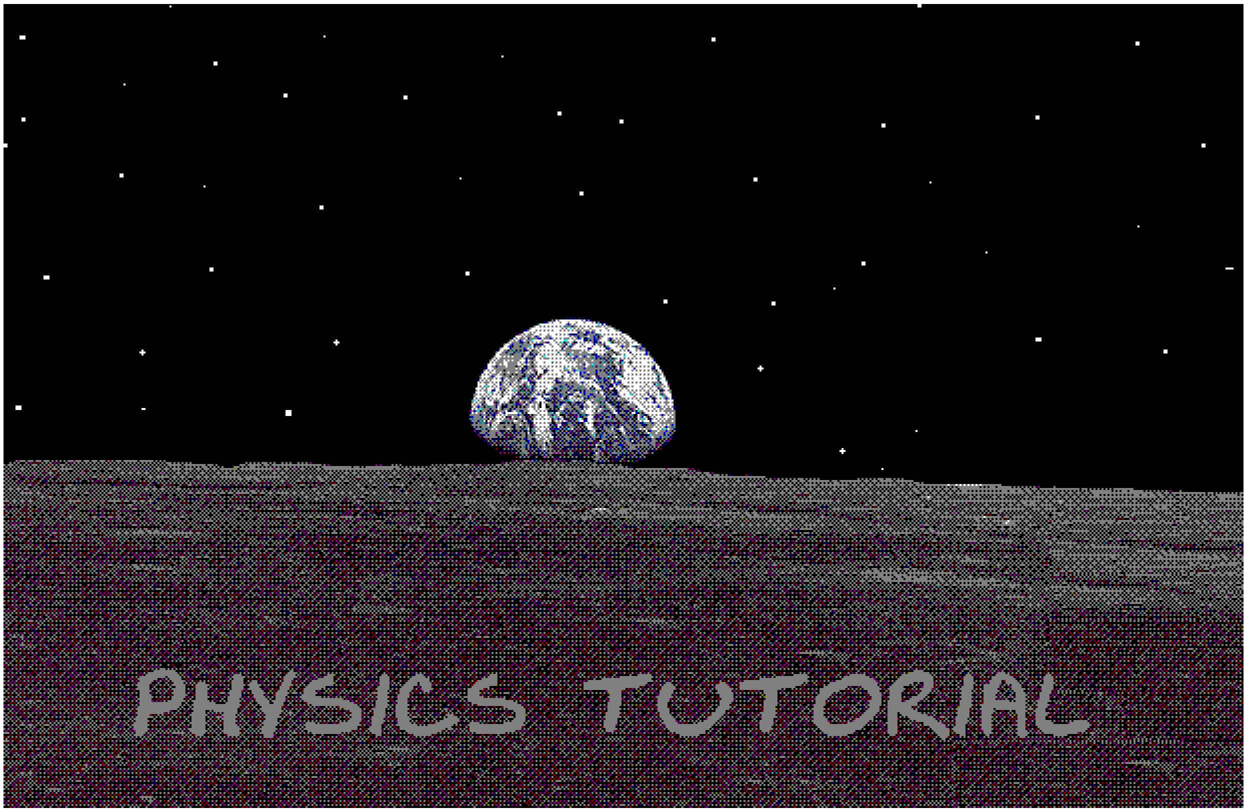
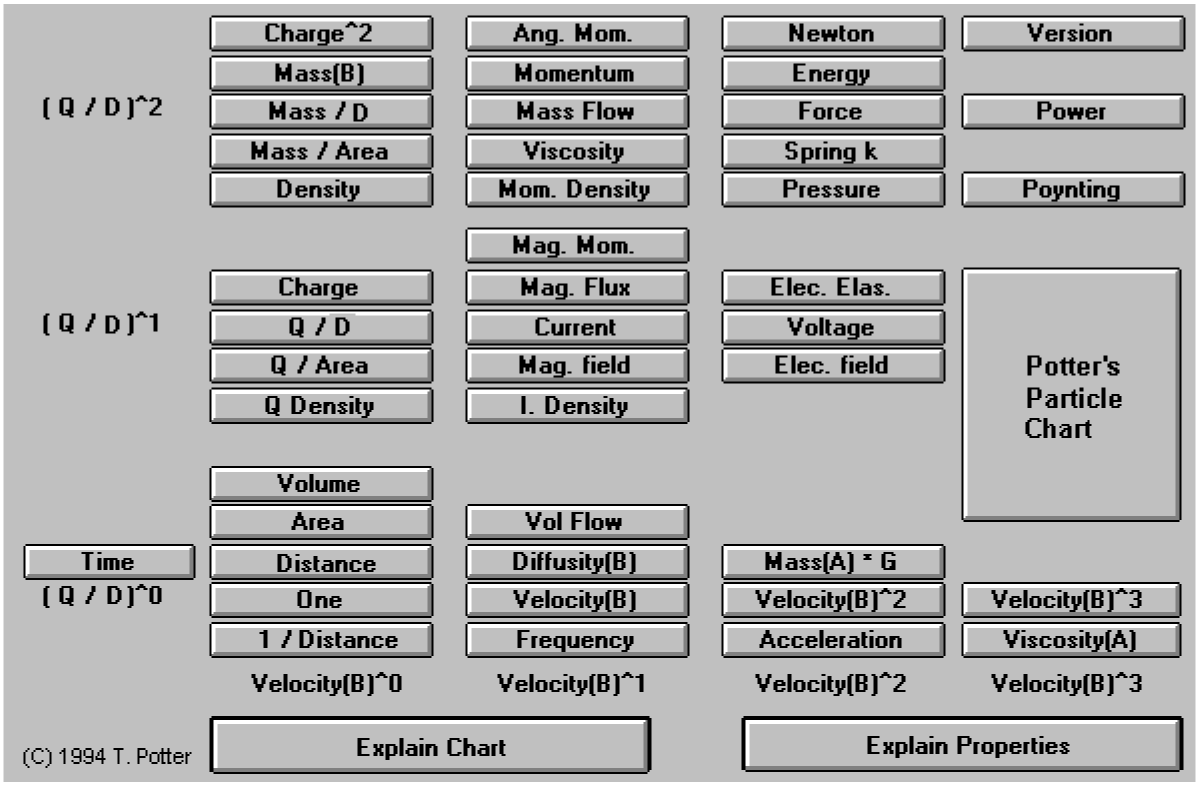
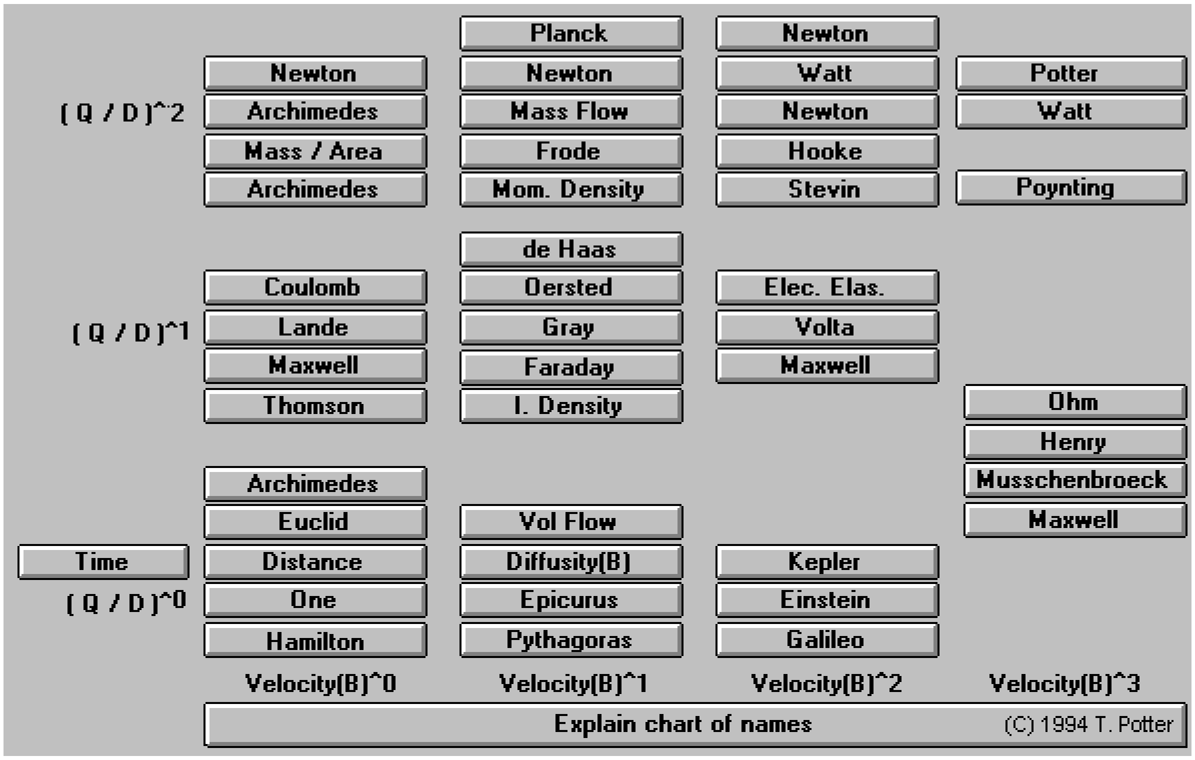
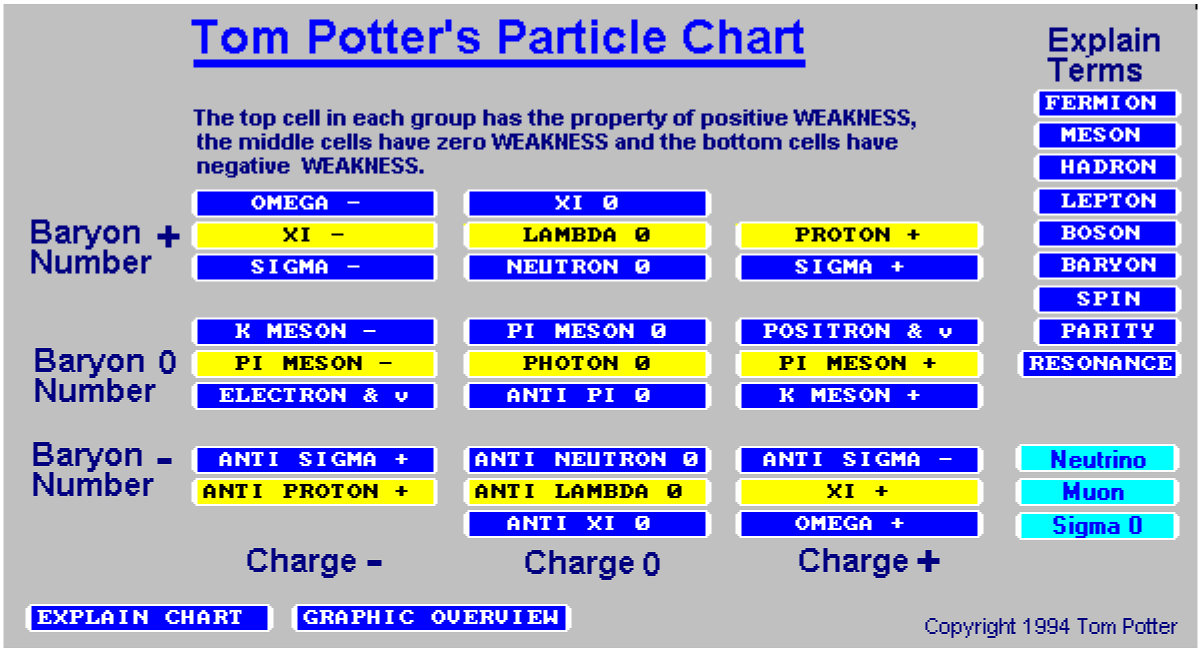

PHYSICS TUTORIAL


Charge^2
Ang. Mom.
Newton
Version
Mass(B)
Momentum
Energy
(Q / D)^2
Mass / D
Mass Flow
Force
Power
Mass / Area
Viscosity
Spring k
Density
Mom. Density
Pressure
Poynting
Mag. Mom.
Charge
Mag. Flux
Elec. Elas.
(Q / D)^1
Q / D
Current
Voltage
Q / Area
Mag. field
Elec. field
Potter's Particle Chart
Q Density
I. Density
Volume
Area
Vol Flow
Time
Distance
Diffusity(B)
Mass(A) * G
(Q / D)^0
One
Velocity(B)
Velocity(B)^2
Velocity(B)^3
1 / Distance
Frequency
Acceleration
Viscosity(A)
Velocity(B)^0
Velocity(B)^1
Velocity(B)^2
Velocity(B)^3
(C) 1994 T. Potter
Explain Chart
Explain Properties

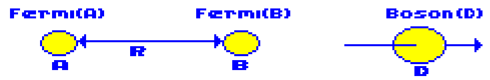

Planck
Newton
Newton
Newton
Watt
Potter
(Q / D)^2
Archimedes
Mass Flow
Newton
Watt
Mass / Area
Frode
Hooke
Archimedes
Mom. Density
Stevin
Poynting
de Haas
Coulomb
Oersted
Elec. Elas.
(Q / D)^1
Lande
Gray
Volta
Maxwell
Faraday
Maxwell
Thomson
I. Density
Ohm
Henry
Archimedes
Musschenbroeck
Euclid
Vol Flow
Maxwell
Time
Distance
Diffusity(B)
Kepler
(Q / D)^0
One
Epicurus
Einstein
Hamilton
Pythagoras
Galileo
Velocity(B)^0
Velocity(B)^1
Velocity(B)^2
Velocity(B)^3
Explain chart of names
(C) 1994 T. Potter


Tom Potter's Particle Chart
Explain Terms
The top cell in each group has the property of positive WEAKNESS, the middle cells have zero WEAKNESS and the bottom cells have negative WEAKNESS.
FERMION
MESON
HADRON
LEPTON
BOSON
BARYON
SPIN
PARITY
RESONANCE
Baryon + Number
OMEGA -
XI -
SIGMA -
XI 0
LAMBDA 0
NEUTRON 0
PROTON +
SIGMA +
Baryon 0 Number
K MESON -
PI MESON -
ELECTRON & ν
PI MESON 0
PHOTON 0
ANTI PI 0
POSITRON & ν
PI MESON +
K MESON +
Baryon - Number
ANTI SIGMA +
ANTI PROTON +
ANTI NEUTRON 0
ANTI LAMBDA 0
ANTI XI 0
ANTI SIGMA -
XI +
OMEGA +
Neutrino
Muon
Sigma 0
Charge -
Charge 0
Charge +
EXPLAIN CHART
GRAPHIC OVERVIEW
Copyright 1994 Tom Potter

OVERVIEW OF PARTICLES

	Volume-like	Area-like	Line-like
Family	Baryons Nucleons Hyperons	Bosons Photons Mesons	Leptons Electrons Neutrinos
Appearance	Matter-like	Wave-like	Both
Laws	Newtonian	Quantum	Both
Statistics	Fermi	Bose	Fermi
Spin	Half-integer	Integer	Half-integer

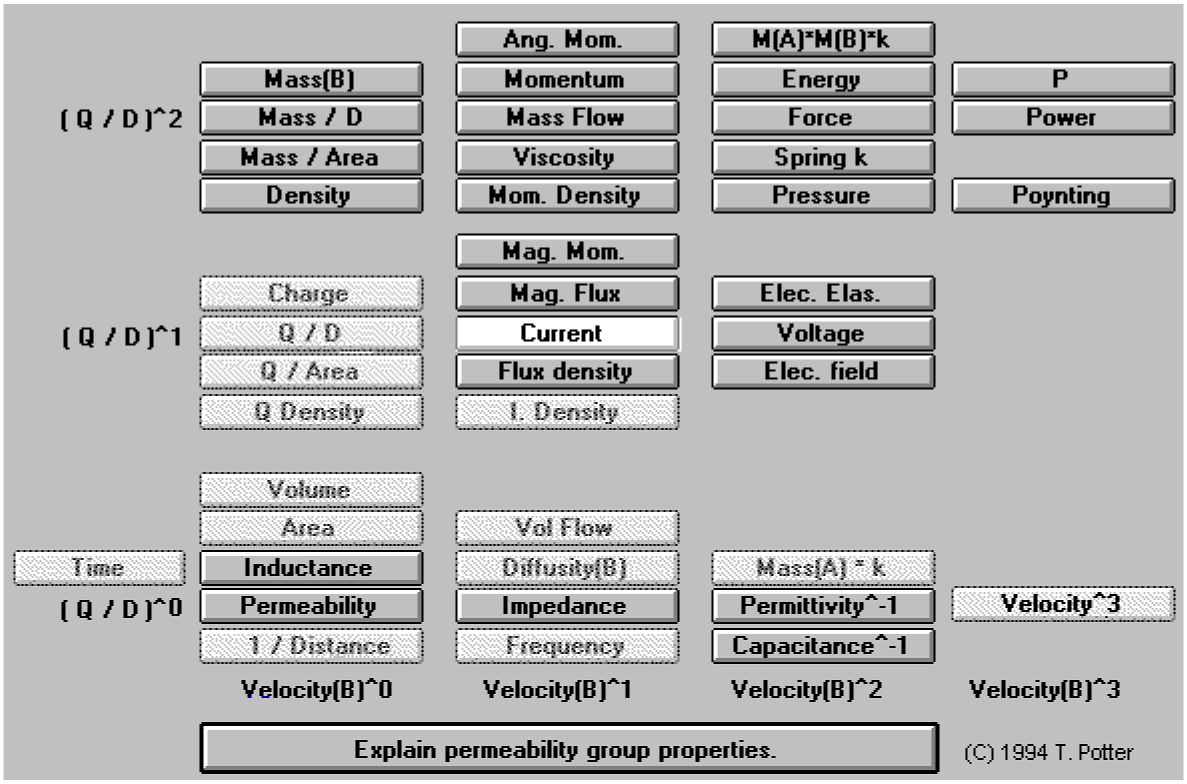
Interactions



1. Two particles interact in a straight line through their respective center of gravities.
2. The distance between the particles changes.
3. A BOSON is absorbed or created in the process.
4. If a BOSON is created, it exists in space until it interacts with another set of particles.
5. If a BOSON is absorbed, it adds energy to the system.

