In the early 1980s I was watching a sci-fi movie taking place in a revolving space station which simulated gravity through its centrifugal force. I wondered if a similar model might somehow account for gravity itself. General Relativity treats gravitational acceleration as indistinguishable from other accelerations. While linear acceleration of an object requires a force, rotational acceleration does not because of Newton's First Law of Motion. The acceleration of a spot on a spinning sphere is due to a change in direction, not a change in speed. So I set the equation for rotational acceleration equal to Newton's equation for gravitational acceleration and obtained a velocity term associated with gravity.This velocity associated with gravity has no recognized meaning and cannot be measured. I did not try to assign a meaning to this velocity at this point but realized that I needed another equation containing this term to link it to reality.

My first thought was gravity might be due to a spinning in higher dimensions. However, this would produce an outward force while gravity is an attractive, or downward, force---just as a deceleration would produce. What velocities does an object possess which could be reduced? The earth, for example, has a spinning velocity, a rotational velocity around the sun, a velocity as being part of the Milky Way's rotation, a velocity in being part of the Milky Way's rotation around the "Great Attractor", and other, perhaps, unrecognized motions including a possible spin of the universe itself along with its expansion. Gravity would then represent a loss of some universal velocity.

This, then, suggests the needed second equation: the vectorial sum of all the velocities of a body including its retardant velocity due to gravity equals a constant. For a photon, which has no mass so no gravitational velocity, that constant is the speed of light,c. These sums and minuses of other bodies should also equal that same constant. From these two equations other equations may be derived. It is upon these two equations that this theory rests.

Vectorially subtracting this gravitational velocity of an object from c gives its absolute velocity. This is also a quantity which, according to Relativity, cannot be measured. That does not mean that it does not exist. I have read that Einstein said that there is an absolute velocity but F = MA motion is allowed. By making certain assumptions;such as, objects belonging to the solar system all share the same universal velocity component, meaningful local calculations can be made and compared with actual values.

Vectorial addition and subtraction of velocities are used to give the overall value of all object's total velocities to be equal to c. This also relates to the energy of an object. The kinetic energy of objects is viewed as mv^2 , not half that value. The conventional formula for kinetic energy is derived assuming that mass is constant which is not the case when dealing with absolute velocities.

Newton gave us two definitions of mass; one based on inertia, the other based on gravity. Here they are viewed as identical and will always show to be so no matter how precise mass may be measured in the future.

So why does a baseball fall to earth when dropped from an airplane? The ball and earth follow the same trajectory traveling through space but, because of the earth's slightly slower absolute velocity, the baseball outraces the earth as it travels the path of earth's curved space.

Gravitational Velocity Equation (1)

Einstein felt that gravity should be treated as any other acceleration which is a change in velocity. The only stable acceleration not requiring a continuous energy supply would be a rotation. So
$g = G\, m / r^2 = v_g^2 / r$ where v_g is the velocity associated with gravity and
(equation 1) $v_g^2 = Gm / r$
Rotation produces a centrifugal force ; whereas, gravity gives rise to a centripetal force. Gravity must then be a deceleration. That implies that the universe contains a rotational component which matter lags behind by an amount represented by $v_{g,}$ a loss of some universal spin.

Absolute Velocity Equation (2)

Newton showed through F = ma + v dm/dt that the first part of that equation holds when mass is constant. Relativity explains that the second part is real suggesting that velocity is constant. I have read that Einstein had said that the absolute velocity of an object is constant but F= ma type motion is possible.
Absolute velocity is not a measurable property but we can be aware of some of the components. The earth spins on its axis, revolves around the sun, is a component of the Milky Way's rotation and revolving around the " Great Attractor ", and likely included in other celestial motions. The universe appears to be expanding at relativistic speeds.* And it also might be spinning if, perhaps, the primordial universal particle possessed spin or the “Big Bang" imparted spin as well as expansion. The lighter components of the universe would be moving faster while the denser ones would experience a larger lag related to v_g.
This suggests that, while massless particles travel at the speed of light (c), objects with mass will travel at an absolute velocity equal to c vectorially minus universal velocity loss (v_g). That is
(equation 2) $c^2 = \sum v_i^2 + v_g^2$
where the v_is are the individual velocities of the body. v_g is linked to gravity and to motion.

