain forms of excessive activity of the thyroid gland or by excessive doses of thyroid hormones.
- thyrotoxicosis** GRAVE'S DISEASE.
- thyrotrophic hormone** THYROTROPIN.
- thyrotropic hormone** THYROTROPIN.
- thyrotropic hormone releasing factor** THYROTROPIN RELEASING HORMONE.
- thyrotropic hormone releasing hormone** THYROTROPIN RELEASING HORMONE.
- thyrotropin** A protein hormone, secreted by the anterior lobe of the pituitary gland, that stimulates the synthesis of thyroid hormones and the release of thyroxine by the thyroid gland. *Var sp* thyrotrophin.
- thyrotropin releasing hormone** A hypothalamic hormone that controls the secretion of thyrotropin from the pituitary gland. *Var sp* thyrotrophin releasing hormone. *Abbr* TRH. *Aka* thyrotropin releasing factor (TRF).
- thyroxine** An iodinated aromatic amino acid that is the major hormone of the thyroid gland and that controls the rate of oxygen consumption and the overall metabolic rate. It is formed by the coupling of two molecules of 3,5-diiodotyrosine. *Abbr* Thx; T₄.

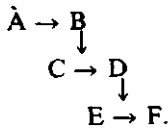
thyroxine-binding globulin A glycoprotein that serves as the major and specific carrier of thyroxine in plasma. It has a molecular weight of 58,000 and has one thyroid hormone binding site (either thyroxine or triiodothyronine will bind). Also known as inter-alpha-globulin because it has an electrophoretic mobility between that of α_1 - and α_2 -globulin. *Abbr* TBG.

thyroxine-binding prealbumin An albumin that serves as a secondary carrier of thyroxine in plasma. A tetramer (MW 55,000) with four binding sites for thyroid hormones (either thyroxine or triiodothyronine will bind). *Abbr* TBPA. *Aka* transthyretin.

TIBC Total iron-binding capacity.

tidal air The volume of air that enters and leaves the body with each normal respiratory movement.

tiered metabolic pathway A metabolic pathway of the type



tight coupling The state of cellular respiration in which the mitochondria are characterized by having a high acceptor control ratio.

tight junction A cell junction in which the interacting plasma membranes of two cells are so close together that there is no intercellular space between them; an impermeable junction that seals the space between cells. *See also* cell junction.

tilde SQUIGGLE.

tilt angle The angle between the perpendicular to the axis of a helical nucleic acid and the plane of an individual base.

time average The average value of a quantity that is measured over a number of time intervals; used for quantities that vary as a function of time, such as atmospheric temperature, blood flow, and caloric intake.

time constant RELAXATION TIME.

time constant of a reaction A measure of the duration of a reaction; for an exponential decay, the time constant is the time required for 63% (the fraction $1 - 1/e$) of the total change to occur.

time factor effect The effect of exposure time on the results produced by irradiation when reciprocity does not hold, so that the product of dose rate and exposure time is not constant; under these conditions, a short-time irradiation at a high intensity is frequently more effective than a long-time irradiation at a low intensity.

time-lapse microcinematography *See* microcinematography.

time-lapse photography A photographic technique in which exposures are taken on a photographic film at selected time intervals and the film is then projected at a faster speed so that the actions shown are speeded up.

time-of-flight mass spectrometer A mass spectrometer in which one measures the time required by an ion to travel from the ion source to the detector. All the ions receive the same kinetic energy during acceleration but since they have different masses, they separate into groups according to velocity and, hence, mass. *Abbr* TOF-MS.

times gravity convention *See* relative centrifugal force.

tin An element that is essential for humans and animals. Symbol, Sn; atomic number, 50; atomic weight, 118.69; oxidation states, +2, +4; most abundant isotope, ^{120}Sn ; a radioactive isotope, ^{119}Sn , half-life, 250 days, radiation emitted, gamma rays.

tincture An alcoholic solution of a chemical or a drug.

TIP 1. Thermal inactivation point. 2. Translation inhibitory protein.

Ti plasmid *See* crown gall tumor.

Tiselius apparatus An apparatus that can be used for either diffusion or electrophoresis measurements; consists of a three-piece U tube that allows the formation of sharp boundaries between solvent and solution. The spreading of these boundaries, or their movement under the influence of an electric field, is then analyzed by means of either a schlieren or an interferometric optical system.

tissue An aggregate of cells and intercellular material that form a definite structure; the cells are generally of similar structure and function.

tissue culture The maintenance of living and metabolizing cells, tissues, or organs in artificial media.

tissue culture infectious dose MEDIAN TISSUE CULTURE DOSE.

tissue factor 1. THROMBOPLASTIN. 2. AUTACOID.

tissue hormones Hormones produced by individual specialized cells, scattered throughout a tissue that is specialized for some other function.

tissue mince Tissue that is cut or chopped into small pieces.

tissue plasminogen activator A protease that converts plasminogen to plasmin and thereby causes blood clots to dissolve. Both the enzyme and plasminogen bind to fibrin in close proximity, but the enzyme has low affinity for plasminogen and great affinity for fibrin. As a result, the enzyme promotes fibrinolysis at the site of a blood clot while having little effect on circulating plasminogen or fibrinogen. *Abbr*

TPA. *Aka* tissue-type plasminogen activator.

tissue polypeptide antigen A polypeptide in human blood; there appears to be a significant correlation between the presence of this substance and the incidence of cancer. *Abbr* TPA.

tissue slice A thin slice of tissue that can carry out metabolic reactions and that freely exchanges gases and metabolites with the suspending medium. The metabolic reactions in such a slice are frequently studied in a Warburg apparatus and monitored by manometric techniques.

tissue-specific enzyme An enzyme that is present in appreciable concentrations in only one tissue or in one organ; the plasma concentration of such an enzyme is of clinical value in assessing the functional state of that tissue or of that organ.

tissue thromboplastin THROMBOPLASTIN.

titer 1. The amount of a standard solution that is required for a defined titration of a given volume of a second solution. 2. The greatest dilution of a sample solution that gives a positive test under defined conditions; the greatest dilution of a virus sample that gives a positive hemagglutination test, and the greatest dilution of an antiserum that gives a positive precipitin test are two examples. *See also* plaque titer.

titin One of three unusually large myofibrillar proteins (MW 1 to 5×10^6) that occur in several vertebrate and invertebrate striated muscles. Titins are found in M lines, Z lines, and at the junctions of A and I bands. They may help to keep the myosin thick filaments centered within the sarcomere during force generation.

titrant The solution that is added to a given volume of a second solution in the course of a titration.

titratable Capable of being titrated. *Aka* titrable.

titratable acidity A measure of the acidity of urine, particularly that due to $H_2PO_4^-$, expressed in terms of the number milliliters of 0.1 N sodium hydroxide required to neutralize a 24-h volume of urine.

titrate To carry out a titration.

titration A method of volumetric analysis in which a test solution is added from a buret to a known volume of a standard solution, or a standard solution is added from a buret to a known volume of a test solution.

titration curve A plot of the amount of acid or base added during a titration as a function of the pH of the solution.

titration equivalent weight The average molecular weight of a fatty acid in a mixture of fatty acids; equal to the number of milli-

grams of fatty acids in the sample, divided by the number of milliequivalents of alkali used in the titration of the sample to a phenolphthalein end point.

titrimetry Chemical analysis by means of titration.

TLC Thin-layer chromatography.

TLD Thymineless death.

TLE Thin-layer electrophoresis.

t-like RNA 5S RNA.

TLV Threshold limit value.

T lymphocyte T CELL.

T_m 1. Melting out temperature. 2. Transport maximum.

