SERVING NEWTON

t the start of the year's University Physics 1 degree course, the Physics Professor looked at the motley crew filling the lecture theatre. He knew some students ere destined to survive, while others would drop -out. In a rather callous way, the professor wrote -off the previous twelve years of the students' scientific lucation before introducing the course. Writing on the board just four symbols, he continued saying " *The single most important equation in the Universe is,"*

" F = m a "

ne experience could be likened to watching the rector at church, singing the praises of the most exalted one. " *From this equation*" he said, "*everything else, all her forces are derived, forces including motion, gravity, electrostatics and magnetism. This can be experimentally proven over-and-over again as a Law of ature, as a Universal truth.* " But this was no rector, this was the bishop, the professor himself outlining Newton's laws of motion, showing the magic lationships that exist in the sciences. The Universe seemed to make sense at that moment, but then his reverent attitude turned. He introduced into this verview scheme of things, three body gravitational systems. At this point, he stated that Newton's laws failed, for " *this is where Einstein's approximations me into their own, for only they can accurately predict and solve the forces that exist between three or more bodies in the Universe."*

omething appeared to be very incorrect; for this did not ring true. It seemed impossibl e that a law of Nature, a known Universal Truth, could be wrong? The ofessor was expressing the common cosmological opinion that Newton's laws of gravity are deeply troubled, if not wrong, yet he found it amusing that smologists could not suggest any mechanism to explain gravity or to improve gravitational theory. To conclude his introduction to Physics 1, the professor id, "*Terrestrially, the laws of Physics work, but when one talks about matters cosmological, Newton's laws fail miserably, giving -way to Einstein's relativity.* This statement appeared to be more contradiction than Science. The Earth exists as a tiny speck of dark matter, orbiting with the Moon around a rather mmon star. As the Earth is part of the Solar System, located in The Galaxy , situated in the Universe, what then, makes the Earth so different to any other smological body? How can Newton's laws only apply here? Surely, if Newton's laws fail miserably in the rest of the cosmos, they must fail here? For any w to be a Natural law, then the law must apply universally, throughout the entire cosmos, where -ever there is matter. How can Newton's laws be called atural laws when they fail? Only one theory can be true, or the accepted theories must be wrong. If both are incorrect then some other law must universally pply.

is important to contemplate some historical facts about Newton's laws of motion. Sir Isaac Newton (1642 -1747) was a man and as such made mistakes, not st in life, but also in his mathematics, language and scienc e. At the start of his academic career, the Great Plague (1666) closed the Universities, so he left ambridge to work on his own in the country. Newton taught himself mathematics from just four books and within a year, was making valuable contributions mathematics and science. When it came to logarithms and The Calculus, Newton had to invent them, developing his own ideas and concepts, or he had to compass, correct and modify the works of others. Words like mass and energy were not contemplated in this period. There was no one available to teach ewton how to use these methods and equally, there was no -one who could correct or confirm his work. Newton sourced much theory from the works of hers and when they seemed true, accepted such mistakes as well. He modified their concepts and ideas into his own constructs. His laws of motion corrected e discoveries of **Galileus Galileus** (the English xenoym is Galileo Galilei), using deduction and fluxions (The Calculus). Galileus did not include the object's itial motion "u.t" when he wrote the distance equation $s = ½ at^2$. Newton's correction made sense, where a minor change , $s =$ **ut** $+ ½ at^2$, bestowed credit on m.

ior to Galileus' discovery, the belief was that when a cannon fired a shot, the shell was given **impetus** by the detonation of the gunpowder. The shell would e up all this impetus as it rose, then fall to the ground when the impetus ran out. Galileus corrected this view by explaining the path of such a projectile as a rabola, where a continual downward motion acts on the object, that being the pull of gravity. Newton furthered Galileus' argument in showing athematically, that the impetus was not used up, rather gravity restricted the cannon's range by altering the shape to that of a parabola. Newton would argue at when sufficient force is given to the shell, the projectile would fall all the way around the Earth, never touching the ground, prescribing an elliptical orbit. ut here is a contradiction. The trajectory of a projectile must follo w the arc of an ellipse, not that of a parabola. The curve of a parabola is totally different to ellipse, so, why then, does Science maintain such a basic false belief? Newton did not realise that he copied an error. It is obvious he did not understand the fects of atmospheric drag, cross -winds, tail winds, chemical behaviour, supersonic melting, and the rotation of the Earth, (the Coriolis effect) because these fects were *scientific mysteries* at that time..

nce Newton's time, much has been discov ered and alterations made to Newton's theory. But these changes were at great cost. Although new words and finitions clarified Newton's laws, the nineteenth century scientists and mathematicians who resolved Newton's initial mistakes and omissions, feare d ientific outrage, for Newton, the legend, grew more powerful in death. Many who although correct and for the correct reasons, attacked The Great Newton, came ostracised by the scientific community. Credit was rarely bestowed on them, leaving them in history's void. One can pick up virtually any Physics book his one included) to discover unique translations and understandings of Newton's laws by each author. In Newton's " *Principia*" (1726) , the three laws of otion are written as;

w 1. ***Every body perseveres in its state of rest, or of uniform motion in a right line, unless it is compelled to change that state by force impressed thereon.***

w 11. ***The alteration of motion is ever proportional to the motive force impressed; and is made in the directio n of the right line in which that force is pressed.***

w 111. ***To every action there is always opposed an equal reaction; or the mutual actions of two bodies upon each other are always equal, and directed to ntrary parts.***

ne second law is perhaps the most changed through translation. There are so many interpretations of this law that the situation becomes rather confusing. The llowing are three common variations on Newton's theme.

he force required to accelerate a body ***is proportional*** *to the product of its mass and its acceleration.*" (Various authors)

hat if an unbalanced force acts upon a body, the body will be accelerated; the magnitude of the acceleration ***is proportional*** *to the magnitude of the balanced force, and in the direction of the ac celeration is in the direction of the unbalanced force.* " (H. Semat) *inversely proportional to the mass of the body*." (Resnick & Halliday)

ıt these translations seem to have different meanings. In the " *Principia*", Newton's words describe this second law with " *If any force generates a motion, a ›uble force will generate double the motion, a triple force triple the motion, whether that force be impressed altogether and at once, or gradually and ccessively. And this motion (being always directed the same way with the generating force), if the body moved before, is added to or subducted from the rmer motion, according as they directly conspire with or are directly contrary to each other; or obliquely joined, when they are oblique, so as to produce a ·w motion compounded from the determination of both*."

ewton's second law seems to be in contradiction to his third law, though there is something in the third law which many fail to see. Again, from Newton's *Principia*", the description of the third law is " *If a body impinges upon another, and by its force change the motion of the other, that body also (because of the uality of the mutual pressure) will undergo an equal change, in its own motion, towards the contrary part. The changes made by these actions are equal, not the velocities but in the motion of bodies; that is to say, if the bodies are not hindered by any other impediments. For, because the motions are equally ıanged, the changes of the velocities made towards contrary parts* *are reciprocally proportional to the bodies*."

oth Newton and **Galileus** noticed that the outcome bore an inverse proportionality to the body (the mass) of the object. Yet, none of the equations involve the uare root of the mass, or the mass squared. In mathematics, when two or more variables are proportional, then the mathematics reflects that concern by the e of the symbol α **.** Normally, Newton calls equal proportions, equal, but here he does not and none of the translations do. Universally, they must use the ord proportional, not equal. The equation written as $F = m a$, does not state any proportionality, rather the emphatic is bluntly stated using the operand *equals*. ıis equation fails to imply proportionality or that the force is directly proportional, or for that matter, that there is a reciprocity in proportions between the ımponents.

