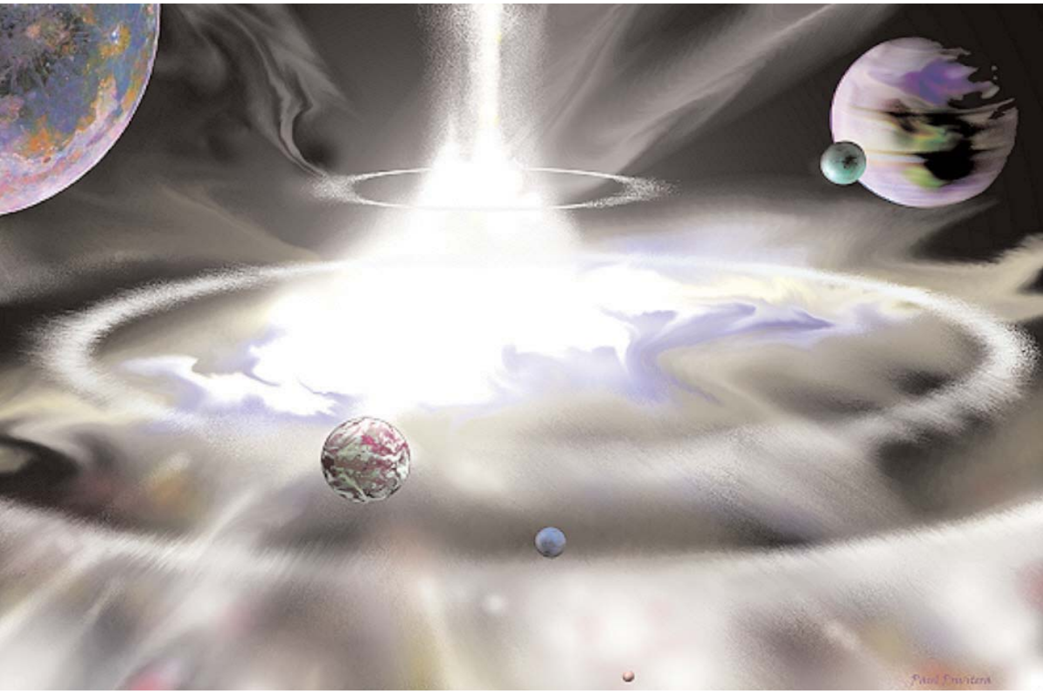
WISP UNIFICATION THEORY

PARTICLES OF NOTHINGNESS



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Particles of Nothingness

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Dedication

To Dawn, Michael and Bethany

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Introduction

Wisp theory is unique and it explains the fundamental properties of nature in a clear and simple way.

In 1978 I had concluded that matter could not possibly be a hard 'something' in a space that was empty, simply because force needs a medium in which to propagate.

Fifteen years later, on 11 December 1993 and quite by chance a simple thought occurred to me:

- Fractals form in 'full' space, creating particles that have empty space at their centres.

I knew immediately that this was the correct answer to the mystery of the composition of matter.

Our senses convince us that matter is hard and that space is empty. Even the great Sir Isaac Newton held this view. In his treatise *Opticks*, published in 1704, he wrote in Query 31 about matter being solid, very hard and unbreakable. But our senses deceive us: the reverse is in fact the truth. Reality is effectively a 'photographic negative' of what we perceive.

Empty space is not void, it is full of wisps (the smallest fundamental particles in nature) and hence full of mass, but its mass lies dormant, and only manifests itself when it is disturbed. Disturbances create particles – fractal shapes – which lock quantities of wisps together, giving particles unique masses.

Wisp space is an ether medium by definition, but it differs from conventional notions, in that matter does not pass through it, but is instead, a part of it. Matter and space are essentially made from the same substance – wisps.

Our understanding of the nature of wisp space will help us visualise how mass and energy interchange in accordance with Einstein's famous equation, $E = mc^2$.

Wisp theory is able to resolve two great mysteries of physics:

- How do particles get their masses?
- What causes gravity?

Answering these questions challenges Einstein's special theory of relativity – a fundamental pillar of modern physics.

However, you are advised to keep an open mind when reading this book as it contains many new unproven concepts. My hope is that theoretical and experimental physicists will consider wisp theory and put it to the test. I have included tests in the appendices that challenge the predictions of special relativity.

Kevin Harkess BSc (Hons)

1

Matter, Space and Time

Before introducing the new concept of wisp theory, we begin by briefly by reviewing our current understanding of what matter, space and time are, while making comparisons with wisp theory along the way.

1.1 Basic understanding

1.1.1 Matter

The ancient Greek philosophers Leucippus and Democritus thought that matter was made from small indivisible lumps called atoms (the Greek *atomos* means uncuttable).

We can tell the shape of matter from the light coming off its surface. We can feel it by touch – through interaction with its electromagnetic force repelling our attempts to compress it. And we can calculate its mass – its reluctance to accelerate when force is applied.

Figure 1.1 shows a space scene: large planet-sized lumps of matter moving through the void. Here our senses guide our thoughts to consider matter as being something hard and solid.

1.1.2 Space

It is a three-dimensional volume that can be filled with something or can be empty. We believe that most of space is empty and that matter can move through it effortlessly.

1.1.3 Time

It is a dimension that enables two otherwise identical events that occur at the same point in space to be distinguished.

Figure 1.1 Scene showing matter in space

Isaac Newton thought that time was the measure of an absolute quantity that is the same throughout the universe and independent of an observer's position or speed.

1.1.4 Perception of reality

Our perception of reality is strongly determined by our visual sense. It is easy to see how early models of atoms were compared to a miniature model of the solar system. Even today the notion that subatomic particles are tiny points of matter is taken very seriously.

You will soon discover that the opposite of what our senses perceive is in fact the reality – matter is empty and space is full.

1.2 Advanced understanding

1.2.1 Matter

1.2.1.1 *Quantum theories*

In 1900 Max Planck devised quantum theory to account for the emission of black-body radiation from hot bodies. He observed that radiation is emitted in discrete packets, or quanta of energy.

In the 1920s advances in this theory led to the development of quantum mechanics, in which matter is described as being both particles with mass and energy, and wave packets – wobbles with mass and energy. But quantum mechanics is only a mathematical tool used to describe the behaviour of matter – with its dual wave-particle property, it does not actually tell us what matter is! Good advice to physicists studying quantum mechanics is 'Don't waste time trying to understand how it works, just use it to calculate results. It works.'

Erwin Schrödinger – an early pioneer of quantum theory and discoverer of the quantum mechanics wave equation of a particle (1927) – admitted that he did not really understand why matter behaved this way.

1.2.1.2 *Fields*

Many physicists believe that the fundamental material entities are fields, where particles are formed by disturbances in the fields. In quantum field theory – first proposed by Paul Dirac in 1927 – particles are represented by quantized oscillations in the fields. Wisp theory supports this view, but suggests that the disturbances that form particles are primarily geometric in nature – fractals – and wave oscillations are a secondary feature. Also, wisp space comprises discrete-sized particles, and so it does not form a continuous field medium.

1.2.1.3 *Mass*

The legendary Richard Feynman wrote in his book: *QED, The Strange Theory of Light and Matter:*

> Throughout this entire story there remains one especially unsatisfactory feature: the observed masses of the particles, *m*. There is no theory that adequately explains these numbers. We use the numbers in all our theories, but we don't understand them – what they are, or where they come from. I believe that from a fundamental point of view, this is a very interesting and serious problem.

1.2.1.4 *Mass energy equivalence*

Albert Einstein has shown that mass and energy are two forms of the same thing, which are related by the equation $E = mc^2$. This important relationship will be explored in detail in a later chapter. Matter is also subject to relativistic effects at very high speeds – its mass appears to increase the faster it moves.

Even though Einstein has shown that mass and energy are interchangeable, do we really understand the process involved?

Wisp theory will enable you to visualise the mass–energy interaction.

1.2.1.5 *The standard model*

Physicists have developed the standard model (Figure 1.2) and are constantly testing new discoveries against it. They have verified the existence of many point-like fundamental particles and are currently searching for the elusive Higgs boson, believed to be the fundamental particle that gives matter its mass; if found, it will add support to the standard model. Scientists at CERN – the European Laboratory for Particle Physics near Geneva in Switzerland – continue their search. However, it looks increasingly unlikely that it will show up, raising doubt about the standard model.

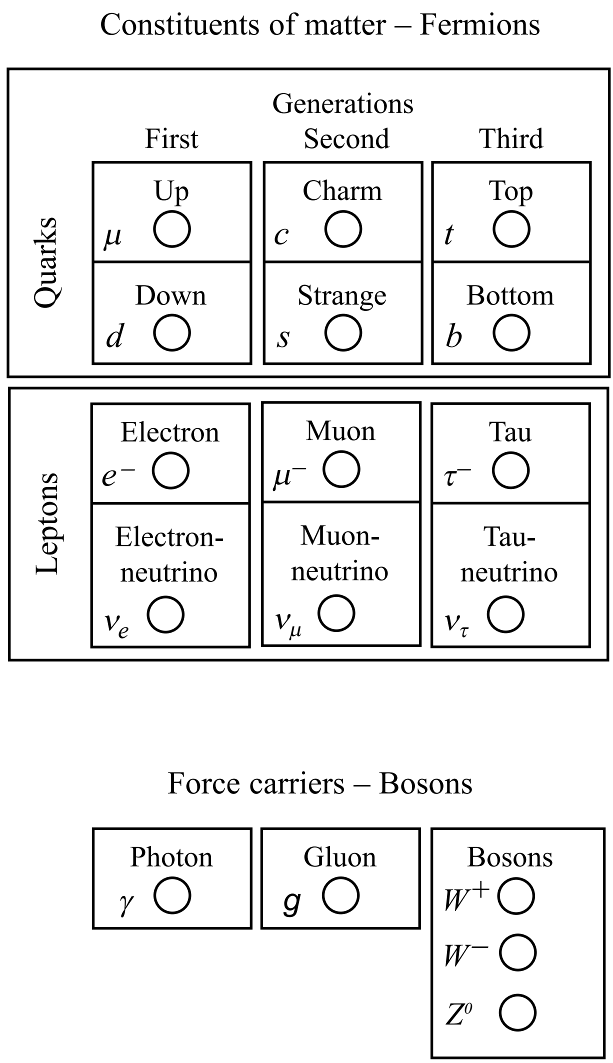


Figure 1.2 The Standard Model

1.2.1.6 *Supersymmetry theory*

A quarter of a century ago, Julius Wess and Bruno Zimino proposed supersymmetry theory that has to do with quantum-mechanical spin. When the ideas of supersymmetry were applied to the standard model, it suggested the existence of new elementary particles that allow bosons and fermions to form particle pairs. Every boson has a corresponding fermion partner and every fermion has a corresponding boson partner.

So far the new particle pairs predicted have not been detected.

1.2.1.7 *String theories*

Michael Green and John Schwarz continued development of string theory – discovered in 1968 by Gabriele Veneziano and improved on in 1970 by Yoichiro Nambu, Holger Nielsen and Leonard Susskind – and in 1984 they released superstring theory. It suggests that matter is made from incredibly small one-dimensional quantum strings 10^{-35} m in length that exist in a 10-dimensional environment – six hidden and four visible to us.

These strings have no mass – like light; they spin, vibrate and rotate, yielding different quantum energy states. Their energy states or harmonics correspond to different fundamental particles within the same family. The extra invisible dimensions can be regarded as mathematical artefacts.

David Gross later added 16 extra dimensions to account for bosons – the transmitters of force. A total of 10 dimensions are needed for fermions, and 26 dimensions are needed for bosons in order to be consistent with quantum theory.

Superstring theory (string theory for short) has incorporated supersymmetry in an attempt to unify the four fundamental forces of nature. But physicists are still a long way from being able to say whether string theory is correct.

1.2.1.8 *M-Theory*

Since the mid-1990s, Edward Witten has been developing M-theory (membrane theory) from string theory. It focuses on the symmetry links between equations and adds an extra 11th dimension to support gravity.

String theory and M-theory have so far not achieving their main goal in becoming the 'theory of everything'.

1.2.2 Space and time

1.2.2.1 *Einstein's space–time*

Einstein's space–time is a relative quantity. Observers in motion with respect to one another will measure their space–time components differently; they will age at different rates; and record different times for similar events.

The notion that space and time are joined together is now universally accepted. Einstein's relativity theories – the special theory, proposed in 1905, and general theory, proposed in 1915 – were developed around this concept. Although it is counter-intuitive that space and time should be joined; Einstein's theories are strongly supported by experiment. However, it is interesting to note that Hendrik Lorentz – whose formula is central to Einstein's special theory of relativity – was critical of the space–time link. Why? Because the loss of simultaneity for separated events defies common sense. Also it should be noted that quantum theory does not require that space and time be joined.

1.2.2.2 *String theory's space–time*

In string theory, the vibrating, rotating, one-dimensional string essentially creates space–time. Remove the string and space–time would cease to exist.

1.2.2.3 *Time dilation*

Einstein predicted the effect of time dilation from his special theory of relativity – the flow of time slows for bodies in motion. And it is an established fact, that muons (created in the Earth's upper atmosphere by high-energy cosmic rays striking oxygen and nitrogen nuclei), moving at near light-speed, age more slowly than those travelling at slower speeds do.

The effect of time dilation has been proven correct many times over and is supported by wisp theory.

1.2.2.4 *Unit of time*

In 1967 a natural unit of time was adopted (SI units), based upon the caesium atom (atomic clock). One second is defined as the time required for a caesium atom to vibrate exactly 9,192,631,770 times.

1.2.2.5 *Demise of the ether*

Space was at one time thought to consist of ether, a hypothetical substance that filled all of space and was responsible for the propagation of electromagnetic waves – such as light. However, the famous 'null result' of an experiment – measuring the Earth's speed through the supposed ether – carried out by Michelson–Morley in 1887, gave scientists good reason to doubt its existence. And finally, when Einstein published his special theory of relativity in 1905, the fate of the ether was sealed.

1.3 Incompatible theories

The two great theories of the twentieth century: general relativity and quantum mechanics are totally incompatible and cannot be unified. The difficulty in merging these is due to the space–time link. Whereas quantum mechanics treat space and time as being separate, general relativity does not. If general relativity is flawed because of this link, then string theories likewise are flawed.

String theorists attempted unification by adding an extra dimension to account for gravity. This creates quantum gravity whose force carrier is predicted to be the graviton. But so far the graviton has not been detected, and so unification is incomplete.

Also they had considered building their theories using rotating, vibrating, three-dimensional blobs. But encountered problems with relativistic covariance – because relativistic equations join space and time, and so the objects they used could only be one-dimensional. Once the link is broken, they will have the freedom to revise their theories.

Wisp theory builds an 'ether' relativity theory, which treat space and time as being separate, breaking the link, and making unification possible.

1.4 Theory foundations – roots

The long-term success of any theory relies to a large extent on the strength of its founding postulates. It is important when dealing with complex problems to be able to work back to the roots of a theory. By doing so, you can check that the theory remains valid and has a practical basis.

Newton's theory of gravity and his laws of motion are simple and easy to understand. From Newton's equations we are able to calculate, for example, how galaxies move, and to plan space missions to the planets in the solar system. The successes of his theories are based upon his ability to use powerful analytical skills to simplify complex problems. He developed his theories hand-in-hand with experimental observation, constantly cross-checking his work.

Quantum theory also developed using powerful logical reasoning coupled to strange experimental observations – particles behaving as waves and vice versa. It too has been built upon solid foundation that should ensure longevity. It uses mathematical tools of complex artificial nature. But nevertheless, theory predictions appear correct and have been verified to very high degrees of accuracy.

Einstein's special relativity is also based on powerful reasoning and simple structure. It appears to be supported by all experimental observations, so that it should have longevity. But there are many aspects of the theory that have to be taken on trust, simply because we do not have the technology to test it fully. And some aspects of the theory defy common sense: the joining of space and time, and the breakdown of simultaneity of events. There is no denying that Einstein's relativity theories are powerful, carefully constructed, and based on clear founding postulates. But with any theory, we should always question its truth, constantly probing it for signs of weakness.

String theories are highly abstract in nature. They deal in space–time dimensions that are beyond the reach of experimental observation. They use highly complex abstract mathematical tools to build models that may not even exist in the real world. But their results may reveal new insights into how the universe works. However, the weakness with such an approach is that it has no solid foundation and lacks clear direction. Its predictions cannot be traced back to its roots.

1.4.1 Wisp theory roots/history

Wisp theory develops around one simple thought – discovered by chance in the local town library on 11th December 1993.

Prior to that powerful thought, many years earlier I had concluded that matter should not be able to interact. For example, if the smallest possible piece of matter is made of a hard substance surrounded by empty space, then there is no conceivable way in which a force could cause two such pieces to move together or push apart. Consider a line of force between two pieces of matter. There is no physical means possible by which a line can cause them to pull together or push apart.

If on the other hand the transfer of force is caused by a force particle, say the graviton, then again the physical process by which the pieces pull together is impossible. How can a graviton – a particle – moving between two pieces of matter, cause them to move together!

Following the above reasoning, particles of matter cannot interact by such means. They should in fact drift aimlessly about, occasionally bumping into one another. The universe should in fact be ‘dead’!

These were thoughts from my early years. Such thoughts were not academically constructive and consequently I did not pursue a career in physics.

In 1994 I drafted the first version of wisp theory. My plan was to keep it simple and document all details so they could be carefully checked.

The first draft included a new theory of gravity that not only agreed with Newton’s law of gravitation, but also in principle supported his idea as to its cause – density variation in space.

I developed a relativity theory based on wisp theory’s postulates. Tests ran on a computer showed that wisp relativity and special relativity did not agree. Although I was confident that wisp relativity was correct and special relativity was wrong, how could I challenge Einstein with such a simple theory?

In 1995 I started a degree course in science with the Open University. After completing my degree I was made redundant – company relocation – and took the opportunity to complete work on wisp theory during 2002.

This book is a complete rewrite of the original draft and a much-improved theory. But any theory that challenges special relativity will be subject to severe criticism. Whether the theory gets established will depend on support from theoretical and experimental physicists who have the knowledge and skills to test it properly. I believe it is correct and that it will enable scientists to make many new discoveries.

2

Symmetry

Wisp theory is essentially a geometrical theory, and an important property of its space is symmetry.

2.1 Symmetry

We tend to associate symmetry with shapes and patterns that stand out from a plain background. Throw a stone into a pond and watch the ripples spread out. They have a high degree of symmetry – circular symmetry. However, the surface of the pond has an even higher degree of symmetry; but because its surface has no interesting features we tend not to notice its symmetry.

Mathematically speaking, symmetry is determined by a process of transformations – rotations, reflections, translations, glide reflections, screw (rotation with translation) – that leave the view of an object unchanged.

Without carrying out any transformations, an equilateral triangle (Figure 2.1) possesses an identity – its shape, its 'trivial' symmetry. It has three lines of bisection and it can rotate

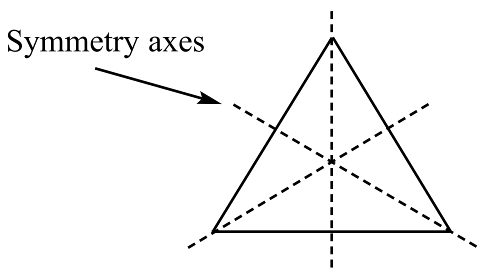


Figure 2.1 Equilateral triangle – 6 fold-symmetry

through 60° or 120° and appear unchanged. It can also be reflected about its lines of bisection, giving it a total of six symmetries.

A sphere has a higher degree of symmetry – spherical symmetry – than say a cube. It can rotate through any angle about a point at its centre, and it look exactly the same; do the same to a cube and it will project different views for different angles. We say that the sphere is spherically symmetric about a point at its centre.

We can determine the degree of symmetry for a cube by rotating it about any of its eight vertices. Including three rotations per vertex and reflections, the cube has 48 symmetries (8 × 3 rotational symmetries, each of which has reflection symmetry).

2.2 Face-centred cubic lattice

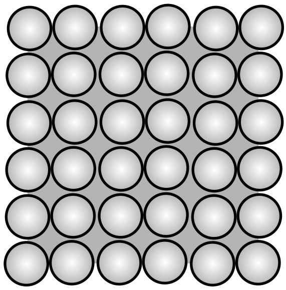
In 1611 Johannes Kepler conjectured that the face-centred cubic packing is the most economic way of packing spheres in 3-D space – known as the Kepler Conjecture.

It is easy to build a model to demonstrate this (Figure 2.2), but mathematical proof is not so easy to demonstrate.

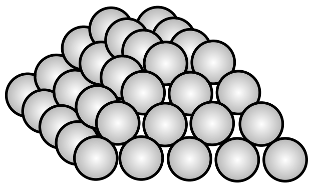
This method of packing has a high degree of symmetry and forms ‘empty space’ in wisp theory – one-state wisp space. Because this stacking forms parallel planes of wisps, the space is essentially ‘flat space’.

2.3 Spherical sphere packing

If we pack small spheres tightly around a larger central sphere, we obtain a spherical shape similar to that shown in Figure 2.3 (the larger central sphere is hidden from view). However, even



a) Base view



b) Side view

Figure 2.2 Face-centred cubic lattice packing

though the shape stays roughly spherical there are gaps between the spheres in its outer layers. The reason gaps exist is because the outer layers are curved and the symmetry associated with densely packed flat space gets lost.

Later, I will show that these gaps create spherical tension forces that are responsible for the effects of gravity, where the small spheres represent wisps and the larger central sphere is matter's 'zero-state space'.