The names point to the properties associated with the persons listed.

As no one seems to have discussed precession times fundamental relationship with period time and interacting masses, I have taken the liberty of using my name as the pointer to it.


Ang. Mom.
M(A)*M(B)*k
Mass(B)
Momentum
Energy
P
(Q / D)^2
Mass / D
Mass Flow
Force
Power
Mass / Area
Viscosity
Spring k
Density
Mom. Density
Pressure
Poynting
Mag. Mom.
Charge
Mag. Flux
Elec. Elas.
(Q / D)^1
Q / D
Current
Voltage
Q / Area
Flux density
Elec. field
Q Density
I. Density
Volume
Area
Vol Flow
Time
Inductance
Diffusity(B)
Mass(A) * k
(Q / D)^0
Permeability
Impedance
Permittivity^-1
Velocity^3
1 / Distance
Frequency
Capacitance^-1
Velocity(B)^0
Velocity(B)^1
Velocity(B)^2
Velocity(B)^3
Explain permeability group properties.
(C) 1994 T. Potter

The physical properties are commonly divided into two major groups.

The first group of properties is defined in the time-space domain.
A second group of properties is defined in the time-space-mass domain.

A constant is needed to equate these two sets of properties.
This constant is a function of the particular force involved in an interaction.

Permeability, the constant which relates the electro-magnetic time-space domain properties to the time-space-mass domain properties, is also known as the **magnetic constant**.

The highlighted time-space-mass domain properties are obtained by multiplying the time-space domain properties by permeability.

The dimensions of the time-space-mass domain properties are permeability times the time-space domain coordinates of the property. For example, the dimensions of voltage are charge per length times velocity squared times permeability.

It must be noted that permeability is a constant only in homogenous space. Permeability varies as there is less than 100% coupling between many interacting systems. This is most evident in hysteresis loops which show the relationship between magnetic field intensity and flux density.

permeability = B / H = coupled energy / available energy

Acceleration (a){ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Acceleration is how quickly a body changes velocity or direction. You feel it when you speed up or slow down. Acceleration acts on a bodies mass to produce a force on the body.

Acceleration is a vector quantity as it has both a direction and a magnitude. A body moving in a straight line has acceleration only when it is changing velocity. A body moving at a constant velocity has acceleration only when it is changing direction. This indicates that velocity and direction are closely related. As indicated in the tutorial, velocity is a function of the tangent of the direction change.

According to Einstein, the equivalence of time-space domain acceleration to time-space-mass domain acceleration was the cornerstone of **general relativity**.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Galileo Galilei (1564-1642) performed experiments on accelerated and falling bodies using towers and inclined planes. He knew that missiles followed parabolas and that the distance traversed by falling bodies was proportional to time squared.

Discovery of time-space link

Isaac Newton (1642-1727) extended the concept of acceleration to astronomy and the motion of celestial bodies.

force = mass * acceleration
distance = acceleration * time^2
acceleration = velocity / time
acceleration = voltage / charge

meters per sec^2
g's
60mph per seconds

Einstein indicated that the equivalence of time-space like acceleration (Inertial mass effect) to mass-like acceleration (Gravitational mass effect) was the cornerstone of General Relativity.

What this means is that time-space like acceleration (velocity per time) is equivalent to mass like acceleration. (force / mass)

Kepler's observation, that the radii cubed divided by the orbital periods squared of planets was a constant, was the first indication of this equivalence. Newton showed a deep understanding, of the equivalence of time-space like and time-space-mass like properties, with his equations:
force = mass(A) * mass(B) * G / distance^2
force = mass * acceleration

An examination of the property charts shows that every property (Except period and precession times) has a static and a dynamic equivalence. In other words, most properties can be defined either in terms of the mass of one body or the velocity of the second body.

Action

Action is time multiplied by the difference between kinetic energy and potential energy.

It is a measure of the of the change exchanged by systems and changes in discrete steps of **Planck's Constant**.

A commonly held, but false, notion is that discrete amounts (quanta) of energy are exchanged between systems. The energy transferred between systems is actually a function of both the quanta of action and the relative motion between the systems.

Nature uses the least amount of action possible when affecting a change. For example, light beams take routes of least action, much as a person takes the path of least resistance when walking through a park filled with trees and other obstructions.

Angular displacement

The ideal physical property system would consist only of dimensionless numbers.
The more constants and fundamental properties used, the more complicated a system becomes. Note that chart #3, of the tutorial, expresses the relationships between all of the physical properties in terms of only one property, **time** and time is basically a dimensionless property.

Time is the dimensionless ratio of two angular displacements. Time is the angular displacement of some external reference per angular displacement of the system under observation.

Time(x) = angular displacement(reference) / angular displacement(x)

For example, the time period of the Earth's rotation about the Sun is:

$$\text{Time(Earth cycles about Sun)} = \frac{\text{1461 Earth cycles about its' axis}}{\text{4 Earth cycles about the Sun}}$$

Note that the product of time(X) and angular displacement(X) is equal to the angular displacement of our reference.

In order to express classical physics precisely, the period of the system under observation must be used as a reference, as any instabilities in an external reference will contaminate measurements made of the system.

As the statistical unfolding of reality involves the relationships between all systems, we must search for and use the most stable periods possible as our reference, as the reference must be relied upon to compare all of the systems to one another.

In order to probe reality to a finer degree, we must use periods which provide us with the most cycles for each cycle of the system under observation.

All properties can be defined in terms of more fundamental angular displacements. Angular displacement seems to be more fundamental than points, angles, space, time and mass. Time is used as the most fundamental property in the tutorial charts, as it is a concept accessible to everyone.

angular displacement = ratios of aggregates of fundamental loops
Time(x) = angular displacement(reference) / angular displacement(x)
Distance = time * a constant "C"
Velocity = distance / time
Mass = velocity^3 * time * a constant "G"
All other properties = mass^x * time^y * distance^z

Fundamentally, angular displacements are ratios of aggregates of loops. At the most fundamental level, we must use cycles to measure other cycles and the only thing we can ever know is when the smallest cycle has been completed. The **Uncertainty Principle** and **information theory** are expressions of this. We need a certain amount of information to describe something else and the smallest unit of information is the cycle or loop associated with the electron (**Planck's Constant)**.

The cycle associated with electrons is like the baud rate of the modem we use to exchange information over telephone lines. It sets a limit to the rate at which we can exchange information. If we want to exchange information at a faster rate, we need a faster modem. If we wish to probe smaller times and thus smaller distances, we need a smaller probe. Although neutrinos would serve this purpose, we have not developed the means to control them.

Angular momentum {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Angular momentum is the rotational momentum of a body. For a given set of conditions more massive bodies have a greater angular momentum as do bodies rotating at higher velocities. A rotating wheel, which is stationary in space, has angular momentum but no linear momentum.

Angular momentum has a polarity as bodies can rotate **clockwise** or **counter-clockwise**.

Action, which is energy times time, and angular momentum have the same physical dimensions.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Joseph Lagrange(1736-1813) formulated the theory of least action about 1758 and this was expanded upon by William Hamilton(1805-1865).

Action changes in tiny increments of **Planck's Constant**.

Nature uses the least amount of action possible when affecting a change. For example, light beams take routes of least action, much as a person takes the path of least resistance when walking through a park filled with trees.

Jean Foucault's (1819-1868) invention of the gyroscope in 1852 indicated the first subtle understanding of angular momentum.

Max Planck (1858-1947) elevated angular momentum to an important position in fundamental physics when he postulated that the angular momentum of atomic particles occurred in integer steps and that energy was conveyed from place to place in integer steps of angular momentum.

angular momentum = mass * velocity * radius
angular momentum = frequency * moment of inertia
energy = angular momentum * frequency
angular momentum = momentum * length

Plancks units
erg seconds
dyne-cm per second
joule seconds
calorie seconds

Area (S) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Area is a measure of the size of a closed surface. We need to know the area when we paint walls or plant crops. Area is a very subtle concept. It implies the existence of orthogonal space dimensions with otherwise identical qualities.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

The ancient civilizations of Sumer and Egypt understood the concept of area as they measured and allocated fields based on area.

Euclid (330-275 B.C.) developed geometry which deals with areas.

Pythagoras (580-500 B.C.) studied geometric areas intensively.

Isaac Newton (1642-1727) developed calculus and used it to calculate the areas of complex shapes.

Area = height * width

square inches
square meters
acres
barns
township
hectares
circular mil

Capacitance (C){ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Capacitance is the capacity of a body to store electrical charge for a given voltage. Devices made to store charges are called capacitors or condensers.

Physically, capacitors are two conductors of electricity separated by a dielectric material. A dielectric is an insulator which is capable of storing a charge.

Contrary to intuition, charge is stored by stressing the dielectric rather than in a pool of charges. When stressed by the application of a voltage, a good dielectric material remains in the stressed state longer than an ordinary insulator.

Capacitance is the time-space-mass domain expression of acceleration^-1. When working with electrical problems, consider that the reciprocal of capacitance occupies the same position on the property chart as acceleration.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

In 1745, Petrus Van Musschenbroeck (1692-1761) accidentally discovered that an electric charge generated by electrostatic generators could be stored in metal foil lined glass jars. Petrus called this device a Leyden jar in honor of his birthplace, Leyden. This discovery open an unexplored dimension of human experience.

Discovery of capacitance

Henry Cavendish (1731-1810) determined the fundamental relationships affecting capacitance. (Plate area, plate separation and dielectric constant)

voltage = charge / capacitance
impedance (capacitive reactance) = 1 / (2 * π * frequency * capacitance)
frequency = 1 / (2 * π * (capacitance * inductance)^.5)
energy = charge^2 / capacitance

farads
microfarads
abfarad
statfarad
international farad

Charge (Q) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Sometimes, after combing your hair, your comb is able to attract tiny bodies. The friction between the comb and your hair has redistributed electrical charges on your hair and comb.

Charge is one of the four properties of matter which causes bodies to react to one another. The other properties are baryon number which is associated with the strong nuclear interaction; strangeness which is associated with the weak nuclear interaction and mass which is associated with the gravitational interaction.

Most matter consists of tiny particles which possess either a positive or a negative charge. The net charge on a body is the algebraic sum of the positive and negative charges.

All known chemical, electric and magnetic effects arise from charge.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Thales of Miletus (640-547 B.C.) was the first to record that rubbing amber with cloth gave it a property which allowed it to attract light bodies.

William Gilbert (1544-1603) studied electric and magnetic attraction and formulated laws about them.

Stephen Gray (1696-1736) used electrostatic voltage generators to experiment with the movement of charges through various materials such as silk and cotton.

These laws were formalized by Charles de Coulomb (1736-1806).

charge = energy / voltage
charge = voltage * capacitance
charge = current * time

coulombs
abcoulombs
statcoulomb
ampere hours
faradays
electron charge

Charge density (ρ){ewl EMBH.DLL,MODEM,0}

History

Equations

Units

Dimensions

Charge density is amount of charge within a volume.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Working from the visual concepts of Michael Faraday (1791-1867), and the concepts of W. Thompson, James Clerk Maxwell (1831-1879) formally expressed most of the relationships between the electro-magnetic properties. His equations provided a precise, unambiguous, three-dimensional description of the orthogonal relationships between electrical charge, magnetism and time-space.

charge density = charge / volume
Hall constant = volume / charge density
density = divergence of dielectric displacement (DIV D)

coulombs per meter^3

Charge per length (ρ){ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Charge and length are intimately bound together. A fundamental length seems to be associated with a unit charge.

Two other quantized properties have qualities similar to charge Baryon number and strangeness).

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Surprisingly, little attention has been paid to this most intimate of relationships. The g factor or Lande factor of particles seems to be a fundamental charge per length property.

charge = charge density * volume
g factor = h / magnetic moment

coulombs per meter
g factor

If there is an unbalance in the charge between opposite ends of any material, charge carriers in the material will migrate so as to equalize the charge.

Materials in which this happens quickly are conductors of electricity.

Materials in which this happens very slowly are insulators.

The materials in between are semi-conductors.

Insulators have high values of resistance.
Dielectrics are insulators which also have a high value of permittivity.
Dielectrics permit charge displacement without charge transport.

Current (I) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Electrical current is the flow of charges. A circular magnetic field exists around moving charges. The flow of current can be detected by this magnetic field.

Current flow through resistive bodies can be detected by the heating of the body.

Electrical current is measured in amperes. One ampere is defined as one coulomb of charge moving past a point in one second. The smallest increment of charge is found on atomic particles such as electrons and protons, and equals about 1 X 10^-19 coulombs.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Stephen Gray (1696-1736) experimented with the transmission of the affects of electrostatic generated voltages along long strings of various materials and was the first person to observe current flow.

George Simon Ohm (1787-1854) studied the relationships between voltage, current and resistance. He likened current to the flow of fluids and voltage to liquid level and developed relationships linking voltage, current and resistance.

The unit used for measuring current is named for Andre Ampere (1775-1836).

Resistance (R) is opposition to a steady state current flow.

Reactance is the opposition to a current flow which changes with time. Capacitors and inductors (coils) have reactance.

Impedance is the total opposition to current flow which consists of both resistance and reactance. An orthogonal relationship exists between resistance and reactance. If we think of resistance as a vector directed east, capacitive reactance can be thought of as a vector directed north and inductive reactance as a vector director directed south. Impedance is the resultant vector.

current = charge / time
current = voltage / impedance

amperes
milliamps
abampere
faradays per second
statampere

Current density (J){ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Current density is the amount of electric current per cross-sectional area.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

History???

current density = current / area

amperes per meter^2

Del{ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Del is a **three dimensional per unit distance** operator. It has dimensions of the reciprocal of distance. It is a measure of the rate of increase of the wave function.

It is associated with del^2, the Laplace Operator, a three dimensional property which has dimensions of **per unit area** property.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

William Hamilton (1805-1865), Marquis Laplace (1749-1827) and James Clerk Maxwell (1831-1879) developed the concepts involving the del factor.

del = i d / dx

reciprocal distance

Density (p){ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Density is the concentration of matter It is the amount of mass per volume of a substance. Iron has a greater density than wood, and wood has a greater density than foam. The relative density (Specific density) of a substance is a measure of how it compares in density to water. The vapor density of a gas is a measure of how it compares to the density of hydrogen at a particular pressure and temperature.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Archimedes (287-212 B.C.) determined that a floating body displaced its own weight and that a submerged body displaced its own volume. Knowing this, he was able to determine the density of various bodies. According to legend, he used this technique to determine the amount of gold in a kings crown.

Discovery of mass-volume link

density = mass / volume
pressure = density * gamma(B)*C^2

grams per cm^3
demal
slug per ft^3
lbs per inch^3

Dielectric displacement (D){ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Dielectric displacement is charge per surface area. When an electrical charge acts on a dielectric material, it stresses and polarizes the molecules in material. The material remains in an electrically stressed state when the charge is removed. Dielectric displacement is charge displacement without charge transport.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Michael Faraday (1791-1867) formulated the concept, of dielectric displacement to explain the residual electrically-stressed state of a dielectric material which had been exposed to a charge.

James Clerk Maxwell (1831-1879) conceptualized this property to explain capacitance and recognized that it could be the vehicle by which electro-magnetic energy moved. He went on to link this mechanism to light and calculated the speed of light from electric and magnetic measurements. He also postulated that forms of electro-magnetic radiation other than light existed. Heinrich Hertz(1857-1894) was able to demonstrate this many years later by generating and receiving radio waves.

Discovery of matter-radiation link

Dielectric displacement = electric field strength * permittivity

Coulombs per meter squared

Diffusity{ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Diffusity is the rate at which a surface area changes.

Examples of diffusity include the change in the surface area of a balloon when the air pressure in it changes, and the dispersion of smoke from a smokestack. Even the universe seems to be diffusing.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

History???

diffusity = area / time
diffusity = angular momentum / mass
diffusity = temperature^.5 / molecular weight^.5

meters^2 per second
poise in^3 per gm
liter per cm per day
inch^2 per second

Domain as used in this tutorial means the fundamental set of properties used to define the physical properties.

This tutorial considers three domains.

1. Defines all properties in terms of times.
2. Defines all properties in terms of time and distance.
3. Defines all properties in terms of time, distance and mass.