TMG Thiomethyl- β -D-galactopyranoside; a nonmetabolizable analogue of lactose that has been used in studies of the lactose transport system in *E. coli*. A gratuitous inducer of β -galactosidase. *Aka* thiomethylgalactoside.

TMP 1. Ribosylthymine monophosphate (ribothymidylic acid). 2. Ribosyl-5'-monophosphate (5'-ribothymidylic acid).

TMS Tetramethylsilane; *see* chemical shift.

TMV Tobacco mosaic virus.

Tn Transposon.

TN Troponin.

TNBS 2,4,6-Trinitrobenzene sulfonic acid; used to examine the orientation of some phospholipids in biological membranes.

TNF Tumor necrosis factor.

Tn3 transposon A large transposon that contains several genes. It differs from a composite transposon in that it is not flanked by insertion sequences.

TNV Tobacco necrosis virus.

tobacco alkaloids NICOTIANA ALKALOIDS.

tobacco mosaic virus A helical plant virus that contains single-stranded RNA and infects tobacco leaves. *Abbr* TMV.

tobacco necrosis virus A spherical plant virus that contains single-stranded RNA and infects seed plants. *Abbr* TNV.

tocol The parent substance of the tocopherols. Tocol is the trivial name for 2-methyl-2(4',8',12'-trimethyl-tridecyl) chroman-6-ol.

tocopherol A generic descriptor for all mono-, di-, and trimethyl tocols. Tocopherol is not synonymous with vitamin E.

T-odd phage A phage that infects the bacterium *E. coli*. A T-odd phage is smaller than a T-even phage and contains DNA that has the same base composition as that of the host cell.

Toepfer's reagent An alcoholic solution of *p*-dimethylaminobenzene that is used in testing for free hydrochloric acid in gastric juice.

TOF-MS Time-of-flight mass spectrometer.

togavirus ARBOVIRUS.

tolerance 1. IMMUNOLOGICAL TOLERANCE. 2. The decrease in, or the loss of, the response of an animal to a dose of a chemical to which it

responded on a prior occasion. 3. The limit of error permitted in the graduation of measuring instruments, standardized products, or analytical evaluations. 4. DESENSITIZATION (3).

tolerance test See epinephrine tolerance test; galactose tolerance test; glucose tolerance test; lactose tolerance test.

tolerogenic antigen An antigen that produces immunological tolerance. *Aka* tolerogen.

Tol G protein A protein in the outer membrane of gram-negative bacteria that appears to function in F-pilus-mediated conjugation and to serve as a receptor for certain phages.

Tollen's reagent A dilute solution of silver oxide (Ag_2O) in ammonia.

Tollen's test A test for reducing sugars that is based on the reduction of silver ions to metallic silver in an alkaline solution.

toluozized cells Bacterial cells that have been treated with toluence to increase their permeability or promote lysis.

tomato bushy stunt virus A plant virus that contains single-stranded RNA.

tomography An x-ray technique that provides a picture of a given plane in a specimen; used medically to scan a planar section of a patient. The measurements are then analyzed mathematically to create a cross-sectional map representing a reconstructed image of bone and tissue structure. *See also* PETT.

tonofilaments KERATIN FILAMENTS.

tonometry The measurement of tension or pressure such as the measurement of blood pressure or the measurement of the partial pressure of CO_2 , in equilibrium with the blood.

tonoplast The membrane surrounding an intracellular vacuole. *Aka* vacuolar membrane.

tophus (*pl* tophi). A deposit of sodium urate in cartilage that occurs in gout.

topography The description and the mapping of the features of a surface; the delineation of the configurations and the structural relationships of a surface.

topoisomer A topological isomer.

topoisomerase One of a group of enzymes that control the topological state of DNA and catalyze the interconversion of topological isomers of DNA. These reactions include changes in superhelicity and the formation of knotted and catenated structures. All topological interconversions of DNA require the transient breakage and rejoining of DNA strands. Accordingly, topoisomerases are divided into two groups: Type I enzymes produce a transient break in a single strand of the duplex, while Type II enzymes produce a transient double-strand break in the duplex. Some of the Type I enzymes (originally named DNA relaxing enzymes, swivelases,

untwisting enzymes, untwistases, or nicking-closing enzymes) carry out the relaxation of superhelical DNA. The Type II enzymes include the DNA gyrases, enzymes that convert relaxed, closed circular DNA to a superhelical form.

topological isomers Isomers that differ in their topological structure; duplex DNA molecules that are relaxed, have positive superhelicity, or have negative superhelicity, are some examples. *Aka* topoisomer.

topology 1. The study of the properties of geometric shapes and figures that are subjected to deformations and transformations such as those produced by twisting or bending. *See also* topoisomerase. 2. A branch of mathematics that deals with those properties of shapes and figures that remain unchanged if the shape or the figure is subjected to one-to-one continuous transformations.

torand One of a group of synthetic macrocyclic compounds, so called because of their toroidal shape. They are rigid, doughnut-shaped, and appear to have useful metal-binding properties; they are unsaturated analogues of 18-crown-6-ethers.

toroidal supercoil One of a class of possible superhelical structures for circular double-stranded DNA. A toroid is a surface generated by a plane closed curve, rotated about a line in its plane that does not intersect the curve. A supercoiled duplex in which the axis is wound as if about a cylinder.

Torr A unit of pressure equal to 1/760 atm; a pressure of 1 mm mercury.

torsional strain A strain in a molecule, believed to be due to the slight repulsion between electron clouds in the C—H bonds as they pass each other in close proximity when the molecule is in the eclipsed conformation. *Aka* eclipsing strain.

torsion angle A rotation angle that can be defined as the angle between the plane containing atoms A, B, and C and the plane containing atoms B, C, and D for a system that consists of four atoms linked in the sequence A-B-C-D. The torsion angle can also be described as the angle between the projection of A-B and that of C-D when the system of four atoms is projected onto a plane normal to the bond B-C. *See also* phi angle; psi angle; omega angle.

Tos Tosyl group.

tosyl group The *p*-toluenesulfonyl grouping; a compound containing this group is known as a tosylate. The tosyl group is used as a protecting agent for blocking the amino group in peptide synthesis.

total activity The total number of activity units in a sample, such as the total number of en-

zyme units or the total number of microcuries.

total cell count The total number of bacteria, both viable and nonviable, in a sample.

total consumption burner A burner used in atomic absorption spectrophotometry and designed so that the gases and the sample are not mixed before entering the flame.

total inhibition The inhibition of the activity of an enzyme in which a saturating concentration of inhibitor can cause the reaction velocity to become zero.

total iron-binding capacity The concentration of iron that is equal to the sum of the actual iron concentration in plasma and the unsaturated iron-binding capacity; generally expressed in terms of micrograms per 100 mL of plasma. *Abbr* TIBC.

totally labeled GENERALLY LABELED.

total osmotic pressure The osmotic pressure produced when a membrane separating two solutions is impermeable to all solutes regardless of their size.

total titer The titer of phage particles that is obtained after disruption of the infected cells and that is a measure of the maturation of phage particles in the host cells. *See also* extracellular titer; intracellular titer.

totipotency The capacity of a cell to express all of its genetic information under appropriate conditions and to develop into a complete and fully differentiated organism. *Var sp* totipotency.

