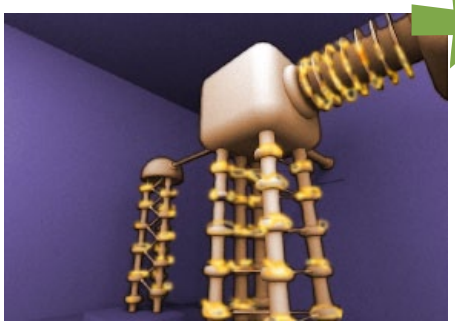
QUARKED!™
Adventures in the Subatomic Universe

GLOSSARY

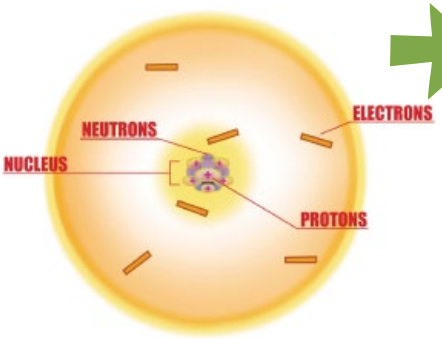
A



Accelerator
A machine that is used to speed up particles. Particle physicists can use accelerators to smash particles into each other to study what they are made of.

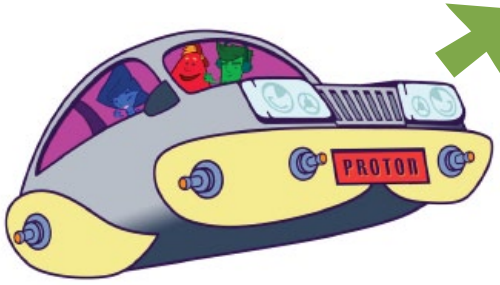
Annihilation
What happens when matter is converted into energy. An example is when a proton and antiproton collide and they are gone, but energy remains in their place.

Antimatter
Matter is the stuff that everything is made of. Antimatter is the counterpart. The antimatter particle will have the same mass as its matter counterpart, but all the other properties are opposite. For example, the **positron** is the antimatter counterpart (or antiparticle) of the **electron**. It has the same mass as the electron, but has positive electric charge instead of negative electric charge.



Atom
A very small (microscopic) structure found in all matter around us that has all of the chemical properties of an **element**. An atom has electrons and a nucleus that contains protons and neutrons.

B



Baryon

A particle that is made of 3 quarks each of a different color. For example, a proton is a baryon which is made of 2 up quarks and a down quark.

Other Baryons also include the **Neutron** and the **Lambda**.

Biofuel

Fuel derived from living or recently living organisms. Examples include biodiesel made from oils or fats, and bioethanol made from the fermented sugar components of plant materials.

Biomass

Living matter that is used as a source of renewable energy. Examples include wood, gasses, garbage, and alcohol fuels.

Boson

All fundamental particles can be classified as either bosons or fermions. Particles have lots of different properties, such as electric charge and spin. Bosons are particles that can group together even if they have exactly identical properties. Force carrier particles, like photons and gluons, are bosons. Fermions are particles that cannot exist together if they have identical properties.

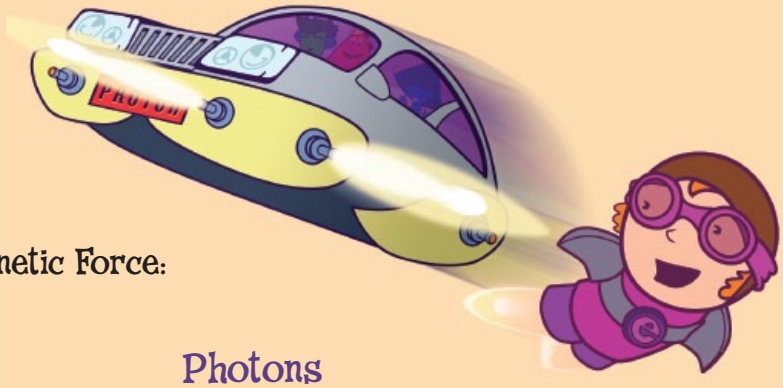
See Boson Chart.

Bottom Quark (b)

One of the **six types (flavors) of quarks**. It is the most massive of the quarks which have negative electric charge. Deena is shown here as a bottom quark.

Bosons

Bosons are particles that can group together even if they have exactly identical particles. Force Carrier Particles are Bosons.



Electromagnetic Force:

Photons

Elly and the SUV are both shooting photons.

Weak Force:

W's

Z's

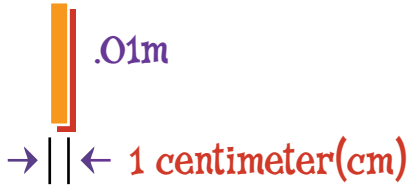
Strong Force:

Gluons

Quarks change color through their interactions with the strong force (gluons) as seen here where Harold and Danny are changing colors.

C

Centimeter (cm)
A **unit** of length in the metric system that is 1/100 (or 0.01) of a meter.
See Length Unit Comparison Chart at the end of the glossary.

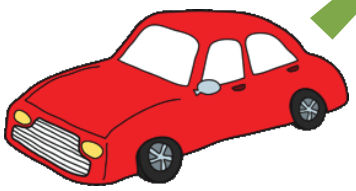


Charm Quark (c)
One of the **six types (flavors) of quarks**. It is the name of the intermediate mass quark with positive electric charge. Patti is shown here as a charm quark.