ıould not the equation be written as

$$F \alpha m a$$

or perhaps, $F = m^2 a$

$F = m^2 a$ happens to be true, it would create a disaster in many areas, for it does not answer (at this moment) any questions, rather it would create a million oblems. Proving such as true, would mean that the standards and definitions currently accepted by Physics and the other sciences, (those that rely on the curacy of Newton's equation $F = m a$) would need to be replaced and reworked.

ewton's laws of motion relate to linear motion, to all motion in a straight line, **when such motion is not found, not possible on the Earth.** The cosmological anet Earth is turning on its axis in 23 hours 56 minutes 4.1 seconds, a rotational speed of 0.0000116057615 rps. This may be slow, but it is rotating, for even alileo's last words "*And the Earth still moves*" made this message clear. The rotation on the Sun is much slower for one revolution takes about 28 days, giving rotational speed of 0.0000004145 rps. Jupiter's rotation is the most rapid of all the planets completing a single rotation in 9 hours 50 minutes, a rotational ›eed of 0.0000282485875 rps. The equatorial tip-speed of astronomical objects, even at low rotational speeds can be an awesome number, due to the radius of e object. A galaxy just a thousand light years across, having a circumference of 3,141.59 light years does not need to rotate very quickly for the tip -speed to esent a red-shift approaching light speed. An annual difference in position of a light year would need to equal the distance light travels in that year, so, the ılaxy would need to turn just once in 3,141.59 years, at which point the outer stars and nebulosity would reach light speed.

enerally, galaxies rotate very slowly, but this does not make them any different to normal matter, for the Laws of Nature apply across and throughout the niverse. The major forces involved in a galaxy are rotational. Although magnetism and gravity are far less powerful forces, they shape the galaxy, promoting her fantastic effects. The source of cosmological rotational energy can originate from near-miss gravitational interactions, such as when a galactic body of ırs is pulled towards a passing galaxy, the gravitational disturbance produces a sling -shot-effect and the distribution of energy causes both galactic bodies to spond to such motion. But to understand a galaxy means understanding rotation.

›ucault's gyroscope is the most amazing scientific toy to observe rotational energy. The toy can be purchased from most toy stores, newsagents and lucational supply companies for less than $20. The basic gyroscope can be made for less than a dollar from odds and ends, constructed by attaching a small ıaft through the centre of a balanced disk. All spinning objects are gyroscopes; a truck's spinning tyre; a spinning thumb tack; a child's top; a motor; the ·wheel and the turbine. As a disk is spun at a high rotational speed, several strange events will be noticed, but be careful, basic safety procedures should be ›served, for spinning objects have a habit of breaking apart, grabbing hair, causing deep wounds, and racing across the floor, possessing a definite tendency to eak the most expensive piece of pottery in the house. Murphey's laws apply. There are many observational illusions that lurk in rotating devices.

'ith the axis vertical, merely placing the stationary gyroscope on the floor, shows the force of gravity, for it falls over. However, when the disk is spun as pidly as possible, the device defies gravity's pull, standing upright without falling over, yet the spinning disk and its frame have the same weight. The ›inning disk may develop a strange wobble, where the top-most point of the axis seems to follow a circular path, but no matter what is done, this precession llows the direction of rotation. This is the precession of the axis. There seems to be no way of making the precession travel in the reverse direction to the tation. One can shake, vibrate, thump it, flick or attack the frame, without any change to the direction of precession. It could be easy to argue using simple ›servations to conclude that precession has something to do with the direction of rotation, gravity, or the bearing drag, but this is not so. Turning the spinning ·roscope upside-down or making it spin in the opposite direction, does not alter the direction of precession for it still follows the direction of spin. Most ıysics educators fall head-first into the *because-it-is-done-this-way* trap, because an observational illusion dictates the mathematics and international scientific ;reement alters the truth, hiding the mechanism. The method locks the bottom axle bearing to a hypothetical x -y-z coordinate point in relating precession to e force of gravity on the entire structure acting at that point.

ıis is not the true reference point for the gyroscope is not a terrestrially referenced device, yet the terrestrial frame of reference is repeatedly used. The ·roscope's frame of reference is Universal. To prove this, it is necessary to do something so trivial, the feat escapes the attention of the most observant. mply pick the spinning gyroscope up by the top-most bearing and it is seen to precess in the opposite direction to the spin! Immediately, all gravitational and aring drag effects have been eliminated. An obvious observational error has introduced a nasty knowledge virus into Science where *all observations of the ·roscope use the terrestrial frame of reference.*

yroscope precesses around the gyroscope's axial centre, not the bottom-most bearing or the centre of mass. Mass irregularities between the axial centre and the ntre of mass result in several commonly observed gyroscopic effects. If precession were a terrestrial event, then it would present opposite motion in each emisphere, but then the Earth also precesses so where is the gravity pulling the Earth? Figure 14-1 changes the mathematical explanations in a single blow.

aving realised the error, the mechanism must be found. But what happens when two disks are fixed to the same shaft? A train has such wheels, where a steel le shaft supports a gyroscopic tyre on each end. Effectively, two independent gyroscopes are connected to a common shaft. The direction and speed of both yroscopes can only be identical, where any differences will result from the mass distribution and balance of the tyres. The axle is connected to the bogie frame pporting each end of the shaft with a bearing. As the two disks rotate together, the left hand gyroscope has a precession clockwise on the left side and anti-ockwise to the right side. The right hand gyroscope is identical, meaning that along the centre shaft, there is a conflict in precession. The left wheel is twisting e shaft anti-clockwise, while the right wheel is twisting the shaft clockwise. At certain speeds, dangerous resonances occur in the shaft as the dual precession vists and strains the shaft.