Townsend avalanche The flood of ions produced by gas amplification in an ionization chamber.

toalbumin One of a group of proteins that are toxic to plants; a phytotoxin. Ricin and abrin are two examples.

toxemia A pathological condition characterized by the presence of toxins in the blood.

toxic 1. Of, or pertaining to, a poison. 2. Poisonous.

toxic goiter 1. A thyroid enlargement accompanied by hyperthyroidism. 2. GRAVE'S DISEASE.

toxicity The degree of harmfulness of a substance for an organism; the capacity of a substance to produce injury.

toxicity index The ratio of the highest dilution of a germicide that kills the cells of chick heart tissue in 10 min to the highest dilution of the germicide that kills the test microbial organisms in the same time and under the same conditions.

toxicology The science that deals with the harmful effects of chemicals on biological systems.

toxicosis A pathological condition caused by the action of a poison or a toxin; systemic poisoning; toxemia. *See also* thyrotoxicosis.

toxigenicity The production of a toxin, particularly the production of a toxin by bacteria. *Aka* toxicogenicity.

toxin A high molecular weight compound of plant, animal, or bacterial origin that is toxic and generally antigenic in animal species.

toxohormone A toxic substance that inhibits the activity of the enzyme catalase; apparently a polypeptide that can be extracted from cancer cells and that may also occur in normal cells.

toxoid A toxin that has lost its toxic properties as a result of denaturation or chemical modification but that has retained its antigenic properties.

toxophore The group of atoms in a toxin molecule that is responsible for the toxic properties of the molecule.

TP 1. Transport piece. 2. Transprotonase.

TPA 1. Tissue plasminogen activator. 2. Tissue polypeptide antigen. 3. *See* phorbol esters.

TPCK *N*-Tosyl-L-phenylalanine chloromethylketone; an irreversible inhibitor of chymotrypsin that acts by alkylating a histidine residue in the enzyme.

T phage *See* T-even phage; T-odd phage.

TPN⁺ Triphosphopyridine nucleotide. *Aka* NADP⁺.

TPNH Reduced triphosphopyridine nucleotide. *Aka* NADPH.

TPP Thiamine pyrophosphate.

trabecular bone *See* lamellar bone.

trace element An element, such as cobalt, copper, manganese, or zinc, that is an essential nutrient for an organism but that is required only in minute amounts of the order of milligrams or micrograms per day for humans and animals. *See also* bulk elements; macronutrients; micronutrients.

tracer 1. An isotope, either radioactive or stable, that is used to label a compound. 2. A compound labeled with either a radioactive or a stable isotope.

tracking dye A dye used as a marker in gel electrophoresis.

track radioautography The radioautography of beta particle tracks that are produced by decaying radiophosphorus atoms incorporated into nucleic acids. *See also* radiophosphorus decay; star gazing.

trailer A nontranslated sequence of nucleotides, excluding the poly(A) tail, that occurs after the termination signal at the 3'-end of mRNA. *Aka* trailer sequence.

trailing The chromatographic and electrophoretic phenomenon in which the material that is separated not only appears in peaks, spots, or bands, but also appears along part of, or the entire, migration path. *See also* tailing; leading.

trans 1. Referring to the configuration of a geometrical isomer in which two groups, attached to two carbon atoms linked by a double bond, lie on opposite sides with respect to the plane of the double bond. 2. Referring to two mutations, particularly those of pseudoalleles, that lie on different chromosomes.

transacetylase ACETYLTRANSFERASE.

trans-acting locus A region on a DNA molecule that affects the activity of genes that are located on a different molecule. *See also* cis-acting locus.

transacylase An enzyme that catalyzes the transfer of an acyl group from one compound to another.

transaldolase An enzyme that catalyzes the transfer of a dihydroxyacetone group from a 2-ketosugar to carbon number one of various aldoses.

transamidation The reaction in which the amide nitrogen of glutamine is transferred as an amino group to another compound.

transamidinase AMIDINOTRANSFERASE.

transamidination The reaction in which the guanido group of arginine is transferred to glycine, thereby forming guanidinoacetic acid.

transaminase An enzyme that catalyzes the transfer of an amino group from an amino acid to a ketoacid, thereby giving rise to the opposite pair of ketoacid and amino acid. Transaminases require a derivative of vitamin B₆ as coenzyme.

transaminase-type mechanism *See* ping-pong mechanism.

transamination The reaction catalyzed by the enzyme transaminase.

transcapsidation The formation of a hybrid virus during phenotypic mixing; the genome of one virus ends up being contained within the capsid of another virus.

transcarboxylase *See* acetyl-CoA carboxylase.

transcarboxylation A reaction in which a carboxyl group is transferred from one compound to another; the reaction is catalyzed by a biotin-requiring enzyme.

transcellular transport The transport across a cell or a layer of cells that moves material both into and out of a cell; the transport across the kidney tubules and the transport across the gastric mucosa are two examples. *See also* intracellular transport; homocellular transport.

transcortin An α_1 -globulin that binds and transports both cortisol and corticosterone in the blood.

transcribed spacer A segment of RNA that occurs in the primary RNA transcript (as that of rRNA) but is subsequently removed during post-transcriptional processing when a

secondary, smaller, but functional RNA transcript is formed from the original transcript.

transcript A transcribed sequence; a nucleic acid molecule formed during transcription.

transcriptase DNA-DEPENDENT RNA POLYMERASE.

transcription The process whereby the genetic information of DNA is copied in the form of RNA; a sequence of deoxyribonucleotides in a strand of DNA gives rise to a complementary sequence of ribonucleotides in a strand of RNA. *See also* reverse transcription.

transcriptional control The regulation of protein synthesis at the level of transcription. *See* operon hypothesis.

transcription enhancer *See* enhancer.

transcription initiation frequency *See* promoter strength.

transcription unit A stretch of DNA that is transcribed as a single, continuous mRNA strand by RNA polymerase; includes the signals for initiation and termination of this transcription. A simple transcription unit is one that carries information for the synthesis of only one protein; a complex transcription unit carries information for the synthesis of more than one protein molecule. *Aka* operon.

transdeamination The deamination of amino acids that involves the coupling of a transamination reaction and the reversal of an ammonia fixing reaction. In the former, the amino acid is deaminated to a ketoacid and glutamate is formed from α -ketoglutarate. In the second reaction, glutamate is converted to α -ketoglutarate and NH₃ is released.

transdetermination A switch from one heritable state to another; a change in developmental fate. The differentiation of a group of cells in tissue culture into structures that are inappropriate with respect to the cells from which the culture was derived, is an example.

transdimer synthesis The synthesis of DNA that occurs across a thymine dimer block despite the distortion of the helix caused by the dimer. The process forms the basis of the SOS repair.

transduce 1. To transfer genetic material from one bacterium to another by transduction. 2. To transform one form of energy into another.

transduced element The chromosomal fragment that is transferred from one bacterium to another during transduction.

transducer A device that transforms one form of energy into another; a photocell that converts light energy into electrical energy is an example.

transducer cell One of a number of neurosecretory cells in the hypothalamus that are stimulated by the central nervous system to

secrete the hypothalamic releasing hormones which act on the adenohypophysis.

transducin A GTP-binding protein (G protein) that has a key role in the visual excitation process; it mediates the light activation signal from photolyzed rhodopsin to cGMP phosphodiesterase. *See also* G protein.

transducing particle A phage particle containing host (bacterial) DNA.

transducing phage A phage that brings about transduction.

transducant A bacterial cell that has received DNA by transduction.

transduction 1. The genetic recombination in bacteria in which DNA from a donor cell is transferred to a recipient cell by means of a phage. A segment of the donor DNA is first incorporated into the phage DNA and is then incorporated, by recombination, into the recipient DNA. 2. The transformation of one form of energy to another. The stimulation of a flow of matter by a gradient in electrical potential (electrophoresis) and the production of ATP through dissipation of a proton gradient (oxidative phosphorylation) are two examples.

trans effect The influence of one gene on the expression of another gene that is located on a different chromosome.

transeliminase PECTATE LYASE.

transesterification INTERESTERIFICATION.

transfection 1. The transformation of competent bacterial cells by infection with naked phage DNA to produce infectious phage particles. Involves the viral DNA alone, without the protein capsid, and the bacterial cells must first be rendered sufficiently permeable to the DNA (that is, one uses protoplasts or spheroplasts). 2. The introduction of foreign DNA into eukaryotic cells in tissue culture; this can be viral DNA or some other type of DNA.

transfectoma a transfected cell; a cell altered by transfection.

transfer BLOTTING.

transferase 1. An enzyme that catalyzes a reaction in which there is a transfer of a functional group from one substrate to another. *See also* enzyme classification. 2. ELONGATION FACTOR.

transferase I ELONGATION FACTOR T.

transferase II TRANSLOCASE (2).

transfer factor 1. ELONGATION FACTOR. 2. A factor that can be extracted from lymphocytes and that can be used to transfer delayed hypersensitivity in humans. *Abbr* TF.