Chemical Bond
An attraction between atoms and molecules due to electric charge. Opposite electric charges are held together by electromagnetic force, this attraction that results from the electromagnetic force is called a 'chemical bond'. Some materials have more or stronger 'bonds' than others.

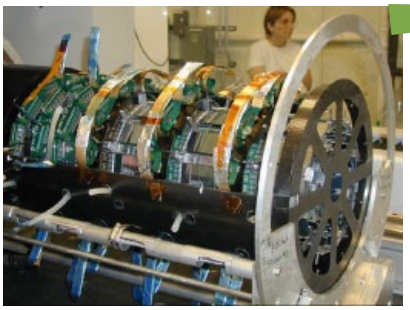
Color
In particle physics this is the name for a property that all quarks have. It refers to the **strong force** that attracts quarks to each other. This force is transmitted by particles called **gluons**. Physicists use the colors red, green, or blue to explain how the force works. Particles will be stable only when the colors add up to give "white", like the primary colors in art class.

Conductors
Materials that allow electrons to move freely between atoms and molecules (e.g. metal). A picture of a car is shown here, which has a metal body.



Current
The flow of electric charge through matter, such as a conductor or semi-conductor.

D



Detector
The device or machine that measures what happens when a particle passes through it.

Down Quark (d)
One of the **six types (flavors) of quarks.** It is the least massive of the negatively charged quarks. Down quarks are in both protons and neutrons so they are all around us. Danny is shown here as a down quark.

E

Electric Charge
This is one of the properties that all matter has. A particle can be positive, negative or neutral (if it has no charge). Particles with positive electric charge are attracted to those with negative electric charge.

Electric Circuit
A complete path through which electrons can flow.

Electric Force
This is one of the fundamental forces of nature, like gravity. This force can either pull particles together or push them apart, depending on whether the electric charges are opposite or the same.

Electricity
The movement of electric charges, such as electrons, through a material, such as a wire. Electricity moves more easily through some types of material (conductors) than others (insulators).

Electromagnetic Force
See electric force.

Electron
One of the smallest particles known today. It is the lightest of the lepton group and has a negative electric charge. Electrons can be in the outer parts of most atoms. Elly is shown here as an electron.

Element
A substance that cannot be separated into simpler substances by chemical means. Examples include helium, oxygen and carbon.
See The Periodic Table of the Elements.

The Periodic Table of the Elements

1 H Hydrogen 0																	2 He Helium 2
3 Li Lithium 4	4 Be Beryllium 5											5 B Boron 6	6 C Carbon 6	7 N Nitrogen 7	8 O Oxygen 8	9 F Fluorine 10	10 Ne Neon 10
11 Na Sodium 12	12 Mg Magnesium 12											13 Al Aluminum 14	14 Si Silicon 14	15 P Phosphorus 16	16 S Sulfur 16	17 Cl Chlorine 18	18 Ar Argon 22
19 K Potassium 20	20 Ca Calcium 20	21 Sc Scandium 24	22 Ti Titanium 26	23 V Vanadium 28	24 Cr Chromium 28	25 Mn Manganese 30	26 Fe Iron 30	27 Co Cobalt 32	28 Ni Nickel 31	29 Cu Copper 35	30 Zn Zinc 35	31 Ga Gallium 39	32 Ge Germanium 41	33 As Arsenic 42	34 Se Selenium 45	35 Br Bromine 45	36 Kr Krypton 48
37 Rb Rubidium 48	38 Sr Strontium 50	39 Y Yttrium 50	40 Zr Zirconium 51	41 Nb Niobium 52	42 Mo Molybdenum 54	43 Tc Technetium 56	44 Ru Ruthenium 57	45 Rh Rhodium 58	46 Pd Palladium 60	47 Ag Silver 61	48 Cd Cadmium 64	49 In Indium 66	50 Sn Tin 69	51 Sb Antimony 71	52 Te Tellurium 76	53 I Iodine 74	54 Xe Xenon 77
55 Cs Cesium 78	56 Ba Barium 81	71 Lu Lutetium 104	72 Hf Hafnium 106	73 Ta Tantalum 108	74 W Tungsten 110	75 Re Rhenium 111	76 Os Osmium 114	77 Ir Iridium 115	78 Pt Platinum 117	79 Au Gold 118	80 Hg Mercury 121	81 Ti Thallium 123	82 Pb Lead 125	83 Bi Bismuth 126	84 Po Polonium 125	85 At Astatine 125	86 Rn Radon 136
87 Fr Francium 136	88 Ra Radium 138	103 Lr Lawrencium 159	104 Rf Rutherfordium 157	105 Db Dubnium 158	106 Sg Seaborgium 160	107 Bh Bohrium 157	108 Hs Hassium 162	109 Mt Meitnerium 159	110 Ds Darmstadtium 171	111 Rg Roentgenium 161	112 Uub Ununbium 173	113 Uut Ununtrium 171	114 Uuq Ununquadium 175	115 Uup Ununpentium 173	116 Uuh Ununhexium 176	117 Uus	118 Uuo

57 La Lanthanum 82	58 Ce Cerium 82	59 Pr Praseodymium 82	60 Nd Neodymium 84	61 Pm Promethium 84	62 Sm Samarium 88	63 Eu Europium 89	64 Gd Gadolinium 93	65 Tb Terbium 94	66 Dy Dryprosium 96	67 Ho Holmium 98	68 Er Erbium 99	69 Tm Thulium 100	70 Yb Ytterbium 102
89 Ac Actinium 138	90 Th Thorium 142	91 Pa Protactinium 140	92 U Uranium 146	93 Np Neptunium 144	94 Pu Plutonium 150	95 Am Americium 148	96 Cm Curium 151	97 Bk Berkelium 150	98 Cf Californium 153	99 Es Einsteinium 153	100 Fm Fermium 157	101 Md Mendelevium 157	102 No Nobelium 157

# of protons

element symbol

element name

# of neutrons

Endothermic Reaction

A chemical reaction in which kinetic energy is transferred into a system (the chemical reaction) from surrounding material.