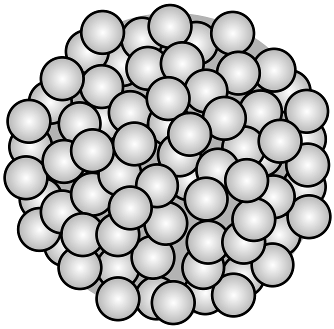


Figure 2.3 Spherical sphere packing

2.4 Symmetry-breaking

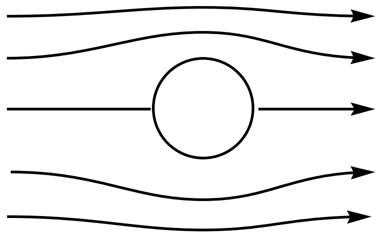
A long circular cylinder is placed upright in a uniformly slow-moving stream, creating a bilateral symmetry flow pattern (Figure 2.4a). As flow speed is increased, vortices that form at the rear of the cylinder begin to break away, alternately shedding from the left and right – vortex shedding.

Increasing flow speed causes the uniform flow associated with bilateral symmetry to become unstable. The pattern breaks forming glide-reflection symmetry flow. This is an example of symmetry-breaking (Figure2.4b).

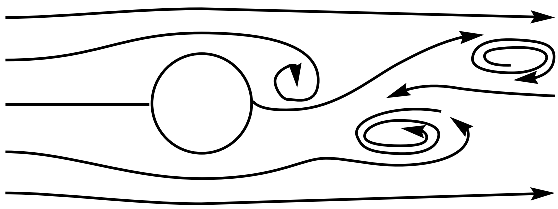
The surface of a pond has a high degree of symmetry, and by throwing a stone into it, its symmetry breaks, creating circular patterns – ripples.

Many objects that we see around us result from symmetry-breaking processes. They possess symmetries of their own and require separate rules to govern their behaviour.

Later I will show that symmetry-breaking of flat space creates particles. And even through particles have less symmetry



a) Bilateral symmetry flow pattern



b) Symmetry-breaking – asymmetric flow

Figure 2.4 Symmetry of flow passing a long cylinder

than flat space; symmetry-breaking creates objects of complex diversity that are bound by real surfaces.

Symmetry-breaking is responsible for the effects of electric charge. A perfectly formed spherical particle has no electric charge. However, if the inner central ‘zero-state space sphere’ is not perfectly spherical, it will pass its asymmetry on to its outer layers. This causes a clockwise or anticlockwise twist, which is responsible for the positive and negative charge around a particle.

2.5 Antimatter

In 1928 Paul Dirac predicted the existence of antimatter.

Wisp theory considers antimatter to be the mirror image or reflection of matter. Positive charges become negative and clockwise spins become anticlockwise. However, the circular symmetry of a particle still remains circular when reflected, and so gravitational force does not reverse.

It is likely that during the big bang, a state of asymmetry existed in the early universe, causing more matter than antimatter to be created. If the symmetry were perfect at that time, equal amounts of matter and antimatter would have formed, resulting in complete annihilation of both.

2.6 Subatomic particles

In 1962 Murray Gell-Mann and Yuval Ne'eman used symmetry to organise the particles into families. And in 1964 Murray Gell-Mann and George Zweig independently proposed that the hundreds of discovered particles could be explained by combinations of two or three fundamental particles called quarks. (Quarks were named by Gell-Mann from the call of a bartender in James Joyce's *Finnegan's Wake:* 'three quarks for Muster Mark'.)

Physicists discovered that particles could be grouped into patterns that formed simple geometrical shapes. And new particles were successfully predicted to fill gaps in these patterns.

After a 17 year search, in 1995 Fermi National Accelerator Laboratory (Fermilab), near Chicago, Illinois, announced the discovery of the massive 'top quark'. The last quark predicted from its symmetry pattern.

It seems highly probable that the underlying cause of this symmetry is due to the fact that the fundamental particles are made from shapes that possess a high degree of symmetry. Wisp theory supports the view that the underlying cause of this symmetry is spherically shaped wisps that form fractal patterns in wisp space.

3
Fractals

Fractals are geometrical figures formed from an identical motif repeating itself on an ever-decreasing scale. Benoit Mandelbrot coined the word fractal in 1975.

Computer programs carrying out simple iteration processes can generate an infinite number of fractal patterns. A small change in the program can change what was a simple pattern into a highly complex one.

Nature is abundant with fractal patterns that are similar to each other on different scales. Many trees grow by making branches that are smaller copies of their basic shape. Fractals appear everywhere, on large and small scales. And I believe that on the smallest scale, the fundamental particles of nature are fractal shapes that form in wisp space.

3.1 Fractal patterns

3.1.1 Cantor dust

This simple pattern (Figure 3.1) was produced by Georg Cantor around 1870, and is possibly the oldest fractal. It contains patterns that are similar to each other on different scales and is produced by placing lines with their middle thirds removed, above neighbouring lines. After an infinite number of iterations all that remains of the line is a set of dust points of zero length.

If we calculate the total length of all lines we find that we are dealing with a limit process. The lengths of the lines form a geometric series that converge as we take the ‘sum to infinity’. The limit value produced is 3 (Equation set 3.1).

Figure 3.1 Cantor dust fractal

Equation Set 3.1

Cantor dust

Geometric series

$$Length = 1 + \frac{2}{3} + \frac{4}{9} + \frac{8}{27} + \frac{16}{81} + \ldots$$

$$Length = S_n = a + ar + ar^2 + \ldots + \frac{a(1-r^n)}{1-r}$$

Where $a = 1$ (first term), and $r = \frac{2}{3}$ (common ratio)

The sum to infinity is given by $S_\infty = \frac{a}{1-r}$

Gives $S_\infty = 3$

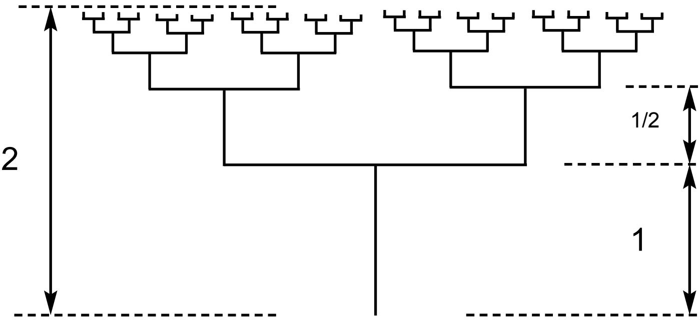


Figure 3.2 Binary tree

Equation Set 3.2

Binary tree

Geometric series

$$Height = 1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \ldots$$

$$Height = S_n = a + ar + ar^2 + \ldots + \frac{a(1-r^n)}{1-r}$$

Where $a = 1$ (first term), and $r = \frac{1}{2}$ (common ratio)

The sum to infinity is given by $S_\infty = \frac{a}{1-r}$

Gives $S_\infty = 2$

3.1.2 Binary tree

The height of the binary tree is also a limit process (Figure 3.2). At each level the vertical branches split in two, and are halved in size. Each horizontal line is twice the length of the vertical line below it, the vertical lines making the height of the tree form a geometric series that converge as we take the 'sum to infinity'. The limit value produced is 2 (Equation set 3.2).

3.2 Particle fractals – 'matter-fractals'

I believe a fractal limit process similarly determines the masses of the fundamental particles. Instead of lines, fractal structures are made up of layers of wisps (weightless one-state particles), held together by strong wisp binding forces.

Fractals that form the fundamental particles are spherical three-dimensional shapes and the numbers of wisps in them converge to limits, which determine their masses.

It would be extremely difficult to use conventional mathematics to calculate the fractal shapes that form in wisp space. One possible solution would be to use computers running cellular automata programs. I believe this is the way that nature works; it does not have a set of instructions to follow, it just shuffles wisps about and particles pop out.

4

Wisp Space

Here we will see our perception of reality reverse. What we think of as ‘emptiness’ is in fact full of ‘ether’ particles called wisps (weightless one-state particles). And what we think of as solid is created by their absence. What we think of as ‘normal flat space’ or ‘void’ occurs when wisp packing is at its maximum.

The idea of an ether medium is not new. So why now should an ether theory be taken seriously? Well, it gives the right answers; it matches special relativity’s predictions; and it gives a simple answer to the question ‘What causes gravity?’

4.1 Wisp space’s structure

4.1.1 States of space

Wisp space is in a state of being either empty or full, or in an intermediate state. For example:

- *Empty space* contains nothing, and wisp theory refers to it as ‘zero-state space’. It has no energy and does not transmit force. It does, however, play a key role in creating matter and the four fundamental forces of nature.

- *Full space* is densely packed with wisps and is referred to as ‘one-state space’ or ‘flat space’. The strong wisp binding force joins wisps together – the only force of nature that is a real property of the wisp. Wisps can move in one-state space, but generally remain fixed within its lattice structure.

- *Intermediate-state space* is a combination of one-state and zero-state space. This creates regions with diverse properties such as: matter-fractals, curved space, magnetism, gravitational compression and tension forces, and electric charge.

4.1.2 Wisps

Wisps are the smallest fundamental particles in nature. They have specific size and mass. Although they possess mass, they are unaffected by gravitational force since the gravitational effect is caused by curved wisp space and does not exist as a separate substance. No antiwisp particle exists.

4.1.3 Matter-fractals

Wisp theory is an ether theory with a unique property – matter-fractals, which I believe, form the fundamental particles of nature – the quarks and leptons.

Spherical fractal structures form within wisp space around regions of zero-state space ('empty' zero-state spheres). Gaps appear between neighbouring wisps as they wrap around the zero-state sphere. These gaps stretch the strong wisp binding force, and this gives the fractal structure enormous strength. Once formed, the matter-fractal is able to move effortlessly through wisp space, since equal and opposite forces form across its surface. As it moves, wisps are displaced, creating transverse wave patterns – quantum waves.

Figure 4.1 shows a cross-section view of a matter-fractal. Its scale is not proportional to the wisp's size, as many millions more would be required to form each structure.

A matter-fractal's size is dependent on the radius of its central zero-state sphere. This is crucial in determining the type of fundamental particle formed. Since matter-fractals form around the surface of zero-state spheres, a particle's mass is proportional to the surface area of its zero-state sphere, and its density will vary inversely proportional to the distance from the sphere. The thickness of a matter-fractal's layers is proportional to its zero-state sphere's radius. A specific number of wisps get locked into its structure, giving it its unique mass.

The formation of matter-fractal structures is based upon simple processes that utilise the principle of least action – wisp movements are minimised while the fractal shapes adjust for maximum stability. As stated earlier, it would be almost impossible to use conventional mathematics to calculate the fractal patterns, since the numbers of wisps involved is too high. The use of cellular automata could provide the answer. Instead of solving complex mathematics, computers running automata programs might determine which fractal patterns form in wisp space. Patterns that produce best stability for lease movement could then be selected for comparison with the known masses of the fundamental particles.

The 'stretched' strong wisp force gives the fractal structure extra strength, allowing it to move effortlessly through wisp space and survive small collisions. However, if the matter-

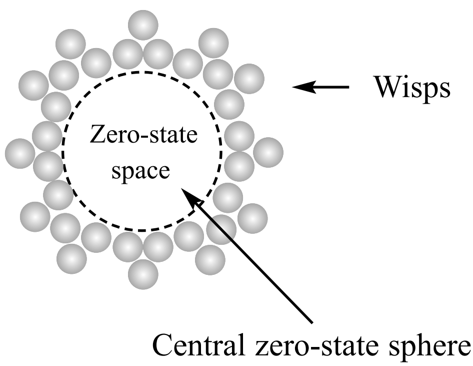


Figure 4.1 A matter-fractal formed around zero-state space

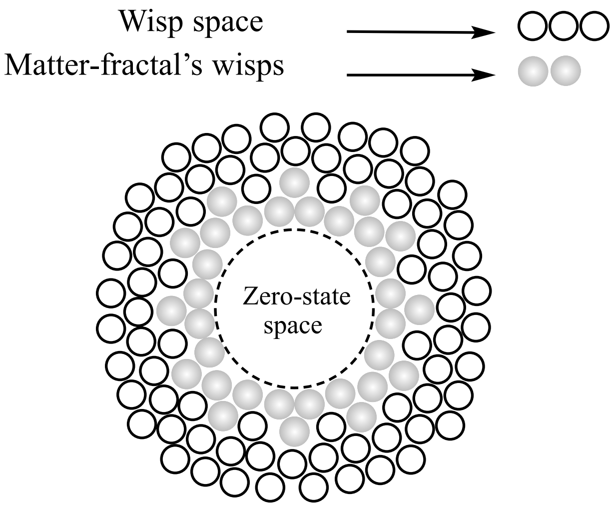


Figure 4.2 A matter-fractal in wisp space

fractal gets too large, it becomes unstable and can quickly break up into smaller more stable structures. Larger fractal structures are more prone to break during high-speed collisions.

Figure 4.2 shows a matter-fractal stationary in wisp space. Its presence breaks the symmetry of flat one-state space. One-state space is forced to wrap around the fractal structure, but it does not have the strength to break it.

As matter-fractals move, they displace wisps – transverse displacement – to either side by the actions of equal and opposite forces, creating quantum wave patterns in wisp space. Only the matter-fractal's shape is preserved as it moves through wisp space; the wisps that form it are continuously replaced.

A few months after I discovered this property of matter, I asked my wife to explain to me what she understood about this new idea. She replied 'Matter is particles of nothingness.' She is right, without nothingness (zero-state space) matter would not exist.

4.2 Early ether theories

4.2.1 René Descartes

The seventeenth century philosopher and mathematician René Descartes thought that the universe was filled with small invisible particles or 'corpuscles' that moved effortlessly in whirlpool vortices. Opaque matter floated in this medium and was caught up by the whirlpools. Once started, their motions would continue and the energy in the universe would stay constant.

4.2.2 James Clerk Maxwell

In 1856 James Clerk Maxwell showed that an incompressible fluid behaved the same way as the fields that produce magnetic and electric effects. In his model, magnetism is caused by vortices in the fluid and electric current contained in fluid cells.

With elasticity added to his model, in 1864 he developed the fundamental equations of electromagnetism and found that transverse electromagnetic waves could move at the speed of light through the hypothetical ether medium.

Maxwell discovered that electromagnetic waves possessed magnetic and electric fields that oscillated at right angles to each other and to the direction of wave propagation. It was difficult to imagine how a fluid could produce these effects, and so the link between his equations of electromagnetism and the ether was lost.

Maxwell developed his theory on the basis that electromagnetic fields transfer force from one point to a neighbouring point, in a field that has properties that may be likened to an elastic fluid. Yet his equations of electromagnetism are purely mathematical in nature and have no direct link to a fluid medium. His work certainly supports the existence of the ether, but it does not prove it exists; more proof is needed.

4.2.3 J.J. Thomson

Sir Joseph John Thomson carried out an analysis of vortex rings in 1883 and theorised that atoms might be vortex rings within the hypothetical electromagnetic ether.

4.2.4 Michelson and Morley

An experiment conducted in 1887, by Albert Michelson and Edward Morley, to measure the velocity of the Earth through the ether, gave good reason to believe that the ether did not exist. If it did, then surely the motion of the Earth through it would give a positive result, but it gave a negative result – zero!

The pressure was on to explain the findings of the experiment or simply dismiss the notion of the ether.

4.2.5 Insufficient proof

There is no direct proof that the ether does or does not exist. Current theories tend to dismiss it rather than include it.

Wisp theory is built upon wisp space – a type of ether medium, which is responsible for creating particles and transmitting force between them. Without it force would not propagate. Later we will see that it is the inability of force to transmit through zero-state space 'emptiness' that causes the effect of gravitation.

Proof of the existence of the ether requires abandonment or major modification to Einstein's special theory of relativity, and an explanation to why the Michelson–Morley experiment gave a null result. A revised relativity theory and an explanation are given by wisp theory.

4.3 Waves in wisp space

Two types of travelling wave are associated with motion through wisp space: transverse waves and longitudinal waves. As they move through wisp space, wisps are displaced in transverse and longitudinal directions respectively, and their respective wavelengths are λ_t and λ_l. They share properties commonly associated with waves: diffraction, reflection, and refraction.

By way of analogy, we can compare them with water waves: Ripples (transverse waves) moving across the water's surface are like electromagnetic waves or matter-fractal's quantum waves. And sound waves (longitudinal waves) that travel through water are like longitudinal waves that travel through wisp space.

Just as sound waves in water travel much faster than surface ripples, so we can expect wisp longitudinal waves to travel faster than wisp transverse waves. The fastest transverse wave in wisp space is light, so wisp longitudinal waves should travel faster than light!

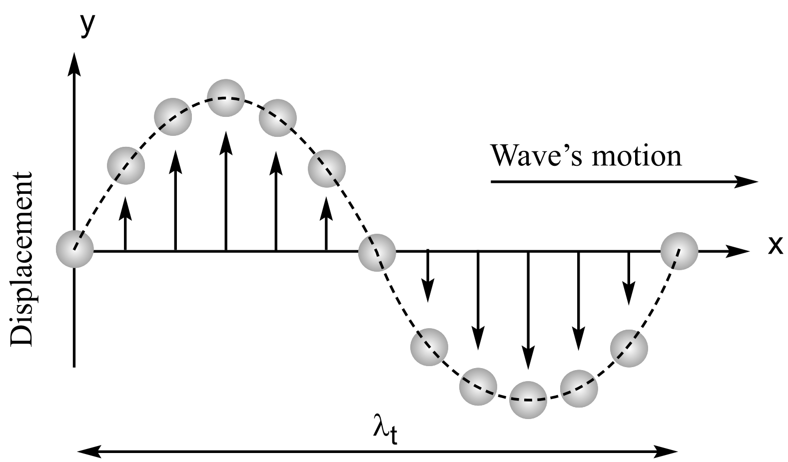


Figure 4.3 Transverse wave displacement at time t

4.3.1 Transverse waves

As they travel through wisp space they displace wisps in directions that are at right angles to the wave's motion (Figure 4.3), and wave speeds are less than or equal to light-speed through wisp space. Types include: matter-fractal's quantum waves, electromagnetic waves, gravitational waves, and de Broglie waves – first proposed in 1924 by Louis de Broglie.

4.3.2 Longitudinal waves

Displacement takes place in the same direction in which the wave travels – similar to sound waves travelling through air or water (Figure 4.4).

The front half of the wave compresses wisp space as it passes through it. This is followed by a half cycle of rarefaction, which stretches wisp space. Pressure and density changes that

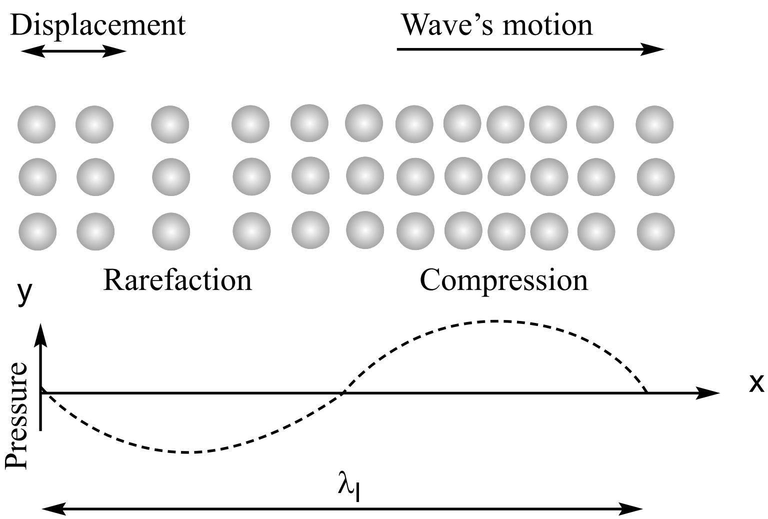


Figure 4.4 Longitudinal wave displacement at time t

occur in wisp space are incredibly small, but the wave speed is very fast – possibly ten times the speed of light.

Wisp theory predicts the existence of faster-than-light longitudinal waves, but this is a new concept and scientists have no knowledge of it. These waves are responsible for meteors' shock waves (discussed later), longitudinal gravitational waves (following supernova events) and possibly quantum entanglement.

4.3.3 EPR Paradox

Longitudinal waves that travel faster than the speed of light may offer an explanation for the strange findings of quantum entanglement.

In 1935, Einstein, with support from Boris Podolsky and Nathan Rosen, proposed a thought experiment referred to as the ERP Paradox. If Einstein was right then quantum theory would be incomplete.

Consider an example where two subatomic particles interact and are moved a great distance apart. The particles are correlated so that the action of one affects the behaviour of the other. When measurements are made simultaneously on the separated particles, the results should be independent of each others quantum state; since they cannot share information, as it would need to travel between them at a speed greater than that of light.

Experiments carried out to test this proposal have proven Einstein wrong. It appears that separated particles remain entangled and do somehow communicate their information at speeds faster than that of light. Einstein referred to this as 'spooky action at a distance', and quantum mechanics argue that these states are non-local and so there is no paradox! But if information is communicated at a speed faster than light, does that not undermine special relativity's claim that nothing travels faster than light?

4.4 Matter-fractal's motion through wisp space

As transverse waves travel through wisp space, the wisps are moved from side to side, they do not travel along with the wave. The wave carries only its shape, energy and momentum.

A matter-fractal travels through wisp space as a transverse wave packet. Wisps that make up the matter-fractal play a similar role to wisps that make up a transverse wave's shape, only here the matter-fractal's shape is much more complex. As the matter-fractal travels through wisp space, a series of equal and opposite forces move wisps in directions that are at right angles to the matter-fractal's direction of motion. All wisps are displaced by the matter-fractal and none travels along with it. Matter-fractals carry fractal shape, energy and momentum.

Transverse wisp displacement can be interpreted mathematically as a Fourier series that forms the wave functions of quantum mechanics. By way of analogy, a circle can be constructed from the points of intersection of an infinite number of tangent lines. But that does not mean that all circles must have an infinite number of tangents attached to them. Similarly we can represent a matter-fractal as an infinite number of sine waves forming a quantum wave packet. But that does not mean that matter-fractals are made from sine waves. It is just that their behaviour in wisp space can be modelled by an infinite number of waves summed together to form a wave packet, since matter-fractals replicate these patterns as they travel through wisp space.