All properties in domain 1 are measured and specified using a single "clock".

Domain number 2 expresses cyclical times as time, and expresses interaction times as distances by multiplying them by the interaction velocity. The interaction velocity for electro-magnetic and gravitational interactions is the speed of light "C". The properties in domain 2 are measured and specified using both a "clock" and a "measuring stick".

Domain number 3 expresses cyclical times as time, interaction times as distances and a particular combination of times and distances as mass. The properties in domain 3 are measured and specified using a "clock", a "measuring stick" and a "scale". Unknown masses are compared using a balance beam scale and a reference mass.

Within each domain, any derivative property could be used as a fundamental property. For example, in domain 2, either velocity, acceleration or even diffusity could be used rather than distance. In domain 3, properties such as energy, momentum and mass per distance could be used rather than mass. The selection of a specific fundamental property skews the resultant chart rather than affects its' content.

Note that the phrase **time-space** is used through out this tutorial rather than the more conventional phrase **space-time**. As time is more fundamental than space, and as space is more fundamental than mass, I have elected to express these properties in their fundamental order.

Electric elasticity {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Electric elasticity is voltage multiplied by distance.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

History???

electric elasticity = voltage * distance volt-meters Don't laugh! :-)

Energy   (W) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Energy is the amount of work done. It is best visualized in terms of force and distance. Carrying 50 pounds up a 10 foot ladder   would require 500 foot-pounds of energy. If pushing a skid took 100 pounds of push, it would take 1000 foot-pounds of energy to push the skid 10 feet.

Power is how fast work is done. It takes more power to do work in less time.

An isolated, homogeneous body cannot possess energy, **even if it has mass.**
Energy can only exist where there are multiple bodies, separated by distance.

I understand.   **I don't understand.**   **I need help.**   **I am confused.**   **This program sucks.**

As the steam engine was being developed as an energy supplement to water power and beasts of burden, the amount of food (fuel) the beast consumed became very important. James Watt (1736-1819) and others worked intently to reduced the beast's appetite and came to understand much about the capacity various fuels had for doing work. James Watt was an assistant to Joseph Black (1728-1799) and learned much about energy and power from him.

energy = power * time
energy = force * distance
energy = charge * voltage
energy = angular momentum / time

ergs
joules
watt-seconds
kilowatt-hours
calorie
foot-pounds
electron-volt
BTUs
megaton TNT

Gamma(A) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Gamma(A) is a function of the velocity of a body divided by the speed of light.
It is a dimensionless ratio which relates mass to energy.

Gamma(A) is defined as:

tangent(A) = velocity(A) / C   where C is the speed of light.
cosine(A) = the cosine of the angle whose tangent is velocity(A) / C
gamma(A) = 1 / cosine(A) -1

The relationship between mass and energy is:

energy(A) = mass(A) * C^2 * gamma(A)

I understand.   **I don't understand.**   **I need help.**   **I am confused.**   **This program sucks.**

This property is not recognized in traditional physics.

tangent(A) (Hydrogen) = Q / L = 9.0490401E-6

Where L = Comptons wavelength * the fine structure constant.

And Q is the electron charge.

The mass of the electron = gamma(A) * L * permeability.

Plancks Constant = gamma(A) * L^2 * speed of light * permeability / fine structure constant.

gamma(A) = gamma(B) * mass ratio(B / A)^(2/3)

Dimensionless

Gamma(B){ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Gamma(B) is a dimensionless property which equates mass to energy.
The basic expression for energy is:

energy(B) = mass(B) * gamma(B) * C^2

Gamma(B) is a function of velocity and C. It can be computed as:

sine(B) = velocity(B) / C
cosine(B) = the cosine of the angle whose sine is velocity(B) / C
gamma(B) = 1/cosine(B) -1

The cosine associated with the velocity of a body can be used to compute various relativistic properties, including:

length = length(rest) * cosine(B)   Fitzgerald contraction.
time = time(rest) * cosine(B)   Time dilation.
mass = mass(rest) / cosine(B)   Inertia mass (A bad concept).

I understand.   **I don't understand.**   **I need help.**   **I am confused.**   **This program sucks.**

Until around 1900, it was assumed that energy was proportional to mass times velocity squared. As measurements were made at higher velocities, it became apparent that this assumption was in error.

Albert Einstein (1879-1955) expressed the relationship between mass and energy as: **energy = mass(B)*C^2*gamma(B).**

Conventional physics does not recognize gamma(b) as a property although its recognition as a dimensionless property would eliminate the commonly misunderstood relationship between mass and energy.

gamma(B) = (2 / radius - 1 / semimajor axis)
permittivity = permeability * C^2 * gamma(B)
gamma(B) (electron) = Compton wavelength * Rydberg constant

dimensionless

Electric field strength (E) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Electric field strength is the intensity of an electric field. Radio waves are composed of an electric component which has a given electric field strength and a magnetic component which has a given magnetic field strength. The product of the electric and magnetic fields is called Poynting's Vector.

Radio waves and light are electro-magnetic waves.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Michael Faraday (1791-1867) performed electro-magnetic experiments and conceptualized the prototype of modern electro-magnetic theory. Before Faraday, people conceived of forces acting like the pull of a rope or the push of a stick upon a body. This is called **action at a distance**. Faraday conceived of fields emanating from bodies and carrying a force to other bodies. This is called **field theory**.

James Clerk Maxwell (1831-1879) expressed Faradays ideas in a three dimensional math form. In 1864, Maxwell precisely described radio waves from experiments performed on coils of wire and capacitors. Heinrich Hertz (1857-1894) was able to generate these waves in 1887.

electric field strength = force / charge
power per area = electric field strength * magnetic strength
Hertz vector = magnetic vector potential * time / permeability

volts per meter
volts per inch

Flux density (B) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Flux density (B) is the amount of magnetism induced into a body by a magnetizing force (H). When a body is placed near a magnetizing force, all of the magnetism from the source is not induced into the body. Furthermore, the amount of magnetism (B) any body can hold approaches a limit. As a body is magnetized, the electrical charges in the body must move at higher and higher velocities. As the velocities of the charges approach the speed of light, the body is saturated and no more magnetism is induced into the body.

Saturation indicates that the relationship between B and H is not linear.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Hans Oersted (1777-1851), Charles de Coulomb (1736-1806), Michael Faraday (1791-1851) and James Maxwell (1831-1879) studied electricity and magnetism intensively in the 1800's.

flux density (B) = magnetic field strength (H) * permeability
flux density = magnetic flux / area
charge mobility = 1 / B

Telsa
gauss
Maxwells per cm^2
webers per cm^2
lines per inch^2

Force (F) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Force is what a spring scale measures. It is what you are aware of when you are touched, or pushed. It is an influence which causes bodies to undergo some change.

Weight is a measure of the force with which a body is attracted to the Earth. Weight is not mass but is dependent upon mass. The weight (force) of a body would vary from planet to planet yet it's mass remains constant.

Force is how fast momentum changes with time. For example, an automobile moving at a high speed has a greater momentum than a feather moving at the same speed. If both of these systems were to crash into an object and dissipate all of their momentum in one second, the automobile would impact the object with a much greater force than the feather.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Archimedes (287-212 B.C.) studied forces using pulleys and levers. He knew that a floating body was subject to an upward force through its' center of gravity.

Isaac Newton (1642-1727) laid the foundation for modern science and engineering with his publication of "Principia Mathematica" in 1687. This work introduced many new concepts including: mass, momentum, gravitation and calculus.

Although balance beam scales, which measure mass, were used over 4000 years ago, the different between mass and weight were not understood until Newton.

force = mass * acceleration
energy = force * distance
Reynolds number = inertial force / viscous force
Fronde number = inertial force / (gravity force)^.5

poundal
newton
kilogram force
dyne
kip
gram weight
ton weight

Frequency (ω) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Frequency is the number of occurrences of a periodic activity per unit of time.
The most common kinds of periodic activity such as radio waves and planetary orbits vary in a sine-like way.

Many sine-like time periods are bound up in complex time varying activity such as speech and music. A mathematical transform (Fourier) can be used to express each of these time functions in terms of frequency.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

When man began to farm, his survival became closely bound to the seasons. Early man learned to accurately predict seasonal and astronomical periods.

Pythagoras (580-500 B.C.) discovered the ratios of the musical notes and scales and studied periodic behavior religiously.

Jean Fourier (1768-1830) developed sophisticated theorems about periodic functions.

frequency = 1 / time
frequency^2 = spring constant / mass
frequency^2 = 1   inductance * capacitance)

Hertz
cycles per second
RPM
radians per second

Impedance (Z) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Impedance is the opposition to the movement of charges. Impedance is a two dimensional property. It has two magnitudes. One magnitude is resistance and the other is reactance. The reactance opposition is apparent rather than real as energy taken from a system is later returned to the system. The resistance opposition is in effect a leakage of energy from the system in the form of heat and radiation.

Impedance can be understood by examining an automobile suspension system. Resistance is like the shock absorber. Both remove energy from systems and convert it to heat. The energy in a suspension system is exchanged between gravity and the compression of a spring, much as the energy in an electrical system is exchanged between a capacitor and an inductor.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Georg Simon Ohm (1787-1854) measured the relationships between voltage, current and resistance. It was later determined that opposition to current flow was a two dimensional property composed of resistance and a reactance which acted at right angles to resistance.

current = voltage / impedance
impedance (inductive reactance) = inductance * frequency
impedance (capacitive reactance) = 1 / (capacitance * frequency)

ohms
abohms
board of trade units
statohm
megohm
siemens units

Inductance (L) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Inductance is a measure of the amount of magnetism which can be stored in a body. Large coils of wire can store more magnetism and thus have more inductance. Magnetism is not only stored in the wire but in the air and in materials about the wire. Inserting iron cores into coils of wire greatly increases the amount of magnetism which can be stored and therefore increases the inductance.

Inductance is the time-space-mass domain expression of length. When working with electrical problems, consider that inductance occupies the same position on the property chart as length.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Joseph Henry (1797-1898) discovered inductance (self induction) in 1842 when he noticed that a spark was produced when an electrical circuit was broken.

The discovery of inductance opened an exciting new dimension to be explored.

Henry also determined that circuits containing inductance tended to oscillate.
Discovery of inductance

inductance = area * permeability / length
frequency^2 = 1 / (inductance * capacitance)
inductance = reluctance * k = k / permeance

henrys
millihenrys
abhenrys
stathenrys
intl henrys

Distance (s) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Distance is the amount of space between two points. Space appears to have three, mutually perpendicular length-like components in which a rigid body can be moved or rotated with no apparent change.

Distance and length are the same property. Length is the extent of an object and distance is the space between two objects.

Fundamentally, distance is interaction time multiplied by the interaction velocity. For electromagnetic and gravitational interactions the interaction velocity is "C", "the speed of light".

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Perception of distance is an innate ability of man and most animals. Animals use extended tactile perceptors, sonar, sound, smell and binocular vision to gauge distance. Man's physiology, psychology, science and philosophy is bound intimately to distance.

Ancient Babylonians and Egyptians developed standard lengths and weights before 2000 B.C. to facilitate bartering.

distance = velocity * time
distance = acceleration * time^2
energy = force * distance
area = length(X) * length(Y)
del = 1 / distance
laplacian = 1 / distance^2

meters
microns
angstrom
light years
parsec
pica
points
caliber
inches
feet
yards
chains
furlongs
angstroms
rods
fathoms
leagues

Kepler{ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

As this property does not have an official name, I will call it Kepler, in honor of the man who discovered this link between mass and the time-space properties.

Kepler = mass(A) * G = velocity(B)^3 * time

Kepler has the dimensions of mass times the universal gravitational constant in the time-space-mass domain, velocity cubed times time in the time-space domain and tangent cubed times time in the time domain.

Although some might consider this property a compound property, it must be remembered that all properties are compound properties.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Johannes Kepler(1571-1630) discovered that certain time-space properties of planetary orbits were constants. Newton, later discovered that one of these constants was the product of the mass of the central body and a constant which equated the time-space properties to the mass properties ("G", the universal gravitational constant).

Discovery of time-space-mass link

Mass(A) * G = velocity(B)^3 * period / 2 π

seconds / (meters per second)^3 / kilogram

Magnetic field strength (H) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Magnetic field strength (H) is the amount of magnetizing force. It is proportional to the length of a coil and the amount of electrical current passing through the coil.

Flux density (B) , or the amount of magnetism induced in a body, is a function of the magnetizing force (H).

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Hans Oersted (1777-1851) was the first person to observe the link between electricity and magnetism when he placed a compass near a wire conducting electrical current and discovered that the compass was deflected when current was flowing in the wire. He noted that the compass direction depended upon the direction of the current and it's intensity depended upon the amount of current.

Discovery of electricity-magnetism link.

Michael Faraday (1791-1867) determined that there was a mutually-perpendicular relationship between electricity, magnetism and motion. Basically what this means is that electricity moving west to east, through a magnetic field running north to south, would be deflected upwards. If the electricity was flowing through a wire, the wire would be deflected upwards also.

flux density (B) = magnetic field strength (H) * permeability
magnetic field strength (H) = current / length

amperes per meter
ampere turns per inch
Gilberts per cm
lines per in^2

Electricity as used here means the movement of negative charges from west to east or the movement of positive charges from east to west.

Magnetic flux (ϕ){ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Magnetic flux is to charge as momentum is to mass. While momentum opposes a change in the velocity of a mass, flux opposes a change in the velocity of a charge. A change in momentum generates a **physical force** while a change in flux generates an **electro-motive force** (voltage). To slow down a mass we must dissipate its' momentum. To slow down a charge, we must dissipate its' flux.

Flux is commonly thought of in terms of magnetic lines passing through a given area.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Natural magnetics (lodestones) were reported by the Chinese over 4500 years ago. Magnetized needles were used as direction indicators about 3000 years ago.

Not much was learned about magnetism until 1819 when Hans Oersted (1777-1851) passed an electrical current through a wire and noticed that a nearby compass needle deflected. This stimulated a great interest in magnetism and led to rapid advances.

Discovery of electro-magnetic link

Michael Faraday (1791-1851) conceptualized most of the electro-magnetic concepts. James Maxwell (1831-1879) expressed Faraday's concepts mathematically and expanded upon them to include dielectric displacement, permeability, electro-magnetic radiation and so on.

voltage = flux / time
magnetic field strength (B) = flux / area
flux = current * length * permeability

webers
Maxwells
line of force
volt seconds
megalines
unit poles

Magnetic moment (m) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Magnetic moment results from the interaction between two charged bodies or between two centers of charge in a single body. It is a vector (two dimensional) property associated with charge, mass and angular momentum. Magnetic moment is associated with a non-symmetrical charge distribution. Even electrons have magnet moments, therefore the internal charge distribution of electrons must be non-symmetrical.

It might be that the magnetic moment and angular momentum of fundamental particles are tied to the expansion of the universe as the expansion would act on charge and mass to create these properties.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

In 1915, W.J. de Haas and Albert Einstein established a link between atomic magnetism and atomic angular momentum with an experiment involving the rotation of an iron cylinder in a magnetic field.

magnetic moment = charge(A) * charge(B)
magnetic moment = charge * angular momentum / mass
magnetic moment = torque / magnetic induction

Bohr magnetrons

Magnetic vector potential (A) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Magnetic vector potential has the dimensions of current times permeability, therefore it seems to be the time-space-mass domain expression of electrical current.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

History???

flux density = magnetic vector potential / length
magnetic vector potential = voltage / velocity
magnetic vector potential = electric field * time

amperes kilograms per meter

Mass (M) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Mass is what a balance beam scale measures. It is the amount of material in a body involved in gravitational interactions. The concept of object is closely bound to the concept of mass.

Mass is perhaps too closely associated with energy although both are completely separate properties. The energy of a body is proportional to its mass times the speed of light squared times a gamma function. The gamma function, and therefore the energy of a body, is relative to each body in the universe. The confusion comes about because gamma is dimensionless.

Mass has the dimensions of mass in the time-space-mass domain,
velocity cubed times time in the time-space domain and
tangent cubed times time in the time domain.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Isaac Newton (1642-1727) formulated the concept of mass to express his laws of universal gravitation.

force = mass * acceleration
force = mass(A) * mass(B) * G / distance^2
energy = mass * C^2 * gamma
mass = (charge / length)^2 / length * permeability

kilograms
grams
stone
hundredweight
pound
ounce
scruple
pennyweight
AMU's
Dalton
carat
grain
ton

Mass flow{ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Mass flow is the amount of mass which flows through some area in a given amount of time. Conventional, gasoline station pumps measure volume flow rather than mass flow. This means we pay a little more for a given mass of gasoline on hot days when the gas expands. Expensive mass flow meters must be used to insure that the correct amounts of mass are combined in critical process control applications.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

History???

mass flow = mass / time

grams per second

Mass per area{ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Mass per area is the amount of mass per cross-section of a body.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

History???

grams / length^2

Kilograms per meter^2

Mass per length{ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

The aggregate mass of a body can be considered to be distributed along the radius between two bodies. Mass per length is the length equivalence of mass.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Archimedes (287-212 B.C.) determined that a floating body exerted a force through the body's center of gravity. In other words, the attraction of MASS(A) (Earth) for MASS(B) (Floating body) acts in a line not in an area.