Energy

Energy is something that everything has, and there are many different kinds (e.g. chemical, electrical). Energy can't be created or destroyed. If one thing gains energy, something else must lose energy. A thing that is moving fast has more energy than if it were moving slow. A thing that is hot has more energy than if it were cold.

Exothermic Reaction

A chemical reaction in which **kinetic energy** is transferred out into surrounding materials.

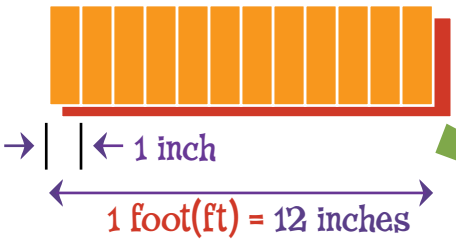
F

Fermion

All fundamental particles can be classified as either **bosons** or fermions. Particles have lots of different properties, such as electric charge and spin. Fermions are particles that cannot exist together if they have identical properties. **Quarks** and **leptons** are fermions and so can only group together if some property they have is different from each other. Bosons are particles that can group together even if they have exactly identical properties. See the Fermion chart.

Fluorescence

The release of energy that has been absorbed by electrons in the form of light particles or photons.



Foot (ft)

A foot is a unit of length equal to 12 inches.
See Length Unit Comparison Chart at the end of the glossary.

Force

When you push or pull on something, there is a force. There are forces in nature that can influence particles including: gravity, electromagnetic, weak, and strong.

Fermions

Are Particles that cannot exist together if they have identical properties.
Quarks and leptons are fermions.

Quarks

There are 6 flavors of Quarks: Up (u), Down (d), Charm (c), Strange (s), Top (t), Bottom (b).

LESS MASS >> MORE MASS

Positive Electric Charge

Up Quark (u)
Ushi

Charm Quark (c)
Ujana

Top Quark (t)
Harold

Negative Electric Charge

Down Quark (d)
Danny

Strange Quark (s)
Derek

Bottom Quark (b)
Deena

Leptons

There are 6 types of Leptons:
Electron-Neutrino (ν_e), Muon-Neutrino (ν_μ), Tau-Neutrino (ν_τ), Electron (e), Muon (μ), Tau (τ).

No Electric Charge

Electron-Neutrino (ν_e)
Nancy

Muon-Neutrino (ν_μ)
Mooki

Tau-Neutrino (ν_τ)
Tim

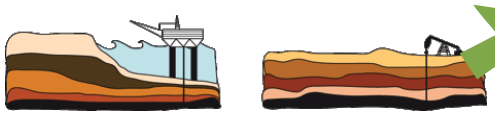
LESS MASS >> MORE MASS

Negative Electric Charge

Electron (e)
Elly

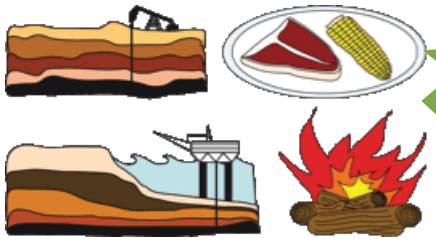
Muon (μ)
Mustafa

Tau (τ)
Tammy



Fossil Fuel

Fuel derived from the decomposition and fossilization of dead organisms. Examples include coal, petroleum or oil, and natural gas. Fossil fuels are non-renewable.



Fuel

Material that is burned to transform potential energy in the form of chemical bonds into kinetic energy. Examples include oil, coal, wood, as well as food.

Fundamental Particles

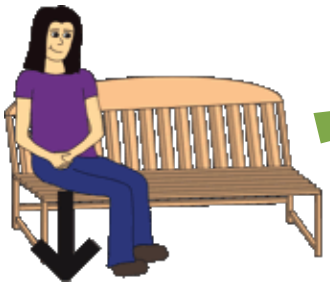
These are the smallest things in nature that scientists know of. So far, no-one has been able to split them into smaller pieces. Everything else is made of combinations of these particles.

See the Fundamental Particle chart.

G

Gluon

This is the name of the particle which carries the strong force. There are 8 different kinds of gluons. Quarks change color through their interactions with the strong force (gluons) as seen here where Harold and Danny are changing colors.



Gravitational Force

One of the fundamental forces of nature. This force attracts particles that have mass. The gravitational force of attraction gets stronger for things with more mass and the closer the objects are together.

H

Hadron

Fundamental particles combine in different ways to make other particles. Hadrons are particles that are composed of quarks and/or anti-quarks. There are two kinds of hadrons: baryons and mesons.

See the Hadron chart.

FUNDAMENTAL PARTICLES

Fundamental Particles are the smallest things scientists have discovered.
So far, no-one has been able to split them into smaller pieces.
Everything else is made of combinations of these particles.