Figure 4.5 shows wisp space displacement resulting from matter-fractal's motion. Note that the wisps that previously made up the fractal have returned to their original positions, and new wisps now form the matter-fractal's pattern.

Matter would be unable to move through wisp space as a transverse wave packet if it did not possess zero-state space. This is needed to form stable matter-fractal structures.

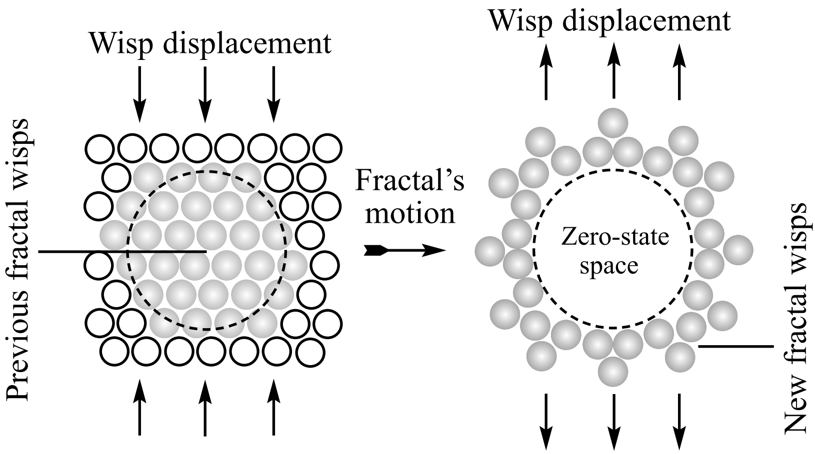


Figure 4.5 A matter-fractal's transverse 'wave' motion

4.5 Absolute frames of reference

A single absolute frame of reference is an abstract notion that in practice does not exist.

Any frame of reference in which wisps are stationary can for practical purposes be considered as absolute. It is theoretically possible for several absolute frames of reference to be in relative motion, so long as they are physically isolated. Otherwise they would combine to form a single absolute frame.

4.5.1 Local absolute frames of reference

It is likely that between any two local frames – separated by a great distance – there may be a small relative motion between them caused by movement of wisp space. It is perfectly reasonable to consider both local frames as absolute in their own right and so ignore negligible relative motion effects.

4.6 Newton's laws of motion

At speeds much less than light speed, matter-fractals move through one-state space according to Newton's three laws of motion. These laws of motion are as follows:

4.6.1 Newton's first law of motion

A body continues in a state of rest or uniform motion in a straight line unless it is acted upon by external forces.

At rest a matter-fractal is stationary in an absolute one-state space. There is no motion whatsoever between the fractal and the surrounding wisps, so quantum waves are absent.

When a matter-fractals moves through one-state space, it displaces wisps at right angles to its motion – transverse wave motion displacement – creating quantum wave patterns. There are no friction forces acting to slowing it down – wisp space is inviscid (frictionless). Equal and opposite forces establish across its surface allowing it to move effortlessly through wisp space in accordance with Newton's first law of motion.

4.6.2 Newton's second law of motion

The rate of change of momentum of a moving body is proportional to and in the same direction as the force acting on it, i.e. $F = \mathrm{d}(mv)/\mathrm{d}t$, where F is the applied force, v is the velocity of the body, and m its mass. If the mass remains constant, $F = m\mathrm{d}v/\mathrm{d}t$ or $F = ma$, where a is the acceleration.

When force acts on a matter-fractal it causes distortion to its shape. But because its shape is held together by the wisp binding force, it is able share the effect of the applied force among all wisps in its fractal structure. These wisps have inertia and react by accelerating in directions at right angles to the bodies motion; the quicker they move the faster the matter-fractal shape moves.

4.6.3 Newton's third law of motion

If one body exerts a force on another, there is an equal and opposite force, called a *reaction*, exerted on the first body by the second.

We would expect forces acting between particles to be equal and opposite, and this is always the case in wisp theory.

However, there is one surprise, due to the fact that in wisp theory transverse force transmits at the speed of light. The effect of force on particles travelling at near-light speed reduces. This makes it harder to speed up and slow down fast-moving particles. We cover this later (Sections 7.14.2 accelerating subatomic particles and 7.14.3 decelerating subatomic particles).

5

Gravity

Gravity is a phenomenon associated with the gravitational force acting on any object that has mass and is situated within the Earth's gravitational field. But what causes it?

Newton was the first of the great scientists who had insight into its true cause, although he never formalised proof of his idea. His law of gravitation deals only with the dynamics of the problem, not its cause.

We shall see that wisp theory's explanation of the cause of gravity is similar to Newton's thoughts. And using the concept of 'zero-state space' reveals that objects are 'pushed down' towards the Earth, not 'pulled down'.

Einstein was also correct in saying that the curvature of space causes the gravitational effect. It is the curvature of wisp space that creates the radial compression force, which 'pushes down' on objects.

5.1 The weakest force

Of the four fundamental forces of nature – the gravitational force, the electromagnetic force and the strong and weak nuclear forces – gravity is the odd one out, and by far the weakest. Physicists have been unable to integrate it successfully into their theories.

The ratio of the strength of the gravitational force to the electrical force between two electrons, is the same as the ratio of the size of an atom's nucleus to that of the entire universe. The gravitational force is so incredibly weak that it almost ceases to exist, and yet, its effect spans the entire universe; and will one day determine its fate.

For two electrons, the ratio of gravitational to electrical force is:

$$\frac{1}{4\,167\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000\,000}$$

We only feel the effect of gravity on the surface of the Earth, because the gravity of the whole mass of the Earth – 6×10^{24} kg – is acting on us.

We are fortunate that most of the positive and negative electric charges are neutralised within atoms, so we do not experience their true power; if we did, we would be subjected to enormously powerful electromagnetic force effects.

5.2 Current theories

The two theories that best explain gravity are Newton's law of gravitation and Einstein's general theory of relativity:

5.2.1 Newton's law of gravitation

This states that the gravitational force of attraction F between any two masses m_1 and m_2 , whose centres are separated by a distance d, is given by the equation

$$F = \frac{Gm_1m_2}{d^2}$$

where G is the gravitational constant, which is a measure of the strength of the gravitational force between two bodies and is usually regarded as a universal constant.

Newton's theory is simple and easy to understand. He intro-

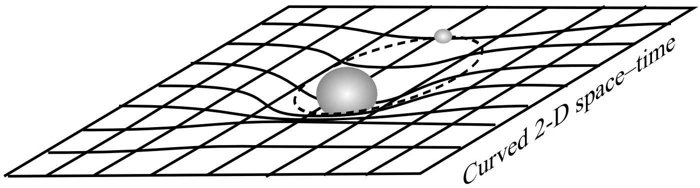


Figure 5.1 A marble orbiting a lead ball on a rubber-sheet

duced the concept that gravitational force is 'action at a distance', and so avoided having to explain how it propagates through space.

5.2.2 Einstein's general theory of relativity

This is a complex theory, and applies to frames of reference that are accelerating with respect to inertial frames. It builds on the *principle of equivalence:* No experiment can distinguish between a uniform gravitational field and an equivalent uniform acceleration.

Tests carried out to an accuracy greater than one part in a hundred million million have shown that there is nothing to distinguish between gravitational and inertial mass.

The theory predicts that mass and energy are responsible for the curvature of space–time, and gravitational effects are a consequence of this. The gravitational 'force' in this sense is regarded as fictitious.

In this space–time, light and material bodies follow paths of shortest distance between points – geodesic lines. The rules of Euclidean geometry breakdown – straight-line paths become curved; angles of a triangle add to more than 180°; and the ratio of the circumference to the diameter of a circle is less than π.

Figure 5.1 shows a simplified model: a heavy mass (lead ball) curving two-dimensional space–time (rubber-sheet). This image helps us to understand the process that causes the gravitational effect. However, it only represents two-dimensional space–time which we view in three-dimensional space. It is difficult to visualise what three-dimensional space–time would look like.

The first success of Einstein's theory was demonstrated by the correct prediction of a small anomaly in the precession of the perihelion of the planet Mercury – that Newton's formula failed to predict – of 43 seconds of arc per century.

Further tests confirm general relativity. In 1919 Arthur Eddington carried out tests during a total solar eclipse and showed that light gets deflected as it passes close to the surface of the Sun.

If Einstein's general theory is the true explanation for the cause of gravity, then it should be able to unify with quantum theory. But it cannot, so some doubt remains as to whether general relativity is wholly correct.

Its predictions are indeed remarkable. And many ideas from Einstein's theories are used in wisp theory – the main exception being the joining of space and time.

5.2.3 Other theories

The standard model does not incorporate a theory of gravity, as it proves too difficult to unify.

For gravity to be consistent with quantum and string theories, a force particle called the graviton is predicted. It is thought to be responsible for carrying force during gravitational interaction. It is predicted to have zero rest mass and travel at the speed of light. However, there is no proof that gravitons exist; their existence is only a theoretical assumption.

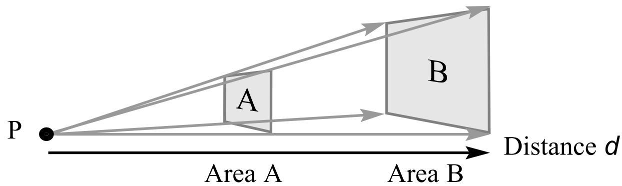


Figure 5.2 Gravitons radiating from particle P

The graviton theory suggests that these particles emit from matter. Figure 5.2 shows gravitons radiating from particle P, and passing through area's A and B. The density of gravitons in area B has been reduced by a factor of 4, since area B is twice the distance from particle P than is area A. As they radiate into space their intensity diminishes inversely proportional to the square of the distance from P.

This is similar to Newton's law of gravitation, in that the magnitude of the force varies inversely proportional to the square of the distance *d* – inverse-square law.

5.3 Wisp theory of gravitation

The gravitational force experience by matter is caused by its central zero-state space interacting with radial compression forces in curved wisp space. We will develop this idea in stages during this section.

Einstein's general relativity says that the curvature of space–time causes the gravitational effect. But in wisp theory, space and time are not joined together and so time has no affect on curved wisp space.

5.3.1 Curved wisp space

Spherical matter-fractals force the surrounding wisp space to adopt spherical symmetry or circular curvature. This forces wisps apart, stretching their 'binding springs', which creates tension force. The greater the curvature, the larger the gaps, and the greater the energy stored in curved wisp space.

Wisp space bends more acutely near matter, creating larger gaps, and becomes rarer as a result. At greater distances the effect is reduced and wisp space becomes denser, approach that of 'flat space' – see section 2.2 (Face-centred cubic lattice).

Wisp space's super-fine structure supports the principle of superposition, whereby small individual effects of curvature due to many matter-fractals are superimposed or added to give greater curvature effect. Therefore curvature is proportional to the mass of a body.

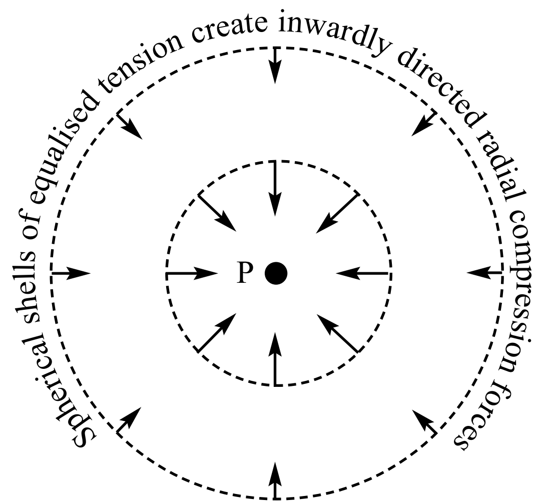


Figure 5.3 Spherical tension and radial compression forces

5.3.2 Tension and compression forces

There are two types of force produced by curved wisp space: spherical tension force and radial compression force.

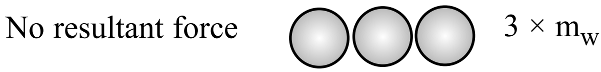
Spherical tension forces are produced when wisp space curves around a body (Figure 5.3). The forces equalise within spherical shells that surround the body. And result because the presence of matter-fractals within the body break the symmetry of flat one-state space, stretching it into spherical shells. Spherical tension forces remain perpendicular to radial lines projected from the body's centre of mass P.

The effects of many spherical tension shells squeezing their enclosed wisp space, produce the radial compression forces. Circular symmetry focuses these towards the body's centre of mass. And symmetry ensures that even though the spherical tension forces create the radial compression forces, the two remain orthogonal and have no component parts in each other's direction.

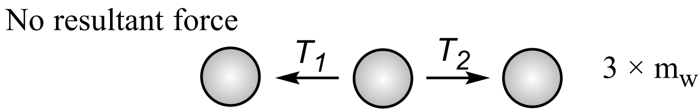
We examine the structure of the forces in more detail. Figure 5.4a shows three wisps in flat wisp space. Their density is at maximum and strong wisp forces bind them together. There is no resultant force as radial compression forces are absent, and any tension forces present cancel out.

Figure 5.4b shows spherical tension forces in curved wisp space. They follow the lines of curvature in wisp space and link together forming closed loops of equalised tension – they form the contour lines of a conservative field.

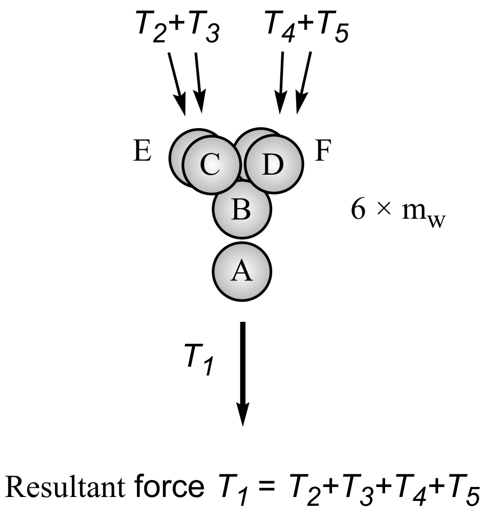
Figure 5.4c shows the radial compression force. Here wisp B plays a key role in force distribution, by coupling the forces from particles C, D, E and F, on to particle A, one large force is created from four smaller ones. An important aspect of this coupling process is that it directs the force along radial lines to underlying wisps and so strengthens the orthogonal relationship between the two force types.



a) Flat one-state space



b) Spherical tension forces in curved wisp space



c) Radial compression forces in curved wisp space

Figure 5.4 Forces in curved wisp space

We could reverse the force arrows in the figure to show a large opposing force splitting into four smaller ones. These smaller forces would further reduce, spreading their effect uniformly throughout wisp space.

The radial compression force is created when matter distorts flat wisp space. It is this force that is responsible for the gravitational effect.

The force that joins wisps together is the strong wisp binding force. Curvature separates wisps by distances that would normally be considered too small to be of any importance. But the strong wisp binding force magnifies these separations, enabling gravitational effects to be readily observed.

If we compare these to spring forces that obey Robert Hooke's law, then the value of spring stiffness would be extremely large. As a consequence wisp space is very stiff. Small curvature produces large gravitational effects, and larger curvature produces enormously powerful gravitational effects.

The forces in the spring model and in wisp space vary according to the inverse-square law, in agreement with Newton's law of gravitation.

5.3.3 Force and the inverse-square law

A model showing springs connected to junction plates can be used to simulate curved wisp space (Figure 5.5).

Consider the forces within a volume segment projected radially from the surface of a body at point P. This volume is filled with springs and identically sized junction plates. The plate boundaries are fixed at double radius increments, i.e. 1, 2, 4, 8 and 16. A single spring connects to the centre on one side of the plate and four identical springs connect to the corners on the other side.

When placed under tension, the junction plates line up forming spherical shells and the forces in the springs obey the inverse-square law – doubling the distance from point P reduces the spring's force by a factor of four. The sum total of forces on the inside of the outer shell is equal in magnitude to the single force *T* acting on P. The effects of the force at P are therefore spread uniformly through the volume segment.

The springs in this example are being stretched, creating tension. But equally, if the springs were compressed, they would still obey the inverse-square law.

Now, comparing this spring model to curved wisp space. Imagine spherical tension shells (junction plates) compressing the strong wisp springs that lie along the radial lines. The force in the springs increases according to the inverse-square law, and it is this force that is responsible for the gravitational effect.

A small amount of energy is used in establishing forces in curved wisp space – the principle of least action. This restores the order of symmetry from one of disruption – caused by matter's presence – to that of circular symmetry. The energy is stored in curved wisp space as gravitational potential energy.

In reality the distribution of spherical tension shells would be continuous around P, and the splitting of forces would be smoothed out and not restricted to specific shells. Wisp space gets stretched, but remains in a state of static equilibrium.

Now, consider what would happen if the body were suddenly removed. Wisp space would adjust to restore symmetry to that of flat wisp space.

If on the other hand we remove a thin layer of wisp space surrounding the body – effectively isolating it – then it would be unable to exert or feel any external force.

So we can conclude that the force responsible for the gravitational effect comes from the surrounding curved wisp space and that it does not emanate from the within the body.

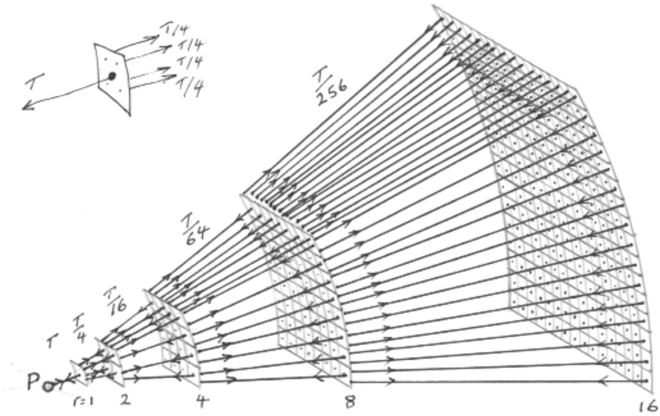


Figure 5.5 A spring model showing inverse-square law forces

5.3.4 Why obey the inverse-square law?

Forces do not have to obey this law; it depends on their environment. For example, if we lived in a two-dimensional flat plane, wisps would bend around 'flat' matter-fractals, following circular lines. And since wisp gap size is proportional to the curvature of the arc of a circle; and one arc is all that is needed for two-dimensional space, the radial compression force would be proportional to the inverse of the circle's radius 1/r, and not its inverse squared.

For a spherical matter-fractal in three-dimensional space, two arcs are required to represent curvature (curved surface area of a sphere). And wisp gap size is obtained by multiplying the curvature of two arcs. So the radial compression force is proportional to the inverse of the radius squared, $1/r \times 1/r$.

If four-dimensional space did exist, then curvature would be obtained by multiplying the curvature of three arcs. And the force would obey an inverse cube law.

In fact, curvature has one dimension less that the space in which it exists. Space has only three dimensions, and so radial compression forces must obey the inverse-square law.

We have taken the first step in developing our gravitation theory by clearly showing that forces in curved wisp space obey the inverse-square law. But this wisp space is in a state of equilibrium, and we have yet to show what effect this has on other matter-fractals placed in it.

Before going further, let us stop to reflect on Newton's thoughts as to the cause of gravity.

5.3.5 Newton's thoughts

Newton published his mathematical work on gravity in his book *Principia Mathematica* in 1687.

It was not necessary for Newton to know the cause of gravity in order to develop mathematical laws describing its behaviour. But later, when he published his treatise *Opticks* in 1704, he gave insight as to what he thought caused gravity.

I believe Newton's thoughts are correct and with the addition of an interaction with matter-fractal's zero-state space, the cause of the gravity is revealed.

In Query 21, Newton wrote on the subject of an ethereal medium link with gravity.

> Is not this Medium much rarer within the dense Bodies of the Sun, Stars, Planets and Comets, than in the empty celestial Spaces between them? And in passing from them to great distances, doth it not grow denser and denser perpetually, and thereby cause the gravity of those great Bodies towards one another, and of their parts towards the Bodies; every Body endeavouring to go from the denser parts of the Medium towards the rarer?

Sir Isaac Newton © Kim Albinson

In wisp space the gaps near bodies are greater than those further from them. So wisp theory confirms Newton's thoughts as to the cause of gravitation, in that wisp space is rarer near bodies and denser further away.

Even though the density variation is so small as to be almost non-existent – similar to our comparison of the size of an atom's nucleus to that of the universe, its size is magnified by the strong wisp force, producing a macroscopic gravitational effect.

But there is something missing! We cannot produce the effects of gravitation from density variation alone (Newton knew this). Matter placed in these fields would experience a force that would be due to the difference in density across its surface. And the resultant force would be proportional to the inverse cube of the separation distance. So we cannot use this concept as it stands, as we know the gravitational force varies as the inverse square of the distance.

5.3.6 Wisp gravitational force

A spherical matter-fractal surrounding its zero-state sphere is placed in curved wisp space (Figure 5.6). Spherical tension and radial compression forces pass through the fractal's layers, but cannot pass through its 'empty' zero-state sphere. The effect of the 'horizontal' spherical tension forces cancel out by symmetry – equal and opposite forces – and are not shown for clarity.

What happens when the radial compression force presses down upon the matter-fractal?

Without rigid support from the fractal's binding force, its 'empty' zero-state sphere would simply collapse, filling with wisps from curved space – wisp space always tries to restore its order of symmetry.

But this does not happen, because the strong wisp binding force rigidly locks the fractal's wisps around its 'empty' zero-state sphere, preventing its collapse.