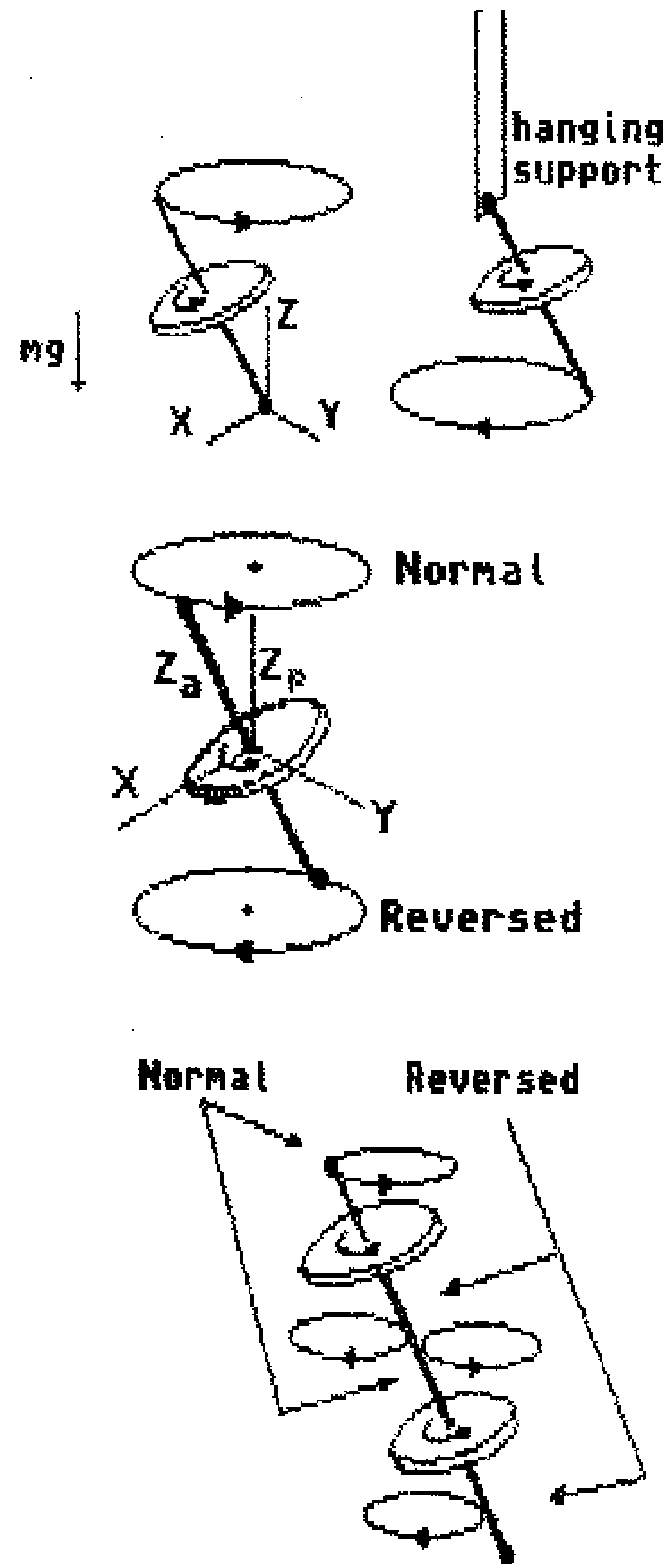

Figure 14-1 Reversing precession

ıe complete bogie mounts two or more independent axle-wheel pairs. As the axles roll on the track, the left side wheels are twisting with a clockwise ecession, while the right hand wheels are twisting with an anti-clockwise precession to the outside. Each wheel may be precessing at different rates. Bogie-ap is the term sometimes used to describe this effect, for no matter how well balanced the wheels may be, the bogie will wobble between the rails so ratically, it is to the discomfort of passengers, knocking the tracks apart, which, if not corrected can lead to a derailment. The solution to bogie-slap is to dependently support inclined wheels on their own axles (figure 14-2).

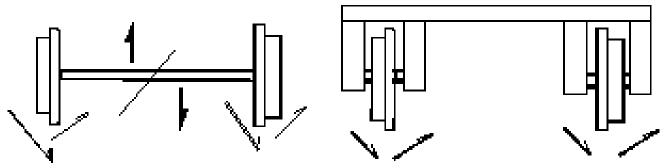

Figure 14-2 The Method of Correcting the dangerous gyroscopic instabilities in train wheels

hat happens when one continually flexes a thin wire? Even though the shaft may be 20 cm diameter machined steel, with time it must suffer metal fatigue, a olecular failure. The broken axle is generally attributed to mechanical failure not gyroscopically produced met al fatigue. Figure 14-2 illustrates this effect here the dual gyroscope action causes flexing, bending and distortion of the axle.

hen a motor is connected to a pulley, it forms the same dual structure with the same inherent twisting and resonance probl ems. As the motor spins up in eed, the connecting shaft enters regular periods of stability and instability as the twisting forces resonate through the shaft. This effect has nothing to do with avity! With high speed drink mixers, the motor's rotation passes through a speed-up gear system. The drive shaft of the high speed blender, has at one end, a ry small gear coupled to a large motor gear. The beauty of this design is that it reduces the dual gyroscope effect, allowing the blender to reach speeds in cess of 10,000 rpm (166.6 rps).

eologists have a great deal of trouble explaining why the Earth's interior is hot. They believe that the internal temperature is related absolutely to the eakdown of atoms through nuclear events, where radioactive d ecay is the only accepted explanation. If this were the case, evidence should be found to bstantiate the claim, like, everyone living near an active volcano should suffer radiation sickness and have mutant children. Radioactive decay need not be e full picture, for the rotating Earth must be considered as a rotating object, not as a static object. Any sphere can be considered as made up of many parallel lanced disk pairs, layer by layer, mounted on the axis. Each pair of disks forms the dual gyroscopi c structure where the twisting forces are at loggerheads ith each other, causing flexure, heating and stirring in the Earth's interior. As long as the Earth turns on its axis, it will remain hot.

nce a planet loses it rotation it will rapidly cool and s olidify. Such dead non-rotating planets include Venus, Mercury and The Moon. Seismically, these dead anetary objects, when struck would all ring -like-a-bell. Massive dark objects, perhaps greater in size and mass than the Sun, will be found to exist in t he alaxy, as collapsed, non-rotating dead-stars. Such objects would contain normal matter, with normal densities, perhaps with a crust much like the Earth, of icates and frozen gasses, water, Helium, Hydrogen, and Carbon structures. Gravitational diffe rentiation (settling and separation of different mass molecules) the cooling stellar mass may lead to critical mass conditions developing unstable shells at particular radial distances within the mass, causing an explosion at may regularly blow the dead-star apart, in many supernova events forming dangerous dark rubble -stars.

fectively, as the Earth is slowing down, it is losing heat ever so slightly. The current rate of slow down may be a second every century, but it is still a slow own. Back when the dinosaurs existed, the Earth would have experienced a much faster rotation. Perhaps, when the primordial Coriolis blob formed the Sun d Earth, the rotation may have been once every eight hours. This leads to a problem, because mankind is attempting to extract electrical power from othermal sources. The greater the rate that power is removed, the cooler the Earth will become and the greater the rate of slow -down. Rotational energy does t work like gravity. It is not related to the actual or inferr ed centre of mass. The centre of mass is only a hypothetical point of maximum signal strength used gravitational-feedback calculations. Nature does not work through calculations, rather she works with cause and effect, selectively evolving through rvivors. Over-and-over-again, Nature will try the same experiment, even though failures occur, but one experiment will create a survivor. Many survivors eate a colony.

ne key needed to solve Nature's rotational trick is the direction of the axis itself. W ith any rotating object, a sphere, shell, cube, box, cylinder or, tube, prism block, the axis must be considered as having no mass. The axle may have a mass, but the axis itself has zero mass. The axis is a hypothetical line joining all ositions of zero motion, about which centrifugal forces radiate. Relativity shows there are actually two primary forces involved here, the centripetal force and e centrifugal force. The centripetal force holds matter together and allows energy to be transferred from th e axis to the circumference of the object or vice rsa. The centrifugal force is the radial spin -out force remaining perpendicular to the axis, from the particular axial height to the circumference at that height the perpendicular direction. The gyrosc ope is not defying gravity, rather it is locking onto a fixed universal stationary direction, having a slipping plane rection. Figure 14-3 addresses the attributes of the gyroscope.