FERMIONS

Fermions are particles that cannot exist together if they have identical properties.

BOSONS

Bosons are particles that can group together even if they have exactly identical properties.

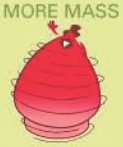
PARTICLES

Quarks there are 6 Flavors of Quarks:

Positive Electric Charge
LESS MASS >> MORE MASS


Up (u)


Charm (c)


Top (t)

Negative Electric Charge
LESS MASS >> MORE MASS


Down (d)


Strange (s)


Bottom (b)

Leptons there are 6 types of Leptons:

No Electric Charge


Electron-Neutrino (ν_e)


Muon-Neutrino (ν_μ)


Tau-Neutrino (ν_τ)

Negative Electric Charge
LESS MASS >> MORE MASS


Electron (e)


Muon (μ)


Tau (τ)

ANTI-PARTICLES

Anti-quarks

Negative Electric Charge
LESS MASS >> MORE MASS


Anti-up ($\bar{u}$)


Anti-charm ($\bar{c}$)


Anti-top ($\bar{t}$)

Positive Electric Charge
LESS MASS >> MORE MASS


Anti-down ($\bar{d}$)


Anti-strange ($\bar{s}$)


Anti-bottom ($\bar{b}$)

Anti-leptons

No Electric Charge


Anti-electron-Neutrino ($\overline{\nu}_e$)


Anti-muon-Neutrino ($\overline{\nu}_\mu$)


Anti-tau-Neutrino ($\overline{\nu}_\tau$)

Positive Electric Charge
LESS MASS >> MORE MASS


Positron ($\bar{e}$)


Anti-muon ($\bar{\mu}$)


Anti-tau ($\bar{\tau}$)

Force Carrier Particles

Electromagnetic Force:


Photons

Weak Force:


W's


Z's

Strong Force:

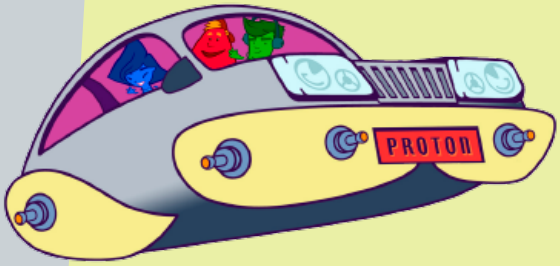

Gluons

Hadrons

Fundamental particles combine in different ways to make other particles.
Hadrons are particles that are composed of quarks and/or anti-quarks.
There are two kinds of hadrons: baryons and mesons.

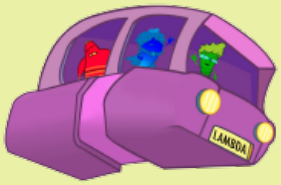
Baryons

Baryons are particles that are made of 3 quarks each of a different color).
Examples: Protons, Neutrons, Lambdas...



Above are Ushi and Harold (2 up quarks) and Danny (1 down quark) in their Proton subatomic universe vehicle (SUV).

Here are Ujana (up quark), Deena (down quark) and Rosa (down quark) in their Neutron subatomic universe vehicle (SUV).



Here are Steve (strange quark), Derek (up quark), and Matt (down quark) ride in their Lambda SUV"

FERMIONS

Fermions are particles that cannot exist together if they have identical properties.

Mesons

Mesons are particles that are made of a quark (of one color) and an anti-quark (with the anti-color of the quark).
Examples: Pions, Kaons...

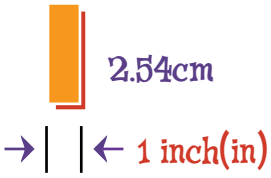
Above are Ushi (up quark) and Ujana (anti-up quark) in the Meson we call the pi-0 (pronounced pie-zero).

Here are Matt (antistrange quark) and Danny (down quark) in the k-0 meson (or kaon).

BOSONS

Bosons are particles that can group together even if they have exactly identical properties.

I



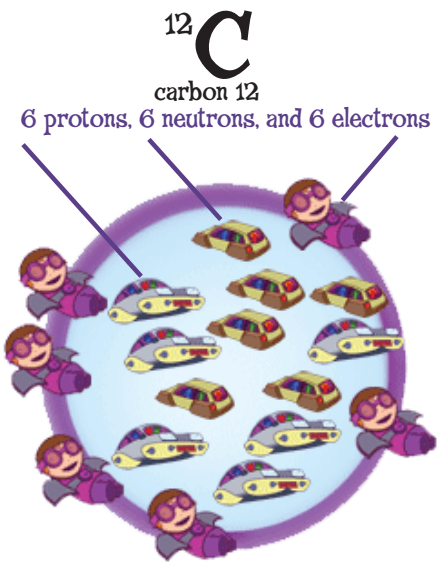
Inch(in)
A unit of length equal to 1/12 of a foot or 2.54 centimeters.
See Length Unit Comparison Chart at the end of the glossary.

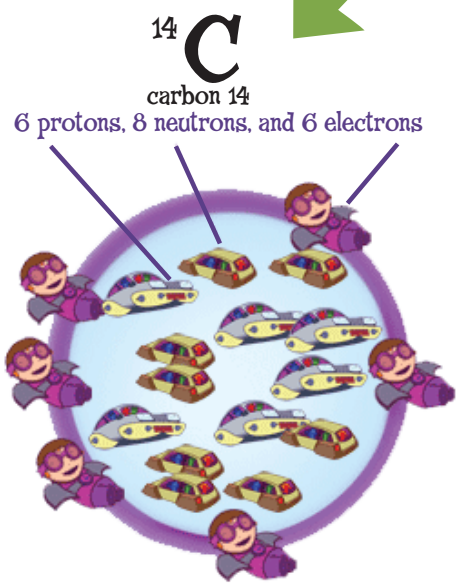
Integer
This is the name for numbers such as 0, 1, 2 that are whole numbers without fractions.