The radial compression force pushing down on the upper surface of the matter-fractal's zero-state sphere causes the gravitational effect. The lower surface of the sphere cannot generate an opposing force, because force cannot pass through 'empty' zero-state space. The radial compression force is unopposed and is distributed on to the fractal's wisps. This causes the matter-fractal to accelerate downwards towards P.

As the zero-state sphere moves towards P, wisps on its lower hemisphere are displaced outwards at right angles to its direction of motion, and close back in forming a new layer on its upper hemisphere.

Directly beneath the matter-fractal, a tiny 'shadow' forms, because the downward acting force cannot pass through its zero-state sphere. However, the chances of lower lying matter-fractals being caught in this 'shadow' are negligible. As the size of a matter-fractal's zero-state sphere is extremely small com-

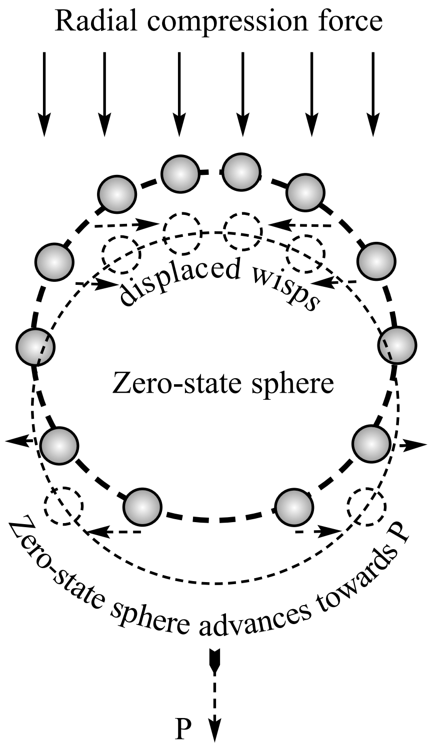


Figure 5.6 The gravitational effect

pared to the diameter of an atom and the shadow is likely to have a short range.

5.3.7 Zero-state space shock waves

Along diagonal paths taken by high-speed particles, small shock waves form as radial compression forces collapse the wisp space in their wakes (Figure 5.7).

Matter-fractals that move horizontally through wisp space do so along lines of equalised tension T, and consequently do not produce shock waves. This is because the displaced wisps move horizontally around their zero-state spheres maintaining constant tension.

Vertical motions of zero-state spheres do not produce shock waves either, because the radial compression force at the top of the spheres never meets up with the wisps beneath, as they are constantly blocked by presence of zero-state space.

Only motions along diagonal lines through curved wisp space produce shock waves. These occur because the radial compression force collapses the wisp space in the wake of the

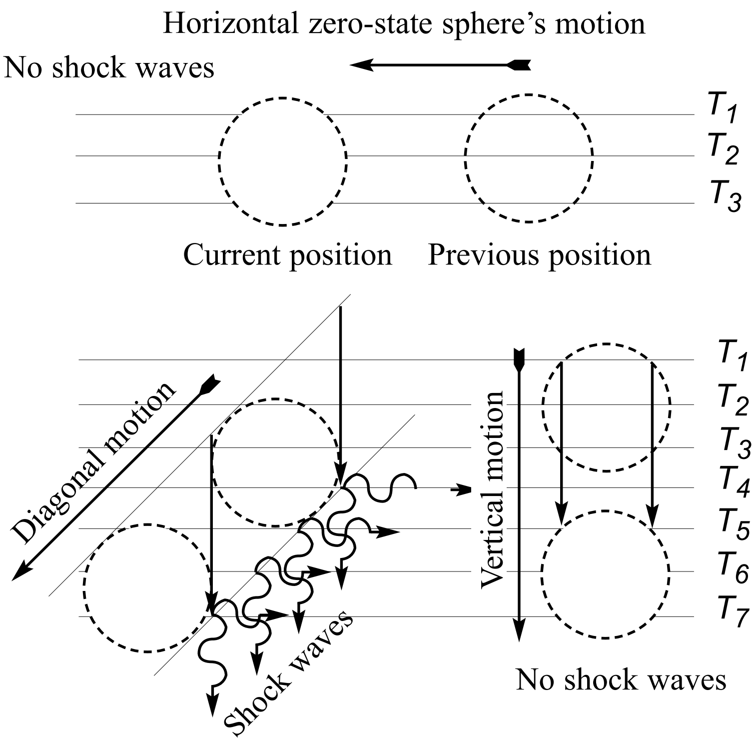


Figure 5.7 Zero-state space shock waves

matter-fractal's fast-moving zero-state sphere. The radial compression force pushes the upper part of the collapsing wisp space into the lower part, knocking them together creating small shock waves.

Fast-moving meteors descending diagonally towards the Earth will produce small shock waves, which make contact with the Earth's surface directly beneath their paths. The shock waves are longitudinal pressure waves that travel through wisp space at a speed of possibly ten times that of light.

5.3.8 Calculating gravitational acceleration

The radial compression force forms a vector field and its lines appear to arise from infinity and terminate on any mass that can be regarded as the source of the field.

At any point in curved wisp space the radial compression force F_r varies proportionally to the mass of the source M, and inversely to the square of the distance r from it. As shown by the equation

$$F_r \propto \frac{M}{r^2}$$

Spherical tension force produces the radial compression force that acts on wisps, creating a downward radial compression vector pressure $\mathbf{P_r}$. Curved wisp space is unique in that it creates vector pressure (having both magnitude and direction), unlike in liquids and gases where pressure is scalar (having magnitude only, which acts equally in all directions).

Wisp space remains in static equilibrium, since equal and opposite forces prevent wisp movements. Its wisps can be compared to bricks in the wall of a tall building – they too can support huge pressures without moving.

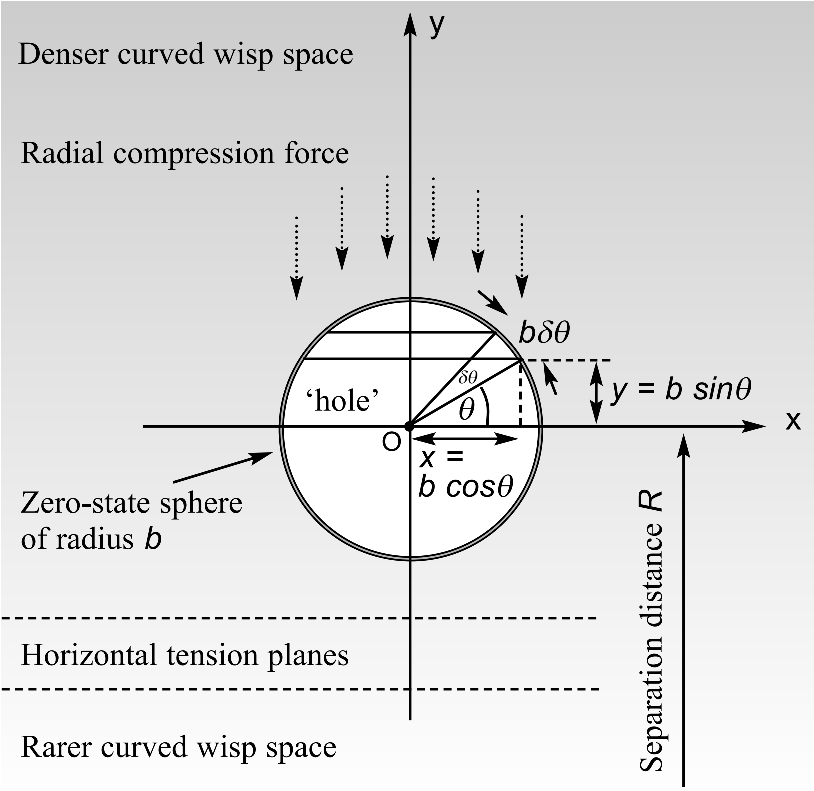


Figure 5.8

The radial compression force acting on a zero-state sphere

Imagine a matter-fractal with a solid centre being placed in curved wisp space. Equal and opposite forces would pass through it, and it would remain stationary. Its fractal shape would slightly distort under pressure, but unless this was extreme (as around a black hole), the effect would be negligible and can be ignored. However, we will discuss this effect later – (Sections 5.6 Pioneers' orbital discrepancies and 11.3.4 Star speeds in rotating galaxies).

Now what happens when bricks are removed from the wall of our fictitious building, creating a hole?

Prior to its collapse, the bricks at the base of the hole had no pressure pushing down on them, whereas the bricks at the top of the hole were under enormous pressure and began to crack. The wall collapses and bricks from above fall into the hole.

Now consider what happens to our solid matter-fractal when its middle is removed – creating a real matter-fractal complete with its zero-state sphere (Figure 5.8)?

In curved wisp space it behaves in a similar way to the hole in the wall, except that its structure does not collapse. Wisps lying at the base of its zero-state sphere have no pressure pushing down on them, while those on the upper surface experience pressure from the radial compression force.

Gravitational acceleration calculations are shown in Equation set 5.1. The centre of the matter-fractal is located at the x-y origin. We carry out an integral that sums the effect of the radial vector pressure over the upper zero-state hemisphere's surface to get the total force acting on the matter-fractal, which is its gravitational force. If we then divide this by the matter-fractal's mass we obtain its gravitational acceleration.

We have to introduce a new constant W, which is similar to the gravitational constant G – it has the same numerical value but different units.

This model accurately predicts gravitational acceleration for matter-fractals – fundamental particles – of any size. On the surface of the Earth its value is 9.8 m/s^2. However, there is one important condition imposed:

> *The masses of the matter-fractals must be proportional to the surface area of their zero-state spheres, i.e. the square of their radii, b.*

Equation set 5.1

Formula for calculating gravitational acceleration

$a =$ Gravitational acceleration (m/s^2)

$b =$ Radius of zero-state sphere (m)

$R =$ Separation distance (m)

$W =$ Wisp space gravitational constant (N/kg)

$M =$ Mass of body (kg)

$m_f =$ Mass of matter-fractal (kg)

$\theta =$ Angle (radians)

$P_r \propto \frac{M}{(R+y)^2}$ Radial compression pressure

$m_f a = \int_S \mathbf{P_r} dA$ Gravitational force on matter-fractal

$$m_f a = -\int_S P_r 2\pi x \sin(\theta) b d\theta$$

$$y = bsin(\theta), \quad x = b\cos(\theta)$$

$$a = -\frac{Constant}{m_f}\int_0^{\frac{\pi}{2}} \frac{2\pi b^2 \cos(\theta)\sin(\theta)d\theta}{(R+b\sin(\theta))^2}$$

and since $m_f \propto 4\pi b^2$

$$a = -WM\int_0^{\frac{\pi}{2}} \frac{\sin(2\theta)d\theta}{(R+b\sin(\theta))^2}$$

Since b is small the equation approximates to

$$a \approx -\frac{WM}{R^2}$$

If the masses of the matter-fractals were to vary in the conventionally manner – as the cube of their radii – then the *equivalence principle* established by Einstein would be violated. However, if a number of atoms made from these matter-fractals were assembled together to make a large homogeneous isotropic body, then the mass of that body would be proportional to the cube of its radius as expected.

Physicists have carried out tests to an accuracy of 1 part in 10^{14} and shown that there is no detectable difference in the inertial and gravitational mass for different substances. To detect a difference using modern methods the zero-state radius would need to be at least one hundred times larger than an atom. The formula shows that for zero-state radii on subatomic scale, the difference in acceleration between different sized particles is far too small to be detected at present.

So far, we have dealt with the gravitational effect of a matter-fractal in curved wisp space. It should be noted, however, that the matter-fractal would also superimpose its curvature of wisp space on the body P, resulting in both bodies accelerating towards each other with equal and opposite forces.

We have not included any relativistic effects in gravity, so as to avoid over-complicating matters.

5.3.9 Bending light

The curvature of wisp space by matter or energy will affect the path of light. Light is a pattern of oscillating transverse wisp waves, which lack zero-state spheres. Even though they do not possess zero-state spheres they are affected by gravitational force, and their paths will follow the curvature of wisp space.

5.4 Podkletnov's experiments

5.4.1 Gravity shielding

There have been some very interesting developments with experiments concerning gravity shielding.

In September 1996 a report of an experiment performed by Eugene Podkletnov was about to be published by the Institute of Physics, London, in their *Journal of Physics D: Applied Physics,* but was suddenly withdrawn by Podkletnov. Possibly because commercial backers wanted the discovery kept secret or the Tampere University of Technology in Finland, where he worked, feared loss of credibility. Whatever the reason is, doubt still remains as to whether this discovery is genuine.

Scientists at the University claimed they had discovered by accident a gravity shielding effect, while carrying out routine research work on superconductivity. They discovered that objects suspended above a cryostat containing a spinning superconductor disc could lose up to 2 per cent of their weight (Figure 5.9). The effect penetrated the floor above the laboratory, but not beneath the device.

The scientists used a spinning ceramic superconductor toroidal disc of composite structure – 275 mm across and 10 mm thick – suspended in a magnetic field and enclosed in a low-temperature container called a cryostat. Liquid nitrogen and liquid helium vapours were used to cool the disc to around 40 K. The upper layer of the disc became superconducting, whilst the lower layer stayed resistive. High-frequency currents were applied to the solenoids causing the disc to lift and rotate.

On first hearing about the experiment, I thought it plausible that such an effect could occur if wisp space were made to rotate at high-speed. And it would only be a matter of time before further news on the subject followed.

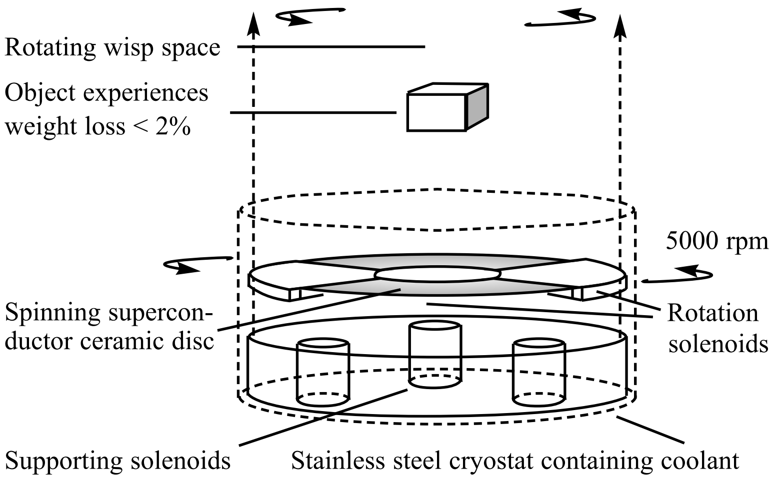


Figure 5.9 Podkletnov's gravity shielding device

The mass of the Earth curves wisp space slightly, and this creates the gravitational force. But when wisp space rotates, centripetal forces stretch the horizontal spherical tension forces moving the wisps further apart. This reduces the curvature and hence the gravitational effect.

Since the disc is small and the curvature of wisp space at the Earth's surface is very small, we can compare the rotation effect to that of bob weights on a spinning governor. They move outward as rotation speed increases and this reduces curvature. The reduction in gravity is related to the disc's size and its rotation speed. And somehow, the high-frequency electromagnetic fields generated by the device interact with the disc's crystal structure causing wisp space to rotate. The spinning motion of the disc magnifies the effect.

Scientists are having great difficulty in trying to repeat this experiment because of secrecy of information. The difficult part is possibly trying to get wisp space to rotate.

Ron Koczor, head of a group at NASA's Marshall Space Flight Center, Huntsville, Alabama, has invested $600,000 in building a replica of Podkletnov's apparatus. Hopefully they will get a positive result soon.

Boeing, the world's largest aircraft manufacturer, is also interested in the work. Their researchers in Seattle are trying to develop gravity propulsion devices.

If results prove positive, then the effects produced by these small devices would violate Einstein's general theory of relativity.

5.4.2 Impulse gravity generator

In an article published in *New Scientist,* 12 January 2002, Podkletnov claimed to have made a device that produces a pulse that has the same properties as a gravitational field. The pulse can pass through a steel plate and knock over a book placed on a table one-kilometre away.

Wisp theory predicts this effect is also possible, simply by rotating wisp space horizontally instead of vertically.

Figure 5.10 shows the horizontal beam acting on a matter-fractal placed in its path. Centripetal forces that develop in the rotating beam cause its wisps to move outwards, reducing the beam's density. Earth's spherical tension force pulls horizontally on one side of matter-fractal's zero-state sphere, but the 'equal and opposite' tension force pulling on the other side is reduced because the beam's density is lower. This causes a net force to act on the zero-state sphere, which causes the matter-fractal to repel from the beam's source. This explains why the book experienced a repulsive impulse force, causing it to fall over.

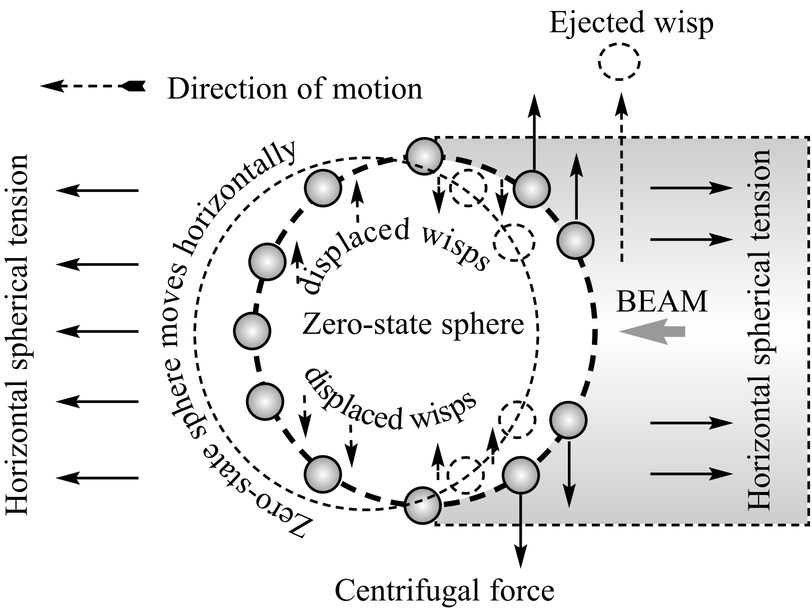


Figure 5.10 Zero-state sphere interacting with the beam

Some of the beam's energy will be absorbed by the steel plate and air particles in its path. But the magnitude of force exerted by a horizontal beam would be much greater than that force cause by a vertical beam.

Again, secrecy shrouds the experiment and it has not been verified. But, wisp theory predicts that if the original gravity 'shielding' effect is possible, then the impulse beam effect is also possible. It is possibly the original 'vertically operated' device, modified and placed on its side, projecting a horizontal beam.

The commercial potential for the impulse beam would be vast, explaining why both NASA and Boeing are taking these reports seriously.

5.5 Quantum gravitational effects

We have looked closely at the gravitational effects that take place at the centres of the fundamental particles. The gravitational effect arises from the radial compression force causing pressure to act on matter-fractal's zero-state upper hemisphere.

Quantum theory is amazingly successful and adapts perfectly to the structure of wisp space. Wisp space's transverse waves cause the wave patterns of quantum theory.

Quantum mechanics does fully explain the behaviour of a particle's bound states in a gravitational field. But I do not believe it is necessary to explain gravity in terms of quantum theory's force particle – the graviton. And it is not necessary to use the theory to explain the cause of gravity.

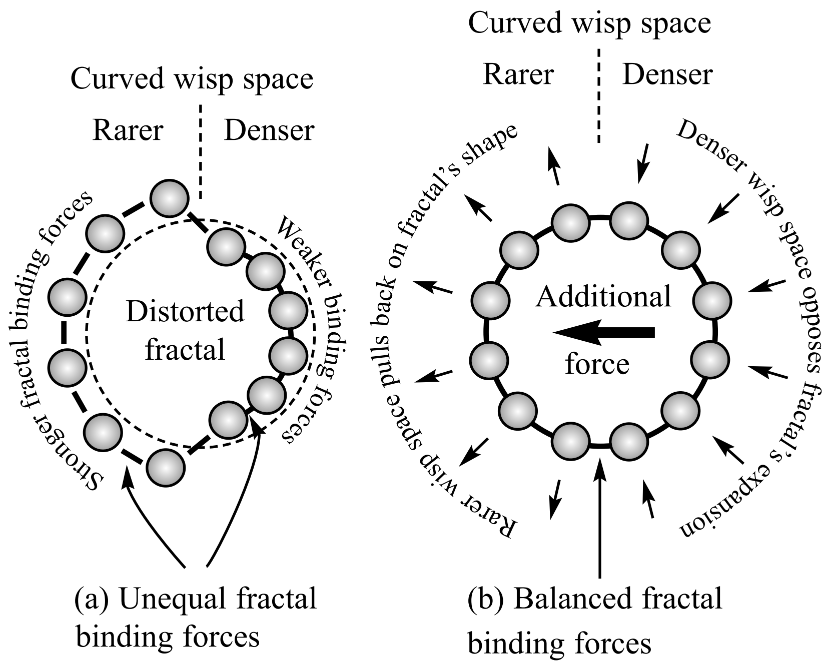
5.6 Pioneers' orbital discrepancies

The first spacecraft to explore the planets in the outer solar system were the Pioneers 10 and 11, launched in 1972 and 1973 respectively. After successfully completing their missions they drifted out of the solar system in opposite directions, journeying on towards the stars.

John Anderson and other scientists at NASA's Jet Propulsion Laboratory have discovered that an unexpected tiny deceleration force (less than a nanometre per second per second) has affected both spacecraft.

According to Newton's law of gravitation, only the weakening gravitational pull from the receding Sun should slow them down. But Pioneer 10's position is some 400,000 km behind schedule, indicating that an additional decelerating force has affected it.

Wisp theory predicts an additional tiny deceleration force directed towards the Sun. This occurs because curvature



Figures 5.11 Additional tiny deceleration force

reduces the density of wisp space. At a greater distance from the Sun, wisp space is denser – closer to one-state space.