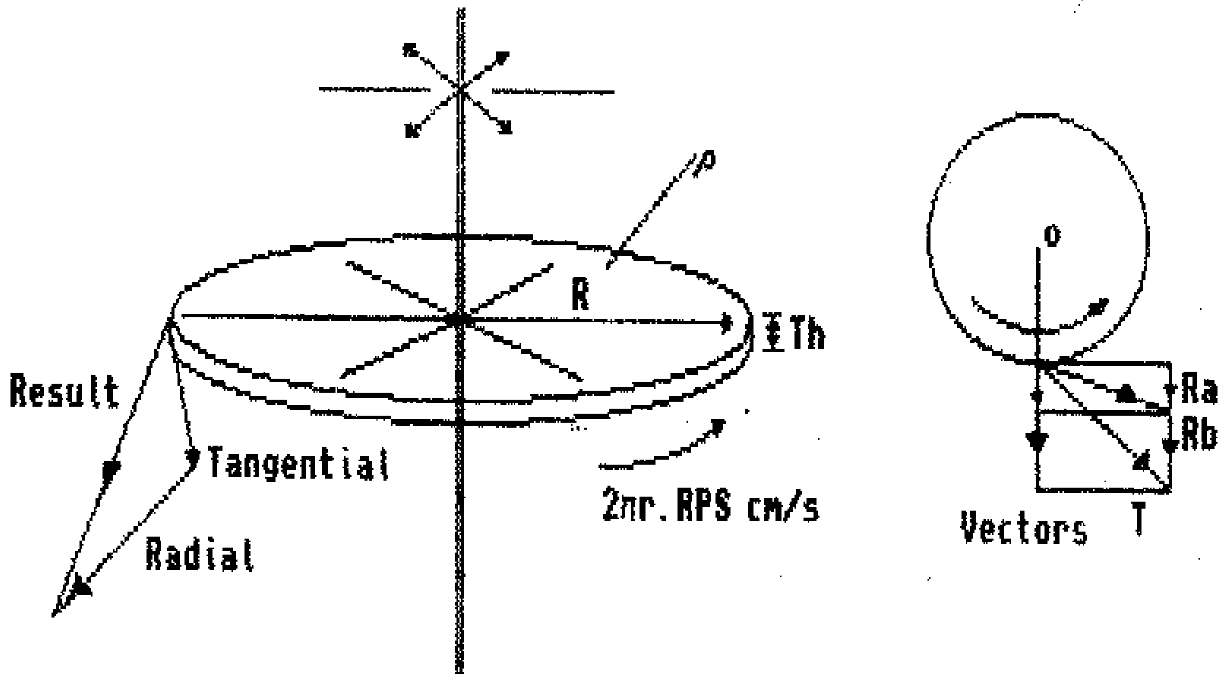

Figure 14-3 The Gyroscope's forces.

ne demonstration of this is the nylon fibre lawn edge trimmer, where a single strand of 8 or 10 gauge nylon thread is twirled around a central hub so rapidly at it takes on the resili ence of blade steel. Slow motion images of this cord show it to be absolutely taut, at an angle perpendicular to the axis of rotation. qually, when a thin plastic disk is rotated, even at relatively low speeds, the disk takes on a rigidity perpendicular t o the axis. Typical applications of this clude the floppy disk drive and CD player. A soft plastic disk when rotated can be used to cut through much harder materials, due to the change in molecular rength. Describe the motion of a spinning woollen pom -pom with respect to the rotation.

cross the surface of a rotating disk, the atmosphere is pulled around with the disk to be spun off creating a super high speed wind immediately above the sk's surface. So powerful is this molecular wind, it is capable of holding tightly sprung disk-drive heads well apart and away from the surface of the floppy sk. A method of killing a disk drive is to evacuate the disk -head chamber. The same occurs in the hard disk drive (HDA), but rather than having one disk, the omputer's HDA may have as many as twenty four pancaked disks. The disk drive heads are virtually clamped together, but as the head assembly approaches e disk, the wind opens the heads and blows them apart, holding then at a constant height at that radius. The slower the disk speed (towards the centre), the oser the heads are to the surface. A particle of smoke hitting the head can cause gyroscopic instabilities between the head and the platter resulting in a head ash. This does not normally eventuate, though, when it does, the event is to be remembered, for nothing much remains. Typically, the head crash causes the sk to be cut away near the axis whereupon the disk sheers away. Needless to say, all the data stored on that disk drive is lost.

ue to the seek times and storage needed in major mainframe computer installations, removable disk platters were used. Some of these drives spun the 8 plate)cm diameter platters at speeds above 5,000 rpm (83.3 rps producing a tip speed of some 178.53 m/s or 282 Km/h). The head crash could cut the disk from e platter in a second. Once airborne, the disk would smash through the protective housing, the casing, flying -off across the computer room to bury itself edge - ise into any distant object, with such an impac t force, chemical reactions take place between the disk and the object it entered. These disks do not strike ojects, they enter them and form chemical bonds.

s the gyroscope spins, it passes through periods of absolute stability, followed by periods of instability. As the disk slows, the precession becomes more and ore pronounced. Eventually as the rotation fails, the force of gravity grounds the gyroscope. This effect indicates an atomic and molecular resonance in the roscope, where the centrifugal a nd centripetal forces are continually compensating. A magnetic shock travels along the axis and rebounds, but in the mean ne, the disk has rotated. If the reflection point is immediately below or 180 degrees out of phase, stability exists in the gyroscop e, however, as the reflection oint drifts out of phase, the system's instability increases as the axis is knocked from the vertical position and then precession follows the rotation. The ecession may cause the object to violently wobble when the phase s hift is 90 degrees. This is a molecular resonance effect and is different between different aterials. This is the G -wave, an effect caused by matter's elasticity. The effect can be seen and heard during instability where the forces are so great, bearing ab presents a drag force causing maximum axial deviation and the observed precession. As the disk precesses, the bearings are pushed and pulled sideways ith greater friction, transferring considerable rotation to the mounting frame. At high speeds the be aring drag pulls the gyroscope's mounting frame around pidly but as soon as stability returns the frame ceases to be dragged around. With the on -set of stability, the pressure on the bearings is constant and minimal hile the energy losses to the mountin g frame are minimised.