Relation to Relativity

From Relativity: $m = m_o / (1 - V^2 / c^2)^{1/2} = m_o / (c^2 - V^2 / c^2)^{1/2} = m_o\, c / (c^2 - V^2)^{1/2}$

equation (2) $c^2 = V^2 + v_g^{\ 2}$ and $v_g^{\ 2} = c^2 - V^2$
therefore $m = m_o\, c / (v_g^{\ 2})^{1/2}$ so

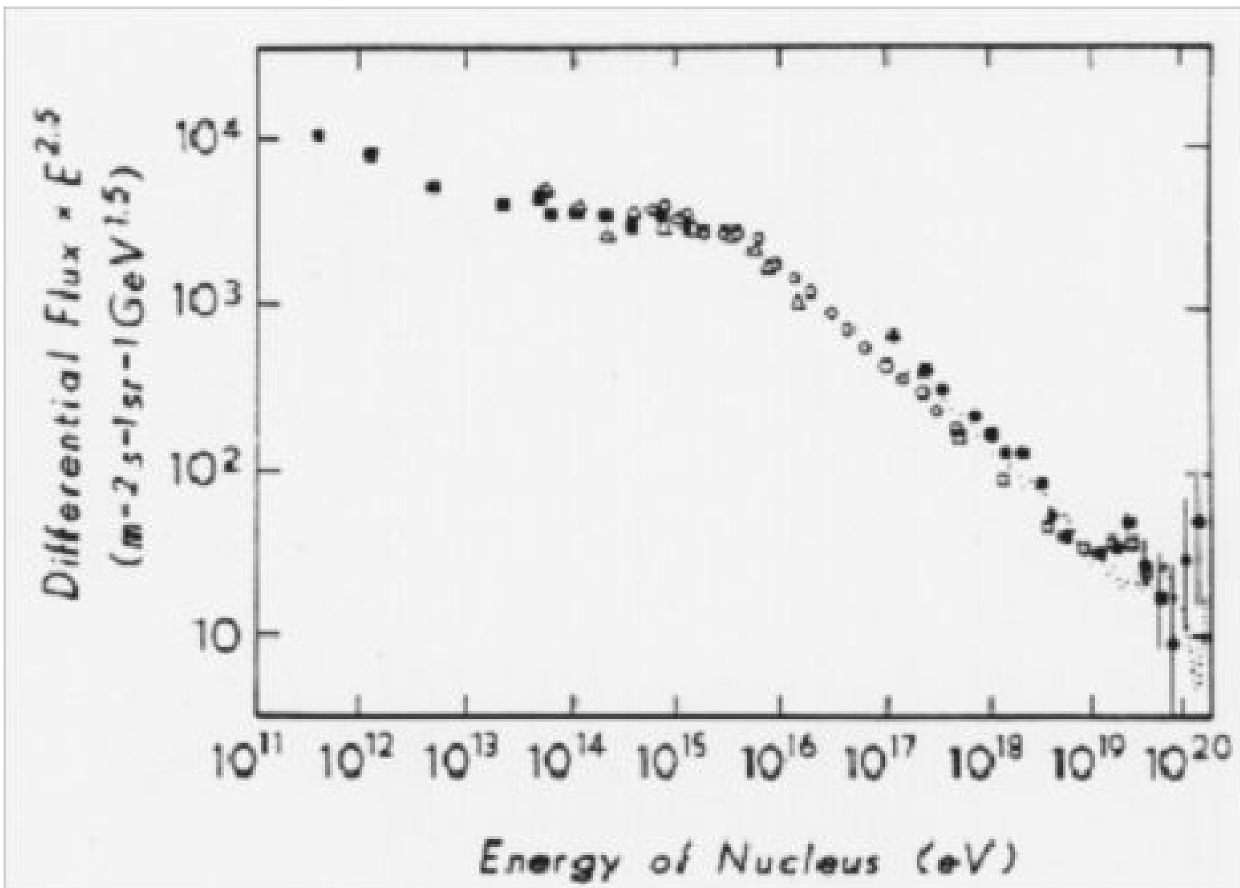
equation (3) $m\, v_g = m_o\, c$ and a similar calculation yields

equation (4) $r_o\, v_g = r\, c$
note that $m\, r = (m_o\, c / v_g) (r_o\, v_g / c)$ or

equation (5) $m\, r = m_o\, r_o$
When $v = v_0$, m and r are the values at the object's absolute velocity.