Transfer origin A unique base sequence in plasmid DNA at which a nick is made during transfer of the plasmid DNA to the recipient bacterium during conjugation. *See also* relaxation complex.

transfer pipet VOLUMETRIC PIPET.

transfer potential *See* group transfer potential.

transfer rate coefficient The permeability coefficient divided by the volume from which diffusion takes place.

transferred DNA *See* crown gall tumor.

transferred immunity *See* adoptive immunity.

transferred tolerance *See* adoptive tolerance.

transferrin *See* siderophilin.

transfer RNA A low molecular weight RNA molecule, containing about 70 to 80 nucleotides, that binds an amino acid and transfers it to the ribosomes for incorporation into a polypeptide chain during translation. Transfer RNA has a sedimentation coefficient of about 4S, is characterized by having a high content of minor bases, and binds to the codon in messenger RNA by way of a complementary anticodon that is present in the transfer RNA. The secondary structure of transfer RNA consists of a clover leaf configuration, with the chain folded back upon itself and held together by means of hydrogen bonding. The clover leaf is folded once more to yield an L-shaped tertiary structure in which portions of the RNA strand are held together by means of tertiary hydrogen bonding. *Abbr* tRNA. *See also* L-type structure.

transfer RNA multiplicity The occurrence of two or more forms of the same transfer RNA molecule, all of which can be charged with the same amino acid.

transformant A bacterial cell that has undergone transformation.

transformasome An extension of the membrane on the surface of transformation-competent bacteria (such as *Hemophilus influenzae*) that is responsible for DNA binding and uptake during transformation.

transformation 1. The genetic recombination in bacteria in which a DNA fragment of a purified DNA preparation is incorporated into the chromosome of a recipient bacterial cell. 2. The change of a normal cell to a malignant one, as that resulting from infection of normal cells by oncogenic viruses. 3. The morphological and other changes that occur in both B and T lymphocytes upon exposure to an antigen. *Aka* blast transformation. 4. The mathematical change of a variable to simplify calculations or for some other purpose.

transforming growth factor One of two polypeptides that alter the phenotype of some normal cells to that of transformed cells; the peptides also promote angiogenesis. *Abbr* TGF.

transforming principle The purified DNA that is incorporated into the recipient bacterial cell during transformation; first described for the transformation of *Pneumococcus*. *Aka* trans-

forming factor.

transgenic Descriptive of an organism that contains some genetic material that has been experimentally transferred into it from some other source.

transgenome A genome that contains some genes that have been experimentally transferred into it from some other source.

transgenesis The overall phenomenon of the transfer of bacterial genes to plants and their subsequent expression within the plant cells; includes gene transfer, gene maintenance, transcription, translation, and metabolic function.

transglycosidation The reaction catalyzed by a glycosyl transferase.

trans-Golgi network See GERL.

trans-Golgi reticulum See GERL.

transhydrogenase The mitochondrial enzyme that catalyzes the interconversion of NAD^+ and NADPH to NADH and NADP^+ . *Abbr* TH. See also supermolecule.

transhydrogenation The reaction $\text{NAD}^+ + \text{NADPH} \rightleftharpoons \text{NADH} + \text{NADP}^+$ that is catalyzed by a transhydrogenase and that occurs in mitochondria.

transient Temporary; transitory; short-lived.

transient dipole-induced dipole interactions DISPERSION FORCES.

transient equilibrium The equilibrium that is established for a radioactive decay reaction if the half-life of the parent isotope is not much greater than that of the daughter isotope.

transient phase A temporary phase in enzyme reactions which precedes the steady-state phase. See also pre-steady-state kinetics.

transient state isoelectric focusing A variation of isoelectric focusing that entails a study of the kinetic behavior of the charged amphoteric molecules during their transport by the electric field; achieved by repetitive optical scanning (absorbance, fluorescence, refraction, etc.) of the concentration distribution of the migrating solutes, followed by computer analysis of the peaks. The method can be used for an isoelectric focusing experiments using either a gel or a density gradient as the supporting medium. *Abbr* TRANS-IF.

transient state kinetics PRE-STEADY-STATE KINETICS.

transient time The time required to reach equilibrium in a sedimentation equilibrium experiment.

TRANS-IF Transient state isoelectric focusing.

transinhibition See transstimulation.

transinteractions Noncovalent interactions between segments, located on different polypeptide chains of the immunoglobulin molecule.

trans isomer See trans (1).

transition 1. A point mutation in either DNA

or RNA in which there is a replacement of one purine by another or a replacement of one pyrimidine by another. In double-stranded nucleic acids, a complementary base is then inserted into the second strand so that a new base pair is produced. 2. A change from one state to another, such as a change in the electronic configuration of an atom or a molecule upon excitation, or a change in the conformation of a macromolecule upon denaturation. See also electronic transition, rotational transition, vibrational transition.

transitional mutant A mutant that differs from the wild-type organism by a transition.

transition dipole moment The dipole moment induced in a molecule as a result of the displacement of charge during the absorption of a photon by the molecule.

transition element One of a group of metal elements, including iron and cobalt, in which filling of the outermost shell to 8 electrons within a period is interrupted to bring the penultimate shell from 8 to either 18 or 32 electrons. These elements can use outermost, as well as penultimate, shell orbitals for bonding, and they form chelates of importance in biochemistry. *Aka* transition metal.

transition moment See magnetic transition moment; transition dipole moment.

transition probability The probability that a molecule will undergo a transition from one energy state to another if it is supplied with the energy required for this transition.

transition state ACTIVATED COMPLEX.

transition state inhibitor A compound that is structurally similar to the transition state and that acts as an inhibitor by binding to the surface of an enzyme in place of the substrate.

transition state theory THEORY OF ABSOLUTE REACTION RATES.

transition temperature MELTING OUT TEMPERATURE.

transitory complex An intermediate in an enzyme-catalyzed reaction that can undergo a unimolecular reaction with the release of a substrate or a product, or that is capable of isomerizing into such an intermediate. See also central complex.

transketolase An enzyme that catalyzes the transfer of a glycolaldehyde group from a 2-ketosugar to carbon number one of various aldoses.

translation 1. The process whereby the genetic information of messenger RNA is used to specify and direct the synthesis of a polypeptide chain on a ribosome; the sequence of codons in messenger RNA gives rise to a sequence of amino acids in a polypeptide chain. Synthesis of the polypeptide chain includes chain initiation, chain elongation, and chain termination.