worst case scenario is called *bike-slap*. It is a problem that has killed many expert motor bike riders. This is not a rider error, it is a serious motor bike oblem. The effect results from numerous design errors in both the desi gn and manufacture of the bike frame. It is a manufacturing fault and as such the anufacturers should be made to pay compensation to the families of those they have murdered and maimed through negligence. There is no justification for i inferior design in the market place, however one often observes the effect during motor bike races (to the amusement of the crowd). Basically, the frame olds the motor and its flywheel (the first gyroscope). As the steering geometry changes at speed, a small displacement in the angle of the front forks caused by twist in the front wheel (the second gyroscope) to a slightly different angle to the real wheel (the third gyroscope) and the engine. The frame is allowed to flex ithin reason and within certain tolerances. The frame absorbs and stores the twisting forces as the rider enters a corner with the power on. As the corner is gotiated, the power applied to the back wheel is changed, but then without any warning, the twist forces stored in the frame suddenly release ca using the bike slap to one side, immediately throwing the front and rear wheels sideways, initiating precession at different rates in different respective directions, violently n be lucky riding this bull and be thrown clear. Then again, one can be thrown under the oncoming traffic, into a curb, or have the bike come crashing down ı top of oneself. This is not a pleasant experience and may occur by simply turning a corner at slow speed.

ome very interesting effects are noted when the gyroscope's curved steel frame is supported by a moderately strong bar magnet (figure 14 -4). An electrical ldy current flows in the spinning disk, effectively holding the gyroscope against the precession forces. To walk the square pole piece of the magnet into a fferent supporting position, (without touching the frame with the hands) is quite difficult. The b earings apply changing forces on the spinning mass, causing e axis to precess differently. One can hear the bearings grab as the axis attempts to remain pointing in the same direction. The energy transfer from the frame the disk and back to the frame causes sudden and rapid axial direction changes. Moving the support position towards the axis reverses the precession while oving the support from the axis to the circumference produces a normal but temporary precession. In each case, the precession is su dden, and locks to a new rection. But there is more.

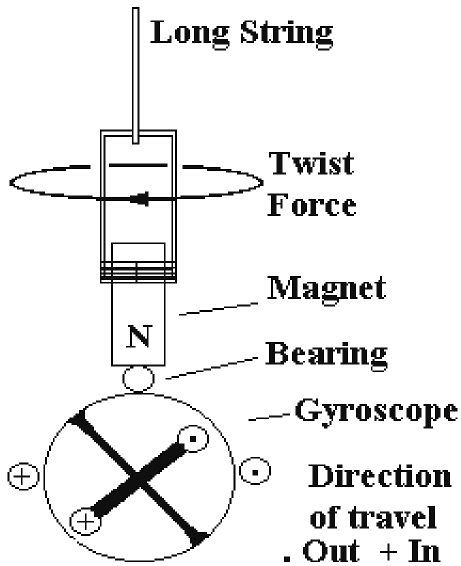

Figure 14-4 Hanging the Gyroscope

'hen the bar magnet is hung from 35 cm of string or wire, so that the magnet is vertical and away from any nearby obstruction, just hanging in space, the roscope's precession oscillates, due to the interaction between the magnet, the Earth's rotation and magnetic field as well as the support position changes king place. A small 1.5 cm steel ball bearing placed in the magnetic circuit between the pole piece and the support housing removes the support position mponent caused by the square face of the magnet. With this change, normal precession is still resisted, giving a wobble until the disk starts to slow down. A eat deal of bearing grab is heard as the gyroscope twists the string. With the axis slipping to the vertical, a great deal of vibration will be seen in the string. 'hen prevented from slipping, the vibration in the string becomes pronounced. This stored twist force does not release until the rotation virtually ceases. The roscope's axis seems to favour coming to rest pointing more vertically in the East -West direction.

well known child's toy, cal led the topsy-turvey-top, establishes a scientific problem of the first order. This has been addressed in several outstanding ientific papers. Basically, the top is weighted differently so that when spun between the fingers, it lands on the surface on it s point, as do most other tops, but en completely does a back-flip to spin in the opposite direction, without any loss of rotational speed, balancing on the top's top point with stability. This is not ally "balancing" as such. This is a demonstration o f the conflict between rotational energy and gravity. How is the direction reversed?

› change the direction of a gyroscope involves overcoming the centrifugal forces holding the axis in place. Once sufficient force is obtained, the axis can be ade to move, to slip or yaw, rolling over so that the rotation of the axis is in the opposite direction, so any precession reverses, being relative to the direction `motion around the axis. For a locomotive pulling a train, travelling on a single track to change direction, requires slowing down, stopping completely and en pushing the train in the opposite direction. The same happens when a ball strikes a wall. Particle reflection takes a great deal of time and uses considerable ıergy to reverse the direction. H owever, the train may travel along a dog -bone or loop-line that allows the train to completely reverse its direction at without tering its speed or direction of energy transfer to the carriages (from pulling to pushing). This direction change occurs in m inimum time and with minor ıergy losses, as the train travels the loop and continues without stopping, to return facing the opposite direction. This loop -line concept is also fundamental to e understanding of inertia and the surface interface effects in the reflection of light and other magnetic radiation.

ıe rugby or gridiron football is elliptical in length, but circular in cross section. As it lays on the ground, it can be spun. The stationary axis passes through the ort centre of the ellipse. The spinning ball stands up on the elliptical nose, with the axis travelling through the centre of the circular cross -section, spinning ith a much greater rotational speed. The same speeding up and slowing down effect is observed when watching an ice skater perform some basic axial spins. 'ith arms outstretched, the skater's rotation is slow, however, as the arms are drawn -in more towards the axis, the rotational speed increases but slows again hen the arms are stretched out due to the conservation of rotati onal energy.

›tational energy is so very much different that many fail to comprehend it or to realise the power or danger that is contained in any rotating object. Rotation :mands respect. Once a rotating object begins to slip in a direction, it will co ntinue to slip in that direction until the internal forces stabilise the slippage. ipping occurs along the axis and on a plane perpendicular to the axis with ease. Once the forces are overcome, the slippage can be end over end, however, if is occurs on a rotating body (such as the Earth), there is a conflict in rotation, where conservation of rotational momentum causes the axial end -over-end slip cease. This is seen in the topsy-turvey top where the top immediately reaches stability after the top tum bles. Precession is seen as a regular cyclical slippage ound the zone of the mean conservation of momentum in a system as the G -wave transfers energy in the system to flip the axis.

tational energy. What gives that fragment of matter the ability to spin once it leaves the parent object even though the parent was not rotating? It is often said at the fragment *spins around its own centre of mass*, but this does not explain a thing. It merely points to a statement of apparent observational fact.

om Newton's first Law, in a universe that is stationary or uniformly moving in a straight line, any object moving in a straight line will continue to travel in at relative direction unless deviated by an external force. All the atoms in that mass will be equally affected, irrespective of the direction, transferring the roughput energy uniformly through the medium. In the rotating Universe, any object travelling in a straight line, will be differentially affected by the external vironment's differential throughput causing the universal motion to be transferred proportionally in and throughout the object.