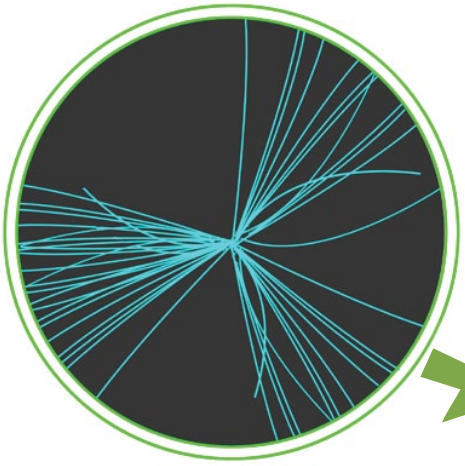
Insulator
Materials that DO NOT allow electrons to move freely between atoms and molecules (e.g. plastic).

Ion
Ions are **atoms** with an electric charge. If they have more protons than electrons, they will have a positive charge, and if they have more electrons than protons, they will have a negative charge.

Isotope
Atoms with the same number of **protons** but different numbers of **neutrons**. For instance there are two isotopes of Carbon called Carbon-12 and Carbon-14. There are 6 protons in Carbon as you can see in the periodic table. Carbon-12 has 6 protons and 6 neutrons (6+6=12) and Carbon-14 has 6 protons and 8 neutrons (6+8=14).







J

Jet
In a particle physics detector, the way you look for quarks is by reconstructing where all the particles that the quark decayed into went. They group together into a bunch of tracks which originate at one point (vertex) we call a jet.

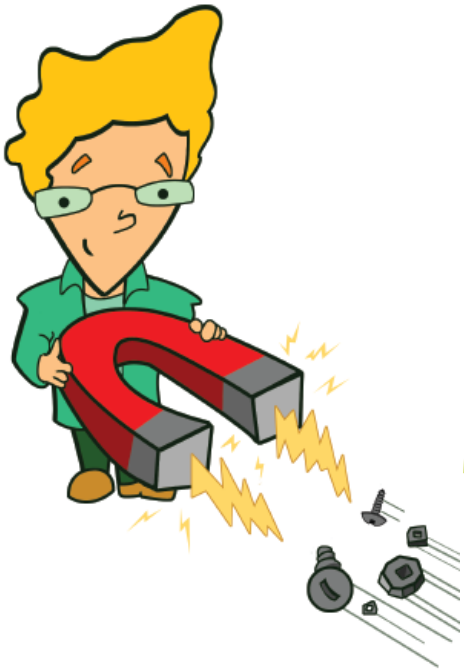
Joule
This is the basic unit of Energy. The more energy you have, the more Joules you have.

K

Kaon
This is a meson that contains an anti-strange quark and either an up or a down quark

Kinetic Energy
Energy that is doing something, often called movement energy.

L



Lepton
Leptons and **quarks** are the smallest things known to exist and are called fundamental particles. Leptons don't have color properties and so don't feel the strong force. Electrons are in this group as are muons, taus, and neutrinos. The other group of particles is the **quarks**. See Lepton chart.

M

Magnetic Force
This is the force that exists between two magnetic poles. It is related to the electric force and occurs when electric charges move around or with a material with magnetic properties, such as lodestone or a magnet.

Mass
The amount of **matter** in an object. Mass is not the same as size. Objects with more matter will have a greater mass. Objects with more mass will weigh more, but weight changes depend on the gravitational force.

Matter
The stuff that everything is made of. See How Matter is Made.

Leptons

There are six types of Leptons. Some of the leptons are negatively charged like the electron(e), the muon(μ - more massive), and the tau(τ - most massive). There are other ghostlike particles with very small masses and no electric charge called neutrinos: electron-neutrino(v_e), muon-neutrino(v_μ), tau-neutrino(v_τ).