Cosmic Rays

Cosmic rays are mostly atomic nuclei generated by celestial events. Their measured energy depends on their velocity relative to us. Those originating from the sun, sharing our solar system's celestial velocity, would show the lowest energy range. Those up to energy levels of 10^{14} ev or 10^{15} ev are believed to originate in our galaxy.



http://imagine.gsfc.nasa.gov/docs/features/topics/snr_group/cr-knee.html

According to equation (2), the maximum velocity for any nuclei would be the square root of ($c^2 - v_g^2$). That value is close to c and so would determine the maximum mass of the nucleus and its maximum energy.

Derivation of the equation for maximum mass

from equation (3) $m_o c = mv_{g,0} = m (Gm_0 / r_0)^{1/2}$
so, $m_o^2 c^2 = m^2 (Gm_0 / r_0)$
equation (6) $m^2 = m_o r_o c^2 / G$

Example calculation: maximum energy of a proton

using 1.67x 10^{-24} g as m_o and 3.2x 10^{-13} cm as r_o,
$m^2 = (1.67 \times 10^{-24} g) (3.2 \times 10^{-13} cm) (3.00 \times 10^{10} cm / sec)^2 / 6.66 \times 10^{-8} cm^3 / g\, sec^2$
So, $m = 9.0 \times 10^{-5}$ g
The velocity is close enough to c to use that value in the calculation of energy.
$E = m v^2 = (9.0 \times 10^{-5} g) (3.00 \times 10^{10} cm/sec)^2 / 1.60 \times 10^{-12} erg/ev = 5.1 \times 10^{28}$ ev The same calculation on other particles gives these projected energies:

particle	m_o (grams)	r_o (cm)	calculated m (grams)	energy (eV)
electron	9.1×10^{-34}	1.0×10^{-16}	3.5×10^{-11}	2.0×10^{22}
Fe56	9.37×10^{-23}	8.8×10^{-13}	9.95×10^{-13}	5.6×10^{20}
U235	3.90×10^{-22}	7.0×10^{-11}	2.74×10^{-12}	1.5×10^{21}

The maximum energies predicted are dependent on the value of r_o selected ,with the heavier nuclei giving the larger energies.These values are far above observed cosmic rays values. These maximum values should also apply in particle accelerators although that may not be of practical concern as their current range is well below these values.

Rotation of Condensing Protostars

Gaseous clouds destined to become stars upon gravitational collapse have rotation which increases as their radius becomes smaller. An unresolved problem is that the Law of Conservation of Momentum predicts that the forming stars should be rotating faster than observed.
Equation (2) limits the amount of speed an object can locally acquire. The v_g increase of a shrinking protostar would have to come from a reduction in some celestial motion. This same

restriction would also apply to the increase in spinning speed. It appears that the spinning speed increases at the same rate as v_g, so that:
$v_g^2 = Gm_o / r = (v_{spin})^2$ and, $(v_{spin})^2 r = Gm_o$ = a constant
If there were enough matter, theoretically, this process could continue to form a black hole where
$v_g^2 = 0.5c^2$ and spin would also be $0.5c^2$, according to equation (2.)
Example calculation: What would the spinning speed of a cloud of one solar mass and radius of 3.39×10^{13} km with a rotational velocity of 3.375×10^{-2} km/sec upon collapsing to the radius of the sun, 6.95×10^5 km
$(v_{1\,spin})^2 r_1 = (v_{2\,spin})^2 r^2$
$v_2^2 = (3.375 \times 10^{-2}$ km/sec $)^2 (3.39 \times 10^{13}$ km $) / 6.95 \times 10^5$ km and $v^2 = 236$ km/sec instead of the value exceeding c as predicted by the Law of Conservation of Momentum.