s motion is relative, the external motion of the environment will be seen as a drag on the linear motion of the object, since the throughput is transferred at a te less than that affecting the object, with the result being the object will slowly deviate from a linear path, progressively travelling on a curved trajectory til all the rotational forces causing the directional change are minimised throughout the object, whereupon the environment and the object will be travelling ith the same differential rate and receiving the maximum of local throughput energy available by the system, even though the object may be moving ahead of e environment's rotation. Such becomes the explanation of both the Coriolis effect and the odd behaviour of Foucault's pendulum. The mathematics behind ese can be gleaned in appendix 7.

bviously, when the rotation of the parent body (from which the body under test came), is maximized, then the effect of the curved trajectory and final axial tation will be greatest. But, what tells matter that it is rotating? How would matter know that it left a rotating system? How would matter know when the rces involved are maximized or where it should establish the centre of mass? Matter knows nothing, having no feelings, since it is mindless (until such time evolution forms a thinking brain). The Laws of Nature must describe the mechanisms and processes involving the motion of mindless matter being directed the differential forces existing in the rotating universe at the atomic level.

onsider a shaft in free space existing at an absolute stop position. The base of the shaft is clamped to a pivot so that an almighty thrust can be applied to the p of the shaft through an impact by a primary object. The force applied so great, it will cause the shaft to bend around the fixed stationary axis, bending so far will break and the broken end spun off. As the shaft bends to breaking point, energy is transferred along the length of the shaft as the magnetic chemical onds are stretched along one side as a stress force, while those on the other side are squeezed together by a compression force. To fully understand the ocesses that occur, one must consider the system at the atomic level, as individual atoms. What are the differences between atoms at the centre of mass to ose at the very ends of the shaft or at the broken pivot point? What processes and mechanisms produce the massive changes observed?

ature's processes occur one at a time in a specific order, however due to the number of atoms involved the situation seems to become confused, owing to the umber of reactions taking place at different points along the length of the bending shaft, and in the surrounding environment at that moment. Several energy-rm mechanisms are activated as the chemical bonds begin to disassociate near the pivot point. As each chemical bond breaks, a magnetic shock travels rough all magnetic structures at a rate dependant on the ability of the material and the environment to transfer that shock. As the shaft is compressed on one de and stressed on the other side, as each stressed bond is released, a magnetic shock travels at different rates through the material along different paths. The ock may cause other neighbouring bonds to reach their breaking threshold energy so the effect becomes cumulative as the break bucket-brigades across the aft at right angles to the direction of stress.

epending on the strength and arrangement of the chemical bonds in the shaft and the speed at which the thrust was applied, the bonds break in a particular shion, from a rough green-stick like break to the clean break. A clean break involves a rapid transfer of energy directly across a line where as each bond eaks, a neighbouring bond experiences the maximum strain and it fails, resulting in a bond breaking cascade across the diameter, perpendicular to the length. ne green-stick break starts to travel across but then travels down the length of the shaft as the resilience of matter increases as it thins and becomes more exible. There is yet another type of break involving a compression break, where sufficient compression forces the bonds to slip out of the maximum mpression zone, breaking the bonds by crumbling or shattering. Needless to say, certain breaks may be a combination of two or more break structures.

ne energy-forms produced from any break are subject to many conditions, in the shaft and externally in the environment. A thrust applied near the pivot or rough a knife edge can be extremely local (as in a guillotine) while that caused by an impact at the end of the shaft generally affects the entire shaft. But then each bond breaks other chemical bonds form since the local environment is magnetically attracted to the break, as freshly exposed free magnetic fields invite olecular attack, so structural changes occur throughout the surrounding environment owing to the magnetic coupling of matter. The number of energy-forms leased at this moment is impressive with the production of sound and light as each magnetic shock wave enters both the surrounding environment and that of e shaft itself.

s the thrust pushed matter to its structural limits in forming the break, the energy stored up in bending the shaft restores like a spring with the chemical bonds turning to their original non-distorted bond length, but as one side of the shaft is under compression and the other is stressed, an over correction can follow oducing a series of resonant magnetic shock waves that travel atom by atom along the length of the shaft and into the environment, compressing the stress gion and stressing the compressed region until this energy is either absorbed or transferred.

nroughout the bending process, the primary object applying the original thrust to the shaft remained in contact with the shaft, however when the break is ompleted the shaft will be released and free to move. Something fascinating now happens, for the freed shaft will appear to rapidly accelerate away from the imary object. This is not really an acceleration although it will be seen that the shaft's tip speed has greatly increased in the direction of maximum mpression. The reason for this will become apparent.

ne geometric relationship of the shaft is changed, so that the broken end is now being pulled along stressing the atoms down the length of the shaft as the oken end begins to move away from the break point at right angles towards the primary object. The shaft's leading tip is travelling with the primary object in e same direction as the applied thrust, while the axis slips along a trajectory away from the stopped point, however as the two directions of motion are at right gles, rotation of the shaft begins since the forces in the shaft are at this time, unbalanced. At the atomic level, there is a great deal happening. Resonance ntinues in the shaft distributing energy from atom to atom, however, the geometry of the structure is about to create a new phenomena, the axis of rotation, (a rely geometric position or hypothetical line around which all the matter in the shaft will be seen to rotate), but only when the centrifugal effects equalise. nortly this will define the centre of mass.

t the first moment after the break, the leading tip remains in contact with the object, pulling the shaft around with it in that direction, so the shaft will escribe a geometric relationship to that object's direction, however the central region of the shaft and broken tip are moving at a much slower rate than the rust motion due to the simple geometry of the system. Since the forces which produced the stress and compression are no longer applied, every atom along e length begins to restore, including those atoms midway along the shaft, but there is a seemingly massive energy boost given by the trailing tip for it actually ıemical bonds that caused the shaft to bend. As the forces are being distributed along the length of the shaft (in free space), the geometry is such that the whip fect forces the break tip to accelerate. Since the structure is whole, the rapidly moving broken tip begins to pull the structure around causing a rotation, fectively accelerating the leading tip away from the primary object. But at this moment the forces are not evenly distributed since this break tip is travelling ster than the leading tip stressing all the matter in the shaft.

s the energy in the freely moving shaft is distributed, the centrifugal forces pulling matter apart due to the rotation are counteracted by the forces holding atter together, the centripetal forces of the chemical bonds, so a spring effect takes place along the length centring the rotation around a precise axis, but also the structure cannot change, the energy is distributed around this point of balance, giving rise to a molecular resonance at ri ght angles to the plane of tation. As different radial positions experience different local gravitational and bond strength needs, due to the battle between centrifugal and centripetal rces, the shaft begins to oscillate along its length, increasing an d decreasing its thickness ever so slightly, effectively producing a continuous wave form that itiates a G-wave signal that travels parallel to the axis. The rotating body is now becoming a system in its own right, where at the local atomic level, the ntrifugal forces pulling matter apart are being counter -acted and balanced by the centripetal forces holding each molecule together, causing a structural ıange. The energy throughput within the system is now proportionally distributed with radius from the axis and true rotation about the axis begins.