No Electric Charge

Electron-Neutrino(v_e)
Nancy

Muon-Neutrino(v_μ)
Mooki

Tau-Neutrino(v_τ)
Tim

LESS MASS >> MORE MASS

Negative Electric Charge

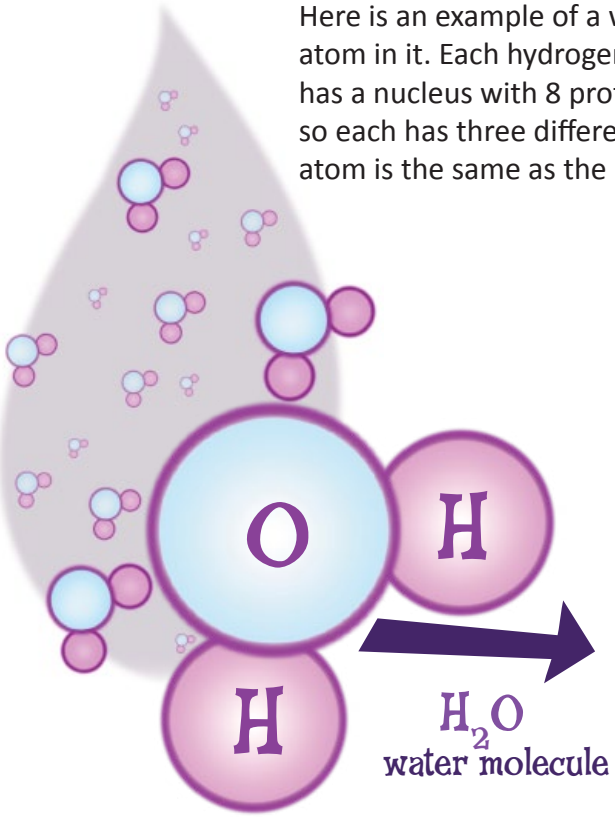
Electron(e)
Elly

Muon (μ)
Mustafa

Tau(τ)
Tammy

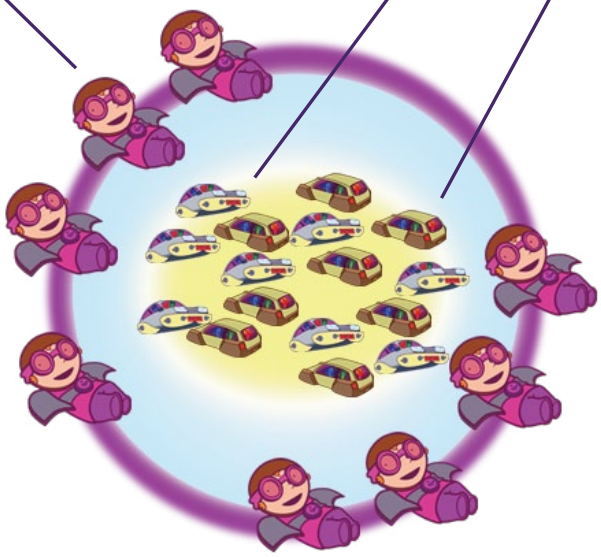
How Matter Is Made

Here is an example of a water molecule. It has 2 hydrogen (H) atoms and 1 oxygen (O) atom in it. Each hydrogen atom has a nucleus with one proton in it. The oxygen atom has a nucleus with 8 protons and 8 neutrons in it. The protons and neutrons are baryons so each has three different colored quarks in it. Since the number of electrons in each atom is the same as the number of protons there is zero electric charge.

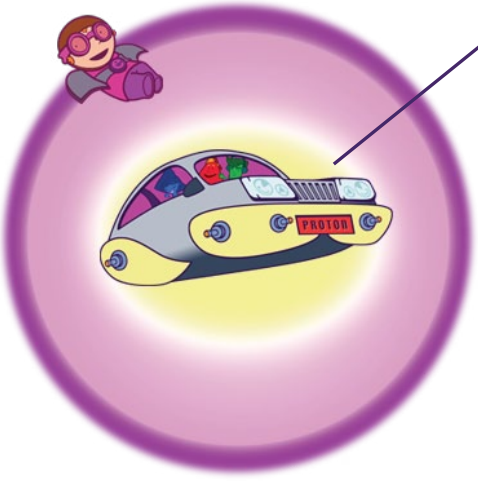


H_2O
water molecule

O
oxygen atom
has 8 electrons and a nucleus with 8 protons and 8 neutrons

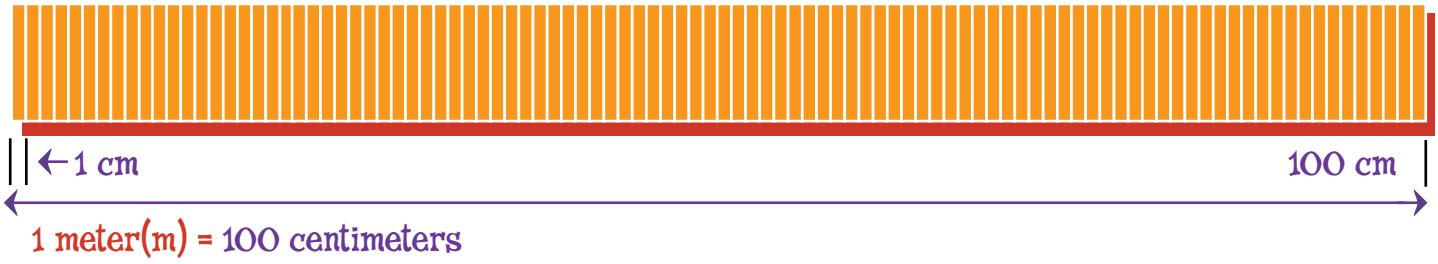


H
hydrogen atom
has 1 electron and a nucleus with 1 proton



Meter (m)

A **unit** of length in the metric system equal to 39.37 inches.
See Length Unit Comparison Chart at the end of the glossary.



Meson

Fundamental particles combine in different ways to make other particles. Mesons are particles that are made of a quark (of one color) and an anti-quark (with the anti-color of the quark). Here are Ushi (up quark) and Ujana (anti-up quark) in the meson we call the pi-0 (pronounced pie-zero).

Nanoscale

Nanoscale refers to a particular size range used to measure things, specifically between 1 billionth of a meter (1 nanometer or 10^6 meter) and 1 millionth of a meter (1,000 nanometers or 10^9 meter). Nanoscale examples include a Rhinovirus (cause of the common cold), and the width of a DNA strand. See Nanoscale Chart.