Figures 5.11 shows the effect this has on a matter-fractal's structure. As it moves away from the Sun, it experiences the expected Newtonian gravitational force – due to the radial compression force. But variation in the density of curved wisp space causes the fractal's shape to distort (Figure 5.11a), becoming larger in the rarer space facing the Sun. The figure's pear-shaped distortion has been greatly exaggerated to show this effect. The fractal's binding force acts to restore spherical symmetry and in doing so creates opposing push–pull forces in the surrounding wisp space (Figure 5.11b). Both the Newtonian gravitational force and the additional retarding force act in the same direction – towards the Sun.

5.7 Gravity Probe B

NASA are planning to launch the Gravity Probe B spacecraft to test two as-yet untested predictions of Einstein's general theory of relativity. It will test for the effect of frame dragging – space dragged around by the Earth's rotation – and geodetic precession.

The experiment will use four small, incredibly precise gyroscopes to help detect the small relativistic effects around the Earth. The frame dragging effect will cause a small force to push the gyroscope's spin axis out of alignment, as it orbits the Earth. And the much larger geodetic effect – warping of space–time – will also affect the gyroscope's spin, but in a direction that is perpendicular to that of the frame dragging; and so the effects can be measured separately.

It seems plausible that large bodies of spinning matter could drag space around. The movement of wisp space around a body would increase its circular curvature on its equatorial plane and flatten the curvature at the poles. These effects are likely to be extremely small around the Earth.

5.8 Conclusion

There have been no major changes to our understanding of gravity for the past 300 years. Newton's law of gravitation gave scientists great opportunity to develop new ideas. So accurate was his theory that it is still widely used today. Scientists used it to calculate the small error in precession of Mercury's orbit, and this prompted a search for a better theory. But Newton's theory has not failed, it has merely been replaced by a theory that gives more accurate results – Einstein's general theory of relativity.

Wisp theory combines a unique property of matter – zero-state space – with both Newton's and Einstein's ideas, to form a new theory of gravity.

I believe that Einstein's success with gravity arose from his ideas on curved space coupled with relativistic time dilation effects. Wisp theory supports these views, but does not agree that space and time are joined, and so differs fundamentally from Einstein's theory.

Wisp theory treats gravity as a force, a view held by Newton but not by Einstein. But most important is that the source of gravity is the radial compression force that passes through space by contact with neighbouring wisps. It is not caused by 'action at a distance' requiring no medium to transmit it.

Einstein believed that the gravity force is fictitious – a consequence of curved space–time.

Wisp theory supports Newton's views as to the cause of gravity. Although its effects propagate through wisp space at the speed of light – a prediction of Einstein's general theory of relativity – and not at infinite speed, as Newton had supposed. However, most scientists believe that Newton's law of gravitation applies to the entire universe. And for slow-moving systems Newton's theory appears correct. It only begins to suffer when speeds in the system increase and relativistic effects come in to play.

Wisp theory predicts that the rotation of wisp space produces additional gravitational effects. And if reports of Podkletnov's gravity experiments are true, which I believe they are, then a new era in science is about to begin.

6

Electromagnetic Force

Electromagnetic force has two components, one electric and the other magnetic.

In his special theory of relativity, Einstein showed that their effects are identical, and it is an observer's frame of reference that determines which of the two causes an effect. An effect that appears as magnetic to one observer may appear as electric to another observer.

Although wisp theory and special relativity differ fundamentally, they do agree on this point, which we will cover in Chapter 8 when comparing wisp theory with special relativity in 'Wisp and Special Relativity: Electrodynamics'. But for now we will keep things simple.

Wisp theory suggests that it is distortions to a charged body's electric field shape that create the effect of magnetic force.

6.1 Electric force

Matter-fractals (fundamental particles) that are not spherically symmetric have structures that create asymmetry in the surrounding wisp space. This produces a slight twist in the surrounding layers – shells – of wisps, and these spiral either clockwise or anticlockwise, widening the gaps between neighbouring wisps, which create the positive or negative electric charge effect (Figure 6.1).

It is important to understand that it is a physical change brought about by asymmetry in the matter-fractal's structure that creates the electric charge effect.

Forces in wisp space act at all times to restore the order of symmetry. So that when 'twisted' clockwise and anticlockwise

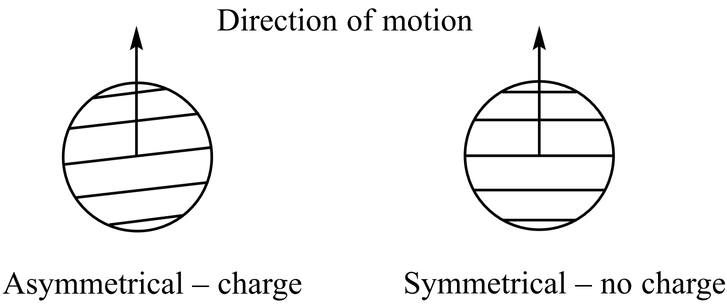


Figure 6.1 Asymmetrical and symmetrical shells

wisp space meet, forces act to restore symmetry to flat one-state space, cancelling their charge effects.

As charged particles move through wisp space their symmetry axes line up with their directions of motion, and wisp space displacement takes place in the normal manner. However, the particles' electric charges have fine spiral structures that rotate as they move through wisp space.

We can think of them as rotating electric charge patterns, which are likened to radial spokes in rotating wheels. The wisps through which they pass are not rotated but get displaced at right angles to the patterns' motions.

6.2 Magnetic force

As a matter-fractal moves through wisp space it displaces wisps at right angles to its direction of motion.

Similarly, when a charged particle's electric field moves, only its rotating pattern moves through wisp space. It is the rotating electric field pattern that forms the magnetic field lines which circle the moving charged particle. And because magnetic field lines are cause by rotation, they are continuous, i.e. they have no beginning or end points.

In order for a magnetic force to occur between two charged particles, the following conditions must apply:

1. A charged particle must move through wisp space to create a rotating electric field pattern – a magnetic field.

2. A second rotating electric field pattern – magnetic field – must be present for the two field patterns to interact and produce a magnetic force between the charged particles, as wisp space alone does not interact with the distorted electric fields that are responsible for causing the magnetic force.

Figure 6.2 shows a charged particle moving into the page. We concentrate on the two wisps shown as small dark circles that lie on the large circle representing the particle's rotating electric field pattern. A second charged particle (not shown) produces an electric field pattern that moves with speed v, as shown in the figure. The two wisps shown move transversely (across the page from side to side as the particle's shape displaces them) to the charged particle's motion. At the points selected they move in opposite directions and at right angles to the rotating electric field patterns.

By summing the speeds of the patterns together, their effect on wisp space can be determined. As the patterns move through wisp space they displace its wisps slightly. The two wisps shown in the figure are displaced by different amounts and so experience different forces, because the sum of the patterns' speeds passing them are different, $(v + u)$ and $(v - u)$ respectively. And since the wisps move in opposite directions, a net magnetic force results, which acts on the charged particle.

In Chapter 8 we will look at the formal relationship between the electric and magnetic force for moving charged particles.

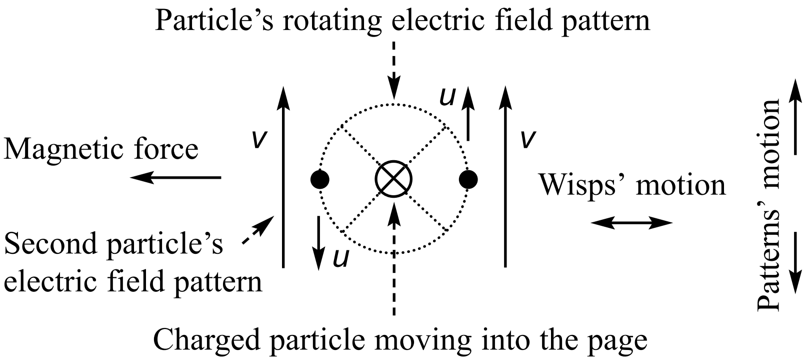


Figure 6.2 Magnetic force on a moving charged particle

6.3 Light

Light is electromagnetic radiation that carries energy through wisp space in the form of oscillating electric and magnetic fields – electromagnetic waves (Figure 6.3).

In one-state wisp space these fields are at right angles to each other and to the direction of propagation. In the figure, gaps in wisp space lie in a vertical plane creating an electric field pattern (vertically polarised light). The changes in motion of the electric field pattern (oscillations up and down) cause a magnetic field effect at right angles to it, and vice versa. The principle of least action ensures that minimal disruption occurs in wisp space if the magnetic field develops this way.

The energy of electromagnetic radiation can also be regarded as a stream of photons that travel through wisp space at the speed of light. Just as electromagnetic waves can propagate only as whole waves – it is not possible for a fraction of a wave to move independently. Similarly, photons can only have quantum units of energy – their values can only be a multiple of a

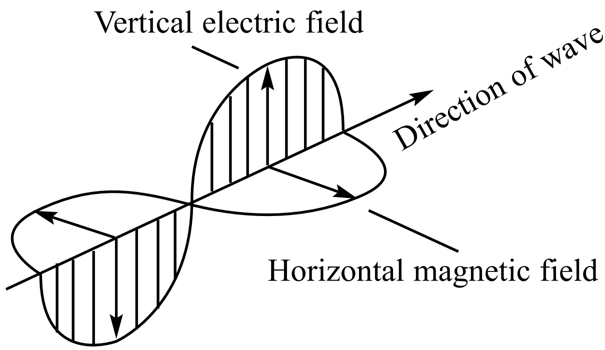


Figure 6.3 Portion of a linear polarized plane wave

fixed amount. Properties of wisp space ensure that the waves' amplitudes remain constant.

An electron emits or absorbs photons when it jumps between energy levels in an atom. If the positive charge at the atom's nucleus twists clockwise and the electron's charge twists anti-clockwise then the electric charge effect will cancel out when they meet.

If an electron is knocked towards an atom's nucleus, it is able to neutralise the atom's positive charge while occupying a smaller volume of space. So it must emit some of its outer structure, making it smaller. It does so by ejecting a layer of its twisted charge pattern. This layer moves away as a plane of electric charge forming an electromagnetic wave – a photon.

But if it emits a layer of its outer charge pattern, why does the charge on an electron stay constant?

Well, its charge is determined fundamentally by the twist in its fractal structure – a physical thing – and this stays the same, even though its outer charge pattern – a non-physical thing – changes as it emits and absorbs photons.

6.3.1 Zero rest mass

A particle possesses mass because its spherical fractal structure locks on to a specific number of wisps, and these possess mass. But light does not possess a spherical fractal structure because it does not have a central zero-state sphere, and so it has zero rest mass.

7

Wisp and Special Relativity: Fundamentals

In 1905 Albert Einstein published his special theory of relativity while working in a Swiss Patent Office in Berne. The theory is world-class and has influenced scientific thinking more than any other theory in history. He used the word ‘special’ to relate to uniform motion in a straight line.

Einstein knew that there was a need for a new theory that could explain the relationship between measurements made in different reference frames for Maxwell’s electromagnetic laws, as Newtonian mechanics could not adequately do this.

Einstein solved the problem by joining space and time together, and by using Hendrik Lorentz’s coordinate transformations. His remarkable understanding of the nature of time lead to the development of time dilation – time runs slower for moving observers, even though they are unaware of it.

Now, nearly 100 years on, special relativity still remains a powerful mathematical tool. Tests still show its predictions to be correct and it remains a remarkably successful theory. But the theory gives no real answers as to why physical processes behave the way they do, whereas wisp theory does provide answers.

The famous null result of the Michelson–Morley ‘ether’ experiment secured credibility for Einstein’s new concepts of space and time, but wisp theory can explain this result and the physical processes behind it.

Wisp theory does not agree with special relativity’s claim that the speed of light stays constant for all observers in motion, although plenty of evidence seems to suggest it does. It challenges both postulates of special relativity, but supports its concept of time dilation. It treats space and time as being separate, and uses the notion of absolute reference frames in which wisps are at rest. Only when observers move through absolute frames do they experience dilation effects.

Wisp theory offers explanations for: the cause of time dilation, mass increase in high-speed subatomic particles, and the Lorentz force law for moving charges.

Special relativity is a simple theory that was developed from simple, clearly defined postulates – even though they appear to defy our common sense notions of space and time. Wisp relativity, too, develops from simple postulates, which incorporate: Newtonian mechanics, a type of Galilean relativity, and Einstein's time dilation for moving observers.

First we look at Einstein's two postulates of special relativity, and consider what implications arise from them.

7.1 Postulates and implications of special relativity

7.1.1 Postulate 1: principle of relativity

All laws of physics have the same mathematical form in all reference frames moving at constant velocity.

7.1.2 Postulate 2: absoluteness of the speed of light

The speed of light in a vacuum has the same measured value in all reference frames moving at a constant velocity.

7.1.3 Implications of postulate 1

This postulate expresses the absence of a universal reference frame. It implies that there is no deviation of any laws of

Albert Einstein © Kim Albinson

physics in a 'vehicle' travelling at any constant speed in a straight line.

It uses the Lorentz coordinate transformations for this purpose, but this requires that we make changes to our common sense notions of space and time:

- Observers in relative motion do not agree on the times and places of separated events.
- They observe each other's lengths to contract in their directions of motion.
- They each record the other's time as running slow.

Experimental evidence for special relativity's predictions seems overwhelming. But when we look for direct proof we find that there is no direct evidence, i.e. no observers have travelled at high-speeds and carried out experiments to see if the laws of physics remain the same.

It is true that fast-moving clocks run slow and fast-moving subatomic particles seem to gain mass. But this does not provide direct evidence to support this postulate.

The experiments that have been carried out on the Earth and aboard satellites are one-sided: the thing being tested moves and is subjected to relativistic effects, while the observers remain practically stationary and experience no relativistic effects. So we cannot truthfully claim that this postulate is correct. Wisp theory will prove that it is incorrect.

In wisp theory, if we set an observer's speed through wisp space to zero, then all of its relativistic equations reduce to those found in special relativity.

7.1.4 Implications of postulate 2

Over the years, experimenters have measured the speed of light with greater and greater accuracy. Today, it is taken for granted that its speed is known exactly, and very few experimenters question this. However, wisp theory shows that these experiments are flawed, because the light always travels in two or more directions – reflected by mirrors.

To measure the speed of light correctly, measurements must be made in one direction only (no mirrors).

No one has accurately measured the speed of light one-way on the surface of the Earth! Wisp theory predicts that if this were to happen, its speed would be found to vary – depending on the motion of the Earth through wisp space. Wisp space is a type of ether medium that limits the speed of light to an exact value.

Many experiments have been carried out to measure the speed of the Earth through the ether. The most famous was the Michelson–Morley experiment in 1887. But it produced the famous null result, casting doubt on the existence of the ether and forming an experimental base for the idea stated in this postulate.

7.2 The postulates of wisp relativity

Wisp theory develops using concepts based on common sense notions of space and time, and so avoids the paradoxes found in special relativity. It is a type of ether theory, which predicts the null result of the Michelson–Morley experiment, and all the observable predictions of special relativity for Earth-based observers.

The postulates of wisp relativity are as follows:

7.2.1 Postulate 1 Laws are different

Current laws of physics are different in inertial reference frames moving at speed relative to stationary wisp space.

7.2.2 Postulate 2 Absolute speeds are constant

The speeds of light and transverse force through one-state space are equal and constant when measured by an observer at rest in wisp space, and are unaffected by their sources' motions.

7.2.3 Postulate 3 Gamma factor

The gamma factor γ is equal to the speed of light c, divided by an observer's absolute relative transverse light speed v_t.
That is $\gamma = c / v_t$.

7.2.4 Postulate 4 Jiggle

Bodies of matter agitate or jiggle wisp space as they pass through it.

Jiggle is the sum effect of motions caused by quantum waves passing points in wisp space. Its effect reduces specific properties of matter by the factor γ. It reduces the speed of light and transverse force by γ in directions at right angles to a body's motion through wisp space.

7.2.5 Postulate 5 Force reduction & time dilation

In inertial reference frames moving through wisp space, light-pulse clock's time (without jiggle) is slowed by γ.
The transverse force is reduced by γ. Mechanical and biological clock's time (including atomic) is slowed by γ (includes the jiggle effect).

Consequently moving observers must apply the *rules for time dilation compensation (Section 7.15.4)* to all physical processes that take place in their reference frames.

7.3 Measurements: absolute and relative

We briefly discussed these measurements here and follow up later with more detail.

7.3.1 Absolute measurements

Absolute measurements are those made in reference frames that are stationary with respect to one-state space. Time in these frames is absolute and unaffected by time dilation.

If we place identically prepared clocks throughout stationary one-state space, they will all remain synchronized and record the same absolute time.

7.3.2 Relative measurements

Relative measurements are those made in reference frames that move through ‘stationary’ wisp space. Clocks placed in these frames would record relative time and run slower than ‘stationary’ absolute clocks, because of the effect of time dilation.

In equations, I show variables primed when they apply to measurements made by observers moving through wisp space, for example:

- t is absolute time measured by observers who are stationary in wisp space.
- t' is relative time measured by observers who are moving through wisp space.

When we move through wisp space, time dilation slows down our body’s senses (body clocks), causing us to become unaware of its effects. Consequently, we observe all physical processes to appear to take place at normal speeds within our frames. However, what we are observing are the effects of an illusion. If we could see processes taking place within slower frames, they would appear to take place speeded up.

Since our senses automatically compensate for time dilation, we must apply the *rules for time dilation compensation (Section 7.15.4)* to all physical processes that take place within our frames. (Square brackets [ ] are used to identify time dilation compensation terms within equations.)

If, when we move through wisp space, we were to modify our body clocks to work only in absolute time, we would see things happen in slow motion within our frames, but would see things happen at normal speeds in ‘stationary’ absolute frames.

7.4 Events

An event is an occurrence, which happens at a definite location and time in wisp space.

In wisp theory absolute simultaneity of events is not lost. If observers could record events using absolute clocks, they would all agree on the absolute times and locations of events in wisp space.

But observers who move through wisp space record relative time – due to the effect of time dilation – and so may not agree on the timing of events.

In special relativity all motions are relative (there is no absolute frame) and observers in relative motion will not agree with each others' times or locations for separated events. This loss of simultaneity defies common sense, and many scientists including Lorentz found this too difficult to accept. But Einstein did not, and he developed new ideas for space–time in which an observer's relative motion affects the very fabric of space–time itself.

7.5 Absolute measurements of light's relative speed

We start by determining the relative speed of light in different reference frames. The speed of light c through absolute one-state space is constant when measured in absolute space and time.

Current measurements indicate that the relative speed of light in a vacuum is always constant, regardless of an observer's motion – special relativity's postulate 2, but wisp relativity's postulate 2, states that it is not constant. Wisp theory will show that the speed of light gets recorded using current methods as being constant, while at the same time its relative speed varies, so do not be concerned with this.

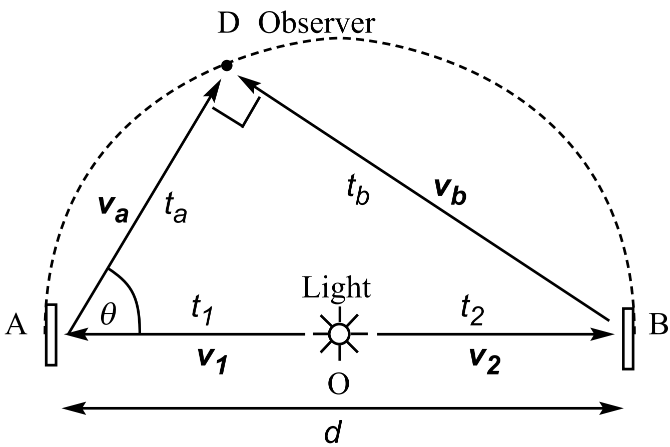


Figure 7.1 Measurements in an absolute frame

Equation set 7.1

$t_d =$ Absolute time difference

$t_d = t_b + t_2 - t_a - t_1$

But $t_1 = t_2 = \dfrac{d}{2c}$ and $v_1 = v_2 = v_a = v_b = c$

so

$$t_b = \frac{d\sin\theta}{c}$$

$$t_a = \frac{d\cos\theta}{c}$$

$$t_d = \frac{d\left(\sin\theta - \cos\theta\right)}{c}$$

7.5.1 Absolute measurements in a stationary frame

We first calculate the absolute time difference taken by light to travel along separate paths to an observer at D (Figure 7.1). (Many light speed experiments look for a time difference to determine whether or not the speed of light stays constant.)

A light source O is placed centrally between two mirrors A and B. The mirrors lie across the diameter d of a semicircle, and the observer D moves freely on its arc. The apparatus remains stationary in one-state space.

We switch on the light source and record the absolute time difference t_d (Equation set 7.1). All measurements are absolute, since the apparatus is stationary in wisp space.

When $\theta = \pi/4$ radians, and the observer is equidistant from the mirrors, the time difference is zero. As the light takes the same trip time to reach the observer.

7.5.2 Absolute measurements in a moving frame

We repeat the measurements with the apparatus moving through wisp space at speed V (Figure 7.2).

Measurements are taken from absolute clocks fixed throughout wisp space, which record the times when the moving apparatus passes fixed points (relative time is ignored).

Light emits from a fixed point in wisp space (Wisp relativity's postulate 2). As the light travels along its separate paths, the apparatus moves through wisp space, and the origin of the semicircle O moves away from the light's point of emission. Equation set 7.2 gives the absolute values for times t_1 and t_2.