› great are these internal forces that many external forces like gravity and other motion will only present a cumulative force, as the gravity feedback situation ı every atom is changing continually across the plane of rotation. This means that the axis can be made to slip in two directions, either along the direction of e axis or along the plane of rotation without the influence of gravity. When three gyroscopes are mounted at right angles, the slipping o f the axis is greatly duced, allowing the device to be used as a navigational aid, as an inertial guidance system. Now the axis can be made to slip, or to lock onto a moving point the universe making it a non-terrestrially referenced tool. Once a slip page occurs, spinning object continue to spin on that plane and with that slippage, ıless the external force causes the axis to yaw or precess at which point a secondary unstable parasitic oscillation may begin to travel across the structure as a -wave shock, further pushing the axis off-centre or to a new stable direction.

istory records several major aircraft disasters where the inertial guidance system was responsible. In one case, a wind gust jolted the aircraft as the gyroscopes ere being spun up, while in another the aircraft was moved. The tiny error of just a few minute of arc from true North, when considering a flight of a few ousand kilometres, can place the aircraft, perhaps fifty kilometres off -course due to in-flight wind correction changes and navigational factors. Disasters curred when the the gyroscope caused the flights to drift into military controlled air space where they were shot down.

should be noted here that breaking a shaft can produce other degrees of rotation where the force causing the break is irregularly applied. The shaft may be isted before the breakage, so that when the break occurs, the roll of the shaft continues so that with restoration, the twist produces another degree of motion ı another plane, causing the primary plane of rotation to tumble as the primary axis of rotation spins end over end. Needless to say, when examined, the break ar the pivot will reflect the direction of energy transfer, as both the compression and stress breaks did not occur at righ t angles to the applied force. The olecules exposed in the broken section of the shaft near the pivot clamp are also chemically attacked by the environment.

nce matter affects and influences all other matter by -way-of magnetic throughput, in the rotati ng external system, such as merely walking on this planet, or ting a 10 Kg body onto a table at the equator, it is necessary to examine relativities, for the matter in the body is moving with respect to other matter, so that e energy is distributed due to its axial radial position, even though the matter moves with the same relative angular displacement. Locally, the force needed to ck up the 10 Kg object is low, but the energy released if that object were to meet an absolutely stationary object woul d be astronomical. Each atom has a ıique and different relative tip -speed or stored energy due to its initial position, be it moving with the Earth's equator or absolutely stationary, so the fference in energy would be released as many energy forms. To really grasp a comprehension of the energies involved means dabbling with the mathematics *angular motion* or rotational energies.

ıere is nothing much wrong with the mathematical methods used throughout the scientific community to describe rotational e nergy, providing one can ımprehend rotational forces. Often the subject is taught by people who understand the mathematics, but do not comprehend rotation or the real forces volved because these forces were not understood. Most text books cover the subj ect in a few pages and return to linear Physics. The mathematical method ed in the scientific community approximates the results very well, despite the fact that all rotation is treated as angular motion, expressed in angular splacement based on the approximate angle, the radian. **It is rare to find anybody crazy enough to use rps** directly, for there are no books that address the bject at the grass-roots level. The only reason for using revolutions per second is to confirm each and every equation.

any people have developed a fixed mind-set, because the method seems to work, though there are some anomalies in the mathematics, such as determining e angular inertia of an annular cylinder where the equation often given is $I = {}^{M}/_{2} (r_1^2 + r_2^2)$. The entire mass M exists in the annulus between the inner radius ,and the outer radius r_1 . There is nothing in the space between the axis and the inner radius r_2. The basic equation for a solid cylinder is given as $I = {}^{1}/_{2} r_1^2 M$ $I = {}^{M}/_{2} (r_1^2)$, being the equation of the inner cylinder (the air) and the outer radius r1 of the total cylinder. But ${}^{M}/_{2} (r_1^2 + r_2^2)$ does seem incorrect for the nple method of determining the mass of any annulus is to subtract the larger mass from the missing mass, not as is s een in the annular cylinder to add the asses. The mathematician would agree with the subtraction as $I = {}^{M}/_{2}(r_1^2 - r_2^2)$. When one uses the technique of calculating energy using rps, the annular linder will be corrected, being $I = {}^{M}/_{2} (r_1^2 - r_2^2)$. As working with rps is extremely slow, so it is best to program the computer and walk away, leaving the ımputer to slowly compute the sum total of all the masses, momentum and energies from the centre to the surface, be it a sphere, a cylinder or disk (a CD). At e end of the calculations, perhaps a day or month later (depending on precision), the answer will be seen to confirm the answer determined through normal ientific means, (but not the annular cylinder), which by the way, can be completed in less than a minute.

vo unique integration methods can be attempted using rps. The first divides a sphere into thin disks, summing the mass of an increasing sized ring or annulus om the centre to the vertical surface. The second method is the faster method, for it considers the sphere as a series of thin cylinders. From the equator, each linder is an annulus of increasing height until the axial poles are reached. Each cylinder has constant thickness. Both methods have their advantages and uses, ınfirming much, while adding to the wealth of observational data and knowledge. With any planet, more information is necessary, because planets are not ımogenous. Important knowledge must be gleaned from seismic geology, such as the size and density of the Earth's layer s, the core, mantle, crust and oceans.

ɔnsider for a moment lifting a 10 Kg mass from a chair to a table top. The height difference is just 10 cm. What energy is required when standing on the quator to pick up this mass? Effectively, the mathematics of lifting 10 Kg through just 10 cm uses the potential difference equation Pd = mgh. At this moment 8 will do for gravity's pull.

So, $P_d = 10 \times 0.1 \times 9.8 =$ **9.8** nt-m

0000116057615 rps.

Multipling 10 Kg by 2 π^3 gives 620.12396

ultiply this by the speed of rotational speed squared (= 0.000000083) Treat this variable as a constant.

Required now is the Earth's radius raised to the third power (r^3) for each distance.

radius = 6,370,000.00 and 6,370,000.01 metres

so $r^3 = 2.58474853 \times 10^{20}$ and $2.58474854217 \times 10^{20}$.