2. A motion along a line without rotation.

translational amplification A mechanism for the production of large amounts of a specific protein by prolongation of the lifetime of the corresponding mRNA.

translational control The regulation of protein synthesis at the level of translation. The regulation of the expression of a gene that is achieved by a control of the rate at which the mRNA, specified by that gene, is being translated.

translational coupling The regulation of the translation of a distal gene in a polycistronic mRNA by a proximal gene. This occurs when the termination codon of the proximal gene overlaps the initiator region of the distal gene and forms a stem-and-loop structure with it. As a result, translation of the distal gene depends on completion of translation of the proximal gene and the opening up of the stem-and-loop structure.

translational diffusion The macroscopic flow of material from a region of high concentration to a region of lower concentration that results from the random Brownian motion of the molecules.

translational diffusion coefficient A measure of translational diffusion that depends on the size and the shape of the diffusing particle; specifically, $D = RT/Nf$, where D is the translational diffusion coefficient, f is the translational frictional coefficient, N is Avogadro's number, R is the gas constant, and T is the absolute temperature. *Aka* diffusion coefficient. *See also* standard diffusion coefficient.

translational frictional coefficient A measure of the frictional resistance experienced by a particle in solution that is equal to the frictional force divided by the translational velocity of the particle. *Aka* frictional coefficient. *See also* translational diffusion coefficient.

translational symmetry The symmetry of a body that exists when identical structures are produced by moving the body along an axis of symmetry.

translation error model A model for the evolution of the genetic code according to which the code evolved so as to minimize errors during translation.

translation inhibitory protein ANTIVIRAL PROTEIN.

translocase 1. TRANSPORT AGENT. 2. The enzyme that catalyzes the GTP-dependent translocation reaction in protein synthesis in which the peptidyl-tRNA is shifted from the A site to the P site in the ribosome, and in which the mRNA is shifted simultaneously by one codon.

translocation 1. TRANSPORT. 2. The reaction catalyzed by the enzyme translocase. 3. An

interchromosomal aberration in which a chromosome fragment becomes inserted into another, nonhomologous chromosome. 4. The movement of an activated hormone-receptor complex from the cytoplasm to the nucleus. Steroid hormone-receptor complexes redistribute themselves in this fashion, thereby leading to activation or inhibition of the transcription of specific genes. 5. INVERSION(2).

translocation factor TRANSLOCASE.

translocator TRANSPORT AGENT.

translocon A cluster of genes that code for the variable and constant regions of the immunoglobulins.

translucent Descriptive of a substance that permits only a partial passage of the light rays striking it; partially transparent.

transmembrane potential MEMBRANE POTENTIAL.

transmembrane protein A protein that spans the entire width (thickness) of a membrane; it extends from one side of the membrane to the other.

transmethylation The reaction whereby a labile methyl group is transferred from one compound to another.

transmissible plasmid *See* self-transmissible plasmid.

transmission 1. TRANSMITTANCE. 2. NERVE IMPULSE TRANSMISSION.

transmission electron microscope *See* electron microscope.

transmittance The ratio of the intensity of the transmitted light to that of the incident light. *Sym* T.

transmittancy The ratio of the transmittance of the solution to that of the solvent.

transmitter *See* chemical transmitter.

transmutation The transformation of one nuclide into the nuclide of a different element, as that which occurs during radioactive decay.

transparent Descriptive of a substance that permits the passage of light rays striking it and that can be seen through.

transpeptidase PEPTIDYL TRANSFERASE.

transpeptidation The reaction catalyzed by peptidyl transferase; peptide bond formation.

transphoresis ISOTACHOPHORESIS.

transphosphorylation The transfer of a phosphoryl group, a pyrophosphoryl group, or an adenylyl group from one molecule to another.

transpiration The passage of water vapor through the surface of an organism, as the passage through a leaf or the skin.

transplant The part of an animal that is transferred within the same, or to a different, animal by transplantation.

transplantation The transfer of a part of an animal, such as a tissue or an organ, to another site of the same animal or to a site of a different animal.

transplantation antigen HISTOCOMPATIBILITY ANTIGEN.

transplantation immunity The reactions of the immune response that occur in the recipient of a transplant and that are caused by the antigens of the transplant.

transplant rejection The immunological reactions by which the recipient of a transplant brings about the destruction of the cells of the transplant.

transport The movement of material from one place to another, particularly in reference to the movement of material within a biological fluid or across a biological membrane. *See also* active transport; mediated transport, passive transport.

transport agent A substance, generally a protein or an enzyme, that is instrumental in transporting material across a biological membrane or within a biological fluid. A transport agent may act as an actual carrier, affect a translocation, or in some other way affect the transport process. *Aka* transporter; carrier; porter; translocase; permease.

transporter TRANSPORT AGENT.

transport maximum 1. The maximum rate at which the kidney can either absorb or secrete a particular substance. *Sym* T_m . 2. The maximum rate of flux in facilitated diffusion that occurs when all membrane-bound transport sites are occupied by solute.

transport-negative mutant A mutant that has lost the ability to synthesize an enzyme, a group of enzymes, or some other protein that is required for a transport system.

transport piece SECRETORY PIECE.

transport process A physical property that is based on the transport of macromolecules in solution; sedimentation, diffusion, electrophoresis, and viscosity are examples.

transport protein TRANSPORT AGENT.

transport system The various components, including transport agents, that function in a given type of transport.

transposable code An early version of the genetic code according to which the DNA strand that is not transcribed consists either of all nonsense codons, or of codons that code for the same amino acids as those coded for by the complementary codons in the transcribed strand. In this fashion each genetic locus would give rise to only one type of protein, regardless of whether one or both of the DNA strands were being transcribed.

transposable element A mobile genetic segment; a section of DNA that can move from one chromosomal site to another. Transposable elements occur in both prokaryotes and eukaryotes. Prokaryotic transposable elements are usually called transposons. *Aka*

transposable genetic element. *See also* transposition.

transposable genetic element TRANSPOSABLE ELEMENT.

transposase An enzyme required for formation of the cointegrate structure which is believed to be an obligatory intermediate in transposition.

transposition The movement of genetic information from one locus to another; the movement of a mobile genetic element. Transposition occurs in both prokaryotes and eukaryotes. The term is used specifically for DNA-mediated events as opposed to retroposition which refers to RNA-mediated events.

transposon A transposable genetic element in bacteria. Three types have been identified: insertion sequences, composite transposons, and Tn3 transposons. The term is also used as a synonym for any transposable element more complex than an insertion sequence.

transprotonase An enzyme that catalyzes a transprotonation reaction. *Abbr* TP. *See also* supermolecule.

transprotonation The transport of protons across a membrane, as that postulated by the chemiosmotic hypothesis.

transsplicing Intermolecular splicing; the splicing of two exons from two separate precursor molecules.

transstimulation A phenomenon observed with some reversible transport systems, that is, those that can operate in either direction. In these cases, extracellular addition of a given transport substance may increase (transstimulate) or decrease (transinhibit) the movement of the same transport substance from the inside of the cells to the outside.

transsulfuration The biosynthesis of cysteine from serine via a pathway that passes through homocysteine (which can arise from methionine).

transthyretin A protein that binds the retinol-binding protein/vitamin A complex in the plasma and serves to carry vitamin A to the eye. The protein also binds the thyroid hormones (thyroxine and triiodothyronine). *Aka* thyroxine-binding prealbumin.

transtubular network *See* GERL.

transudate The fluid exuded during transudation.

transudation The movement of solvent plus solutes through the pores of a membrane or through the interstices of a tissue.

transverse diffusion The movement of proteins and lipids from one side of a biological membrane to the other; flip-flop.

transverse mutation TRANSVERSION.

transverse relaxation SPIN-SPIN RELAXATION.

transverse system T SYSTEM.

transverse tubule See T system.

transversion A point mutation in either DNA or RNA in which there is a replacement of a purine by a pyrimidine or vice versa. In double-stranded nucleic acids, a complementary base is then inserted into the second strand so that a new base pair is produced.

transversional mutant A mutant that differs from the wild-type organism by a transversion.

Trappe's eluotropic series See eluotropic series.

Traube's covolume See covolume.

Traube's rule The rule that, for a homologous series of surfactants, the concentration of surfactant required to produce an equal lowering of surface tension in a dilute solution decreases by about a factor of three for each additional CH_2 group in the surfactant molecule.