Discovery of space-mass link

Event diameter(A) = mass(A) * (universal length per mass constant)
(Universal length per mass constant for gravity) = G / 2 * C^2)
Where G is the universal gravitational constant and C is the speed of light.

kilograms per meter
poundals per foot

Momentum (p) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Momentum is the amount of impulse possessed by a moving body, where **impulse is force times time**. A body with momentum can cause a large force for a short time when it collides or it can cause a smaller force for a longer time.

Momentum is passed along to other bodies during collisions. Momentum is the mechanical equivalent of magnetic flux. A change of flux creates a voltage whereas a change of momentum creates a force.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Zeno of Elea (490-430 BC) anticipated the need for momentum. His paradoxes indicated that something more than static interaction was needed to bridge the gap between static intervals.

Isaac Newton (1642-1727) provided the modern definition of momentum.

force = momentum / time
momentum = mass * velocity
momentum^2 = mass * energy

kilogram meters per sec

Momentum density{ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Momentum density is the amount of momentum per unit volume.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

History???

electromagnetic momentum density = Poynting vector * permeability * permittivity kilograms per second per meter^2

Newton {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

As this property does not have an official name, I will call it Newton, in honor of the man who discovered the link between two masses and the time-space properties.

Newton = mass(A) * mass(B) *G = force * distance^2

This property has the dimensions of mass(A) times mass(B) times the universal gravitational constant in the time-space-mass domain,
velocity to the sixth power times time squared in the time-space domain
and tangent to the sixth power times time squared in the time domain.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Isaac Newton (1642-1727) defined this relationship in his famous law of universal gravitation.

Discovery of mass(A), mass(B) link

force = mass(A) * mass(B) * G / radius^2

grams
newton

One (1){ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

One is the identity element for the conjunction **product(one,X) = X**
much as **zero** is the identity element for the conjunction **sum(zero,X) = X**.
Note that **one** can be associated with multiplication and **zero** with addition**.**

One serves as the central point on all of the property charts. Properties and their reciprocals are located symmetrically opposite on the charts. Note that only one quadrant of properties has been shown and that time and capacitance lie in one of the uncharted quadrants.

Permeability is the time-space-mass domain expression of **One**. The time-space-mass domain properties are time-space domain properties multiplied by a constant such as permeability.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

The words "a", "an", "it", "that", etc. indicate that man had a fundamental awareness of oneness or unity thousands of years ago.

Clifford Paulson examines articles, integers, ordinality and real numbers in depth in his book "Language, Philosophy and Logic".

one = property(X) / property(X)
one = property(X) * reciprocal of property(X)

dimensionless

Many physical properties have orthogonal relationships.

Orthogonal means composed of right angles (90 degrees).

For example, magnetic fields, electrical currents and velocities all act at right angles to one another.

Orthogonal relationships are not measured on the same scale or line as the properties they are orthogonal to. For example, we can plot the square roots of positive numbers on a positive, real number line. As we cannot plot the square roots of negative numbers on this line, we must conceptualize another line or axis on which we can plot these numbers.

Orthogonal properties do not contaminate one another. If a property A is orthogonal to a property B, then A contains no amount of B, and B contains no amount of A,

Permeability (μ) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Permeability is the magnetic flux density in a body divided by the strength of the magnetic field which created the flux. Although permeability is considered to be a dimensionless property, it seems to be an electro-magnetic mass per length constant. It is considered to be the ability of a medium to modify a magnetic field. For example, iron has a much higher permeability than air.

Permeability is the time-space-mass domain expression of one. Time-space domain properties are located symmetrically about "One". The time-space-mass domain properties are time-space domain properties multiplied by a mass per length constant such as permeability.

When working with electrical problems, consider that **permeability** occupies the same position on the property chart as **one**.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

James Clerk Maxwell (1831-1879) determined the need for this property to establish a link between time-space domain and time-space-mass domain properties in his famous equations.

inductance = length * permeability
velocity(light) = (permittivity / permeability)^.5
flux density = magnetic strength * permeability
permeability = magnetic induction / magnetic strength

Henrys per meter
kilograms per meter
(This indicates that the link between space and electro-magnetic mass is in henrys per kilometer.)

Permittivity (ε) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Permittivity is the capacity of a material to store electrical charge. A given amount of material with high permittivity can store more charge than a material with lower permittivity. Dielectrics are insulators with high permittivity.

Permittivity is the time-space-mass domain expression of velocity^-2. When working with electrical problems, consider that the reciprocal of permittivity occupies the same position on the property chart as velocity^2.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

James Maxwell (1831-1879) formulated the concepts of permittivity and permeability to serve as constants in his equations which described most electro-magnetic behavior. Amazingly, using data from experiments on capacitors and coils, he was able to predict the existence of radio waves including their velocity. Maxwell's books on electro-magnetics and "Matter and Motion" are powerful reading and provide a much clearer view of reality than most modern books.

permittivity = electric field strength / dielectric displacement
speed of light^2 * permeability * permittivity = 1
capacitance = permittivity * area / length
permittivity = refraction index^2

farads/meter
kilograms * seconds^2 / area

All physics and math is based on the vague concept of point.

Upon close examination, points seem to be mind constructs rather than external facts. For example, where is an electron located? When we look at a diverse set of objects, where are the points associated with each object?

When the simplest interaction between two fundamental objects is examined, two ephemeral points are perceived interacting about a common ephemeral point.

Although the Uncertainty Principle defines the uncertainty of points for electrons, even the centers of being of macroscopic things like planets and people are fleeting concepts.

In randomly or chaotically modulated aggregates of objects (Centers of mass.), observers can concepualize many points, some fixed and some changing in time.

A point seems to be a composite center of mass associated with an observation.

Where are points? Perhaps they exist only in the mind of the beholder.

Power (P) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Power is how fast of energy is changing. To accomplish the same amount of work ten times faster, you must dissipate ten times the power.

Real power is the amount of power leaving an isolated system. The real power in a pendulum system is that power which is being converted to heat by friction and wind resistance.

Apparent power is power that stays within a closed system but changes form with time. The apparent power in a pendulum system is the power that is exchanged between momentum and gravity. This power stays in the system until dissipated by friction at which time it becomes real power.

There can be no **real power** in a completely isolated system.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

James Watt (1736-1819) was very instrumental in promoting the use of steam engines to replace water power and beasts of burden. He learned to evaluate his engines in terms of the horses they replaced and the amount of fuel they consumed so he could sell them to potential users. He learned much about energy (food for the machines) and power (how fast they could work) and like entrepreneurs through out history transmitted this information to the public.

James Joule(1818-1889) established the relationship between electrical power and heat.

power = energy / time
Power = force * velocity
power = voltage * current
power = electric field strength * magnetic field strength * area

watts
erg per seconds
calorie per hour
horsepower
ft-lbs per second
BTUs per minute
force de cheval
lumen

Poynting's vector{ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Poynting's vector is the vector product of the electric and the magnetic fields.This property has the dimensions of power per area. It describes the power in an electro-magnetic wave front.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

History???

poynting vector = magnetic field * electric field watts per meter^2

Precession is the rotation of a body in response to some disturbance.

It is best understood with reference to a gyroscope
When the steady state condition of a gyroscope is disturbed,
it precesses about an axis which will bring it into a new state of equilibrium.

Precession time{ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

As this property does not have an official name, I will call it **precession time** as this best describes this important property.

This property has dimensions of time in the time domain, velocity^6 * time in the time-space domain and mass(A) * mass(B) *G / time (Or mass(B) * velocity(B)^3) in the time-space-mass domain.

Precession time is a systems three dimensional interface with the larger universe.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

This concept is introduced in this tutorial.

Explained in the tutorial

seconds in the most fundamental units.

Precession time per period{ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Time(precession) per time(period) is the precession time per orbital time of a system.

As time(precession) per time(period) is a ratio of time properties, it is dimensionless.

When the tangent functions are expressed as velocities it has the dimensions of velocity^6. It has dimensions of mass * velocity^3 per time in the time, distance, mass domain

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

This concept is introduced in this tutorial.

Precession per time = precession period / orbital period dimensionless in the time domain.

Pressure (Pr) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Pressure is energy density or force per unit area. Pressure pushes out on balloons and keeps them firm. A change in pressure sometimes makes your ears pop when you go up in a fast elevator.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Simon Stevin (1548-1620) published three books on liquid forces and pressures including one on hydrostatics in 1605.

Evangelista Torricelli (1608-1647) invented the barometer and was the first to measure air pressure.

Robert Boyle (1627-1691) studied volume and pressure.

Blaise Pascal(1623-1662) rediscovered and popularized Stevin's work.

Daniel Bernoulli(1667-1748) explained air pressure.

pressure = force / area
energy = pressure * volume
pressure = volume * gamma * C^2 / G

PSI
newton per meter^2
pascal
dyne per cm^2
bars
millimeters of mercury (torr)
inches of water
atmospheres
pound per inch^2

Spring constant (k) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Spring constant is the restoring force of a spring per unit of length. The more you deflect a linear spring, the more it resists.

Surface tension is the restoring force of the surface of a liquid.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Prehistoric man's use of bows to propel arrows showed some intuition about spring constant. Later use of catapults increased knowledge of force and spring constant. Alexander the Great had engineers on his staff to design catapults.

Robert Hooke (1635-1703) developed the theory of springs and studied the stress-strain (Deformation by force) characteristics of materials.

spring constant = force / distance
frequency^2 = spring constant / mass

grams per meter

Tangent(A) (N){ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Tangent(A) is the dimensionless property defined by the velocity of a body(A) divided by the velocity of light. In this tutorial, the more massive body is referred to as mass(A) and the less massive body is referred to as mass(B)

Tangent(A), being associated with the more massive body in an interaction, would be associated with gravitational mass.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Conventional physics does not recognize this property although it is needed to define a symmetrical relationship between two interacting bodies and construct a dimensionless physical property system.

tangent(A) = velocity(A) / C
tangent(A) = charge / length * a length per charge constant

dimensionless

Tangent(B) (N){ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Tangent(B) is a dimensionless property equal to the velocity of body(B) divided by the velocity of light. In this tutorial, the more massive body is referred to as mass(A) and the less massive body is referred to as mass(B).

Tangent(B), being associated with the less massive body in an interaction, would be associated with inertial mass.

The tangent(B) for the hydrogen atom is the fine structure constant.
Some other names for tangent(B) include velocity and the phase constant.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Conventional physics does not recognize this property although it is needed to define a symmetrical relationship between two interacting bodies.

Epicurus (341-270 B.C.) formulated the concept of atoms and recognized that a tangential velocity must exist if atoms were to exist. Lucretius (99-55 B.C.), who wrote a book on the theories of Epicurus (The Nature of the Universe), called this property "atomic swerve".

tangent(B) = velocity(B) / C
tangent(B) = 1 / index of refraction

dimensionless

Time (T) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Time is the interval between events. Time is measured with reference to some external reference such as the rotation of the moon about the earth or the vibration period of an atomic system.

Time in the sense of aging is a function of the decay of a vibrating system rather than its period.

Fundamentally, time is the dimensionless ratio of two angular displacements.
Three components are needed to measure time. The angular displacement to be measured, an angular displacement to use as a reference and a stable background against which to compare the two angular displacements.

Time(X) = angular displacement(reference) / angular displacement(X)

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Primitive man was very interested in the daily and monthly periods. As he turned to agriculture, annual periods became very important.

The Egyptians developed calenders of 365 days per year as early as 3000 B.C.

When man began to sail the high seas, more precise time became important for navigational purposes and makers of better clocks were in great demand.

The first pendulum clock was made by Christian Huygens (1629-1695).

distance = velocity * time
current = charge / time
power = energy * time
force = momentum / time

seconds
minutes
hours
days
weeks
fortnights
months
years
centuries

Velocity (v) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Velocity is distance traveled per unit of time. Velocity must be referenced to specific points in space.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

The earliest historical references to words like haste and quickly show that man has long understand the concept of velocity.

Epicurus(342-270 BC) who originated the concept of atoms, postulated a tangential velocity, he called **atomic swerve**, to explain how atoms maintained their integrity. Today, some people call this atomic swerve, the **fine structure constant**.

Einstein determined that the maximum velocity of electro-magnetic interactions through homogeneous space was a constant ("C"). "C" is an interaction distance per time constant. Basically, distance is simply interaction time multiplied by a constant.

distance = interaction time * C

When we say that no velocity can exceed the speed of light, what we are saying is that an interaction cannot occur faster than the interaction time. If an interaction did occur faster than the speed of light, then we would have to come up with the concept of a new force in order to describe this new faster interaction.

distance = time * velocity
velocity = acceleration * time
momentum = mass * velocity
average velocity of a gas = (pressure / density)^.5

meters per second
miles per hour
feet per second
knots
warp speed
machs
cm per century
furlong per fortnight

Viscosity{ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Viscosity is the opposition of fluids and gases to flow. More viscous liquids such as molasses pour slower than less viscous fluids such as water.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

William Froude (1810-1879) experimented on the resistance of fluids to motion.

Ernst Mach (1838-1916) studied resistance to gas flows.

George Stokes(1819-1903) studied viscosity by observing the movement of tiny spheres falling through liquids.

force = viscosity * area * velocity / distance
viscosity = density * velocity * length

poise
centipoise
lb weight per in^2
gm weight per cm^2

Voltage (E) {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions
Sound

Voltage is an electromotive force which forces electrical current through a circuit. Batteries are a common source of voltage. Voltage provides the push and current is the motion of charges in an electrical circuit.

The proper name for voltage is **electromotive force**.

Potential difference is the difference between the voltage at two points.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Electrostatic voltages were known of and written about before 1600.
Otto von Guericke (1602-1686) was the first to make an electrostatic generator. The availability of sources of the high voltages, which were made possible by the inventions of electrostatic generators, stimulated an even great interest in this field.

In 1791, Luigi Galvani (1737-1798), a medical doctor, while experimenting with animals, noticed that a dead frog twitched when touched with certain metals. He thought that he had discovered some kind of life force.

Alessandro Volta (1745-1827), for whom the unit for voltage is named, experimented with the phenomenon and discovered that the reaction was caused by the action of dissimilar metals. He experimented with stacks of dissimilar metals and was able to build reliable batteries. His invention of the battery in 1800 provided the first reliable source of electrical energy and stimulated widespread interest in this strange new property of matter. Rapid advances were made after this.

Stephen Gray (1670-1736), Francois du Fay (1698-1739), J von Kleist (1700-1748) and Petrus Van Musschenbroeck (1692-1761) contributed to the advance of electrical knowledge with their earlier work in electrostatics.

voltage = current * impedance (resistance)
voltage = charge / capacitance
voltage = energy / charge
voltage = power / current

volts
abvolts
statvolts

Volume{ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

Volume is the extent of a three dimensional body.
Although volume is an extremely subtle concept, even young children seem to understand that a large bag holds more candy than a small bag.

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

Prehistoric man understood volume and developed standard volumes for trading purposes. Around 300 BC. Archimedes (287-212 BC.) determine the volume, density and center of gravity of spheres, cylinders and odd shaped bodies. He determined that a floating body displaced its own mass and that a submerged body displaced its own volume.

volume = length * height * width
volume = energy / pressure
volume = volume flow * time
volume = mass / density

liters
teaspoons
cups
pints
quarts
gallons
peck
bushels
barrel
gills
hogshead
cord
acre-foot
displacement ton

Volume flow {ewl EMBH.DLL,MODEM,0}

History
Equations
Units
Dimensions

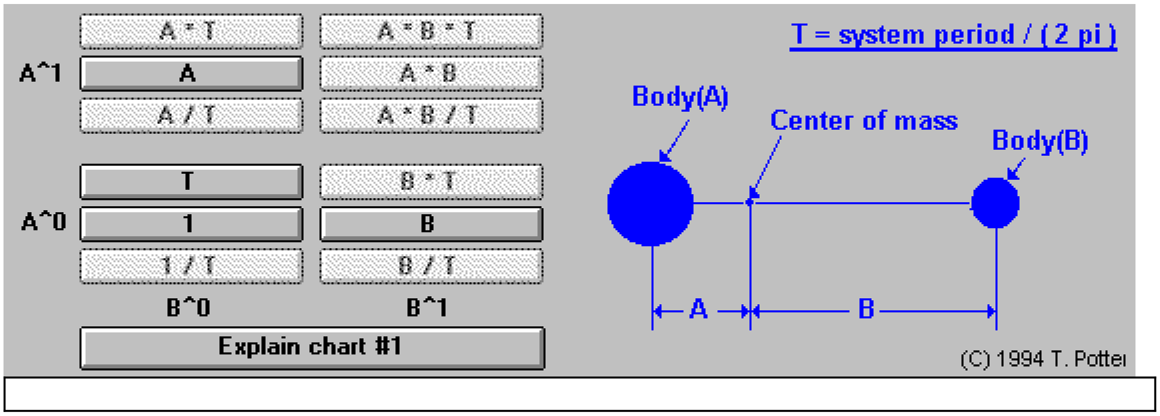
Volume flow is volume per unit time. Ordinary water and gas pump meters measure volume flow and integrate (total) the flow over time to get an indication in volume. This means that when we purchase gas on hot days, we get a little less gas in terms of mass, as masses tend to occupy more volume when they are hot. Mass flow rather than volume flow meters are used in applications where mass rather than volume is critical. (Such as in chemical process control.)