Solar System

The Solar System presents a similar, although more complex, situation as the stellar rotation case. It consists of objects sharing the same celestial velocity. The planets, rather than collapsing along with other debris to form the sun, collapse independently to acquire their own spin while revolving around the sun at the same time. The latter two velocities are lumped together here; rotation being viewed as a special case of revolution where the revolving distance is zero. This means that v_g^2 should be equal to the sum of $v^2_{spin} + v^2_{revolving}$ The chart below shows the results for the planets:

	Rotation cm/sec	Revolution cm/sec	$(v_s^2 + v_r^2)^{1/2}$ cm/sec	$(Gm/r)^{1/2}$ cm/sec
Mercury	3.01×10^2	4.79×10^6	4.79×10^6	3.00×10^5
Venus	1.80×10^2	3.50×10^6	3.50×10^6	7.30×10^5
Earth	4.65×10^4	2.98×10^6	3.01×10^6	7.90×10^5
Mars	2.41×10^4	2.41×10^6	2.42×10^6	3.55×10^5
Jupiter	1.26×10^6	1.31×10^6	1.82×10^6	4.20×10^6
Saturn	1.00×10^6	9.64×10^5	9.72×10^5	2.50×10^6
Uranus	4.06×10^5	6.80×10^5		4.75×10^4
Neptune	2.68×10^5	5.43×10^5	6.10×10^5	16.4×10^5

Pluto	$2.85x10^{-2}$	$4.74x10^{5}$	$4.74x10^{5}$	$5.33x10^{4}$
Moon		1.0**2**x10^{5}	1.0**2**x10^{5}	$1.68x10^{5}$
Sun	$2x10^{5}$		~$2.20x10^{7}$*	$4.355x10^{7}$

*Galactic Velocity cm/sec

Other than Mercury, the agreement was within a factor of ten for the planets. Uranus' horizontal axis spin does not allow addition of its two velocities. Inclusion of a planet's moons should probably be included in the calculation for a more precise result. The sun's high temperature should also be included as an energy-velocity equivalent.

Beta Pictoris b was recently found to be the fastest rotating planet known to date. Its 56,000 mph is equal to 2.5 x 10^{6} cm / sec.

Taking the orbit to be 9.0AU and its period to be 20.5 years means its orbiting velocity is 1.3 x 10^{7} cm / sec. Combining the velocities vectorially would result in an overall velocity of 1.3 x 10^{7} cm / sec.

If this total velocity squared is expressed as G x mass / radius , then using the mass as being 3J and the radius 1.65 rJ gives:

v^2 = (6.67 x 108 cm^3 / g sec^2) (1.33 x 10^{31}g) / 1.18 x 10^{10} cm

and v = 2.7 x 10^{7} cm / sec

Reuters: The head-spinning speed at which Beta Pictoris b whirls, the scientists said, lends support to the notion that a planet's rotational velocity is closely related to its size: the bigger, the faster.

"Yes, the relation between mass and spin velocity was already known in our solar system," said University of Leiden astronomy professor Ignas Snellen, another of the researchers.

"We now extend it to a more massive planet to see that the relation still holds. We need to observe more planets to confirm this is really a universal law," Snellen added.

This paper suggests that, while mass and radius are factors in determining rotational velocity, also so is the orbital velocity which is determined by the distance of the planet from its sun.

Our moon shares the same velocities as the earth but,in addition, has its own orbital velocity. That speed should be amenable to the same type calculation. The result is shown in the above table. Below is a table showing the results for seven other larger moons. The calculated values are within a factor of ten of the average actual values for all of these.

	m (grams) x 10^{25}	r (cm) x 10^{8}	v (calc) cm/ s x10^{5}	v (ave obs) cm/s x10^{5}
Callisto	10.76	2.41	1.73	8.20
Titan	13.45	2.576	6.00	1.87
Triton	2.14	1.35	4.38	1.03

Io	8.93	1.82	1.81	17.3
Ganymede	14.82	2.634	1.94	10.9
Europa	4.80	1.56	1.43	13.7
Iapetus	0.1805	0.7345	0.405	3.24

For smaller moons (~10^{19} grams),the discrepancy appears to be several hundred to a thousand fold. These moons' speeds would be affected greater by other gravitational forces.
The calculated velocities of stars are higher than the observed rotational velocities, ranging from within a factor of ten to as much as 200. The difference could be the galaxy revolving, as is the case of the sun.