Trautman plot A graphical method for the representation of data obtained by the Archibald method that is particularly useful for the comparison of a number of different experiments.

treadmilling A steady-state phenomenon of microtubules and actin filaments in which the length of the polymeric structure remains constant despite the fact that monomeric molecules constantly add to, and come off from, both ends of the microtubule or the actin filament. In the case of microtubules, tubulin molecules come off predominantly (but not exclusively) at one end, and are added on predominantly (but not exclusively) at the other end. The net rate of addition at one end equals the net rate of loss at the other end, so that the net rate of growth of the polymer is zero. A similar situation exists in the case of actin filaments. For both types of polymers, the process is driven by nucleoside triphosphate hydrolysis; if this were not the case, then treadmilling would represent a type of perpetual motion machine in violation of the second law of thermodynamics.

tree diagram A graphical representation of nuclear magnetic resonance data; shows the individual effects of each coupling constant on the overall nuclear magnetic resonance pattern.

trehalose A nonreducing disaccharide of glucose that occurs in the hemolymph of many insects (hence, also called "blood sugar") and also in bacteria and fungi (hence, also called "mushroom sugar").

TRF Thyrotropin releasing factor; See thyrotropin releasing hormone.

TR factor Transfer RNA releasing factor; an enzyme, postulated to be involved in the re-

lease of tRNA from ribosomes during protein synthesis.

TRH Thyrotropin releasing hormone.

tri- Combining form meaning three or thrice.

triacylglycerol A compound formed by the esterification of one glycerol molecule with three fatty acid molecules. *Aka* triglyceride.

trial and error A method for obtaining a desired result by trying various ways and/or values, noting the errors and causes of failure, and eliminating them in subsequent steps.

triangulation A method for approximating the area under a symmetrical peak by assuming the peak to be an equilateral triangle. The area is then given by the width of the peak, at one-half the maximum height, multiplied by the maximum height.

triangulation number 1. The total number of small equilateral triangles into which the surfaces of an icosadeltahedron have been divided. 2. The number of 60-unit sets in the capsid of icosahedral viruses. Thus, a virus having 240 subunits is said to have a triangulation number of 4.

triantennary See high-mannose oligosaccharides; complex oligosaccharides.

tribasic Descriptive of a compound that contains three hydrogen atoms replaceable by a metal (such as $\text{Na}_2\text{H}_3\text{IO}_6$) or an acid that can furnish three hydrogens ions (such as H_3PO_4).

tribology The science and technology of interacting surfaces in relative motion.

tricarboxylic acid cycle CITRIC ACID CYCLE.

trichloroacetic acid A halogenated derivative of acetic acid, used to precipitate proteins; the compound $\text{Cl}_3\text{C}-\text{COOH}$. *Abbr* TCA.

trichothecenes A family of sesquiterpenoids that constitute a large group of mycotoxins.

tricine *N*-Tris(hydroxymethyl)methylglycine; used for the preparation of biological buffers in the pH range of 7.4 to 8.8 See also biological buffers.

tridentate Describing a ligand that is chelated to a metal ion by means of three donor atoms.

triethylenephosphoramidate See TEPA.

triethylenethiophosphoramidate See thio-TEPA.

trigger protein A hypothetical protein that may have to be accumulated by a cell up to threshold levels before the cell can proceed beyond the restriction point (R point) in the G_1 phase of the cell cycle and thus complete the latter. *Aka* unstable protein (U protein).

trigger reaction A reaction that initiates another reaction or a sequence of reactions.

triglyceride TRIACYLGLYCEROL.

triiodothyronine A minor hormone of the thyroid gland that has the same functions as thyroxine but is present in much smaller amounts. *Sym* T_3 .

triketohydrindene hydrate Ninhydrin. See also

ninhydrin reaction.

trimer An oligomer that consists of three monomers.

trimethylpsoralen A low molecular weight, planar molecule that intercalates with double-stranded DNA and, upon exposure to ultraviolet light, becomes linked covalently to pyrimidines; it can link to a single strand or cross-link two strands.

triose A monosaccharide that has three carbon atoms.

triparental recombinant A progeny phage that contains genes, derived from three different phages which had simultaneously infected the same bacterial cell. *See also* Visconti-Delbrueck hypothesis.

tripartite repeating unit *See* supermolecule.

triphosphopyridine nucleotide NICOTINAMIDE ADENINE DINUCLEOTIDE PHOSPHATE.

triple bond A covalent bond that consists of three pairs of shared electrons.

triple-chain length A crystalline form of glycerides in which three acyl groups form a unit structure.

triple helix Three intertwined helical chains such as the three left-handed polypeptide chains of tropocollagen that are wound together to form a right-handed triple helix.

triplet 1. CODON. 2. A triple peak, as that obtained in nuclear magnetic resonance.

triplet code A genetic code in which an amino acid is specified by a codon that is composed of a sequence of three adjacent nucleotides.

triplet state The excited electronic state of an atom or a molecule in which two single electrons in two orbitals (two unpaired electrons) have their spin in the same direction and are not spin-paired so that $S = 1$ and $2S + 1 = 3$, where S is the resultant spin and $2S + 1$ is the spin multiplicity. A triplet state is a long-lived, metastable state with a lifetime of about 10^{-3} to 1 s; a triplet state atom or molecule has a net magnetic moment. *See also* singlet state.

triplex A triple helix.

triploid state The chromosome state in which each of the various chromosomes, except the sex chromosome, is represented three times. *Aka* triploidy.

Tris Tris(hydroxymethyl)aminomethane; used for the preparation of biological buffers in the pH range of 7.2 to 9.2. *Aka* THAM. *See also* biological buffers.

tris- Prefix indicating three phosphate groups linked at three different positions. Thus, adenosine-2',3',5'-triphosphate is now preferred to adenosine-2',3',5'-triphosphate.

triskellon *See* clathrin.

triti-, trito- Proposed prefixes for the ^3H isotope. *See also* proti-, proto-.

tritiated Labeled with tritium.

tritium The heavy radioactive isotope of hydrogen that contains one proton and two neutrons in the nucleus; a weak beta emitter having a half-life of 12.26 years. *Sym* T.

tritium gel filtration A method for studying the hydrogen exchange of macromolecules by gel filtration chromatography of a tritiated sample and analysis of the eluate for tritium content.

triton 1. The tritium nucleus that consists of one proton and two neutrons. 2. Trademark for a series of organic, nonionic surface-active agents.

tritosome A lysosome that contains large amounts of the nonionic detergent Triton WR-1339. Such secondary lysosomes have lower densities than primary lysosomes and, hence, are readily isolated by differential centrifugation.

triturate To grind or rub to a powder, usually with the aid of a liquid.

trityl group A triphenylmethyl group; used to block the amino group of amino acids. *Abbr* Trt.

trivial name A working or common name that is not based on rules of nomenclature, such as the name of an enzyme that is not based on the classification rules of the Enzyme Commission. *See also* systematic name.

Trizma Trademark for a group of Tris buffers.

tRNA Transfer RNA.

tRNA^{AA} Transfer RNA that is specific for the amino acid AA.

tRNA arm *See* arm.

tRNA^{met} Methionine transfer RNA that allows the methionine, after it becomes attached, to be enzymatically formylated; also abbreviated tRNA_f^{met}.

T4 RNA ligase A ligase from phage T4 that catalyzes the ATP-dependent formation of 3',5'-phosphodiester bonds between 5'-phosphate ends and 3'-hydroxyl ends of oligoribonucleotides.

tRNA^{met} Methionine transfer RNA that does not allow the methionine, after it becomes attached, to be enzymatically formylated.

tRNA nucleotidyltransferase *See* CCA enzyme.

tRNA stem *See* stem; arm.

tRNA synthetase AMINOACYL-tRNA SYNTHETASE.

tRNA synthetase recognition site The site on the transfer RNA molecule to which the aminoacyl-tRNA synthetase becomes bound.