I understand. **I don't understand.** **I need help.** **I am confused.** **This program sucks.**

History???

volume flow = volume / time

gallons per minute
liters per second
milli-liters per hour
ft^3 per minute
acre-feet per year



All physical properties can be defined in terms of three times.

A = the interaction time between body A and the system center of mass.
B = the interaction time between body B and the system center of mass.
T = the common period of interacting bodies divided by 2 π.

Explain Chart #1{ewl EMBH.DLL,MODEM,0}

All physical properties can be defined in terms of three times.

A = the interaction time between body A and the system center of mass.
B = the interaction time between body B and the system center of mass.
T = the common period of interacting bodies divided by 2 π.

Systems (And particles) are observed as centers of mass.

Bodies interact about a center of mass in a common time.
The common time is the system period.

A system can be visualized as a baton rotating freely in space. Both ends of the baton rotate with the same period and the system rotates about a point closer to the more massive end.

All charts in this tutorial are three dimensional tables.
Various properties are used as pointers to the other properties.
The "pointer" properties are called fundamental properties and the property "pointed to" is composed of the pointer properties.

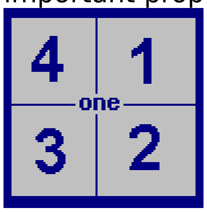
Chart #1 uses the times A, B and T as pointers to the other properties.
To multiply by T, move one line up. To divide by T move one line down.
To multiply by A, move one group up. To divide by A move one group down.
To multiply by B, move one group to the right. To divide by B move one group left.

One is the central point on all of the property charts.

Properties and their reciprocals are located symmetrically about **one** on the charts.

As the **Property Charts**, in this tutorial show the properties in only one of four quadrants, reciprocal properties are not shown.

On some charts, some common properties like capacitance and permittivity lie in uncharted quadrants, and on some charts, time is in an uncharted quadrant. The reciprocals of some important properties are shown on the charts when possible.



Time(A) is the interaction time between the center of mass of body(A) and the center of mass of the system it is a part of.

Bodies interact about a common point in a common time.
The common point is the system center of mass and the common time is the system period.

A system can be visualized as a baton rotating freely in space. Both ends of the baton rotate with the same period and the system rotates about a point closer to the more massive end.

Observers perceive a system (Or a particle) as a center of mass.

An observer can mentally zoom in on any system, an atomic particle, a hydrogen atom, a planetary system, etc. but regardless of the system selected, it is observed and measured in terms of a perceived center of mass. If no body under observation has a preferred status (And none should have in a system.), the properties defining each body in a system will be orthogonal to the property defining the observation and all properties will coincide at a point.

Observers perceive changes in a system, caused by changes at a body, expressed at the center of mass of the system.

As the center of mass of a system is closer to the more massive end,
changes at this end appear at the system center of mass sooner.

A change in the amount of mass, in any party to an interaction, affects the system center of mass and the system interaction times.

Time(B) is the interaction time between the center of mass of body(B) and the center of mass of the system it is a part of.

Bodies interact about a common point in a common time.
The common point is the system center of mass and the common time is the system period.

A system can be visualized as a baton rotating freely in space. Both ends of the baton rotate with the same period and the system rotates about a point closer to the more massive end.

Observers perceive a system (Or a particle) as a center of mass.

An observer can mentally zoom in on any system, an atomic particle, a hydrogen atom, a planetary system, etc. but regardless of the system selected, it is observed and measured in terms of a perceived center of mass. If no body under observation has a preferred status (And none should have in a system.), the properties defining each body in a system will be orthogonal to the property defining the observation and all properties will coincide at a point.

Observers perceive changes in a system, caused by changes at a body, expressed at the center of mass of the system.

As the center of mass of a system is closer to the more massive end,
changes at this end appear at the system center of mass sooner.

A change in the amount of mass, in any party to an interaction, affects the system center of mass and the system interaction times.

Time(T) is the system period divided by 2 π.

Bodies interact about a common point in a common time.

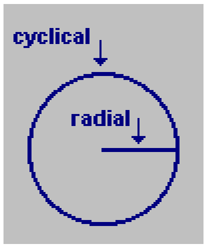
The common point is the system center of mass and the common time is the system period.

A system can be visualized as a baton rotating freely in space.
Both ends of the baton rotate with the same period.

**Some times, such as system periods, are observed as cycles,
and some times, such as interaction times, are observed as radii.**

As most physical properties such as mass, energy and power are expressed in radial rather than cyclical units, mathematical calculations involving properties are greatly simplified when cyclical times are converted to radians.

As cyclical times (Periods) are expressed in complete cycles (2 π radians) and interaction times are expressed in radii, it is necessary to divide periods by 2 π, in order to express these two classes of times in the same units (radians).



Angle A is the angle whose tangent is time(A) / time(T).

Angle(A) is the time angle between a system center of mass and a body(A).
The velocity of a body is a function of this angle and the mass ratios of interacting bodies are functions of angle ratios.

Angle B is the angle whose tangent is time(B) / time(T).

Angle(B) is the time angle between a system center of mass and a body(B).
The velocity of a body is a function of this angle and the mass ratios of interacting bodies are functions of angle ratios.

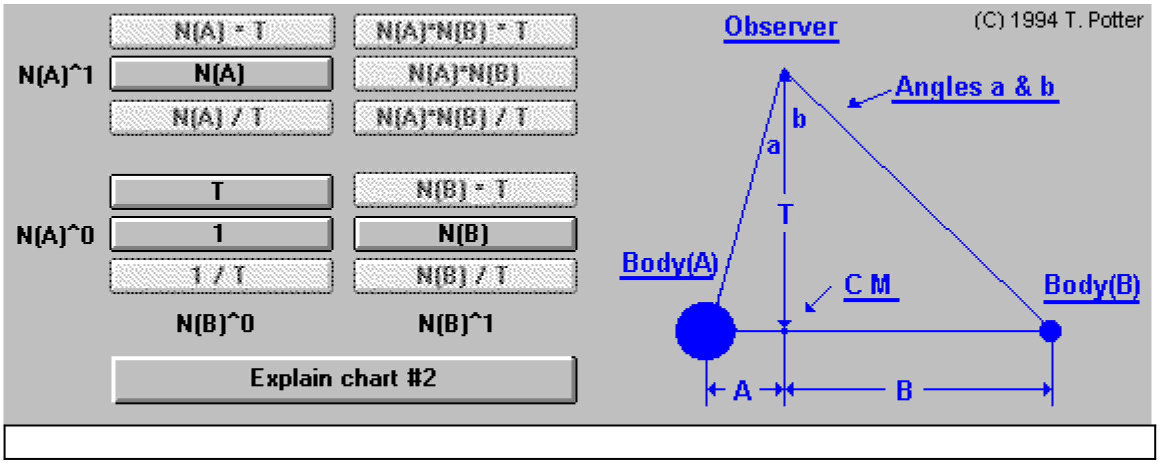


Chart #2 renames the time ratios to N(A) and N(B).

N(A) = tangent(a) = A / T = time(A) / time(T)
N(B) = tangent(b) = B / T = time(B) / time(T)

Explain Chart #2{ewl EMBH.DLL,MODEM,0}

Chart #2 displays some of the same properties as chart #1 but gives each property a new name.

In order to show the relationships between interacting bodies in the simplest, most symmetrical form, and to make a logical transition to the conventional physical property system, it is convenient to define two functions:

N(A) = tangent(a) = A / T = time(A) / time(T)
N(B) = tangent(b) = B / T = time(B) / time(T)

What was called time(A) divided by time(T) in the previous chart is called tangent(a) in this chart. **Tangent(a) is just another way of saying time(A) divided by time(T).**

The tangent functions are dimensionless. Dimensions cancel out when a property is divided by a property with the same dimensions. Dividing an interaction time by a cyclical time leaves us with a tangent function, a property which has no dimensions.

Chart #2 uses the properties N(A), N(B) and T as fundamental properties or pointers to the other properties.

To multiple by T, move one line up. To divide by T move one line down.
To multiply by N(A), move one group up. To divide by N(A), move one group down.
To multiply by N(B), move one group to the right. To divide by N(B), move one group to the left.

N(A) or tangent(a) is the interaction time from body(A) to the system center of mass divided by the system period.

$$N(A) = tangent(a) = time(A) / time(T) = A / T$$

Where time(A) is the interaction time from body(A) to the system center of mass and time(T) is the system period divided by 2 π.

Tangent(a) is just another way of saying time(A) divided by time(T).

N(B) or tangent(b) is the interaction time from body(B) to the system center of mass divided by the system period.

N(B) = tangent(b) = time(B) / time(T) = B / T

Where time(B) is the interaction time from body(B) to the system center of mass and time(T) is the system period divided by 2 π.

Tangent(b) is just another way of saying time(B) divided by time(T).

The center of mass is the point at which a system or object seems to be located.

The center of mass is a primary concept in understanding physical interactions. A gain or loss of mass, by any party to an interaction, affects the system center of mass, and all of the interaction times between the system center of mass and each party in the system.

Systems and the bodies which make up systems are observed in terms of centers of mass.

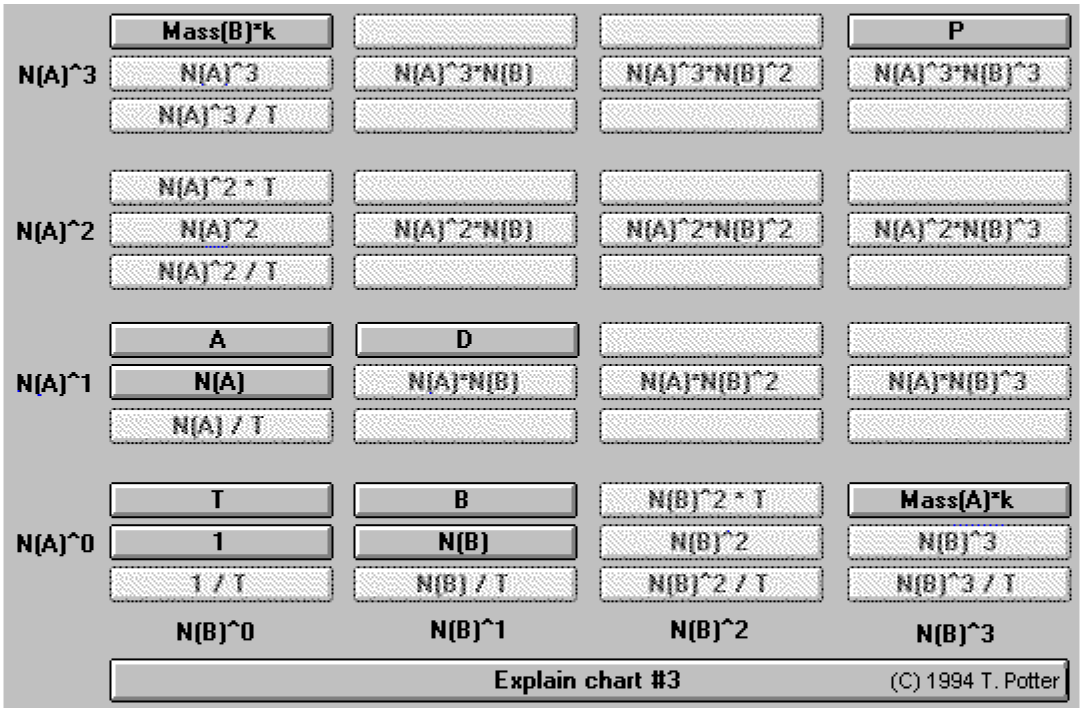


Chart #3 expresses the physical properties in the time domain.

Explain Chart #3 page 1{ewl EMBH.DLL,MODEM,0}

Chart #3 expands chart #2 from 2X2 cell groups to 4X4 cell groups and enters the names of some properties of special interest.

Charts #2 and #3 have the following dimensions:
The top cell in each group has the dimension of time.
The middle cell in each group is dimensionless.
The bottom cell in each group has the dimension of reciprocal time.

Charts #2 and #3 express the physical properties in terms of only time and all properties have dimensions of: **tangent(A)^l * tangent(B)^m * time(T)^n**.
This is the simplest way to express the physical properties!

Seven times of special interest are emphasized in chart #3:
A, B, T, D, mass(A)*k, mass(B)*k and P.

Time A is the interaction time from body A to the system center of mass.
Time B is the interaction time from body B to the system center of mass.
Time T is the system period divided by 2 π.
Time D is the one dimensional precession of the system, defined by the equation:

time(A) * time(B) = time(T) * time(D)

Click here for page 2

Explain Chart #3 - page2{ewl EMBH.DLL,MODEM,0}

A mass can be expressed in terms of its' time equivalence by multiplying the mass by a universal time per mass constant.

"k" is the universal time per mass constant which is defined as:

k = universal time per mass constant = G / C^3
C = the speed of light
G = the universal gravitational constant

time(mass A) = mass(A) * k = the time equivalence of the mass of body A.
time(mass B) = mass(B) * k = the time equivalence of the mass of body B.
time(T) is the period of a system divided by 2 π.
time(P) is the three dimensional precession of a system, defined by the equation:

(mass(A) * k) * (mass(B) * k) = time(T) * time(P)

Or stated more simply:

time(mass A) * time(mass B) = time(period) * time(precession)

This is the most fundamental three dimensional equation of Nature!

(This equation equates the wave-like to the particle-like properties.)

In order to be avoid clutter, some of the cells were left blank.
Hopefully it is clear to the reader that cells could be extended upwards by multiplication by time and downwards by division by time.
Likewise, groups of cells could be extended right and left by powers of N(B)^n
or up and down by powers of N(A)^n.

Time(precession) / time(period) is the precession time per orbital time of a system.
It can be expressed as:

time(precession) / time(period) = tangent(A)^3 * tangent(B)^3

As time(precession) / time(period) is a ratio of time properties, it is dimensionless.

When expressed as a time-space property, this property has dimensions of velocity^6.

When expressed as a time-space-mass property, this property has dimensions of mass * velocity^3 divided by time.

This property is the most fundamental property associated with an interaction between two bodies.

Time(D) is the one dimensional precession time of a system.

A rotating system precesses when it is not in balance with its' environment.
Systems thoughout the universe exchange energy
by precessing when out of balance conditions exist.

Time(D) is defined by the equation:

time(T) * time(D) = time(A) * time(B)
or time(D) = tangent(A) * tangent(B) * time(T)

These are the most fundamental laws of interactions.

This can be expressed in plain language as:
time(period) * time(D) = interaction time(A) * interaction time(B)

Where:
time(T) = time per radian of the system period
time(D) = time per radian of the one dimensional precession
time(A) = interaction time(A) = distance(A) / C
time(B) = interaction time(B) = distance(B) / C

Where "C" is the speed of light, or more correctly an interaction distance per time constant.

Time(P) is the three dimensional precession time of a system.

A rotating system precesses when it is not in balance with its' environment.
Systems thoughout the universe exchange energy
by precessing when out of balance conditions exist.

Time(P) is defined by the equation:

time(T) * time(P) = time(mass(A)) * time(mass(B))

This equation equates the wave-like to the particle-like properties of a system.
Where:

time(T) = time per radian of the system period
time(P) = time per radian of the three dimensional precession
time(mass(A)) = mass(A) * k
time(mass(B)) = mass(B) * k

"k" is the universal time per mass constant which is defined as:

k = universal time per mass constant = G / C^3
C = the speed of light
G = the universal gravitational constant

Note that time(P) can also be expressed as:

time(P) = tangent(A)^3 * tangent(B)^3 * time(T)

Time(P) has dimensions of **time** in the time domain,
velocity^6 * time in the time-space domain and
mass * velocity^3 in the time-space-mass domain.

Precession time * Period time is the equivalence of mass products.

The product of precession time and period time is equal to the product of the time equivalences of interacting masses. This is the most fundamental expression of the equivalence of static and dynamic properties and can be expressed as:

time(period) * time(precession) = time(mass(A)) * time(mass(B))

Where:

time(period) = time per one radian of the system period
time(precession) = time per one radian of system precession
time(mass(A)) = mass(A) * k
time(mass(B)) = mass(B) * k

"k" is the universal time per mass constant which is defined as:

k = universal time per mass constant = G / C^3
C = the speed of light
G = the universal gravitational constant

Time(precession) * time(period), expressed in terms of the conventional fundamental properties, equals mass(A) * mass(B) * G^2 which becomes part of Newtons equation when the "G" constant is dropped from one of the interacting masses as is done in the time-distance-mass domain. This property has the same dimensions as the 1st radiation constant.

1st radiation constant = time(precession) * time(period)

Time(precession) * time(period) has dimensions of time squared in the time domain, velocity^6 * time squared in the time-space domain and mass * velocity^3 * time* G in the time-space-mass domain.