A stationary observer in wisp space sees the light strike mirror A first, because the mirror is moving towards light's fixed emission point. And the light takes longer to reach mirror B,

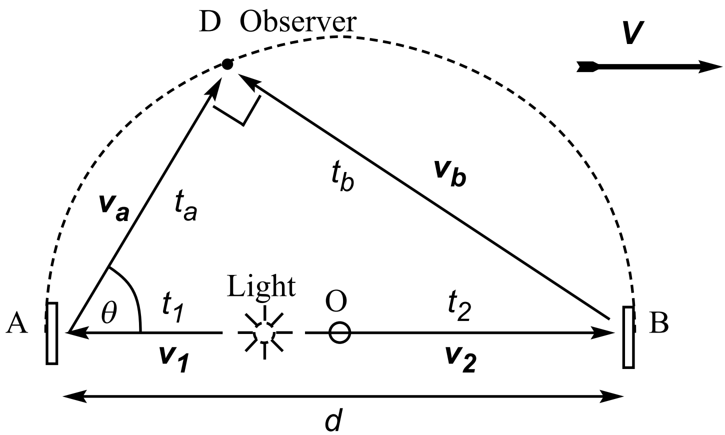


Figure 7.2 Absolute measurements in a moving frame

Equation set 7.2

$t_d =$ Absolute time difference

$t_d = t_b + t_2 - t_a - t_1$ But now $t_1 < t_2$

$v_1 = c + V$ and $v_2 = c - V$

so

$$t_1 = \frac{d}{2(c+V)}$$

$$t_2 = \frac{d}{2(c-V)}$$

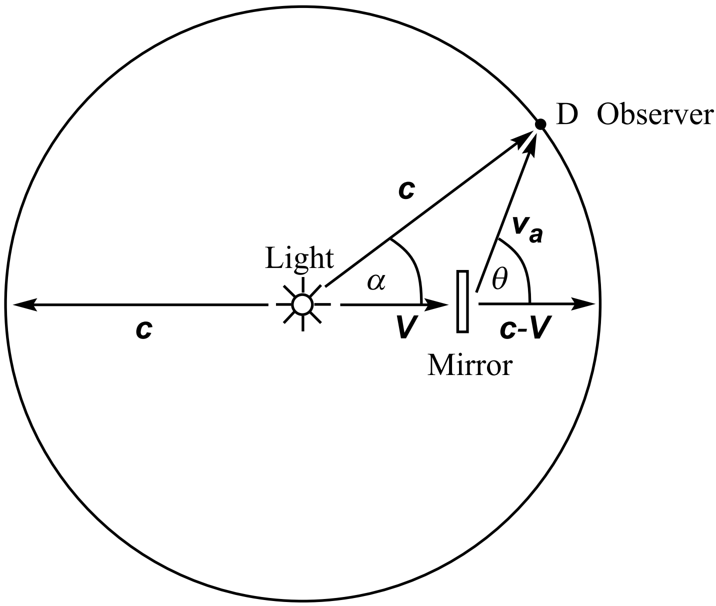


Figure 7.3 Polar diagram showing relative velocity $\boldsymbol{v_a}$ measured with respect to absolute time

which is moving away from the emission point.

Before we calculate absolute values for t_a and t_b we need to determine the absolute measurements of light's relative speed in all directions in the moving frame.

Imagine that you are the observer D moving at speed V through wisp space and your senses have been specially modified to work in absolute time, so that the time dilation effect is absent. You would measure the relative speed of light reflected from the moving mirror to vary depending on the angle θ and speed V.

Figure 7.3 shows the relative velocity of light $\boldsymbol{v_a}$ reflected off the moving mirror – as measured with absolute time. The rela-

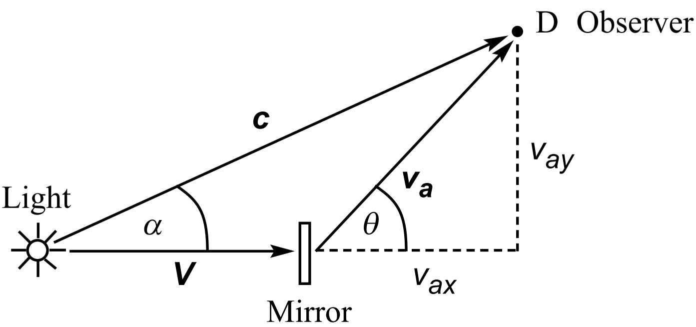


Figure 7.4 Relative velocity components with respect to absolute time

Equation set 7.3

Using Pythagoras' theorem

$$(V+v_{ax})^2 + v_{ay}{}^2 = c^2 \quad \text{and} \quad v_{ax}^2 + v_{ay}^2 = v_a{}^2$$

Substituting for v_{ay}^2 gives

$$v_a{}^2 + 2Vv_{ax} + (V^2 - c^2) = 0 \quad \text{but} \quad v_{ax} = v_a \cos\theta$$

and so

$$v_a{}^2 + 2v_a V \cos\theta + (V^2 - c^2) = 0$$

The positive root is given as

$$v_a = -V\cos\theta + \sqrt{c^2 - V^2 \sin^2\theta}$$

Equation set 7.4

Since $\cos\left(\dfrac{\pi}{2}+\theta\right) = -\sin\theta$

and $\sin\left(\dfrac{\pi}{2}+\theta\right) = \cos\theta$ we can write the formula as

$$v_b = V\sin\theta + \sqrt{c^2 - V^2\cos^2\theta}$$ and so

$$t_a = \frac{d\cos\theta}{-V\cos\theta + \sqrt{c^2 - V^2\sin^2\theta}}$$ and

$$t_b = \frac{d\sin\theta}{V\sin\theta + \sqrt{c^2 - V^2\cos^2\theta}}$$

tive speeds of light clearly differ from speed c, but do not be concerned with this.

We need to find an expression that shows v_a in terms of V, c and angle θ. Equation set 7.3 gives the formula.

Now, referring back to Figure 7.2, ADB is a right-angled triangle and so distance AD = $d \cos \theta$.

Now we just need to find t_a, and

t_a = AD / v_a measured in absolute time.

Similarly v_b (relative speed of light travelling from B to D, Figure 7.2) is found by substituting the angle ($\pi/2 + \theta$) and calculating the positive root (Equation set 7.4). This yields a larger value than v_a because the light has a component of its velocity in the opposite direction to $\boldsymbol{V}$.

Figure 7.4 and Equation set 7.3 shows more detail and the maths used to calculate the relative velocity of light.

We have now produced equations that enable us to calculate absolute time intervals for light's journey in fixed and moving frames. But before we consider how these times relate to an observer placed in a moving frame, we need to consider the effect of Einstein's time dilation.

7.6 Gamma factors

7.6.1 Time dilation: light-pulse clocks

Time is an abstract notion and as such does not exist as a physical substance, but we can use physical systems to measure its flow.

Einstein used a hypothetical 'light-pulse clock' to measure time in special relativity. He predicted the time dilation effect from studying the periodic motion of a pulse of light bouncing between two mirrors.

Time dilation is an expansion of the time interval measurement between ticks in a moving clock, which causes time in moving clocks to run slow.

Wisp relativity's postulate 3 states: The gamma factor γ is equal to the speed of light c, divided by an observer's absolute relative transverse light speed v_t. That is $\gamma = c / v_t$.

Our bodies are mechanical and so are affected by time dilation in the same way as moving mechanical clocks are. The mechanical time dilation effect on Earth just happens to be the same as Einstein's light-pulse clock. Everything (except longitudinal force) has its time slowed down by γ. Our senses, how-

Equation set 7.5

General gamma factor equation

$\theta =$ angle from the direction of V

$V =$ Observer's absolute velocity

$\gamma =$ Gamma factor

$$\gamma = \frac{c}{v_a}$$

$$\gamma = \frac{1}{-\frac{V}{c}\cos\theta + \sqrt{1 - \frac{V^2}{c^2}\sin^2\theta}}$$

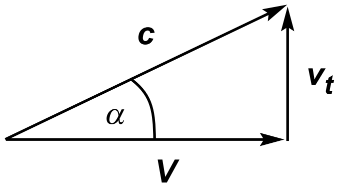
ever, are unaware of the effect – passing of time appears normal to us.

Equation set 7.5 shows the *general gamma factor equation*. It is important to understand the way matter-fractals move through wisp space: Their movements displace surrounding wisps at right angles to their directions of motion, and only their fractal shapes travel in their directions of motion through wisp space.

So the dilation effect experienced by all types of moving matter (including mechanical and atomic clocks) is due solely to right-angle motions, where angle $\theta = \pi/2$ radians.

Substituting this into the *general gamma factor equation* gives the gamma factor γ, which just happens to be the same formula as that used by Einstein for time dilation in moving clocks. Although Einstein derived time dilation using a different method and based on different postulates, the effect is the same.

Figure 7.5 shows a simple vector diagram used to calculate



$$v_t = \sqrt{c^2 - V^2}$$

$$\gamma = \frac{c}{v_t}$$

$$\gamma = \frac{1}{\sqrt{1-\frac{V^2}{c^2}}}$$

Figure 7.5 Gamma factor γ for $\theta = \pi/2$ radians

the gamma factor for matter moving through wisp space – due solely to right-angled motions of wisps. The relative transverse velocity of light is given as $\boldsymbol{v_t}$.

The time dilation effect measured on the Earth for high-speed subatomic particles is always that given by Einstein's formula (identical to wisp's formula for $\theta = \pi/2$).

An observer who travels in a craft moving at near light speed would be affected by Einstein's time dilation, but would also notice that the relative speed of light varied throughout the craft, creating visual illusion effects within the craft. This is because the relative speed of light is dependent upon the angle θ it makes with the craft's velocity $\boldsymbol{V}$.

7.6.2 Force reduction

Transverse force propagates at the speed of light and so is reduced by the factor γ. The force's substance does not diminish, only its effect near light speed diminishes.

Force reduction is one of two factors that slow time in moving mechanical clocks – the other factor is jiggle.

Force reduction and jiggle also affect moving gravitational and electromagnetic forces.

7.6.3 Jiggle

When matter-fractals move through wisp space, their zero-state spheres push wisp space apart, creating quantum waves patterns. These are transverse waves that cause wisps to oscillate in directions at right angles to the matter-fractals' directions of motion. At any point in wisp space the agitation or jiggle is the sum effect of all transverse waves passing that point. This produces random motions at points in wisp space and causes reduction of the transverse force by the factor γ.

Around any large body moving through wisp space the jiggle motions can be grouped into planes that are at right angles to the body's motion (Figure 7.6).

Jiggle has the effect of reducing the strength of the electric charge on a body moving through jiggle planes. This is equivalent to an effective increase in the value of ε_o – the electric constant or absolute permittivity of free space – by γ.

Similarly μ_o – the magnetic constant or permeability of free space – increases by γ.

The magnetic and electric fields of light move at right angles to its direction of motion. When light travels parallel to jiggle planes, one or both of these fields experience random fluctuations as they transverse through adjacent jiggle planes. This has a net effect of reducing the speed of light by γ (this is the cause of the famous null result of the Michelson–Morley experiment).

Light travelling at right angles to jiggle planes has magnetic and electric fields that move within the planes, and so jiggle motions are equally added and subtracted, producing no net change in the speed of light.

Charged particles that move through jiggle planes will experience a reduction in the strength of their electric charge in all directions of motion:

- Charged particles that travel parallel to jiggle planes displace their electric fields at right angles to their directions of motion. Their charge crosses into adjacent jiggle planes, which reduces its strength by the jiggle factor γ.

- Charged particles that travel at right angles to jiggle planes displace their electric fields within the planes. But the motions of the particles transfer the shape and structure of their electric fields across neighbouring jiggle planes, and so the jiggle motion effect is induced, again reducing the strength of the charge by the jiggle factor γ.

It is the motions of matter-fractals' zero-states spheres through wisp space that are responsible for creating jiggle motions. Since light is an electromagnetic wave, it does not possess a zero-state sphere, and so does not create jiggle motions.

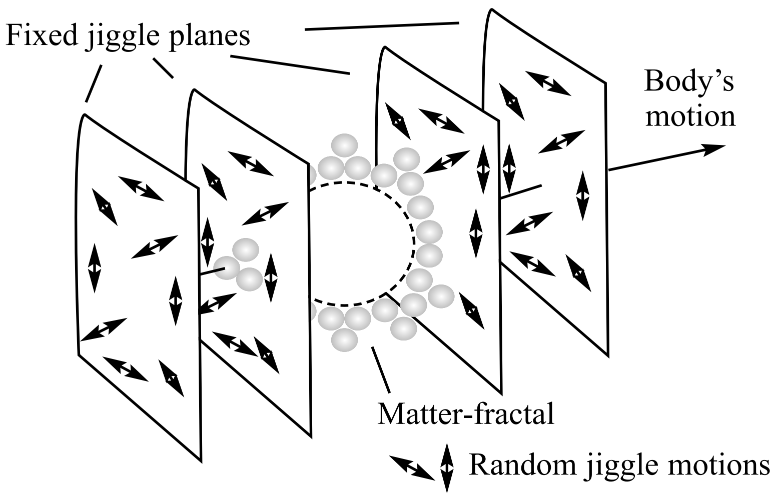


Figure 7.6 Matter-fractal's motion causes jiggle motions

Likewise forces propagate through wisp space without creating jiggle motions.

7.6.4 Time dilation: mechanical/biological clocks

Everything made from matter associates with mechanical clocks for measuring the passing of time – absolute or relative time.

A mechanical clock's internal components move at speeds much less that that of light, and so we can use classical equations to calculate its internal forces.

The rule for time flow in all material bodies is:

> *The strength of the transverse force operating within these bodies determines the rate at which time flows.*

In simple harmonic motion devices such as pendulums and masses on oscillating springs, periodic time intervals vary inversely proportional to the square root of the force – gravitational or spring respectively.

Bodies that move through jiggle planes are affected by both transverse force reduction and jiggle, which has the net effect of reducing the strength of the forces within the bodies by γ squared.

Equation set 7.6 gives an example that shows the time dilation effect in a simple mechanical clock.

The period of oscillation for simple harmonic devices therefore increases by γ. This just happens to produce the same time dilation effect that Einstein discovered.

Time dilation causes all physical processes that happen in moving frames to slow down. However, moving observers are unaware of its effects as their senses are automatically compen-

Equation set 7.6

Mechanical spring/mass clock (simple harmonic motion)

$T' =$ Relative period of oscillation (s)

$k' =$ Relative force per unit displacement (N/m)

$m' =$ Realative mass on "light" spring (kg)

$k' = \frac{k}{\gamma^2}$ (Force reduction and jiggle effect)

$F' = -k'x'$ Hooke's law – spring restoring force (N)

$F' = m'a'$ Newton's second law (N)

$$a' = -\frac{k'x'}{m'}$$

$$T' = 2\pi\sqrt{\frac{m'}{k'}} = 2\pi\gamma\sqrt{\frac{m}{k}} = \gamma T$$

$f' = \frac{1}{T'} = \frac{1}{\gamma T}$ Cycles per second

$$f' = \frac{f}{\gamma}$$

and so

$t' = \frac{t}{\gamma}$ Equation for time dilation

sated – see section 7.15.4 (Rules for time dilation compensation).

We now know that a physical process – force reduction and jiggle – causes time dilation, and that it is not an inherent property of time itself that results from Einstein's concept of space–time.

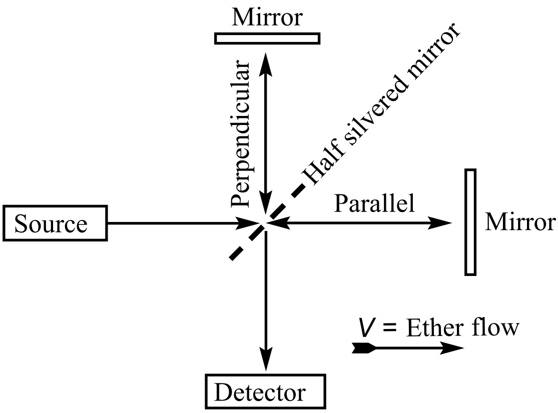


Figure 7.7 The Michelson interferometer

7.7 The Michelson–Morley experiment

Of the experiments designed to measure the speed of the Earth through the supposed luminiferous ether, the most famous was that performed by Michelson and Morley in 1887.

The Michelson interferometer (Figure 7.7) is mounted on a horizontal turntable so that it can be rotated relative to the motion of the ether stream.

Monochromatic (one wavelength) light is directed at a half-silvered mirror, which splits it into two beams. These travel in different directions, along and across the ether stream, and then recombine to interfere either constructively or destructively, producing a pattern of light and dark fringes.

According to classical physics, light should take different times to travel along the paths, and the time difference should show up as a shift in the observed interference pattern.

Even though the experiment was carried out with great accu-

Equation set 7.7

The Michelson – Morley experiment

$L =$ Mirror separation (m)

$T_{\leftrightarrow} =$ Parallel journey time (s)

$T_{\updownarrow} =$ Perpendicular journey time (s)

$\Delta T =$ Absolute time difference (s)

$\Delta T' =$ Relative time difference (s′)

$c =$ Absolute speed of light in one-state space (m/s)

$c' =$ Relative speed of light on the Earth's surface (m/s′)

$V =$ Speed of the Earth through wisp space (m/s)

$$\gamma = \frac{1}{\sqrt{1-\frac{V^2}{c^2}}} \quad \text{Gamma factor}$$

Without gamma effects a non-zero result is expected

$$\Delta T = T_{\leftrightarrow} - T_{\updownarrow} = \left(\frac{L}{c-V} + \frac{L}{c+V}\right) - \left(\frac{2L}{\sqrt{c^2 - V^2}}\right)$$

$$= \frac{2L/c}{(1-\frac{V^2}{c^2})} - \frac{2L/c}{\sqrt{1-\frac{V^2}{c^2}}} = \frac{2L\gamma^2}{c} - \frac{2L\gamma}{c}$$

With the jiggle effect – affecting perpendicular motions

$$\Delta T = \frac{2L\gamma^2}{c} - \frac{2L\gamma^2}{c} = 0$$

Compensating for time dilation on the Earth gives

$$\Delta T' = \frac{2L\gamma^2}{c'} - \frac{2L\gamma^2}{c'} = 0 \quad \text{or} \quad \Delta T' = \frac{2L\gamma}{c} - \frac{2L\gamma}{c} = 0$$

racy, and repeated with the apparatus rotated through 90°, the results were always the same – zero.

Possible explanations for this result are either that the Earth's motion through the ether cannot be detected by this method or that the supposed ether does not exist.

George Stokes provided a theory on ether drag as a possible solution. It predicted that null result would occur because somehow the Earth dragged the ether along with it.

Wisp theory does not support this notion, because wisps have mass, and the effect of dragging wisp space would increase the Earth's mass enormously. So we can clearly rule out this possibility.

Wisp theory holds the view that the Earth moves effortlessly through wisp space, because it is made of matter-fractals that are part of wisp space. The motion of the Earth (a large body of matter-fractals) through wisp space creates jiggle plane motions. This causes jiggle effect, which reduces the speed of light in directions at right angles to the Earth's direction of motion.

The Michelson interferometer fails to measure the Earth's motion through wisp space because the effect of jiggle cancels out the expected small time difference for light to travel along opposite paths.

Equation set 7.7 shows the equations for the experiment, which include the jiggle effect. Jiggle produces a zero result for all wisp space (ether) speeds.

It should also be noted that because of the effects of time and jiggle effect on the Earth's surface, light's measured speed is relative – see section 7.16 (Absolute speed of light).

7.7.1 One-way light speed test

Modern methods that calculate the speed of light by measuring its time along two or more paths are fundamentally flawed.

In the case of the Michelson–Morley experiment, the gain and loss in light's speed along the parallel arm exactly match that for the speed in the perpendicular arm, due to the jiggle effect. So scientist have wrongly assumed that the speed of light is constant in all directions.

Only by making accurate measurements along a single path (no mirrors) can the true relative speed of light on the Earth's surface be determined. But the motion of the Earth through wisp space and the effects of time and jiggle effect need to be taken into account before the absolute speed of light can be determined – see section 7.16 (Absolute speed of light).

A test to measure the speed of light one-way is as follows:

Two receiver/transmitter stations are placed on the equator a large distance apart, each contains a high-precision atomic clock and high-power laser.

At the moment the stations line up perpendicular to the Earth's orbit, their clocks synchronize by sending pulses of light to each other. Synchronization is possible because the relative speeds of light in perpendicular directions are equal.

Six hours later the stations will be parallel to the Earth's orbit, and each station can independently fire a pulse of light to the other, and separately measure the time light takes to travel one-way.

Wisp theory predicts that the motion of the Earth through wisp space affects the relative speed of light. By comparing one-way journey times, a non-zero difference will result. The difference in time recorded for journeys with and against the wisp space flow is $L \times 6.67\times10^{-13}$ seconds, where L is the distance separating the stations.

7.8 Kennedy-Thorndike experiment

In 1932, Roy Kennedy and Richard Thorndike performed a modified Michelson–Morley experiment, in which the lengths of the light paths were different.

The purpose of the experiment was to check the viability of the Lorentz-FitzGerald contraction proposal – a body moving through the ether contracts by γ in its direction of motion.

Tests carried out over several months found no evidence of contraction effects and the results were unaffected by the Earth's motion rotating the apparatus.

The length contraction proposed by special relativity applies to moving observer reference frames and not the frame in which the test apparatus resides.

Both wisp theory and special relativity predict equal values.

7.9 Stellar aberration

In 1725 James Bradley discovered stellar aberration: a yearly variation in the angular displacement of the position of stars. A combination of the motion of the Earth in its orbit and the speed of light cause this effect.

In 1728 Bradley measured the angular displacement α, and from it calculated the speed of light to within 5 per cent.

The angle α is approximately 20 arc seconds and is calculated using $\alpha = \arctan V/c$, where V is the speed of the Earth orbiting the Sun and c is the speed of light (Figure 7.8).

Early ether theories proposed that the speed of the ether relative to the Earth would affect the direction of light striking it. If the ether was dragged along by the Earth, the approaching light would be carried along with it and remain at the same approach angle and the aberration would be zero.