	Solar Mass	Solar Radius	Oberved Rotation cm/s x 10^7	Calculated Rotation cm/s x 10^7
Altair	1.79	1.63 to 2.03	2.40	3
Betelgeuse	7.7 to 20	950 to 1200	0.05	0.25 to 0.45
Epsilong Eridani	0.82	0.735	0.024	3.3
Formalheut	1.92	1.84	0.93	3.17
Pollux	2.0	8.8	0.028	1.48
Rigel	18	74	0.40	1.5
Sirus	0.978	0.0084	0.16	33
Spica	10	7.4	1.99	3.6
Tau Ceti	0.78	0.79	0.024	3.1

Cosmology

Perhaps, by the reverse engineering of collapsing bodies, we can get insight of the dynamics of our expanding universe. A sub-atomic size particle with the mass of the universe, upon creation, might expand according to some yet unknown Quantum behavior to a size where non- Quantum

laws take over. At that point, Equation 2 would be violated, as $v_g^2 >>> c^2$, prompting an instantaneous expansion to bring $v_g^2 = ½ c^2$. This would account for the hypothesized Inflation at 10^{-33} seconds after inflation.
At that point, $c^2 = v_g^2 + v^2_{spin} + v^2_{expansion}$. Assuming v_{spin} to be zero, the expansion velocity squared would then also be $½ c^2$. Upon expanding, v expansion would increase and v_g would be correspondingly reduced in accordance with Equation 2, which is what is observed.
Equations 1 and 2 may be written as: $m (c^2 – V^2) = Gm^2 / r$, where V is the absolute velocity of the object. This equation is stating that the total positive energy of an object is equal in amount to its gravitational energy which is negative. The net total energy of objects in our universe, and the universe itself ,is zero, just as a planet revolving around a sun at a certain velocity while spinning at an equivalent opposite velocity could have no intrinsic net movement. Some physicists have speculated in the past that this is the case with our universe.
If this theory is correct our universe was created not from energy but from nothing!

Calculation of the Expansion Rate of the Radius of Universe

Selecting the mass of the universe to be $6x10^{54}$ grams and its radius $4.40x10^{28}$ cm, then
$v_g^2 = Gm / r = (6.66x10^{-8} cm^3 / gsec^2) (6x10^{54} g) / 4.40x10^{28} cm = 9.08x10^{18} cm^2/sec^2$
$v^2_{expansion} = c^2 - v_g^2 = 9.00x10^{20} - 0.18x10^{20} = 8.82x10^{20}\ cm^2/sec^2$
$v_{expansion} = 2.97x10^{10}$ cm/sec depending on the actual value m and r

Calculation of the Age of the Universe

At Inflation: $v_g^2 = ½ c^2 = G m / r$
$r = 2Gm / c^2 = 2 (6.67x10^{-8} cm^3 /g\ sec^2) (6x10^{54} g) / 9.00x10^{20} cm^2 = 8.9x10^{26} cm$
Estimating the average expansion velocity between the point of inflation ($½ c^2$) and today ($2.97x10^{10}$ cm/sec) to be $2.6x10^{10}$ cm/sec then,
time required = increase in radius of the universe / average expansion velocity
$t = (4.40x10^{28} cm - 0.09x10^{28} cm) / 2.6x10^{10} cm/sec = 1.66x10^{18}$ sec
Today’s accepted age of the universe based upon observations is 13.7 billion years or $4.32x10^{17}$sec

An exercise

A particle with Planck’s mass $(hc / G)^{1/2}$ and radius of Planck’s length $(hG/ c^3)^{1/2}$ would have its $v_g^2 = Gm / r = G(hc/G \times c^3/hG)^{1/2} = c^2$

This describes a tiny motionless black hole.Its absolute mass determined by $m_A^2 = m_P r_P c^2 / G$ and m_A turns out to equal m_P. That is consistent with the particle not violating equation (2) by having motion, $v^2 + v_g^2 > c^2$. The energy of this particle may be expressed as $m_P c^2$ or $m_P^2 G / r_P$.