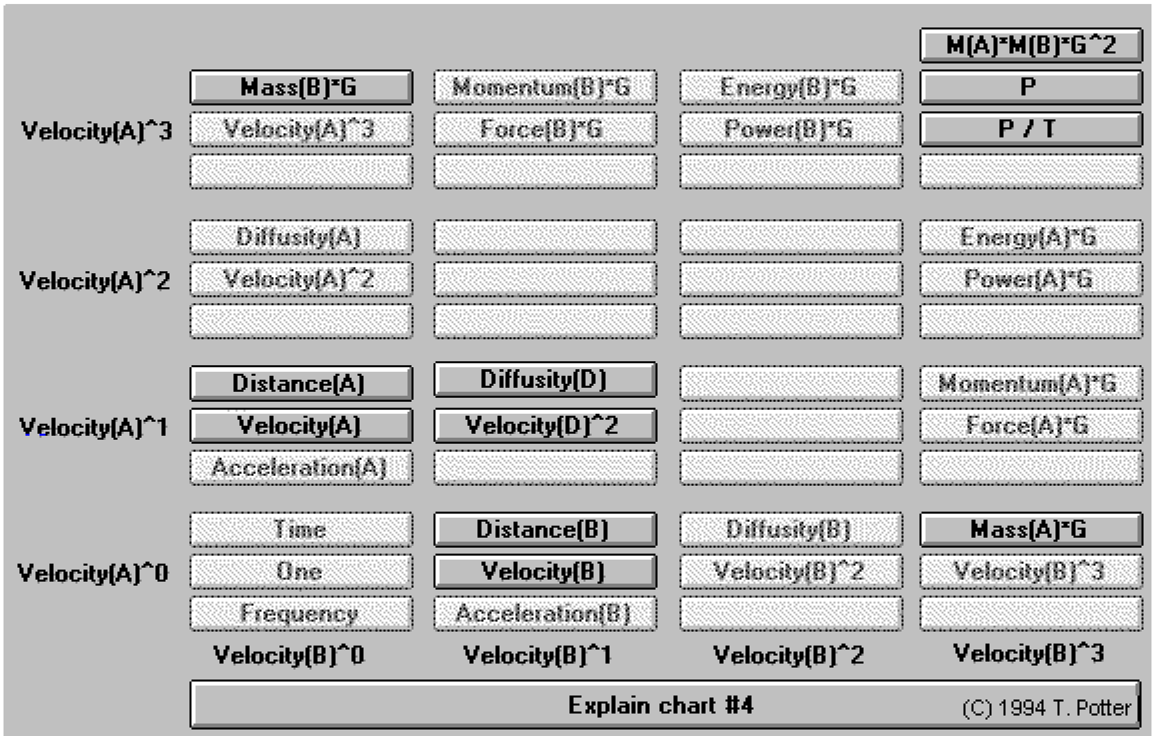


Chart #4 expresses the physical properties in the time-space domain.

Explain Chart #4{ewl EMBH.DLL,MODEM,0}

Chart #4 displays the properties in terms of velocity(A), velocity(B) and time, and inserts the names of some of the common properties into the chart.

Cyclical times are perceived as times. Radial times are normally multiplied by a space per time constant and called distances. This constant differentiates between interaction time and cyclical time, and introduces the concept of space.

Distance is another word for interaction time.

distance(A) = interaction time(A) * a constant

As velocity equals distance per time, when distance (Interaction time) is multiplied by a constant, velocity must be multiplied by the same constant.

Velocity is another word for tangent.

velocity(A) = tangent(A) * a constant

Chart #4 is the simplest quasi-conventional expression of the physical properties.
The system expressed on Chart #4 differs from the conventional system in that both masses are multiplied by the constant "G". This expresses the masses and the properties defined in terms of mass in the time-space domain and maintains the symmetry between the masses.

Note that the **velocity(B)^3, time** product equals the **mass(A), G** product.
Kepler made one of the great discoveries in history when he observed that certain time-space properties of planets were constant. Newton made a great intellectual leap when he determined that one of Keplers time-space products was equivalent to a central mass or more importantly that mass was equivalent to time-space. Einstein perceived this as the equivalence of gravity and inertia.

Distance(A) is the distance from the center of mass of a body(A) to the center of mass of the system it is a part of.

Distance is simply another word for interaction time.

Distance is interaction time multiplied by a distance per time constant.
distance(A) = time(A) * C

A distance per time constant can be selected to express interaction time in any desired units. Microns, inches, meters, miles, light years, furlongs, etc.

Conventional physics, incorrectly, considers the distance between the centers of mass of interacting bodies (distance(A) + distance(B)) a proper consideration in computations. This leads to many errors, including the reduced mass of the electron.

Distance(B) is the distance from the center of mass of a body(B) to the center of mass of the system it is a part of.

Distance is simply another word for interaction time.

Distance is interaction time multiplied by a distance per time constant.
distance(B) = time(B) * C

A distance per time constant can be selected to express interaction time in any desired units. Microns, inches, meters, miles, light years, furlongs, etc.

Conventional physics, incorrectly, considers the distance between the centers of mass of interacting bodies (distance(A) + distance(B)) a proper consideration in computations. This leads to many errors, including the reduced mass of the electron.

Velocity(A) is the orbital velocity of a body(A) about a system center of mass.

Velocity(A) is simply another word for tangent(A).

Velocity (A) is tangent(A) multiplied by a constant.
velocity(A) = tangent(A) * C
where C is a distance per time constant.

A distance per time constant can be selected to express Tangent(B) in any desired units. Meters per second, miles per hour, furlongs per fortnight, etc.

As more massive bodies are closer to the system center of mass they have smaller orbits and thus their orbital velocities are less than that of less massive bodies.

The concepts of distance and velocity (distance per time) come about in order to differentiate between cyclical and radial times. We accept cyclical times for what they are. We multiply radial times by a constant and call them distances. When we conceptualize interaction time as distance, we must conceptualize interaction time divided by cyclical time as a velocity.

Velocity(B) is the orbital velocity of a body(B) about a system center of mass.

Velocity(B) is simply another word for tangent(B).

Velocity (B) is tangent(B) multiplied by a constant.
velocity(B) = tangent(B) * C
where C is a distance per time constant.

A distance per time constant can be selected to express Tangent(B) in any desired units. Meters per second, miles per hour, furlongs per fortnight, etc.

As more massive bodies are closer to the system center of mass they have smaller orbits and thus their orbital velocities are less than that of less massive bodies.

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Diffusity(D) is the one dimensional precession of a system It has dimensions of time in the time domain and area per time in the time-space domain**.**

diffusity(D) = distance(A) * distance(B) / time(T)

Note that diffusity(D) also can be expressed as:

diffusity(D) =tangent(A) * tangent(B) * time(T) * C^2

Velocity(D)^2 is the time-space expression of a dimensionless precession.

Velocity(D)^2 is the product of velocity(A) and velocity(B).

velocity(D)^2 = velocity(A) * velocity(B) = tangent(A) * tangent(B) * C^2

Velocity(D) is dimensionless in the time domain and has dimensions of velocity squared in the time-space domain.

Mass(A) times k is the time equivalence of a mass(A).

"k" is a **universal time per mass constant** which is defined as:

k = universal time per mass constant = G / C^3
G = the universal gravitational constant
C = the universal space per time constant for gravity in space = the speed of light

A mass can be expressed in terms of its time equivalence by multiplying it by a universal constant.

time(mass(A)) = time equivalence of mass(A) = mass(A) * k

Note that mass(A) can also be expressed as:

time(mass(A)) = mass(A) * k = tangent(B)^3 * time(T)

This equation is perhaps the simplest expression of Kepler's Third Law and Einstein's Equivalence Principle. It indicates the equivalence of gravitational (mass(A) * k) and inertia (tangent(B)^3 * time(T)) effects.

Mass(A) times G is the time-space equivalence of a mass(A).

"G" is a **universal time-space per mass constant**.
"G" has dimensions of **velocity^3 * time / mass**.

Note that mass was multiplied by a **universal time per mass constant k** in chart #3 in order to equate mass to the time properties. As the tangents are multiplied by "C", in chart #4, to express them as velocities, we must define a new constant to equate mass to the time-space properties. As mass is a function of the tangent cubed and the tangents were multiplied by "C" to express them as velocities, we must divide the new constant by "C" cubed in order to maintain the same units of mass.

mass(A) * G = velocity(B)^3 * time(T)
mass(A) * G / C^3 = velocity(B)^3 /C^3 * time(T)
mass(A) * k = tangent(B)^3 * time(T)
k = G / C^3

Kepler determined that the time-space products of planetary orbits were constants. Newton discovered that Kepler's **velocity^3 * time** product was proportional to what he called the mass of a central body. He called the constant, needed to express the time-space properties in terms of mass, "G".

Mass(B) times k is the time equivalence of a mass(B).

"k" is a **universal time per mass constant** which is defined as:

k = universal time per mass constant = G / C^3
G = the universal gravitational constant
C = the universal space per time constant for gravity in space = the speed of light

A mass can be expressed in terms of its time equivalence by multiplying it by a universal constant.

time(mass(B)) = time equivalence of mass(B) = mass(B) * k

Note that mass(B) can also be expressed as:

time(mass(B)) = mass(B) * k = tangent(A)^3 * time(T)

This equation is perhaps the simplest expression of Kepler's Third Law and Einstein's Equivalence Principle. It indicates the equivalence of gravitational (mass(B) * k) and inertia (tangent(A)^3 * time(T)) effects.

Mass(B) times G is the time-space equivalence of a mass(B).

"G" is a **universal time-space per mass constant**.
"G" has dimensions of **velocity^3 * time / mass**.

Note that mass was multiplied by a **universal time per mass constant k** in chart #3, in order to equate mass to the time properties. As the tangents are multiplied by "C", in chart #4, to express them as velocities, we must define a new constant to equate mass to the time-space properties. As mass is a function of the tangent cubed and the tangents were multiplied by "C" to express them as velocities, we must divide the new constant by "C" cubed in order to maintain the same units of mass.

mass(B) * G = velocity(A)^3 * time(T)
mass(B) * G / C^3 = velocity(A)^3 /C^3 * time(T)
mass(B) * k = tangent(A)^3 * time(T)
k = G / C^3

Kepler determined that the time-space products of planetary orbits were constants.
Newton discovered that Kepler's **velocity^3 * time** product was proportional to what he called the mass of a central body. He called the constant, needed to express the time-space domain properties in the time-space-mass domain, "G".

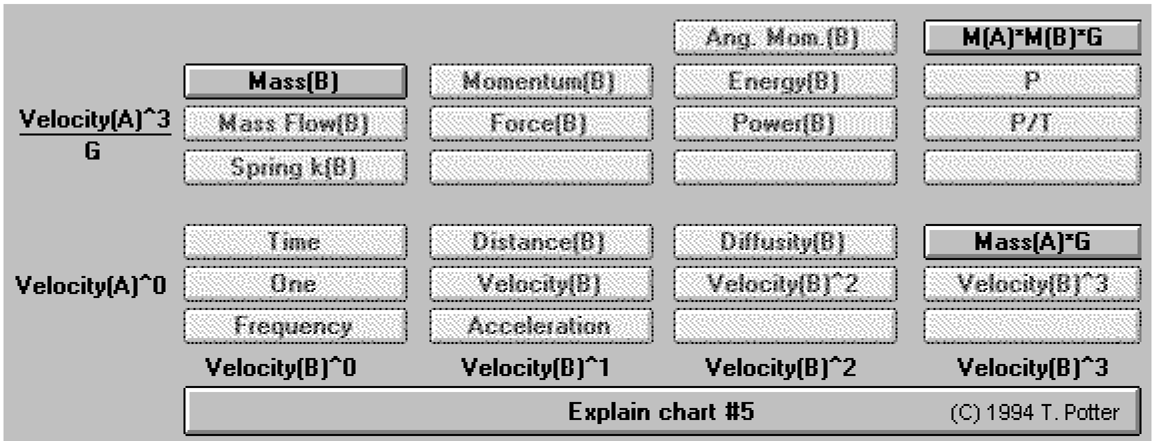

Chart #5 expresses the physical properties in the time-space-mass domain.

Explain Chart #5{ewl EMBH.DLL,MODEM,0}

As conventional physics focuses on the least massive body in an interaction,
it is necessary to delete the two middle rows of property groups, in order to develop the conventional property system. (Mass(A) is considered as the more massive body in this tutorial.)

The deletion of the middle **rows** of property groups emphasizes mass(B).
If the two middle **columns** of properties had been deleted, the properties left would emphasize mass(A).

Note that mass(A) is multiplied by "G" in chart #5 and mass(B) is not. The elimination of the "G" constant from mass(B) isolates mass(B) from a time-space link, and forces us to look at it as an independent property.

The constant "C" makes us look as interaction times as a new property, distance. The multiplication of one mass by the constant "G" makes us look at mass as a new property. Both of these constants, conceptually, move us further from fundamental reality.

The elimination of the "G" constant from mass(B) severs it's relationship with time-space, and destroys the symmetry between mass(A) and mass(B).

Note that all properties in the top row are divided by "G" including the pointer property velocity^3. Momentum, force, energy and so forth are defined in terms of a mass and are affected by the constants which affect the mass. The mass(A),G factor retains mass(A)'s link to the time-space properties.

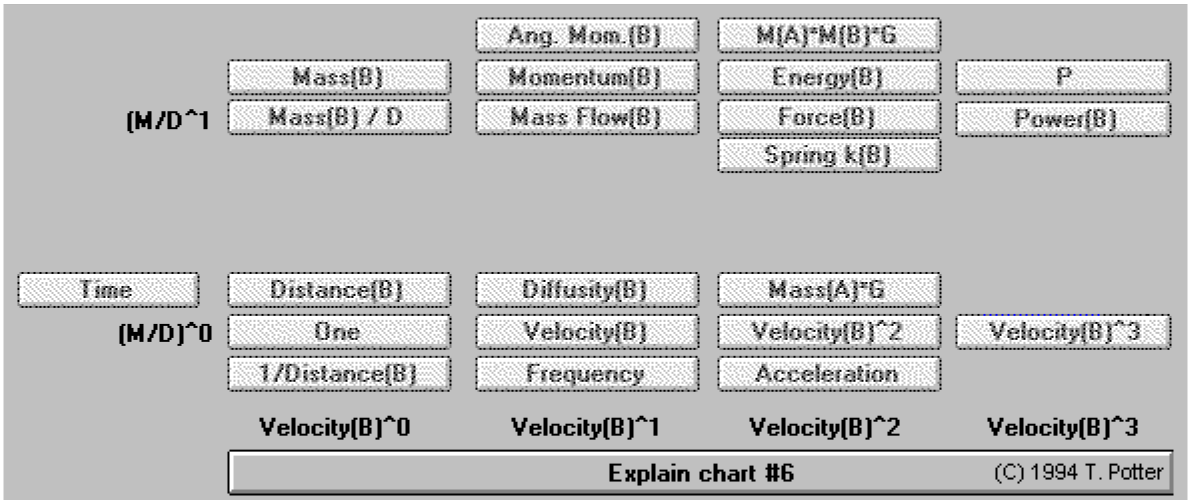

Chart #6 replaces time with distance as a fundamental property.

Explain Chart #6{ewl EMBH.DLL,MODEM,0}

Chart #6 expresses the relationships between the properties in terms of distance, velocity and mass per distance. **These fundamental properties are in the time-space-mass domain.**

Chart #6 is used as a template for the main property chart of this tutorial.
It is a compromise between symmetry and the conventional view of the physical properties.

Charts #1 through #4 focused on the symmetrical interaction between bodies.
Those charts imply that an observer perceives systems symmetrically and that changes in systems are perceived at the center of mass of the system.

The deletion of the two rows in Chart #5 removed most of the properties associated with mass(A) and focused the attention on mass(B).

Chart #6 focuses all of the attention on one body by defining all of the fundamental properties in terms of one body. By associating all fundamental properties with one body, chart #6 emphasizes the interface between an observer and the observed. This lends its self to a philosophical approach to physics whereby the observer interacts with reality directly rather than as an independent observer. The observer becomes body(A) and interacts with the bodies(B) of the universe.

A common period arises from interactions between an observer and the observed.
(Or more fundamentally, a common angular displacement occurs.)

Note that chart #3 provides an **objective view of reality**,
whereas chart #6 provides a **subjective view of reality**.

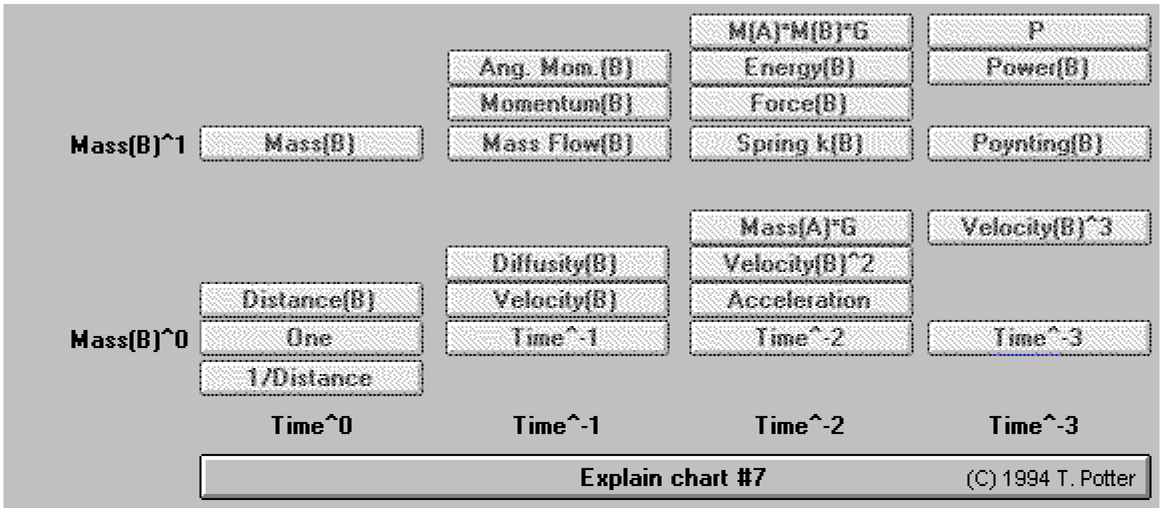

Chart #7 replaces velocity with time as a fundamental property.