Trojan horse inhibitor An inhibitory compound introduced into an active site of an enzyme or a protein by the technique of affinity labeling.

tropane alkaloids *See* alkaloids.

-trophic Combining form meaning related to nutrition; a common ending for the names of

many hormones where it is used interchangeably with -tropic.

trophic hormone A hormone, the main function of which is to stimulate the secretion of another hormone from an endocrine gland.

trophic value The value of a nutrient in terms of the raw material that it furnishes for the building and the maintenance of the metabolic machinery; it is greater than that described by the caloric value of the nutrient.

trophosome A structure in the hydrothermal worm *Riftia pachyptila* that contains chemotrophic bacteria as suppliers of nutrients.

-tropic Combining form meaning a turning; a common ending for the names of many hormones where it is used interchangeably with -trophic.

tropism An involuntary response of an organism to a stimulus. The response, such as bending, turning, or directional growth, may be either toward, or away from, the stimulus and is then referred to as positive or negative tropism.

tropocollagen The basic structural unit of collagen that consists of a triple helix having a molecular weight of about 300,000. Tropocollagen units associate to form collagen fibrils and the fibrils associate to form larger fibers. The term is also used to describe the collagen of embryonic or fetal tissue which is much more soluble than the collagen of adult tissue.

tropomyosin A minor protein of the myofilaments of striated muscle; a rigid, rod-shaped protein.

tropomyosin A A water-insoluble form of tropomyosin that is present in the catch muscles of mollusks.

tropomyosin B A water-soluble form of tropomyosin that is present in the thin filaments of the I bands of striated muscle; consists of two nonidentical subunits (each having a molecular weight of 34,000), has no ATPase activity, and has a helical content of about 90%.

troponin A minor protein component of the thin filaments of striated muscle. Troponin (MW 76,000) consists of three different subunits, each named according to its function: TN-T (MW 37,000) contains the binding site for tropomyosin; TN-I (MW 21,000) is an inhibitor of actomyosin ATPase; it inhibits the interaction between myosin and actin; TN-C (MW 18,000) binds calcium ions and regulates the interactions among TN-T, TN-I, and other components of the contractile system. *Abbr* TN.

troponin C-like protein CALMODULIN.

Trp 1. Tryptophan. 2. Tryptophanyl.

Trt Trityl group.

TRU Tripartite repeating unit.

true fat NEUTRAL FAT.

true order ORDER WITH RESPECT TO CONCENTRATION.

true plasma Plasma that is obtained from whole blood after the blood has been equilibrated with carbon dioxide at a specific partial pressure.

true toxin An exotoxin against which an antitoxin can be produced.

trypanosome An intracellular protozoan parasite; a unicellular eukaryotic flagellate and the causative agent of several diseases in humans and livestock, including sleeping sickness and Chagas' disease.

trypsin An endopeptidase that acts primarily on peptide bonds in which the carbonyl group is contributed by either arginine or lysine.

tryptamine A biogenic amine derived from tryptophan by decarboxylation. It stimulates the contraction of smooth muscle and occurs in both plants and animals.

tryptase A trypsin-like mast cell proteinase, present in fairly large concentrations in skeletal muscle, lung, and skin, and believed to be involved in inflammatory reactions.

tryptic Of, or pertaining to, trypsin.

trypticase A tryptic digest of casein.

tryptic peptide A peptide obtained by digestion of a protein with trypsin.

tryptone A peptone produced by the proteolytic action of trypsin.

tryptophan An aromatic, heterocyclic, and nonpolar alpha amino acid. *Abbr* Trp; W.

tryptophan dioxygenase A widely distributed enzyme that utilizes a heme prosthetic group to cleave the pyrrole portion of the indole ring of tryptophan to yield *N*-formylkynurenine. The enzyme is inducible in the liver of higher organisms. *Aka* tryptophan pyrrolase.

tryptophan load test *See* load test.

tryptophan pyrrolase TRYPTOPHAN DIOXYGENASE.

tryptophan synthetase The enzyme that catalyzes the terminal step in the biosynthesis of tryptophan; it consists of four polypeptide chains, one of which, the A chain, has been used for studies of amino acid replacements.

T_s *See* elongation factor.

ts Temperature-sensitive mutant.

TSH Thyroid-stimulating hormone.

ts mutant Temperature-sensitive mutant.

T suppressor cell *See* suppressor T cell.

T system A system of tubules that interconnects the sarcolemma and the myofibrils of striated muscle; it is instrumental in communicating the depolarization of the sarcolemma almost simultaneously to all the myofibrils of the muscle fiber. *Aka* transverse system.

t test *See* Student's *t* test.

TTP 1. Ribosylthymine triphosphate. 2. Ribosylthymine-5'-triphosphate.

T tubule See T system.

T_n See elongation factor.

tube dilution method A method for determining the sensitivity of a microorganism to an antimicrobial drug; based on measuring the concentration of drug that prevents microbial growth in one or more tubes of a series of tubes that contain identical microbial inocula but different concentrations of the drug.

tuberculin A protein preparation obtained from the tubercle bacillus *Mycobacterium tuberculosis* that is used in the tuberculin test for delayed-type hypersensitivity. See also old tuberculin; purified protein derivative.

tuberculin hypersensitivity Delayed-type hypersensitivity to inoculation with tuberculin following an infection by the tubercle bacillus *Mycobacterium tuberculosis*.

tuberculin PPD Tuberculin purified protein derivative; See purified protein derivative.

tuberculin test A test, performed in humans or animals, for delayed-type hypersensitivity to tuberculin.

d-tubocurarine An active component of the neurotoxin curare that acts like α -bungarotoxin.

tubular ion exchange A set of ion exchange reactions that proceed across the kidney tubules and that represent the major mechanism for the acidification of urine by the kidney.

tubulin A dimeric protein, composed of two closely related subunits (α and β), that is the principal component of microtubules. See also treadmilling.

tumor NEOPLASM.

tumor angiogenesis factor A factor, released from tumors capable of unlimited growth, that causes the growth of blood vessels toward the tumors. *Abbr* TAF.

tumor antigen T ANTIGEN (1).

tumorigenesis The formation of a tumor.

tumorigenic Capable of causing tumor formation.

tumor initiator See initiator (4).

tumor necrosis factor A cytokine, produced naturally by macrophages in response to bacterial infection and other challenges. It appears to work synergistically with interferon and results in the killing of tumor cells. *Abbr* TNF. See also cytokines.

tumor progression 1. The series of changes whereby a cancerous lesion becomes more and more malignant with time. 2. The third stage in a multistage mechanism of carcinogenesis in which a dependent cancer cell is converted to an autonomous cancer cell.

tumor promoter See promoter (2).

tumor-specific transplantation antigen An antigen that is present on tumor cells but not on the normal cells of the organism in which the tumor developed. The presence of this antigen can induce an immune response, resulting in rejection of an situ or a transplanted tumor.

tumor virus ONCOGENIC VIRUS.

tunicamycin One of a group of homologous nucleoside antibiotics produced by *Streptomyces lysosuperificus*. Tunicamycins consist of uracil, *N*-acetylglucosamine, an aminodeoxydialdose (tunicamine), and a fatty acid of variable chain length. Tunicamycins are active against viruses, gram-positive bacteria, yeast, and fungi.

tunneling The transfer of a particle, such as an electron or a proton, across a potential energy barrier without the particle acquiring sufficient energy to surmount the energy barrier. The transfer occurs as a result of the probability distribution of the particle on both sides of the barrier. See also scanning tunneling microscope.