Neutrino

Fundamental particles that belong to the **lepton** group. They have no electric charge and do not interact with other particles except through the **Weak force**. They are very light and travel very fast. There are three kinds: electron neutrino, muon neutrino, and tau neutrino. Nancy is shown here as an electron neutrino. See Lepton chart.

Neutron

A particle with no electric charge (neutral) made of 2 down quarks and an up quark. It is in the nucleus of most atoms. Here are Ujana (up quark), Deena (down quark) and Rosa (down quark) in their neutron subatomic universe vehicle (SUV).

Nucleus

The small central part of the atom that contains neutrons and protons. Most of the mass of the atom comes from the nucleus.

- Zeptoscale
- Yoctoscale

Attoscale

10^{-18}
0.000000000000000001 mm
0.000000000000000000001 m

Femtoscale

10^{-15}
0.000000000001 mm
0.000000000000001 m

Picoscale

10^{-12}
0.000000001 mm
0.000000000001 m

Nanoscale

1 nanometer

1,000 nanometers

10^{-9}
0.000001 mm
0.000000001 m

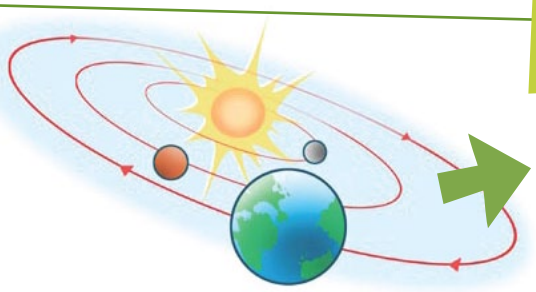
Microscale

10^{-6}
0.001 mm
0.000001 m

10^{-3}
1 mm
0.001 m

s m a l l e r

O



Orbit
An object going around in a circle around another object

Oxygen
An element, or atom, that contains 8 protons. If two of these atoms form a molecule, it makes up 21% of the air we breathe.

P

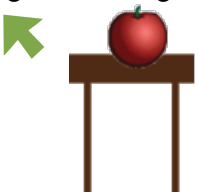
Periodic Table
The Periodic Table of the Elements arranges all of the known elements in the universe. It shows the abbreviation of each atom, as well as how many protons and neutrons they each contain.

Photon
The particle which carries the electric and magnetic forces. It has no electric charge and no mass. Light is made of these particles. Here, our proton SUV shoots a photon torpedo at Elly.

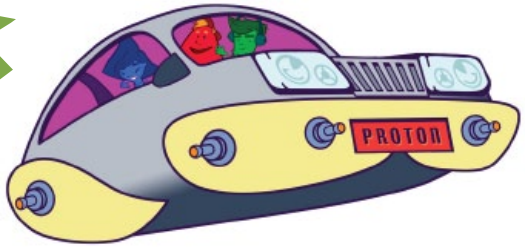
Pion
This is a **meson** that contains an up or a down quark along with an anti-up or an anti-down quark.

Positron
This the antimatter counterpart (or antiparticle) of the electron. Eddy is shown here as a positron.

Potential Energy
Energy that could be doing something, often called stored energy.



Proton
This is a baryon that has positive electric charge and is found in the nucleus of the atom. It is made of 2 up quarks and a down quark. The number of protons in the nucleus determines what kind of element you have.



Q

Quantum
The smallest amount (or unit) of any kind of thing. For example, the smallest amount of electricity would be a single electron. The science of small particles is called "quantum mechanics."

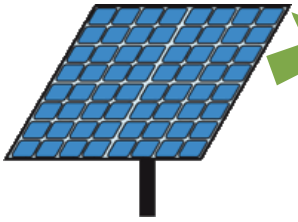
Quarks
Quarks and **leptons** are the smallest things that are known to exist and are called fundamental particles. There are six types or flavors of quarks: **up (u)**, **down (d)**, **charm (c)**, **strange (s)**, **top (t)**, and **bottom (b)**. These are what protons, neutrons and many other particles are made of. Quarks can interact by the strong force since they have the property of color. The other group of particles is the **leptons**.
See Six Flavors of Quarks.

R

Radioactivity
A process where energy is given off by atoms that have nuclei that aren't stable (or balanced).

Radiation
When energy travels in waves.

S



Semiconductor
Materials that allow some electrons to move freely between atoms and molecules (e.g. silicon).

Spin
A property of particles that relates to how they move in the quantum world. **Quarks** have a half unit of spin that can be pointed so the quark is either spin up or a spin down.

Quarks: six flavors of quarks

There are six types of flavors of Quarks: up (u), down (d), charm (c), strange (s), top (t) and bottom (b).They each have different things that make them unique like their mass (or weight) and their electric charge. The top quark is the heaviest. Up and down quarks are in most everything we know of and they are the lightest. These are what protrons an neutrons are made of. Quarks can interact by the strong force since they have the property of color.