Explain Chart #7{ewl EMBH.DLL,MODEM,0}

Chart #7 presents a conventional look at the physical properties by using time, distance and mass as fundamental or pointer properties. These fundamental properties are in the time-space-mass domain.

The conventional physical property system was not stressed in this tutorial as it leads to several problems. It requires the use of fractional powers of mass; leads to an asymmetrical property chart and provides an ambiguous view of reality.

It is my suggestion that chart #3 should be used for an objective view of reality, and that chart #6 should be used for a subjective view of reality.

Summary and editorial

Disclaimer:

This summary and editorial presents a few unconventional ideas. This information should be ignored by those who do not wish to be contaminated by unconventional ideas, and students must understand that these views are not 100% compatible with conventional physics.

Reality consists of properties rather than objects.

If you recursively examine the intensions of any object,
you ultimately end up with a small set of quantized, bi-polar properties.
These include: charge, baryon number and strangeness.

If you recursively examine the intensions of these properties,
you ultimately end up with a single property. Angular displacement!

Angular displacement, and all other properties arise from closed loops.

Loops can have a clockwise or counter-clockwise "polarity" and combine algebraically.
Aggregates of loops are perceived as objects.

Angular displacements are ratios of loops.

Times are ratios of angular displacements.

The concept of space arises when radial times are differentiated from cyclical times by multiplying radial times by a distance per time constant.

The concept of mass arises when interacting bodies are differentiated from one another by multiplying the time-space properties associated with one body by a mass per time-space constant. This equates the time-space properties of one body to what is perceived as the mass of the second body.

The following equations indicate how the fundamental properties arise from loops or cycles. All other properties, including the classical definition of angular displacement, can be defined in terms of these fundamental properties. An asterisk is shown before the conventional fundamental properties.

loop = a closed path
angular displacement = ratios of aggregates of loops
* **time(X) = angular displacement(reference) / angular displacement(X)**
* **distance = time * k1**
velocity = distance / time
* **mass = velocity^3 * time * k2**

k1 is a constant used to differentiate between radial and cyclical times. It includes the constant 2 π and another constant C which expresses the interaction time in the desired distance units.

k2 is a constant used to equate mass to time-space, or more fundamentally, to differentiate between two interacting bodies. (One body in an interaction is multiplied by this constant and one is not.)

Summary of constants:

- 2 π equates interaction times to cyclical times.
- C equates distances to cyclical times * tangent (interaction times).
- k equates masses to cyclical times * tangent^3.
- G equates masses to cyclical times * (tangent * C)^3.

An observation is the process of determining angular displacement ratios.

An external angular displacement must be used as a reference to measure the relationships within a closed system. Time, distance and mass do not exist in an isolated system. The only properties which can exist in an isolated two body system are dimensionless tangent functions.

A system is observed in terms of a center of mass.

Chart #3 of this tutorial, which uses the interaction times of interacting bodies and the common period between them as fundamental properties, provides a symmetrical, objective view of reality.

Chart #6 of this tutorial, which uses the distance, velocity and mass associated with one body as fundamental properties, provides a subjective view of reality.

Chart #7, the conventional property system, which uses time, distance and mass as fundamental properties, provides an ambiguous, unsymmetrical view of reality.

Equations based on the conventional distance and distance squared are erroneous.

When an isolated body is observed, the observer becomes part of the system.
The precession which results from an observer-observed interaction is, like all interactions, about the system center of mass.

Space (Time) is orthogonal and acts to maintain it's orthogonality.
This can be expressed with the following equations:

- arctangent(time(A) / time(D)) + arctangent(time(B) / time(T)) = a right angle.
- arctangent(time(B) / time(D)) + arctangent(time(A) / time(T)) = a right angle.
- arctangent(time(MA) / time(P)) + arctangent(time(MB) / time(T)) = a right angle.
- arctangent(time(MB) / time(P)) + arctangent(time(MA) / time(T)) = a right angle.

As indicated in the tutorial:

- time(A) is the interaction time from body(A) to the system center of mass.
- time(MA) is the time equivalence of mass(A)

time(B) is the interaction time from body(B) to the system center of mass.
time(MB) is the time equivalence of mass(B)
time(T) is the system period divided by 2 π.
time(D) is the one dimensional precession period divided by 2 π.
time(P) is the three dimensional precession period divided by 2 π.

What this means is that Nature acts in such a way as to insure that certain time angles always add up to be 90 degrees or π / 2 radians.

The **speed of light** means that observation time (Time(T)) equals interaction time (Tangent equals one.). **Faster than light** means that time(T) is less than time(A). In other words, we "observe" an effect on a system, caused by a change in body(A), at a center of mass **before it happens**. There is nothing unusual about this. Man's capacity to store data, auto-correlate it and project the correlations into the future provides him with the capacity to generate tangents greater than one (See into the future.). As tangents much greater than one involve looking far into the future, they become less accurate as they can be affected by unperceived circumstances (Interference by other conscious observers.). The capacity of most observers is limited to first order affects as they ignore what one philosopher called the "unseen". To look far into the future, one must be selfless and dispassionate. If you don't think people can "see into the future", light a firecracker and throw it into a crowd.

The resolution of observation is limited to complete cycles of the reference angular displacement. The present reference angular displacement is based on the electron. The use of the angular displacement of neutrinos would greatly increase the resolution of observation.

Present day math and physics are based on the vague concept of point.
The only sure measurements which can be made are cycle ratios or angular displacements.
Points exist only in our minds.

The most common ratio measurements involve time periods or frequencies which are closely associated with angular displacements. A ratio measurement involving less than a whole cycle of the smallest angular displacement is not possible. Information theory covers this concept.

The mass product of interacting bodies or the **precession time, period time product** would provide a firmer foundation for quantum mechanics than Planck's Constant. Planck's Constant applies to electrons and a different constant is needed for other bodies such protons and nuclei. Planck's Constant also requires that the "tangents" (Velocities) associated with electrons vary in integer ratios, whereas it appears that what varies in electro-magnetic interactions are charge ratios. The tangent associated with the electron seems to remain constant and in fact specific tangent constants seem to be associated with each type of particle. The tangent associated with the electron is called the fine structure constant.

The distribution of negative entropy seems to indicate that what arises from uncertainty is not random. Negative entropy might arise from some chaotic modulation of the wave function which is the essence of "I"ness.

The unfolding of reality seems to be a recursive, fractal-like evolution of topological structures which tends to optimize a balanced hierarchy of "objects". Loops have a dipole as they have a polarity. These loops tend to form into strings. These strings tend to form new loops or knots and so on. Loops -> particles -> atoms -> compounds -> dna -> plants-animals -> ecosystems -> etc.

Angles, time, distance, mass and all properties must ultimately be defined in terms of angular displacements or cycles. Objects, likewise, must be defined in terms of fundamental angular displacements, as objects are expressions of a small set of quantized angular displacements. (Charge, baryon number, strangeness, etc.)

Perhaps new geometries, physics and philosophies should be built from the ground up, using topology, information theory and mind as foundations and a self balancing hierarchy as form.

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Strangeness is a quantized property which is associated with the **weak force**.

Other quantized properties include **charge** and **baryon number**. Charge is associated with the **electro-magnetic force** and baryon number is associated with the **strong force.**

Hypercharge and isospin are other quantized properties of sub atomic particles which are associated with strangeness. These properties are defined as:

hypercharge = strangeness + baryon number

isospin = charge - hypercharge / 2

As a symmetrical sub-atomic particle property chart can not be constructed using either isospin, strangeness or hypercharge, I have defined a quantized property which seems to be more fundamentally associated with the weak force:

weakness = strangeness + baryon number - charge

Weakness, charge and baryon number seem to be fundamental, bipolar units of angular displacement. The bipolar aspect seems to be related to clockwise and counterclockwise displacement, while the difference between charge, weakness and baryon number seems to be related to topology or orientation.

Baryon number is a quantized property which is associated with the strong force.

Other quantized properties include **charge** which is associated with the electro-magnetic force, and **h**ypercharge, isospin and strangeness which are associated with the weak force**.**

Quantized properties occur in plus and minus units which seem to be associated with fundamental clockwise and counter-clockwise rotation.

The concepts of object, body, matter, substance, and mass are closely bound together.

Mass is quantized in terms of the integer amounts of the subatomic particles which make up the mass. In other words, the mass of a body depends upon the number of protons, neutrons and electrons it is made up of.

An object, substance or body is usually said to exist at the time-space point where mass seems to be centered. If much mass is concentrated at a point, we have a dense substance or body. If the mass about a point is sparse, the body or object is defuse or ephemeral.

The **Schwarzschild radius** is the radius to which matter must be compressed to form a black hole. A **black hole** is a volume which contains so much mass that the escape velocity for anything leaving the hole must be greater than the speed of light. As the speed of light is an **interaction distance per time constant**, and as an interaction cannot occur across a distance interval before it happens, nothing can escape a black hole.

Schwarzschild defined the critical radius as:

Schwarzschild radius = 2 * G * mass / C^2

I have defined an event diameter to be one half , rather than twice, that of the Schwarzschild radius. I have also defined a gravitational universal mass per length constant as: **U = C^2 / G**

In effect, a fundamental particle is a black hole. As the escape velocity for any part of a fundamental particle, such as a proton, is greater than the speed of light, or at least greater than any velocity which can be generated internally within the particle, it remains an integral unit.

A property is an attribute or characteristic which can be assigned to an object, or substance, or more fundamentally, to members of a class.

Science uses properties which can be measured and quantified to describe Nature. Properties are quantified by using some small amount of the property as a reference against which other members of the class are compared.

As it turns out, all of the physical properties such as mass, energy and velocity, can be defined in terms of three properties. Almost any three properties could be used to define the other properties. The properties normally used are time, distance and mass.

Simply stated, science expresses reality in terms of adjectives and nouns. The nouns are the properties and the adjectives are the numbers which express the number of units of the reference property in the observed sample.

The dimensions of a property are the fundamental properties which point to the property. For example, the dimensions of velocity in the time, distance, mass property system are distance per time, and the dimensions of momentum are mass times distance per time.

For reasons discussed in the tutorial, the properties in the main chart are expressed in terms of velocity, distance and charge per length. The sounds used to aurally define the properties use these dimensions. Although these aural dimensions are not conventional, the reader should not fear committing the sounds to memory, as it is easy to convert to other systems, once the relationships between the various properties are learned.

The Potter Physical Property Chart graphically shows the relationships between the physical properties.

The position of each property in the chart is determined by it's dimensions, in terms of fundamental properties which serve as pointers to the properties.

The main chart uses distance, velocity and (charge per length) as fundamental properties.

Charge per length, rather than charge or some other property, was used as a fundamental property in order to avoid fractional power properties and to provide a chart with the greatest symmetry.

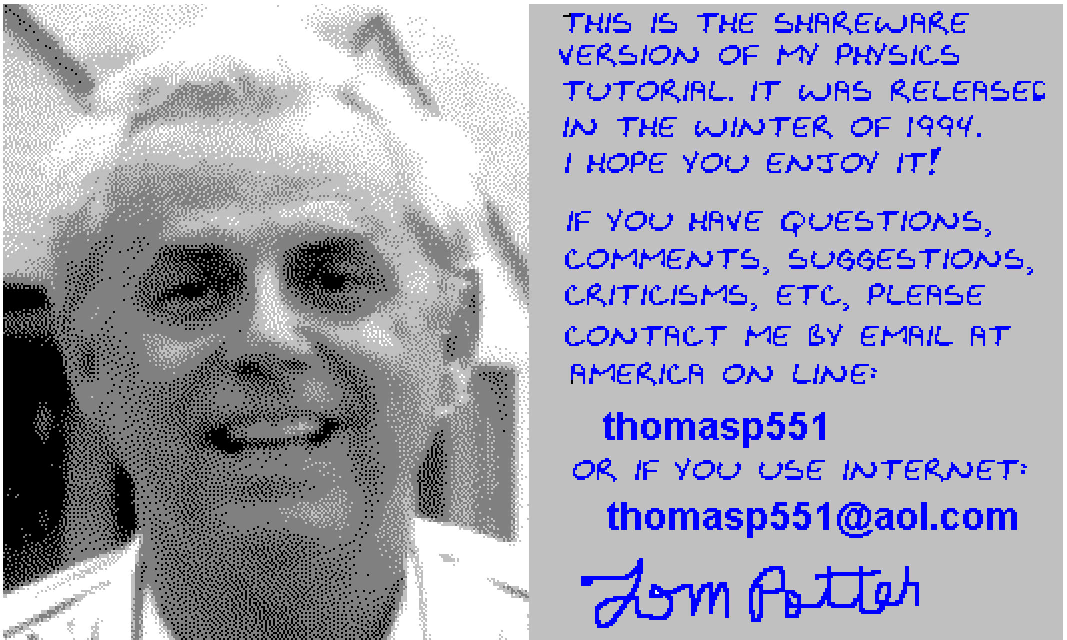
Multiplying a property by distance (Length) yields the property immediately above.
Dividing a property by distance (Length) yields the property immediately below.

Multiplying a property by velocity yields the property to the immediate right.
Dividing a property by velocity yields the property to the immediate left.

Multiplying a property by time (Or dividing by frequency) yields the property one cell up and one cell to the left.

Dividing a property by time (Or multiplying by frequency) yields the property one cell down and one cell to the right.

The resultant of any combination of properties is determined by summing the fundamental property pointers. For example: **Power = energy / time = force * velocity = voltage * current**



Version 5.0

Click here for information on using this tutorial.

How to use this tutorial.

The menu bar, across the top, provides quick access to some sections of the tutorial.

CONTENTS - displays the title screen.
SEARCH - displays a list of key words to search.
BACK - jumps to the previous topic.
HISTORY - displays information on the properties associated with people.
<< - moves backward through a sequence of topics.
>> - moves forward through a sequence of topics.
PROPERTIES - displays technical and historical information on the properties.
TUTORIAL - develops an overview of physics in seven easy steps.
ELECTRIC - displays information on the electrical properties.

Point the cursor at **buttons**, **highlighted words** and **items of interest**.The cursor will change to a **pointing finger** if there is information on the item.

This is a **sound hot spot.**
Don't click on sound hot spots unless you have a sound card.

Use the **B** key to back up and the **comma** and **period** keys to browse.

Browse the properties to see how the various properties are related, before trying the tutorial.

This is a test to see if you are paying attention.

Observers perceive systems (And bodies) as centers of existence. The physical center of existence is associated with a center of mass. If a component of a system changes in some way, observers perceive a change occurring at the system center of mass. Changes in the center of mass of a system affect the system period and the interaction times of the components of the system.

The concepts of perception, centers of mass, system period and interaction times are closely bound.

Particle	Mass	Spin
PI MESON +&-	139.57	0

Decay time	Decay Products	Momentum
2.6x10^-8	99.9% mu- & neutrino0	30

[ ] Lepton - "Length-like"
[ ] Baryon - "Volume-like"
[ ] Fermion - "Non-integer spin"
[ ] Hyperon - "Non-zero strangeness"
[X] Meson - "Area-like"
[X] Boson - "Integer spin"
[X] Hadron - "Strong interactions"
[ ] Nucleon - "Proton & neutron"

In 1935 Hideki Yukawa (1907-1981) suggested that a particle 270 times more massive than the electron was the nuclear force carrier. Cecil Powell (1903-1969) observed such a particle in 1946.

On the Particle Chart, a mu meson, neutrino pair has the same dimensions as a charged pi meson.

Particle	Mass	Spin
ELECTRON	.511	.5

Decay time	Decay Products	Momentum
stable	none	

[X] Lepton - "Length-like"
[ ] Baryon - "Volume-like"
[X] Fermion - "Non-integer spin"
[ ] Hyperon - "Non-zero strangeness"
[ ] Meson - "Area-like"
[ ] Boson - "Integer spin"
[ ] Hadron - "Strong interactions"
[ ] Nucleon - "Proton & neutron"

George Stoney (1826-1911) published a paper in 1881 calling the carrier of electricity an electron. Joseph Thomson (1856-1940) performed the experiment confirming the existence of the electron in 1897. In 1928 P.A.M. Dirac (1902-1984) introduced the concept of antimatter. The positron is the antimatter equivalent of the electron. Carl Anderson (1905..) first observed the positron in 1932. The muon is a heavy electron, rather than a meson.

Electrons and positrons are commonly found paired with neutrinos in nuclear interactions.