tunneling electron microscope See scanning tunneling microscope.

turbidimetry The quantitative determination of a substance in suspension that is based on measurements of the decrease in light transmission by the suspension due to the scattering of light by the suspended particles. See also nephelometry.

turbidity 1. A measure of the scattering of light by a solution; the apparent absorbance caused by scattering. Defined as $(1/I)\ln(I_0/I)$, where I is the intensity of the transmitted light, I_0 is the intensity of the incident light, \ln is the natural logarithm, and l is the length of the light path; sometimes defined as $\ln(I_0/I)$. 2. The cloudiness of a solution that is caused by fine suspended particles.

turbidostat A type of chemostat in which light is passed through the growing culture and onto a photocell. When the intensity of the light striking the photocell falls below a preset value, the culture is diluted with fresh medium.

turbid plaque A plaque produced in the plaque assay or in the plaque technique when a mixture of cells is present so that not all of the cells in the area of the plaque are lysed.

turbid plaque mutant A phage mutant (plaque-type mutant) that produces turbid plaques.

turbulent flow The disturbed flow of a liquid along a tube; produced by obstacles and/or high rates of shear. See also laminar flow.

turgor The outward pressure of a cell caused by the osmotic imbalance between the intracellular and extracellular fluids.

turnip yellow mosaic virus A plant virus, containing single-stranded RNA, that infects turnips and other vegetables. *Abbr* TYMV.

turnover 1. The rate at which a substrate is acted upon by an enzyme and measured by the turnover number. 2. The rate at which an intracellular protein is renewed; the balance between the rate of degradation and the rate of synthesis. 3. **TURNOVER TIME**.

turnover number A measure of enzymatic activity, expressed either as molecular activity or as catalytic center activity. *See also* molar activity.

turnover time 1. The time required for the transfer of a substance into or out of a pool under steady-state conditions such that the amount of the substance transferred is equal to the amount of the substance in the pool. 2. The half-life of an intracellular protein that results from its intracellular degradation.

Tween Trademark for a series of nonionic detergents that consist of fatty acid esters of polyoxyethylene sorbitan.

twin ion technique A mass spectrometric technique in which a substance is labeled with two isotopes and the substance and its metabolic transformations are recognized and identified by the characteristic twin ions in their mass spectra.

twist *See* twisting number; twist conformation.

twist conformation The conformation of furanoses in which the ring is not planar; three adjacent atoms of the ring are coplanar while the other two atoms lie above or below the plane of the ring. *See also* envelope conformation.

twisting number The total number of turns of the double helix of DNA. The twisting number (T) is equal to the number of base pairs in duplex DNA divided by the number of base pairs per turn of the double helix. It is a measure of the pitch of the helix and is related to the linking number (L) as follows: $L = W + T$, where W is the writhing number. *Sym T*.

two-carbon fragment 1. A group of atoms or a compound containing only two carbon atoms. 2. An early designation of acetyl coenzyme A.

two-dimensional chromatography A flat-bed chromatographic technique in which the compounds are first separated in one direction and, after rotation of the chromatogram by 90° , are then separated in a second direction.

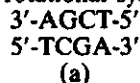
two-dimensional electrophoresis A flat-bed electrophoretic technique in which the compounds are first separated in one direction and, after rotation of the electropherogram by 90° , are then separated in a second direction.

two-factor cross A genetic recombination experiment involving two nonallelic genes.

two-five A One of a group of unusual nucleotides having the formula $\text{pppA}(2'p5'A)_n$, where $n = 1$ to 10; they are produced as part of

the mechanism by which interferon enables mammalian cells to resist attack by RNA viruses. The oligonucleotides are formed from ATP after a particular synthase is activated by interferon; they activate an endonuclease which degrades viral mRNA and thus inhibits viral protein synthesis.

twofold rotational symmetry The type of symmetry present in a palindrome; the sequence of bases is identical in both strands when each strand is traversed in the same sense of polarity. Thus, the double-stranded segment (a) shows twofold rotational symmetry.



two-genes-one-polypeptide chain *See* one-gene-one-polypeptide chain hypothesis.

two-messenger hypothesis The hypothesis that hormonal action can be interpreted by invoking a two-messenger mechanism. *See also* first messenger; second messenger.

two out of three method A proposed alternative method of codon reading that might apply in some cases; according to this method, only the first two nucleotides of a codon are recognized by the anticodon.

two-point cross A genetic recombination experiment involving two linked genes.

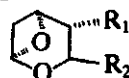
two-sided test A test for which the region of rejection comprises areas at both extremes of the distribution of the test statistic. *aka* double-tailed test; two-tail test.

two-state model A proposed model to explain the functioning of receptors. According to this model, a receptor exists in two states, an active and an inactive one, which are in equilibrium. Agonists bind preferentially to the active form of the receptor, thus shifting the equilibrium between the two forms toward the active form. *See also* mobile receptor model.

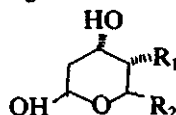
two-tail test **TWO-SIDED TEST**.

TX Thromboxane.

TXA A thromboxane that contains the following oxane ring structure:



TXB A thromboxane that contains the following oxane ring structure:



ty elements Transposable elements of yeast; the term is derived from transposon-yeast.

tygon A copolymer of vinyl chloride and vinyl acetate.

TYMV Turnip yellow mosaic virus.

Tyndall effect The phenomenon that the path of a beam of light through a solution containing colloidal particles becomes visible as a result of the scattering of light by the particles.

Tyndallization FRACTIONAL STERILIZATION.

type A hepatitis See hepatitis.

type A RNA virus See oncornavirus.

type A virus See oncornavirus.

type B hepatitis See hepatitis.

type B RNA virus See oncornavirus.

type B virus See oncornavirus.

type C RNA virus See oncornavirus.

type C virus See oncornavirus.

type I error In hypothesis testing, the erroneous rejection of a null hypothesis. *Aka* α error; error of the first kind.

type II error In hypothesis testing, the erroneous acceptance of a null hypothesis. *Aka* β error; error of the second kind.

type I immunoglobulin TYPE K IMMUNOGLOBULIN.

type II immunoglobulin TYPE L IMMUNOGLOBULIN.

type K immunoglobulin An immunoglobulin containing light chains of the kappa type.

type L immunoglobulin An immunoglobulin containing light chains of the lambda type.

type 1 reaction ANAPHYLAXIS.

type 2 reaction A form of immediate-type hypersensitivity in which antibodies combine

with cell surface antigens or with cell-bound antigens.

type 3 reaction A form of immediate-type hypersensitivity that involves complement fixation.

type 4 reaction CELLULAR IMMUNITY.

type-specific antigen An antigen that is found in only one subdivision of a family of viruses.

Tyr 1. Tyrosine. 2. Tyrosyl.

tyrocidin One of a group of cyclic polypeptide antibiotics, produced by *Bacillus brevis*; gramicidin S (misnamed) is an example.

tyrosinase The enzyme that catalyzes the oxidation of tyrosine to dopa and the oxidation of dopa to dopa quinone which is then converted to melanin.

tyrosine An aromatic, polar alpha amino acid that contains a phenolic hydroxyl group. *Abbr* Tyr;Y.

tyrosinemia I TYROSINOSIS.

tyrosinemia II A genetically inherited metabolic defect in humans that is due to a deficiency of the enzyme tyrosine aminotransferase.

tyrosinosis A genetically inherited metabolic defect in humans that is characterized by excessive excretion of *p*-hydroxyphenylpyruvic acid and excretion of hawkinsin (an unusual, sulfur-containing, dicarboxylic amino acid); due to a deficiency of the enzyme *p*-hydroxyphenylpyruvic acid oxidase.