LESS MASS >> MORE MASS

Positive Electric Charge

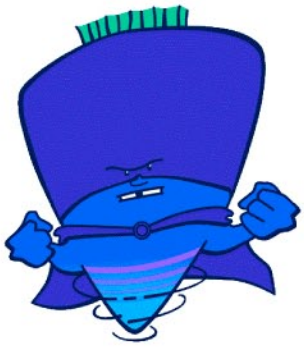
Up Quark (u)
Ushi

Charm Quark (c)
Ujana

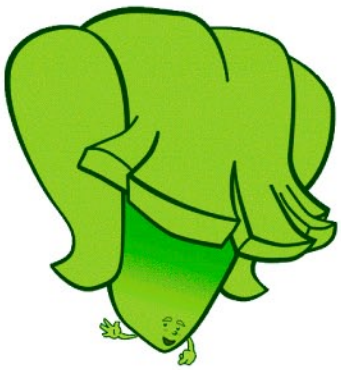
Top Quark (t)
Harold

Negative Electric Charge

Down Quark (d)
Danny



Strange Quark (s)
Derek



Bottom Quark (b)
Deena

Anti-quarks:

LESS MASS >> MORE MASS

Negative Electric Charge

Anti-up Quark ($\bar{u}$)
Ushi

Anti-charm Quark ($\bar{c}$)
Ujana

Anti-top Quark ($\bar{t}$)
Harold

Positive Electric Charge

Anti-down Quark ($\bar{d}$)
Danny

Anti-strange Quark ($\bar{s}$)
Derek

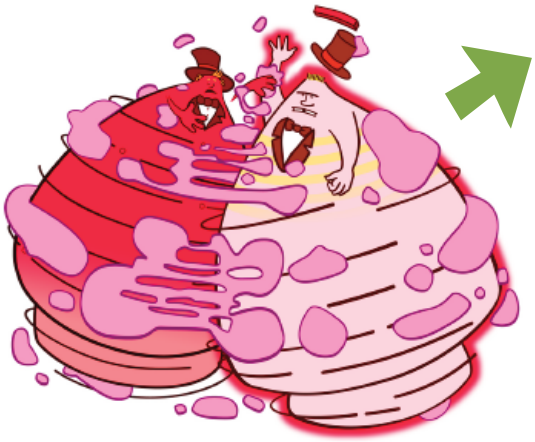
Anti-bottom Quark ($\bar{b}$)
Deena

Strange Quark(s)

One of the **six types (flavors) of quarks.** This particle has a negative charge and its mass is intermediate. Derek is shown here as a strange quark.

Static Electricity

When objects become electrically charged and the charge can't move around.



Strong Force

One of the fundamental forces in nature. This force attracts particles that have the property of color. It is the force that binds quarks inside protons and neutrons (and other particles). It is also the force that holds protons and neutrons together in the nucleus of an **atom.** The carrier for the force is the **gluon.**

Subatomic

Smaller than the atom. This means smaller than a billionth of a meter or 0.000000001 of a meter.

T

Top Quark(t)

One of the **six types (flavors) of quarks.** This is the most massive of all quarks and has a positive electric charge. Here Harold is shown as a top quark.

U

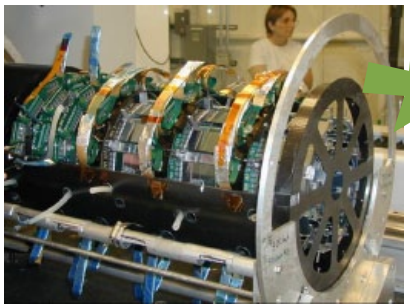
Unit

A quantity accepted as a standard of measurement like the dollar is the U.S. unit of currency.

Up Quark (u)

One of the **six types (flavors) of quarks.** This is the least massive one with positive electric charge. Ushi is shown here as an up quark.

V



Vertex Dectector

The detector closest to where the particles are smashed together or collided. It can measure the position of particles very precisely. Computer software is used to reconstruct what happened in a collision, so you can find out where it happened because the tracks from the particles all originate from that point, the vertex.

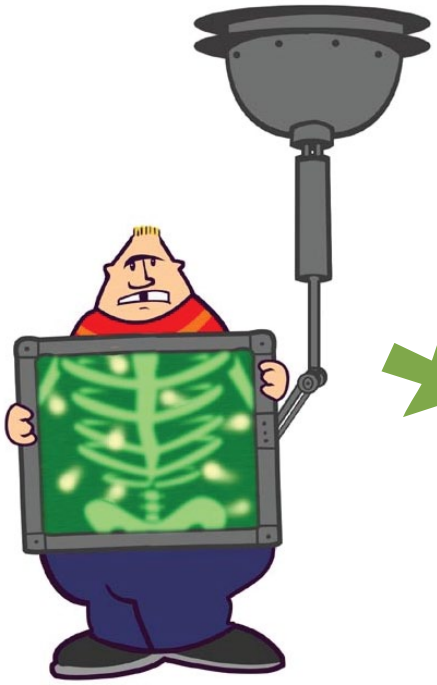
W

W Boson

This particle is the carrier for the Weak force. There are two kinds of W bosons: one which has positive electric charge and one which has negative electric charge.

Weak Force

This is one of the fundamental forces in nature and is mostly responsible for some of what we know as radioactivity. The particles that carry the weak force are the **W** and **Z bosons**. This force acts over short distances, so particles that are far apart are not affected by this force. Far in the subatomic world means separated by more than about the diameter of an atomic nucleus.



X

X-ray

A photon (particle that carries the electromagnetic force and makes up light) with alot of energy. You can use these photons to help take pictures of things such as bones or teeth if you go to a doctor or dentist.

Y

Yard
A unit of length that is 36 inches, or 3 feet.
See Length Unit Comparison Chart at the end of the glossary.

Year
A unit of time. There are 31536000 seconds in one year.

Z

Z Boson
This particle is the carrier for the **Weak force**.
It has no electric charge.

Length Unit Comparison Chart