Particle	**Mass**	**Spin**
PHOTON 0	0	1

Decay time	**Decay Products**	**Momentum**
stable	none	

[ ] Lepton - "Length-like"
[ ] Baryon - "Volume-like"
[ ] Fermion - "Non-integer spin"
[ ] Hyperon - "Non-zero strangeness"
[ ] Meson - "Area-like"
[x] Boson - "Integer spin"
[ ] Hadron - "Strong interactions"
[ ] Nucleon - "Proton & neutron"

Lucretius (100-55 B.C.) described a kind of photon in his book "The Nature of the Universe". Isaac Newton (1642-1727) studied light extensively and considered light to be corpuscular. Christiaan Huygens (1629-1695) developed the wave theory of light. Albert Einstein (1879-1955) formulated an equation describing how photons and electrons interact.

Photons and mesons, are Bosons. Mesons transport energy between particles inside nuclei while photons transport energy between particles outside nuclei.

Particle	**Mass**	**Spin**
MU MESON +	105.659	.5

Decay time	**Decay Products**	**Momentum**
2.197x10^-6	99.9% electron- & - 2	neutrino0 53

[X] Lepton - "Length-like"
[ ] Meson - "Area-like"
[ ] Baryon - "Volume-like"
[ ] Boson - "Integer spin"
[X] Fermion - "Non-integer spin"
[ ] Hadron - "Strong interactions"
[ ] Hyperon - "Non-zero strangeness"
[ ] Nucleon - "Proton & neutron"

In 1936, while searching for the pi meson postulated by Hideki Yukawa (1907-1981), Carl Anderson, (1905-) who had earlier discovered the positron, discovered the mu meson. The mu meson is, effectively, a heavy electron rather than a meson. On the Particle Chart, a mu meson, neutrino pair has the same "dimensions" as a charged pi meson.

Particle	**Mass**	**Spin**
LAMBDA 0	1115.6	.5

Decay time	**Decay Products**	**Momentum**
2.58x10^-10	65% proton+ & pi-	100
	35% neutron0 & pi0	104

[ ] Lepton - "Length-like"
[X] Baryon - "Volume-like"
[X] Fermion - "Non-integer spin"
[X] Hyperon - "Non-zero strangeness"
[ ] Meson - "Area-like"
[ ] Boson - "Integer spin"
[X] Hadron - "Strong interactions"
[ ] Nucleon - "Proton & neutron"

As the sigma zero particle has the same dimensions as the lambda particle, it is either a resonance of the lambda particle or another property (Other than charge, baryon number and weakness.) is needed to account for it.

Particle	Mass	Spin
SIGMA +	1189.37	.5

Decay time	Decay Products	Momentum
8x10^-11	52% proton+ & pi0	189
	48% neutron0 & pi+	185
	1% proton+ & photon0	225

[ ] Lepton - "Length-like"
[X] Baryon - "Volume-like"
[X] Fermion - "Non-integer spin"
[X] Hyperon - "Non-zero strangeness"
[ ] Meson - "Area-like"
[ ] Boson - "Integer spin"
[X] Hadron - "Strong interactions"
[ ] Nucleon - "Proton & neutron"

Particle	**Mass**	**Spin**
SIGMA 0	1192.47	.5
Decay time	**Decay Products**	**Momentum**
< 1x10^-14	99.9% lambda0 & photon	75

[ ] Lepton - "Length-like"
[X] Baryon - "Volume-like"
[X] Fermion - "Non-integer spin"
[X] Hyperon - "Non-zero strangeness"
[ ] Meson - "Area-like"
[ ] Boson - "Integer spin"
[X] Hadron - "Strong interactions"
[ ] Nucleon - "Proton & neutron"

As the sigma zero particle has the same dimensions as the lambda particle, it is either a resonance of the lambda particle or another property (Other than charge, baryon number and weakness.) is needed to account for it.

Particle	Mass	Spin
SIGMA -	1197.35	.5

Decay time	Decay Products	Momentum
1.5x10^-10	99.9% neutron0 & pi-	193

[ ] Lepton - "Length-like"
[X] Baryon - "Volume-like"
[X] Fermion - "Non-integer spin"
[X] Hyperon - "Non-zero strangeness"
[ ] Meson - "Area-like"
[ ] Boson - "Integer spin"
[X] Hadron - "Strong interactions"
[ ] Nucleon - "Proton & neutron"

Particle
XI 0

Mass
1314.9

Spin
.5

Decay time
2.96x10^-10

Decay Products
99.9 lambda0 & pi0

Momentum
135

[ ] Lepton - "Length-like"
[X] Baryon - "Volume-like"
[X] Fermion - "Non-integer spin"
[X] Hyperon - "Non-zero strangeness"

[ ] Meson - "Area-like"
[ ] Boson - "Integer spin"
[X] Hadron - "Strong interactions"
[ ] Nucleon - "Proton & neutron"

Particle	**Mass**	**Spin**
XI + & -	1321.29	.5
Decay time	**Decay Products**	**Momentum**
1.65x10^-10	99.9% lambda0 & pi-	139

[ ] Lepton - "Length-like"
[X] Baryon - "Volume-like"
[X] Fermion - "Non-integer spin"
[X] Hyperon - "Non-zero strangeness"

[ ] Meson - "Area-like"
[ ] Boson - "Integer spin"
[X] Hadron - "Strong interactions"
[ ] Nucleon - "Proton & neutron"

Particle	**Mass**	**Spin**
PI MESON 0	134.96	0

Decay time	**Decay Products**	**Momentum**
8.28x10^-17	98.9% photon & photon	67
	1.1% electron,positron&photon	67

[ ] Lepton - "Length-like"
[ ] Baryon - "Volume-like"
[ ] Fermion - "Non-integer spin"
[ ] Hyperon - "Non-zero strangeness"
[X] Meson - "Area-like"
[X] Boson - "Integer spin"
[X] Hadron - "Strong interactions"
[ ] Nucleon - "Proton & neutron"

In 1937, Hideki Yukawa (1907-1981) suggested that interactions inside the nucleus between nucleons (Protons and electrons) could be carried by a particle which came to be known as the pi meson.

Click here for information on the k1 meson.
Click here for information on the k2 meson.

Particle	Mass	Spin
OMEGA + & -	1672.2	1.5

Decay time	Decay Products	Momentum
1.3x10^-10	x% XI0 & pi-	293
	x% XI- & pi0	289

[ ] Lepton - "Length-like"
[X] Baryon - "Volume-like"
[X] Fermion - "Non-integer spin"
[X] Hyperon - "Non-zero strangeness"
[ ] Meson - "Area-like"
[ ] Boson - "Integer spin"
[X] Hadron - "Strong interactions"
[ ] Nucleon - "Proton & neutron"

In 1961, Y. Ne'eman and Murray Gell-Mann (1929..) predicted the existence of the omega minus particle. These particles were seen in accelerator tracks in 1964.

Particle	Mass	Spin
K MESON + & -	493.7	0

Decay time	Decay Products	Momentum
1.237x10^-8	64% mu+ & neutrino	236
	21% pi+ & pi0	205
	6% pi+ & pi+ & pi-	125

[ ] Lepton - "Length-like"
[ ] Baryon - "Volume-like"
[ ] Fermion - "Non-integer spin"
[ ] Hyperon - "Non-zero strangeness"
[X] Meson - "Area-like"
[X] Boson - "Integer spin"
[X] Hadron - "Strong interactions"
[ ] Nucleon - "Proton & neutron"

Particle	Mass	Spin
K1 MESON 0	497.7	0

Decay time	Decay Products	Momentum
8.93x10^-11	69% pi+ & pi-	206
	31% pi0 & pi0	209

[ ] Lepton - "Length-like"
[ ] Baryon - "Volume-like"
[ ] Fermion - "Non-integer spin"
[ ] Hyperon - "Non-zero strangeness"
[X] Meson - "Area-like"
[X] Boson - "Integer spin"
[X] Hadron - "Strong interactions"
[ ] Nucleon - "Proton & neutron"

Tsung Dao Lee suggested that the decay of the K0 particles violated Parity. This was confirmed by researchers about 1955.

Two chargeless K mesons have the same mass. The K1 decays in 8.93x10^-11 seconds, while the K2 decays in 5.18x10^-8 seconds.

Particle	**Mass**	**Spin**
K2 MESON 0	497.7	

Decay time	**Decay Products**	**Momentum**
5.18x10^-8	39% pi+,electron- & neutrino0	229
	27%pi+,muon- & neutron0	217
	21% pi0, pi0 & pi0	139

[ ] Lepton - "Length-like"
[ ] Baryon - "Volume-like"
[ ] Fermion - "Non-integer spin"
[ ] Hyperon - "Non-zero strangeness"
[X] Meson - "Area-like"
[X] Boson - "Integer spin"
[X] Hadron - "Strong interactions"
[ ] Nucleon - "Proton & neutron"

Particle	Mass	Spin
NEUTRON 0	918	.5

Decay time	Decay Products	Momentum
918	100% proton+,electron-&neutrino	1

[ ] Lepton - "Length-like"	[ ] Meson - "Area-like"
[X] Baryon - "Volume-like"	[ ] Boson - "Integer spin"
[X] Fermion - "Non-integer spin"	[X] Hadron - "Strong interactions"
[ ] Hyperon - "Non-zero strangeness"	[X] Nucleon - "Proton & neutron"

Around 1930, experiments showed that particles without charge were being emitted during nuclear experiments. In 1932, James Chadwick (1891-1974) measured the properties of this particle.

Particle	**Mass**	**Spin**
PROTON + & -	938.28	.5
Decay time	**Decay Products**	**Momentum**
stable	none	

[ ] Lepton - "Length-like"
[X] Baryon - "Volume-like"
[X] Fermion - "Non-integer spin"
[ ] Hyperon - "Non-zero strangeness"
[ ] Meson - "Area-like"
[ ] Boson - "Integer spin"
[ ] Hadron - "Strong interactions"
[X] Nucleon - "Proton & neutron"

William Prout suggested that all matter was built from fundamental building blocks consisting of hydrogen. In 1911, Ernest Rutherford (1871-1937) described the atomic nucleus and was the first to observed the proton in 1921.

Particle	Mass	Spin
NEUTRINO 0	< 6x10^-5	.5

Decay time	Decay Products	Momentum
stable	one	

[X] Lepton - "Length-like"
] Meson - "Area-like"
[ ] Baryon - "Volume-like"
] Boson - "Integer spin"
[X] Fermion - "Non-integer spin"
] Hadron - "Strong interactions"
[ ] Hyperon - "Non-zero strangeness"
] Nucleon - "Proton & neutron"

Wolfgang Pauli (1900-1958) suggested that a light, neutral particle was needed to account for conservation of spin in the decay of certain atomic particles. Enrico Fermi (1901-1954) gave it the name of "little neutral one" (Neutrino). The particle was first observed by Clyde Cowan and Frederick Reines in 1957.

Neutrinos rarely interact. If 200,000,000 neutrinos passed through the earth, perhaps one would interact with earth matter.

Three types of neutrinos are known to exist.

Resonances are extremely short lived states of particles. A particle resonates or "rings like a bell" when hit with a jolt of energy. It stores this energy in the form of a mass increase. Resonances decay or give off this excess energy in about 10 to the minus 23 seconds.

A particle can only absorb certain levels of mass as it can only "ring" at certain frequencies. The Resonances of some particles have been given different names and some so-called particles may actually be resonances.

Parity is left-right symmetry (Bi-lateral symmetry, space reflection symmetry, etc.) A body has Parity if its' mirror reflection is identical to the original. Parity violation lets us identify left-handed and right-handed screws. Weak interactions involve changes in parity, much as electro-magnetic interactions involve a change in charge.

Processes involving parity can be thought of as generating left-handed and right-handed screws. (The direction a particle spins in relationship to its' direction of motion.) A parity invariant process generates equal numbers of left-handed and right-handed screws. Parity is violated in beta decay as all resultant electrons are "left-handed screws".

Spin is the intrinsic angular momentum of a particle. Spin gives a polarity or directional sense to objects as it can be either clock-wise or counter-clock-wise. Spin, in terms of Plancks Constant, occurs in half-integer steps.

Spin multiplied by Plancks Constant is called angular momentum. Angular momentum is "conserved" if space is isotropic or the same in every direction (Rotational symmetry).

Charge is the property of sub-atomic particles associated with electro-magnetic interactions. Like charges repel and unlike charges attract. All electric, magnetic and chemical phenomenon originates with charge.

Thales of Miletus (640-547 B.C.) noted that amber, when rubbed with wool, was able to attract small objects.

The common atomic particles are commonly described in terms of three fundamental properties (Charge, Baryon Number & Strangeness). Fundamental particles have only harmonic amounts of these properties.

In order to avoid a skew in the ATOMIC PARTICLE CHART, I have defined a property I call weakness. It is related to the conventional atomic particle properties of isospin, hyper charge and strangeness.

WEAKNESS(Baryons) = STRANGENESS -CHARGE + BARYON NUMBER

Weakness is involved in the decay of neutrons and all other "weak force" interactions. Weakness may be associated with neutrinos.

Leptons are particles which are affected by the Weak force but not the Strong force. Leptons have little or no mass.

ELECTRONS, MUONS and NEUTRINOS are Leptons. Leptons are line-like entities which have non-integer spin. Leptons with charge are affected by electro-magnetic forces and leptons with mass are affected by gravity.

Brugnatelli discovered electro-plating in 1805.
William Crookes (1832-1919) invented the CRT in 1878.
Joseph John Thomson (1856-1940) was the first to isolate and observe the electron in 1897.

Bosons are "area-like" particles which obey Bose-Einstein statistics. Bose-Einstein statistics deals with the energy distribution of bosons. Bosons do not obey the Exclusion Principle. They seem to have zero thickness in that any number of bosons can be "stacked" in the same "space cell". Bosons, which include photons and mesons, store and convey interaction-information between systems. Bosons are named for S.N. Bose (1894..), who was the first to study the statistical distribution of bosons in time-space.

Baryons include protons and neutrons (Nucleons) plus many heavy unstable particles (Hyperons). Baryons have non-integer spin. Baryons obey the Exclusion Principle in that only one baryon can occupy a particular state.

Baryon number is to the strong interaction as charge is to the electro-magnetic interaction.

Heavy particles of matter have a "strong charge" or baryon number of one, while heavy anti-matter particles have a baryon number of minus one.

Fermions are particles which have half integer spins and obey Fermi-Dirac statistics. Fermi-Dirac statistics deals with the energy distribution of fermions. Theory proposes that all matter is composed of fundamental fermions. Fermions obey the "Exclusion Principle" in that only one can occupy a particular state. Quantum mechanics describes the various "states" or "rooms" which can be occupied by a fermion. Proton-electron systems have four sets of "rooms" called "quantum numbers".

Mesons (Intermediate particle) have integer spins. Mesons carry energy between Fermions in nuclei.

Hideki Yukawa (1907..1981) postulated the meson in 1935 to account for the nuclear binding force. The meson was discovered in 1947.

Hadrons (Strong in Greek.) are particles involved in strong interactions. Mesons and baryons are hadrons. Baryons are particle-like hadrons and mesons are wave-like hadrons which carry interaction information between fermions.

The subatomic particles can be differentiated from one another on the basis of their dimensions in terms of a small set of quantized properties. The properties used to specify the qualities of particles include: **charge**, **baryon number**, **strangeness**, **hypercharge** and **isospin**.

It seems clear that charge is an independent property associated with electro-magnetic interactions and that baryon number is an independent property associated with strong interactions

Strangeness, hypercharge and isospin appear to be composite properties which can be associated with more than one type of interaction.

Although **isospin**, **strangeness** and **hypercharge** contain a component sensitive to the weak force, I have found it necessary to define a property I will call weakness in order to create a symmetrical property chart.

hypercharge = strangeness + baryon number
weakness = hypercharge - charge

The Potter Particle Chart shows the relationships between the long lived subatomic particles in terms of three quantized subatomic properties, **charge**, **baryon number** and **weakness**.

The particles in the left column have a negative charge while the particles in the right column have a positive charge.

The particles in the top groups have a positive baryon number while the particles in the bottom groups have a negative baryon number.

The top particle in each group has a plus weakness while the bottom particle in each group has a negative weakness.

Although property changes can be conveyed by fermions, most change is conveyed by bosons and boson-like property pairs. Note that the top and bottom groups of properties are fermions while the middle group of properties are bosons or lepton pairs. This arrangement best shows how volume-like particles (Fermions) are modified by area-like particles (Bosons).

This chart provides insights into the decay modes of the particles. Note that pi plus mesons combine with particles to yield the particles to the right and pi minus mesons combine with particles yield the particles to the left. Photons can combine with particles to create more massive particles called resonances.

The Positron is the antimatter equivalent of the electron.

Inertia mass is a bad concept.

Rest mass is a global invariant. That is, it has the same value for all observers.

Inertia mass is a function of rest mass and the relative velocity of each observer to the rest mass. Inertia mass can be different for every observer. Inertia mass is **not** mass but is energy multiplied by a constant.

As rest mass is invariant, and as inertia mass is actually energy, it is best to keep these concepts separate. The term mass should always refer to rest mass and the term energy should be used in lieu of the term inertia mass.

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