Multiply that constant by the two values of r^3

$E = 0.000000083 \times 2.58474853 \times 10^{20}$ and $E = 0.000000083 \times 2.58474854217 \times 10^{20}$

$= 2.145341279 \times 10^{12}$ nt-m $= 2.145341289 \times 10^{12}$ nt-m

Subtract these two values. The difference in rotational energy is

ΔE @ 10,000 nt-m (give or take a bit)

ich a figure is unbelievable, well above what Newton's calculation suggests. The mathematics are heavier than the object. The problem is simply explained , *everything is being thrown off the Earth at the Equator by the centrifugal force and pulled down to Earth by the centripetal forces of gravity and matter, so ature is balancing out all the forces involved.* Such mathematics identify the reasons for the Foucault Pendulum's motion as each atom in the mass of the ndulum is experiencing rotation during its simple harmonic motion, so it stores the energy when it is stationary and then Coriolis forces apply as the mass vings. The result is a figure eight shaped trajectory starting at a position, travelling to a position, then returning, while the Earth moves under that position. ie pendulum is a gyroscope!

ie Earth is also a gyroscope and in Table 7-1, the gravitational anomaly was illustrated, identifying the pull of gravity at the poles to be greater than at the quator, (9.83217 Vrs. 9.78039 ms^{-2}). The difference in gravity may seem almost insignificant as $^1/_{190}$. Perhaps more insignificant is the Earth's oblateness of $_{96}$. The oblateness is the ratio of the physical difference between the polar diameter to the equatorial diameter. The Earth also has a period of precession ound 2,225 years, however it is highly probable that in geological history, the G-wave effect has caused the Earth to precess at a much greater rate, perhaps ith the oceans swamping the lands on a regular basis, thus explaining why certain marine fossil deposits occur in geologically stable areas, far from the eans.

ie hideous calculation-run above, is typical of what the computer is expected to do over and over again. In a series of calculations, to determine the mass of e Earth to a relatively high degree of precision, a disk thickness of about 500 metres could be used. As the Earth's polar radius is around 6,376 Km, that nounts to about 12,752 disks. Since each disk is sub-divided into individual rings with differing tip speeds, there must be another 12,900 calculation -runs erely to work out an equatorial disk from the centre to the surface. As the disk approaches the poles, there will be fewer calculations to determine the mass of disk. However, just using the mean value of the annulus, the mass of the Earth involves around 130 million calculation -runs. In comparison, the cylinder ethod uses 12,900 calculation-runs to reach a similar bottom line result. With causal research, the slow way, using rps, is the precise way, the only way. The auty of such a slow integration method is that one can alter the program to suit any real world condition or some abstract situation, such as taking into nsideration the mass of the crust, as distinct from the oceans and those volumes filled with air.

ie mathematics used is really basic, since both equations use the equation of an annulus. But with each step, greater complexity creeps into the mathematics, itil one begins to tear hair out and stressed-out by the explanation of the mathematics involved.

The disk's Circumference = $2\pi r$

and since the disk's Area = πr^2

then the disk's Volume = $\pi r^2 t$ where t is the thickness

so as volume times the density of the disk is mass, $M = \pi r^2 t \rho$ where ρ is the density

With the annulus, the Volume = $\pi r_1^2 t - \pi r_2^2 t = \pi t (r_1^2 - r_2^2)$

where the volume is equal to the volume of a large disk minus the volume of a small disk.

In this case, the mass is given by Mass = $\rho \pi t (r_1^2 - r_2^2)$

ie momentum is typically taken as the mass times the velocity. The velocity is the tip speed. Each annulus has an inside and an outside diameter, so the mean omentum will be found at either $r_2 + 0.707 \Delta r$ or $v_2 + 0.707 \Delta v$.

oth exist together where $\Delta r = (r_1 - r_2)$ and $\Delta v = (v_1 - v_2)$. This means calculattiing the tip speed at both the inner radius r_2 and the outer radius at r_1.

times the velocity $v = rps . 2 \pi(r^2 + 0.707 (r_1^2 - r_2^2))$.

So, the Rotational Momentum = $\rho \pi t (r_1^2 - r_2^2). rps . 22 \pi(r^2 + 0.707 (r_1^2 - r_2^2))$.

$= 2 . rps . \pi^2 \rho t (r_1^2 - r_2^2) . (r^2 + 0.707 (r_1^2 - r_2^2))$.

s the Coriolis energy equation is ½ mv^2, the 2 cancels out with the half , so the above equation can be simply multiplied by the mass. As this is an integration dding all the mass effects together) , it may be represented by the symbol Σ(Sigma) indicating that the mathematics are sampling and adding each increasing inulus to form a disk. Mathematicians may use the integration symbol *f* to express the functions involved. The following equat ion is definitely something for e computer to work out 100,000,000 times.

$t=0.001r_0$

$$E = \Sigma(rps . (\pi^3 \rho t (r_1^2 - r_2^2))^2 . (r^2 + 0.707 (r_1^2 - r_2^2)))$$

r = 0 to r = radius

$t=0.001r_c$ _ $t=0.001r_0$

and then the sum of all the disks to form a sphere, **Es = Σ(Σ(E)) or = *ff*(E)**

r = 0 to r = radius

h=0 to h=radius

'hat started as simple integration becomes more complex when the limits are included in the mathematics, because the above equation becomes a triple tegration. Many mathematicians are horrified by triple in tegrations, **Σ(Σ(Σ(x))) or *fff*(E)**, because 3-D structures are very difficult to resolve. In the ore complex optical systems, telescope makers must use triple integrations (because everything in the Universe exists in three dimensional space with 3 -D :ometry), just as it the sphere, but here the fun part is playing tricks to make the calculations faster and simpler. Hidden in the mathematics is the lens maker's ıgitta equation, which is based on the theorem developed by the Ancient Greek, Pythagoras. Since the Earth is an oblate spheroid, the lens maker's equation, ›rmally used for determining the depth of the sagitta, (the depth of a curved spheroidal surface between certain radial limits,) can be applied with the greatest `ease with a minimal error, revealing the physical limits of each latitude slice, as the centrifugal force works at an angle perpendicular to the axis.

ıe sagitta and the radius of curvature are selected in the mathematical limits, le aving the lens-radius to set the actual calculation limits. The limits apply in 'o directions, the vertical depth and perpendicular radius of the latitude disk, to rationalise the three dimensional sphere by rotating the structure through ldition of each ring or cylinder. As the triple integration enters the picture, one must use the computer program (Appendix 8) to reach a bottom line figure, at is, providing the compu ter can add. Just put numbers into it and let the computer do the hard work. Appendix 7 explains how to use Appendix 8. The ıgitta or depth of a circular

arc is given as $S = R - \sqrt{(R^2 - r^2)}$

where R is the Radius of Curvature and r is the radius of the disk or sample size.

In this case, the Basic language statement would be

```
L# = R# - ( R# - SQR (( R# ^2 ) - ( LAT# ^2 )))
```

where the depth "L#" of the arc at radius LAT# for the particular radius of curvature R#.

ɔtational energy does not work from the centre of mass, rather it operates in two separate directions, one perpendicular to the axis of rotation at a height on e axis of rotation parallel to the primary body's equatorial plane, while the other is away f rom the axis at that radial distance, hence, the key parameters in :termining the total rotational energy are the radial distance, the distribution of mass and the revolutions per second. Owing to relativity, the forces :perienced on the surface are different as one needs to examine the centripetal forces in the structure. To further the understanding of rotational energy and its lativity to a system, means examining the behaviour of mindless matter in systems. Perhaps the best place to continue this qu est is to view the worst situation ›ssible, absolutely mindless destructive matter in the rotating Universe.

-------end chapter 14 -----