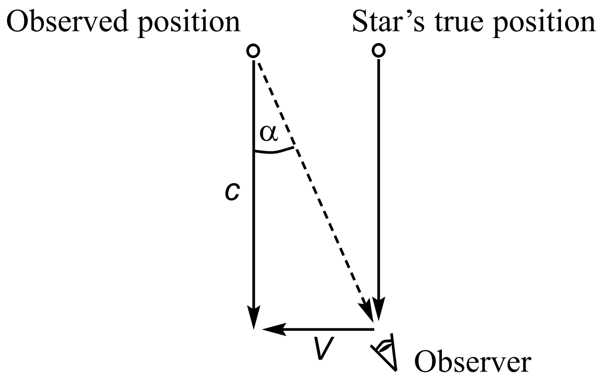


Figure 7.8 Stellar aberration

Wisp theory predicts that the speed of wisp space (ether) relative to the Earth will not change the direction light takes. If during its long journey, the light from the star passes through moving one-state space, its speed will alter slightly but not its direction.

The aberration angle is simply an optical effect that results from the addition of velocities. Both special relativity and wisp theory predict similar results.

7.10 Fizeau's experiment

In 1851 Armand Fizeau performed an experiment to measure the speed of light in moving water. The purpose of the experiment was to measure the value of the ether drag coefficient predicted earlier by Augustin Fresnel.

Both Fresnel and Einstein developed theories that correctly predicted the speed of light in moving water. Wisp theory uses their equations, but modifies them to conform to wisp theory's postulates.

The results (shown in Appendix B) suggest that the Earth's motion through wisp space cause a small, but constant offset, which increases previously predicted results by a factor of 1.000265.

Using sensitive measuring equipment it may be possible to detect this.

7.11 Wisp coordinate and frame velocity transformations

These allow us to take positions and times measured in one frame, S, and transform them to positions and times measured in another frame, S'.

In wisp theory, space and time are absolute, and so we use a variation of the transformations of classical physics developed by Galileo Galilei and Isaac Newton as a starting basis. However, we know that the effect of time dilation on particles moving through wisp space is real, so we must include Einstein's time dilation in moving frames.

Consider an event E_1 occurring at some point in space and time (Figure 7.9). To an observer placed at the origin of frame S – stationary in wisp space – the coordinates of the event are x_1, y_1, z_1, t_1.

A second observer is placed at the origin of moving frame S', which moves through wisp space at speed V in the direction of the x-axis. The axes of their frames remain parallel, and at time $t = 0$, both observers set their clocks to zero. The observer in frame S' records the event as x'_1, y'_1, z'_1, t'_1.

The measurements in stationary frame S are with respect to absolute space and time, while those in the moving frame S' include the time dilation effect. Both observers will agree on the location within wisp space of the event, but they will not

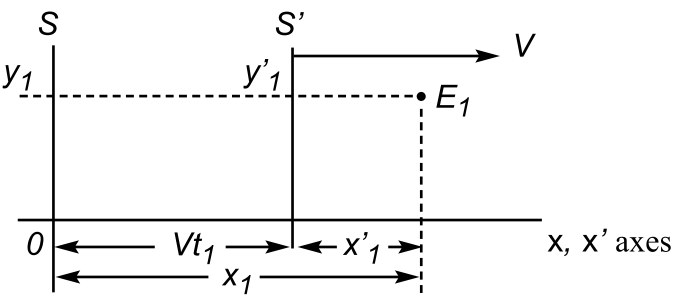


Figure 7.9 Frames recording event E_1 at times t_1 and t'_1

agree on the time at which the event occurred – unless the event occurred at $t = 0$.

Equation set 7.8 shows the wisp coordinate and frame transformations.

7.11.1 Wisp frame velocity transformation

A moving observer's time runs slow because of the effect of time dilation, and stationary observers are seen to approach or recede at faster speeds because of this.

Time has not changed for stationary observers; they see things according to Galilean relativity where time and space remain absolute.

An observer moving through wisp space at light speed divided by 'the square root of two', would see stationary observers approach or recede at the speed of light. If a moving observer's speed through wisp space were greater than this, they would see stationary observers approach or recede at speeds greater than light.

Of course light does not travel faster than speed c through wisp space, but the effect of time dilation on moving observers creates an optical illusion that it does.

Equation set 7.8

Wisp coordinate and frame velocity transformations

$$\gamma = \frac{1}{\sqrt{1 - \frac{V^2}{c^2}}}$$

$$x' = x - Vt$$

$$y' = y$$

$$z' = z$$

$$t' = \frac{t}{\gamma}$$

$$V' = \frac{dx'}{dt'} = \gamma \frac{dx'}{dt} = -V\gamma$$

Inverse coordinate and frame velocity transformations

$$\gamma' = \frac{1}{\gamma} = \frac{1}{\sqrt{1 + \frac{(V')^2}{c^2}}}$$

$$x = x' - V't'$$

$$y = y'$$

$$z = z'$$

$$t = \frac{t'}{\gamma'} = t'\gamma$$

$$V = \frac{dx}{dt} = \frac{1}{\gamma} \frac{dx}{dt'} = -V'\gamma'$$

7.12 Invariance of distance

Space is absolute and so all observers whether stationary or moving must agree on distance measurements between points in wisp space.

Wisp theory does not use the notion that moving objects shorten their lengths in their directions of motion relative to stationary observers – known as the Lorentz-FitzGerald contraction.

All observers in wisp space record the same locations and absolute times for events.

Observers in motion through wisp space will experience the time dilation effect and will unknowingly record measurements in relative time. By using wisp transformations we can convert relative measurements to absolute measurements.

7.13 Absolute simultaneity: events

In a stationary frame S a ball rolls across a table, which is 1 m wide, and the table moves at speed V along the positive x-axis (Figure 7.10).

At time $t = 0$, the ball is at the origin of the x-axis (we can think of this as event E_0) and it rolls across the surface of the table at relative speed u in the positive x-axis direction. The absolute speed of the ball is $V+u$. Let $u = 1$ m/s and $V = 0.6c$. After 1 second of absolute time, the ball reaches the end of the table and the event is recorded in absolute measurements as E_1, where

$$x_1 = (V+u)t = (0.6c + 1) \text{ m}$$
$$t_1 = 1\text{s}$$
$$(x_1 , t_1) = (0.6c + 1, 1).$$

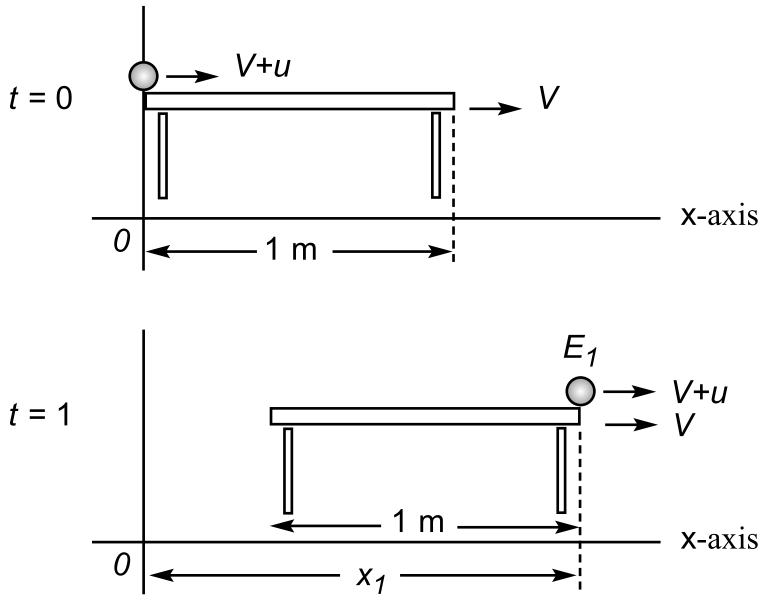


Figure 7.10 Frame S, ball rolling across table – absolute time

An observer moving with the table in frame S*’* (Figure 7.11) will be affected by time dilation, and consequently will record an increase in the speed at which the ball moves across the table. The ball travels faster by the factor γ, when measured using relative time. However, this relative speed increase is an illusion caused by time dilation, and all absolute measurements are unaffected.

The relative time t'_1 taken for the ball to move across the table is therefore shorter than the absolute time by the factor γ. However, the event is recorded as occurring at the same point in space and time when recorded by absolute clocks fixed throughout wisp space.

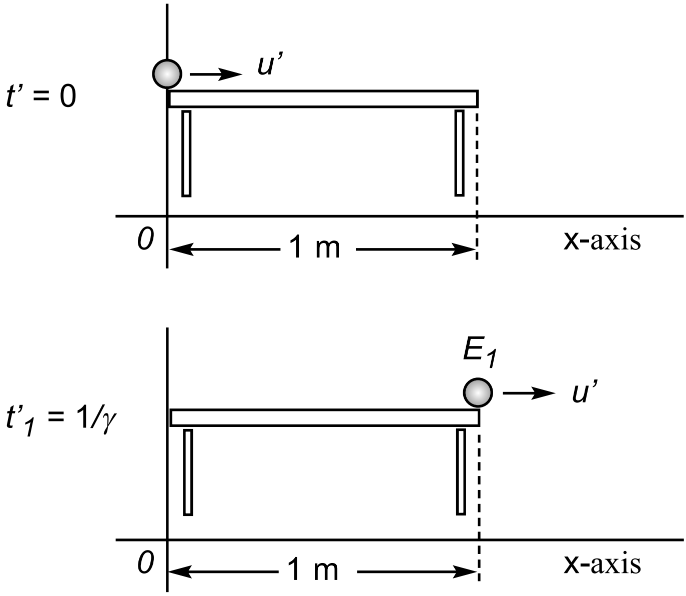


Figure 7.11 Frame S', ball rolling across table – relative time

The event calculates to the same values as before

$x_1 = (V'+u')t' = (V\gamma+u\gamma)t/\gamma = (0.6c + 1)$ m
$t_1 = t'_1\,\gamma = 1$ s
$(x_1\,,\,t_1) = (0.6c + 1, 1)$.

According to both stationary and moving observers, the events (E_0 and E_1) take place at the same points in wisp space and at the same absolute times. So wisp theory supports the concept of absolute simultaneity, whereas special relativity does not.

The effect of time dilation slows time for the moving observer who witnesses the event after a shorter period of relative time $1\gamma'$ or $1/\gamma$ seconds.

Of course being able to detect the motion of wisp space in the first place is essential to establishing a reference to absolute time, and hence be able to determine if the effect of time dilation applies to a particular frame.

Light speed measuring devices capable of measuring speeds one-way will make determining the motion through wisp space commonplace in the near future.

7.14 Mass invariance

In wisp theory, a particle does not gain mass as it speeds up, but it does increase its kinetic energy.

The supposed mass increase of subatomic particles moving at speeds close to light is in fact a quasi-mass increase caused by the effect of transverse force reduction.

Einstein's mass energy equivalence equation $E = mc^2$ suggests that energy and mass are interchangeable, and this is well proven. This does not result from a particle's mass increasing with speed, but is related to a process whereby particles' zero-state spheres join, expand or shrink during collisions – see section 10.2.1 (Energy into mass).

7.14.1 Relativistic mass increase: quasi-mass

It is a known fact that subatomic particles' masses appear to increase as they approach the speed of light.

The standard equation for mass increase is

$$m' = m_0\gamma, \qquad \text{where } \gamma = \frac{1}{\sqrt{1-\frac{V^2}{c^2}}}.$$

Where m' is the mass of the particle moving at relative speed V,

m_o is its rest mass, and c is the speed of light.

However, the numbers of wisps that make up a moving particle's matter-fractals have not increased, and so its real mass stays the same. The only possible explanation for the perceived mass increase is for the force acting on the particle to reduce in strength, because transverse force travels at the speed of light, and consequently it is not possible to accelerate a particle faster than that speed through wisp space.

As the speed of light is approached, the effect of the transverse force drop to zero, giving the impression that the particle's mass has increased. But in reality it has not, its mass stays the same. So we say that mass is invariant or

$$m' = m.$$

We conclude, that the perceived mass increase (quasi-mass) experienced by fast moving particles is due to the effect of the forces acting on it being reduced by the gamma factor γ.

7.14.2 Accelerating subatomic particles

A particle accelerator in a laboratory accelerates electrons (Figure 7.12).

Force-devices in the laboratory generate powerful magnetic and electric forces that act on the electrons, accelerating them along circular paths to near the speed of light.

The force-devices remain stationary with respect to the laboratory's frame and so stay fixed within the laboratory's perpendicular jiggle planes. So jiggle effect does not affect the forces generated in the laboratory – since positive and negative jiggle motions cancel out within the jiggle planes.

The figure shows the electric force lines F_e grouped into columns within the jiggle planes. For clarity, magnetic field

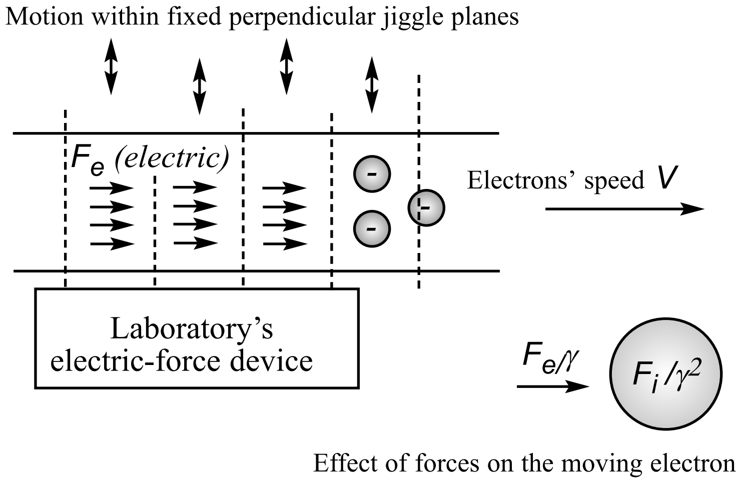


Figure 7.12 Forces on accelerating particles

lines are not shown, but they too would lie within the planes.

The laboratory's forces are unaffected by jiggle motions, but their effects are depleted near the speed of light, due to the effect of transverse force reduction. And so the electrons cannot accelerate past the speed of light. The quasi-mass effect is created as the electrons speed up, but in reality it is the force acting on them that diminishes.

Other importance effects occur due to the gamma factor for the moving electrons. Transverse force reduction occurs, because the electrons are moving at high-speed through wisp space. And also, because they move through the laboratory's perpendicular jiggle planes, they experience the jiggle effect.

As a consequence, the internal forces F_i within the moving electrons are reduced by γ squared, which cause their mechanical clocks to run slower by γ – see section 7.6.4 (Time dilation – mechanical/biological clocks).

7.14.3 Decelerating subatomic particles

If the electric force-device that had previously accelerated the electrons to near the speed of light were suddenly reversed, the energy needed to slow the electrons down would be exactly the same as that used to speed them up.

A 'reverse' force reduction process applies, which reduces the effect of the retarding force on particles moving at speeds close to the speed of light. The particles behave as though they have more mass (quasi-mass) and are harder to slow down, but this is not so.

7.15 Wisp accelerations and transformations

We examine the effects of acceleration in four ways.

1. Find the magnitudes of the relativistic forces that act on a charged particle accelerating in a circular particle accelerator.

2. Derive the acceleration transformations from the *wisp coordinate and frame velocity transformations (Section 7.11)* given earlier for a particle accelerating from rest through stationary wisp space.

3. Calculate – using classical dynamics – the absolute accelerations of a particle placed in a force-device, which is first stationary, and then moving. We take into account mass invariance, and the effects of force reduction and jiggle.

4. Examine the affect time dilation has on moving observers' perspectives for physical processes that take place in their local reference frames. We must apply the *rules for time dilation compensation (Section 7.15.4)* to these local processes to compensate for the effect that time dilation has on local observers.

7.15.1 Particle accelerator force magnitudes

Figure 7.12 shows a strong electric field accelerating charged particles in directions parallel to their motions. For simplicity the accelerator is at rest in wisp space.

The rate of change of a particle's relativistic momentum with respect to time is a measure of the effect that a force has on it. Equation set 7.9 shows wisp's interpretation of the standard equation for relativistic momentum.

Equation set 7.10 shows the calculations for determining the magnitudes of magnetic and electric forces that act on a charged particle moving in the stationary accelerator. Remember that in wisp theory a particle's mass m remains constant, while the effect of the force on it diminishes near the speed of light.

Figure 7.13 shows the effects that the two orthogonal forces

Equation set 7.9

Wisp's relativistic momentum

$$\gamma_{ua} = \frac{1}{\sqrt{1 - \frac{u_a^2}{c^2}}} \quad \text{Gamma factor}$$

$u_a =$ Absolute speed of particle (m/s)

$p = \gamma_{ua} m u_a$ Relativistic momentum

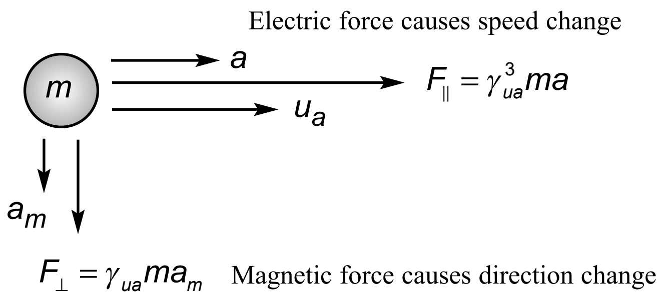


Figure 7.13 Particle accelerator forces

(parallel and perpendicular) have on a charged particle. The magnetic force causes it to accelerate by changing its direction of motion, causing it to follow a circular path (it plays no part in changing its speed) whereas the electric force alters its speed but not its direction.

The results confirm experimental finding that for equal measures of acceleration on a particle travelling near the speed of light, it takes a greater force to accelerate it in a linear direction than it does to keep it on a circular path.

7.15.2 Wisp acceleration transformations

Transformations couple measurements made in one reference frame to those in another. By using them it is possible to predict what observers in different frames will measure.

We compare a stationary observer's measurements made in absolute space and time (frame S) to a moving observer's relative measurements (frame S'). (We do not apply the *rules for time dilation compensation (Section 7.15.4)* to transformation equations, because the equations couple events that are non-local.)

A force-device at rest in absolute frame S accelerates a parti-

Equation set 7.10

Forces on a particle in the particle accelerator (frame S)

$$F = \frac{dp}{dt} = \frac{d}{dt}(\gamma_{ua} m u_a) \quad \text{Relativistic force (N)}$$

$$F = \gamma_{ua} u_a \frac{dm}{dt} + \gamma_{ua} m \frac{du_a}{dt} + m u_a \frac{d\gamma_{ua}}{dt}$$

A moving particle's mass is invariant, so $\frac{dm}{dt} = 0$

So the centripetal magnetic force component is

$$F_{\perp} = \gamma_{ua} m \frac{du_a}{dt} + m u_a \frac{d\gamma_{ua}}{dt}$$

and since magnetic force does not speed up the particle

$\frac{d\gamma_{ua}}{dt} = 0,$ and so

$$F_{\perp} = \gamma_{ua} m \frac{du_a}{dt} = \gamma_{ua} m a_m$$

The electric force component is

$$F_{\parallel} = \gamma_{ua} m \frac{du_a}{dt} + m u_a \frac{d\gamma_{ua}}{dt}$$

But now γ_{ua} varies as the particle speeds up, so

$$F_{\parallel} = \frac{m}{(1-\frac{u_a^2}{c^2})^{\frac{1}{2}}} \frac{du_a}{dt} + \frac{m}{(1-\frac{u_a^2}{c^2})^{\frac{3}{2}}} \frac{u_a}{c^2} \frac{du_a}{dt}$$

$$F_{\parallel} = \frac{m}{(1-\frac{u_a^2}{c^2})^{\frac{1}{2}}} a + \frac{m}{(1-\frac{u_a^2}{c^2})^{\frac{3}{2}}} \frac{u_a^2}{c^2} a = \frac{m}{(1-\frac{u_a^2}{c^2})^{\frac{3}{2}}} a$$

$$F_{\parallel} = \gamma_{ua}^3 m a$$

cle in the + x direction with acceleration a. At time $t = 0$ the particle is at rest at the origin, and so its initial speed is zero, $u_o = 0$.

A second observer moves at speed V along the + x direction (frame S'). Time measurements in both frames start at the moment their origins coincide.

The acceleration transformations are given in Equation set 7.11 and they show that $a' = a\gamma^2$. In other words a moving observer sees an accelerating body in frame S accelerate at a faster rate by a factor of γ squared.

The effect of time dilation in a moving frame S' creates the illusion of increased acceleration for a body accelerating in the stationary frame S. This is because the force-device causing the acceleration operates in the stationary frame S and is unaffected by dilation or reduction effects (its forces remain strong).

Moving observers' clocks run slow, but they are unaware of this because their body clocks also slow down.

If moving observers wished to determine the absolute accelerations of bodies, they first need to determine their own absolute speeds through wisp space. Only then would they be able to determine true absolute values for accelerations.

7.15.3 Motion produced by a force-device in absolute frame S

A force-device remains fixed in absolute frame S (Figure 7.14) and produces a force F_1 that acts on a small particle of mass m.

The particle accelerates through a distance h, reaching a maximum speed u_1. (This speed is negligible when compared to the speed of light, and so we can ignore $\gamma_{\upsilon 1}$ gamma effects.)

