Glossary

baryon number a conserved physical quantity that is zero for mesons and leptons and ± 1 for baryons and antibaryons, respectively

baryons hadrons that always decay to another baryon

boson particle with zero or an integer value of intrinsic spin

bottom a quark flavor

charm a quark flavor, which is the counterpart of the strange quark

colliding beams head-on collisions between particles moving in opposite directions

color a quark flavor

conservation of total baryon number a general rule based on the observation that the total number of nucleons was always conserved in nuclear reactions and decays

conservation of total electron family number a general rule stating that the total electron family number stays the same through an interaction

conservation of total muon family number a general rule stating that the total muon family number stays the same through an interaction

cyclotron accelerator that uses fixed-frequency alternating electric fields and fixed magnets to accelerate particles in a circular spiral path

down the second-lightest of all quarks

electron family number the number ± 1 that is assigned to all members of the electron family, or the number 0 that is assigned to all particles not in the electron family

electroweak theory theory showing connections between EM and weak forces

fermion particle with a half-integer value of intrinsic spin

Feynman diagram a graph of time versus position that describes the exchange of virtual particles between subatomic particles

flavors quark type

fundamental particle particle with no substructure

gauge boson particle that carries one of the four forces

gluons eight proposed particles which carry the strong force

gluons exchange particles, analogous to the exchange of photons that gives rise to the electromagnetic force between two charged particles

grand unified theory theory that shows unification of the strong and electroweak forces

hadrons particles that feel the strong nuclear force

Higgs boson a massive particle that, if observed, would give validity to the theory that carrier particles are identical under certain circumstances

leptons particles that do not feel the strong nuclear force

linear accelerator accelerator that accelerates particles in a straight line

meson hadrons that can decay to leptons and leave no hadrons

meson particle whose mass is intermediate between the electron and nucleon masses

muon family number the number ± 1 that is assigned to all members of the muon family, or the number 0 that is assigned to all particles not in the muon family

particle physics the study of and the quest for those truly fundamental particles having no substructure

pion particle exchanged between nucleons, transmitting the force between them

quantum chromodynamics quark theory including color

quantum chromodynamics the governing theory of connecting quantum number color to gluons

quantum electrodynamics the theory of electromagnetism on the particle scale

quark an elementary particle and a fundamental constituent of matter

standard model combination of quantum chromodynamics and electroweak theory

strange the third lightest of all quarks

strangeness a physical quantity assigned to various particles based on decay systematics

superstring theory a theory of everything based on vibrating strings some 10^{-35} m in length

synchrotron a version of a cyclotron in which the frequency of the alternating voltage and the magnetic field strength are increased as the beam particles are accelerated

synchrotron radiation radiation caused by a magnetic field accelerating a charged particle perpendicular to its velocity

tau family number the number ± 1 that is assigned to all members of the tau family, or the number 0 that is assigned to all particles not in the tau family

theory of quark confinement explains how quarks can exist and yet never be isolated or directly observed

top a quark flavor

up the lightest of all quarks

Van de Graaff early accelerator: simple, large-scale version of the electron gun

virtual particles particles which cannot be directly observed but their effects can be directly observed