Calculation of the radius of quarks

Below is a table of the six quarks. A mid-range energy value is selected. New values should be substituted as their certainty increases for the forthcoming calculation. These values are converted to grams in the next column for use in equation 6.
When a quark and antiquark combine to form a meson the assumption is made here that they attain their absolute velocity which determines the energy of that meson. The Phi meson, made up of a Strange quark and Strange antiquark, has a rest energy of 1020 MeV/c^2 so that each is assigned half of that amount and that value is entered in the next column. In a like manner, the J/PSI meson, consisting of a charm quark and charm antiquark, has a rest mass of 3096 MeV/c^2 so each is assigned a maximum value of 1548 MeV/c^2. The Upsilon meson (b, b) at 9460 MeV/c^2 is used to get the value for the bottom quark. The Kaon meson (u, s) of 493.7 MeV/c^2 was used to get the up quark value by subtracting the strange quark value. In the same way, the down quark value was gotten from the Pion meson (u, d) rest mass of 493.7 MeV/c^2. Other mesons could also be selected for this purpose which would slightly change the results. It is the method being featured here rather than the precision of the results.

Quark	m_0 MeV/c^2	m_0 x10^{-27}g	m MeV/c^2	m x10^{-25}g
up	2.4	4.3	419	7.46
down	4.9	8.7	419	7.46
charm	1290	4077	1548	27.56
strange	100	178	510	9.08
top	172,900	307,380		
bottom	4190	7449	4730	84.2

It is interesting to apply these results in the next chart. Here the actual energy of particles is compared to the value calculated from the quark chart. In all cases shown, the actual energies are lower than the calculated one, with one exception. The assumption will be made here that this is due to the quarks contained have fallen short of their absolute velocity. The exception, Z(4430), contains heavier quark charges which would raise its potential energy. The potential energy component here has been assumed to be small enough to ignore.

meson	quark makeup	actual MeV/c^2	calc MeV/c^2	% difference

Rho	u (d)	775	838	9.9
D,null	c (u)	1865	1967	5.2
D,star	c (d)	1869	1967	5.0
Kaon	u (s)	494	929	50
Pion	u (s)	140	838	83
baryon				
Lambda,null	u d s	1115	1348	17
Lambda,+	u d c	2281	2386	4.4
Sigma,+	u u s	1189	1348	12
Sigma,null	u d d	1232	1257	2.0
Delta,++	u u u	1232	1257	2.0
Cascade,null	u s s	1315	1439	8.6
proton	u u d	$1.67x10^{-24}$g	$2.24x10^{-24}$g	25.4
Z(4430)	c (c) d (u)	4430	3935	-12.6
Theta,+	u u d d (s)	1540	2186	29.6

Moving to the below chart, those values are then used in equation 6 to calculate the quark radius: $r_0 = Gm^2 / m_0c^2$

eg. Up quark: r_0 = ($6.67x10^{-8}cm^3$ g-1 sec-2) ($7.46x10^{-25}g)^2$ / ($4.3x10^{-27}$g) ($3.00x10^{20}$cm sec-1$)^2$ = $9.6x10^{-51}$ cm

The same calculation is made for the other quarks and is entered into the first column. If the assumptions made are valid, this figure would be the radius of each quark. If the quark mass falls short of its absolute value, this figure would represent the minimum of the uncertainty range of the quark radius

quark	r_0 x 10^{-52}cm	r x 10^{-52}cm
up	96	0.55
down	47	0.55
charm	1.4	1.1

strange	3.4	0.67
bottom	6.96	6.2

In the next column the radius at maximum speed is listed as calculated from equation 5:

eg, Up quark: $r = r_0\ m_0 / m = 2.4\text{MeV} \times 96 \times 10^{-52}\text{cm} / 419\ \text{MeV} = 0.55 \times 10^{-52}\text{cm}$

While the r0 range is almost 70 fold, the r range has shrunk to almost 10 fold.