The device is representative of a mechanical/biological clock, to which we can synchronize our body clocks. A series of particles singularly pass through the device, each represent-

Equation set 7.11

Wisp velocity and acceleration transformations

$$\gamma = \frac{1}{\sqrt{1-\frac{V^2}{c^2}}}$$

$$\delta t = \gamma \delta t'$$

$$x' = \frac{at^2}{2} + u_0 t - Vt$$

$$u' = \frac{dx'}{dt'} = \gamma \frac{dx'}{dt} = \gamma \frac{d}{dt}(\frac{at^2}{2} + u_0 t - Vt)$$

$$u' = \gamma(at + u_0 - V)$$

$$a' = \frac{du'}{dt'} = \gamma \frac{du'}{dt} = \gamma^2 \frac{d}{dt}(at + u_0 - V)$$

$$a' = \gamma^2 a$$

Inverse acceleration transformations

$$\gamma' = \frac{1}{\gamma} = \frac{1}{\sqrt{1+\frac{(V')^2}{c^2}}}$$

$$x = \frac{a'(t')^2}{2} - V't'$$

$$u = \frac{dx}{dt} = \frac{1}{\gamma}\frac{dx}{dt'} = \frac{1}{\gamma}(a't' + u_0' - V') = \gamma'(a't' + u_0' - V')$$

$$a = \frac{du}{dt} = \frac{1}{\gamma}\frac{du}{dt'} = \frac{1}{\gamma^2}\frac{d}{dt'}(a't' + u_0' - V') = \frac{1}{\gamma^2}a'$$

$$a = (\gamma')^2 a'$$

ing one beat of our body clocks – say one second.

We can also infer that the beat of this clock is proportional to the speed at which our brains process information and it determines our sense of the flow of time.

The motion of particles in the device is in accordance with classical dynamics, and because the device is stationary in wisp space, relativistic effects are ignored (Equation set 7.12).

7.15.3.1 *Motion produced by a force-device moving in frame S*

A force-device moves through absolute wisp space (frame S) at speed V, and so is subject to the effects of force reduction and jiggle.

In frame S, a stationary observer records absolute measurements of the motions of the particles in the moving force-device. Applying the *rules for time dilation compensation (Section 7.15.4)* to the stationary observer has no effect on the absolute measurements recorded.

The observer notices that the time the particles spend in the moving force-device is now longer than if it were stationary. This is because the effects of force reduction and jiggle physically reduce the effectiveness of forces that operate within the device, causing the particles to accelerate more slowly.

The relative motion of the particle to the force-device is u_2, which is negligible when compared with the speed of light, and so we can ignore additional relativistic effects. However, the speed at which the force-device moves through wisp space could be significant and so we must take into account the effects of force reduction and jiggle acting on the force-device. They reduce the strength of the force F_2 operating within the device, so the classical dynamics equations used earlier need modifying accordingly (Equation set 7.13). All measurements are absolute.

Absolute time beat – one second

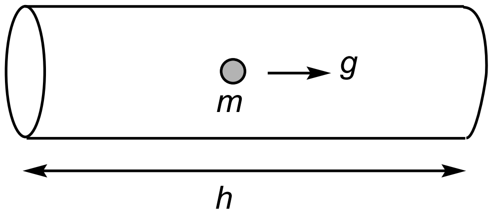


Figure 7.14 Force-device – mechanical clock

Equation set 7.12

Classical dynamics equations for a force-device operated at rest in stationary frame S

We ignore the γ_{u1} dilaton factor, as $u_1 << c$

$x = \frac{1}{2}gt^2$	Displacement of particle from origin
$u_1 = \sqrt{2gh}$	Maximum speed of particle
$a_1 = \frac{F_1}{m} = g$	Acceleration of particle in force-device
$t_1 = \sqrt{\frac{2h}{g}}$	Time travelling in force-device
$\Delta E_1 = \frac{1}{2}mu_1^2$	Change in classical kinetic energy
$\Delta p_1 = mu_1$	Change in classical momentum
$F_1 t_1 = mgt_1$	Classical impulse given to particle

If the moving force-device slows its beat by a factor of two, then for two beats of an absolute clock, the moving clock would beat once when measured in absolute time.

Now if we substitute our bodies in place of the force-device, our body clocks would run at half speed in absolute time. But we would be unaware of this fact, because our senses would slow down and time would appear to run at normal speed.

Jiggle and force reduction affect all physical processes that take place on the Earth as it moves through wisp space. But our senses automatically compensate for the effects of time dilation (caused by force reduction and jiggle), which cancels out our awareness of its slowing effect on physical processes that surround us.

Consequently we must apply *rules for time dilation compensation (Section 7.15.4)* to simulate the actions of our senses when confronted with time dilation effects. And we will find that physical systems that move through wisp space behave in the same way as ones that are stationary.

Before testing this out on the moving force-device we will look at the *rules for time dilation compensation.*

7.15.4 Rules for time dilation compensation

Moving observers' body clocks slow in the same manner as moving mechanical clocks do, and so they are unaware of the effect of time dilation. Without their knowledge the *rules for time dilation compensation* (Equation set 7.14) are automatically applied, and any measurements they make are with reference to relative time.

To compensate for observers' time slowing, we must apply the *rules for time dilation compensation* to all physical processes that are 'local' to their moving reference frames.

The next example will demonstrate this.

Equation set 7.13
Classical dynamics equations for a force-device moving with respect to absolute frame S

The force-device moves at speed *V*

$$\gamma^2 = \frac{1}{1-\frac{V^2}{c^2}}$$ Force-device dilation (force and jiggle)

We ignore the γ_{u2} dilaton factor, as $u_2 << c$

$$a_2 = \frac{F_2}{m} = \frac{F_1}{m\gamma^2} = \frac{g}{\gamma^2}$$ Absolute acceleration

$$x = Vt + \frac{a_2 t^2}{2} = Vt + \frac{gt^2}{2\gamma^2}$$ Displacement from fixed origin

$$u_2 = V + \sqrt{\frac{2ah}{\gamma^2}} = V + \frac{u_1}{\gamma}$$ Absolute maximum speed

$$t_2 = \sqrt{\frac{2\gamma^2 h}{g}} = \gamma t_1$$ Absolute time in force-device

$$\Delta E_2 = \frac{\Delta E_1}{\gamma^2}$$ Δ Classical KE due to force-device

$$\Delta p_2 = \frac{\Delta p_1}{\gamma}$$ Δ Classical momentum due to force-device

$$F_2 t_2 = \frac{F_1 t_1}{\gamma}$$ Classical impulse given to particle

7.15.4.1 *Motion produced by a moving force-device with respect to frame S'*

An observer travels with a moving force-device and is unaware of its motion through wisp space. In the observer's frame S*'* the force-device appears stationary.

A stationary wisp space observer in frame S sees the force-device moving and sends the moving observer information about its absolute measurements (Equation set 7.13). The moving observer then applies the *rules for time dilation compensation* (Equation set 7.14) to the absolute measurements, which converts them into relative ones.

Equation set 7.15 shows the compensated data. The moving observer's predicted measurements are shown primed. (Square brackets [ ] are used to identify time dilation compensation terms.)

The moving observer then carries out local measurements on the motions of particles in the force-device, and discovers that the measurements agree with those predicted. All timings, accelerations, speeds, energy and momentum increases are identical. Both observers find that their force-devices operate identically in their local reference frames according to known laws of physics.

If they were unaware of the motion of wisp space they each would wrongly conclude that the laws of physics were the same in all inertial frames (special relativity's postulate 1).

Sceptical of the findings, the moving observer asks for confirmation about the truth of the absolute measurements supplied. And both observers agree to watch each other as they repeat their experiments.

The stationary observer in frame S sees the moving observer's force-device operate more slowly. And the moving observer in frame S*'* – although witnessing normal operations locally

Equation set 7.14
Rules for time dilation compensation for observers
Compensation terms are shown in [ ]

$x' = x$ No change to distances

$u' = [\gamma]u$ Absolute speeds are increased by γ

$a' = [\gamma^2]a$ Absolute accelerations are increased by γ^2

$F' = [\gamma^2]F$ All absolute forces are increased by γ^2

$\delta t' = \dfrac{\delta t}{[\gamma]}$ Absolute time intervals are reduced by γ

$\Delta E' = [\gamma^2]\Delta E$ Δ Kinetic energy value is increased by γ^2

$\Delta p' = [\gamma]\Delta p$ Δ Momentum is increased by γ

$F'\delta t' = [\gamma]F\delta t$ Force-device impulse is increased by γ

– notices that the force-device in frame S appears to be working more quickly.

The moving observer finally accepts that time dilation, coupled with the effects of force reduction and jiggle, is the reason why both sets of local measurements appear identical.

Equation set 7.15

Predicted relative measurements for a moving observer

$a' = [\gamma^2]\frac{g}{\gamma^2} = a$ Relative acceleration of body

$x' = \frac{a't'^2}{2} = \frac{at^2}{2} = x_2$ Displacement from moving origin

$u_2' = [\gamma]\sqrt{\frac{2ah}{\gamma^2}} = u_1$ Relative final speed of body wrt S′

$t_2' = \left[\frac{1}{\gamma}\right]\sqrt{\frac{2\gamma^2 h}{a}} = t_1$ Relative time spent in force-device

$\Delta E_2' = [\gamma^2]\frac{\Delta E_1}{\gamma^2} = \Delta E_1$ Change in classical KE wrt S′

$\Delta p_2' = [\gamma]\frac{\Delta p_1}{\gamma} = \Delta p_1$ Change in classical momentum

$F_2' t_2 = \frac{F[\gamma]t_1}{\gamma} = F_1 t_1$ Classical impulse from force-device

Force-device operated in frame S′

Force reduction, jiggle and time dilation effects apply

Observer in frame S′ sees

$a' = a$ Acceleration of body

$v' = v$ Final speed of body

$t' = t$ Time travelling in force-device

$\Delta E' = \Delta E$ Change in KE of body due to force-device

$\Delta p' = \Delta p$ Change in momentum due to force-device

$F't' = Ft$ Impulse received from force-device

7.16 Absolute speed of light

The speed of light measured on Earth in a vacuum is 299,792,458 m/s. Although this value does not take into account the effects of time dilation caused by the motion of the Earth through wisp space, it does give the correct value - this measurement is based on two-way speed of light experiments.

Light's two-way speed on Earth is slowed by gamma due to a combination of jiggle effect and c+/-V summing. However, by making two-way speed of light measurements in relative time the slowing effect is cancelled out by time dilation.

Equation set 7.16 shows that the true absolute value for the speed of light is c, even though the average speed of light in two directions is slower than this on the Earth.

Equation set 7.16

Absolute speed of light through one-state space

$c' = 299792458$ m/s Measured two-way light speed

$V = 370000$ m/s Earth's speed through wisp space

$$\gamma \simeq \frac{1}{\sqrt{1-\frac{V^2}{(c')^2}}}$$

$$c = \frac{c'}{\gamma} \text{ x gamma}$$ Absolute speed of light

So the absolute speed of light remains the same

$c = 299792458$ m/s

7.17 Earth's absolute and relative times

The effect of time dilation causes all clocks on the Earth to run slow by 762 ns each second. This happens because the clocks on the Earth measure relative time, which runs slower than absolute time.

A time interval of 1.0 second measured on the surface of the Earth would correspond to 1.000000762 seconds in absolute time (Equation set 7.17).

Equation set 7.17

Absolute time measure

$t' = 1.0$ second Relative time measurement on Earth

$V = 370000$ m/s Earth's speed through wisp space

$$\gamma \simeq \frac{1}{\sqrt{1-\frac{V^2}{(c')^2}}}$$

$$t' = \frac{t}{\gamma}$$

$t =$ 1.000000762 seconds Absolute time measure

8

Wisp and Special Relativity: Electrodynamics

8.1 Electrodynamics of moving bodies

Inertial reference frames that move through wisp space do so with respect to absolute frames in which the wisps are stationary. And so we cannot simply switch between stationary and moving frames and expect all laws of physics to be the same.

For example, in stationary frame S an electron moves and generates a magnetic field by rotating its electric field pattern in the surrounding wisp space. So we know that the physical effect of pattern rotation does occur in wisp space.

Now consider yourself moving with the electron (frame S′). From a purely relativistic viewpoint, special relativity would argue that because the electron is stationary in frame S′ no magnetic field exists, and any force that results must be purely electrostatic in origin. Indeed, Einstein successfully used this argument in special relativity to explain the Lorentz force law. But here, the two frames differ only by a uniform linear boost – linear velocity translation – and so we cannot simply say that patterns in wisp space have stopped rotating.

However, we can show that relativistic effects in moving frames can make some physical laws behave in ways that are indistinguishable from those in an absolute rest frame.

First we look at the total electromagnetic force **F** acting on a charge q, with velocity **v**, moving in electric and magnetic fields **E** and **B**, as given by the Lorentz force law

$$\mathbf{F} = q(\mathbf{E} + \mathbf{v}\mathbf{x}\mathbf{B}) \quad \text{Lorentz force law}$$

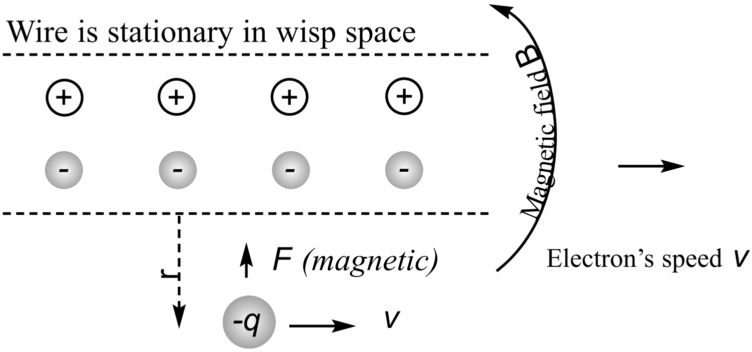


Figure 8.1 Electromagnetic force (absolute) in frame S

Equation set 8.1

Force on a charge due to current in the stationary wire

$N =$ Charge carriers per unit wire length (1/m)

$-e =$ Electron charge (C)

$-q =$ Charge on moving particle (C)

$\mu_0 =$ Permeability of free space (kg m / C^2)

$B =$ Strength of magnetic field around wire (T)

$v =$ Speed of electrons and moving charge (m/s)

$r =$ Distance of charged particle from wire (m)

$c =$ Speed of light in one-state space (m/s)

$I = -Nev$ Current in wire (A)

$B = \dfrac{\mu_0 I}{2\pi r}$ Magnetic field strength (T)

$F = -qvB$ Magnetic force on charged particle (N)

$$F = \frac{\mu_0 q N e v^2}{2\pi r}$$

8.2 Force measurements in different frames

We will calculate the electromagnetic force exerted on a particle with charge *-q* by electrons moving in a wire.

The force will be calculated by stationary and moving observers, first with the wire at rest in absolute wisp space, and then with the wire and observer moving.

Results will show that the magnitude of the force is the same in all reference frames, regardless of whether the wire is moving or stationary in wisp space.

Twentieth-century scientists thought that the properties of ether could not produce equal forces in all frames and so could not support the Lorentz force law. Einstein held this view when he developed special relativity.

But it is not necessary to dismiss the concept of ether to explain the Lorentz force law. As we will now discover, wisp theory shows that the effects of the force are the same in all reference frames.

8.2.1 Electromagnetic force in absolute frame S

A wire at rest in absolute frame S carries a current of electrons, which generate a rotating magnetic field *B* (Figure 8.1).

The wire has no electrostatic surface charge, because positive ions within the wire neutralize the negative charge on the moving electrons.

A charge *-q* moves parallel to the wire in the direction of the electron current, and experiences an attractive force *F*.

Equation set 8.1 shows the equations for calculating the magnitude of the magnetic force. Calculations show that the wire's magnetic field attracts the moving negative charge towards it.

Since the wire is electrically neutral it experiences no electric

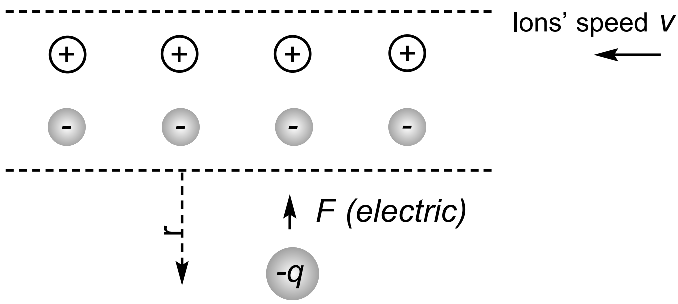


Figure 8.2 Electromagnetic force (relative) in frame S′

force and the force of attraction must be solely magnetic. The measurements made are absolute because the wire and observer are stationary in wisp space, and so the effect of time dilation is absent.

8.2.2 Electromagnetic force in moving frame S′

Now consider the same events as seen by an observer moving with the charged particle (frame S′). In this frame the electrons and the charged particle appear 'at rest'. So we will hypothesize that the charged particle does not experience any magnetic force, since it is 'at rest' (Figure 8.2). (In reality magnetic fields are still present, although to the moving observer in frame S′ they would go undetected.)

The purpose of this example is to demonstrate – from wisp theory's viewpoint – how Einstein came to discover that the electric and magnetic effects are the same thing, but appear different to observers in relative motion. What one observer considers electric another may consider magnetic, and vice versa.

But even though the observer in frame S′ does not detect a magnetic effect, nevertheless it is still present (pattern rotations

Equation set 8.2

Electric force in the moving observer's frame S'

$\left[\gamma^2\right] =$ Rules for time dilation compensation

$N =$ Charge carriers per unit wire length (1/m)

$e =$ Ion charge (C)

$-q' =$ Charge on stationary (wrt S') particle (C)

$\varepsilon_0 =$ Permittivity of free space (C^2 / (Nm^2))

$\lambda' =$ Linear charge density (C/m)

$v =$ Speed of ions (m/s)

$r =$ Distance of charged particle from wire (m)

$\gamma =$ Dilation factor

$c =$ Speed of light in one-state space (m/s)

$$\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$$

$$\lambda' = Ne(1-\frac{1}{\gamma^2}) = \frac{Nev^2}{c^2}$$ Linear charge density (C/m)

$$E' = \frac{\lambda'}{2\pi\varepsilon_0 r}$$ Electric field around wire (N/C)

$$F' = -q'E'\left[\gamma^2\right]$$ Electric force on charged particle (N)

$$-q' = \frac{-q}{\gamma^2}$$ Charge reduced by force reduction & jiggle

$$F' = -\frac{Neqv^2\left[\gamma^2\right]}{2\pi\varepsilon_0 rc^2\gamma^2} = -\frac{Neqv^2}{2\pi\varepsilon_0 rc^2}$$ Relative force

through wisp space cannot simply be cancelled out through relative concepts), and manifests itself as a change in electric charge. Equation set 8.2 shows the calculations used to measure the magnitude of the relative electric force in frame S*'*.

The positive ions are now in 'motion' with respect to the 'stationary' electrons. In reality the effects of force reduction and jiggle are present, which reduce all negative charges by γ squared. And the positive ions are really at rest in absolute wisp space and so remain at full strength. This produces the charge strength term ($1-1/\gamma^2$) in the linear charge density equation.

We first expressed the moving observer's force in absolute terms, and then applied the *rules for time dilation compensation*, which convert the absolute measurements into relative ones (moving observers' measurements are always relative).

The calculations show that the wire acquires a net positive electrostatic charge, which acts on the charged particle.

All things being taken into account, we find that a force originating from a magnetic field in one frame compares equally to an electric force in another frame (Equation set 8.3).

Earlier I stated that you cannot simple switch between frames that are absolute and ones that move, and expect there to be no physical changes. In this instance physical changes have taken place – the effectiveness of the negative charges have been reduced by the force reduction and jiggle. However, the moving observer is unaware of any changes as the application of time dilation compensation masks them.

Only by knowing their absolute motions through wisp space can observers determine the true effects of force, jiggle, and time dilations. But even with this knowledge, they will not notice the gamma effects and will measure identical forces in all inertial frames.

However, tests will soon be able to demonstrate the existence

Equation set 8.3

Force magnitudes in reference frames S′ and S

$$F' = \frac{N|e||q|v^2}{2\pi\varepsilon_0 rc^2}$$ Magnitude of the electric force in S′

$$F = \frac{\mu_0|q|N|e|v^2}{2\pi r}$$ Magnitude of the magnetic force in S

By replacing $\frac{1}{\varepsilon_0 c^2}$ with μ_0

we have

$$F' = \frac{\mu_0 N|e||q|v^2}{2\pi r}$$

and so the magnitudes of the forces are equal

$$F' = F$$

of motion through wisp space.

Finally, we calculate the magnitude of the force when both the wire and the observer are moving through wisp space. The gamma effects will be more complex, but the magnitude of the force measured by the observer will be the same as if the wire were stationary.

8.2.3 Electric force on wire moving through wisp space

The wire moves through wisp space at absolute speed V_W. The positive ions, electrons and the negatively charged particle all have their speeds equally increased.

An observer moves with the negative charges (frame S″). We

Equation set 8.4

Electric force in the moving observer's frame S″

The observer moves with the electrons, which are moving faster than the wire through wisp space

$v_w =$ Speed of wire and ions through wisp space (m/s)

$v_{ep} =$ Absolute speed of negative charges wrt wire (m/s)

$v_{ea} = v_w + v_{ep}$ Absolute speed of negative charges (m/s)

$v''_{ep} = v_{ep}\gamma_{ea}$ Relative speed of positive ions (m/s″)

$$\gamma_{ea} = \frac{1}{\sqrt{1-\frac{v_{ea}^2}{c^2}}} \quad \text{Gamma factor for moving observer}$$

$\gamma''_{ep} =$ Inverse gamma for ions wrt electrons in frame S″

$$\gamma''_{ep} = \frac{1}{\sqrt{1+\frac{v''^{\,2}_{ep}}{c^2}}} = \frac{1}{\sqrt{1+\frac{(v_{ep}\gamma_{ea})^2}{c^2}}} \quad \text{Inverse gamma}$$

$$F'' = \left[\gamma_{ea}^2\right]\frac{N}{2\pi\varepsilon_0 r}e\left(\frac{1}{\gamma_{ea}^2\gamma''^{\,2}_{ep}} - \frac{1}{\gamma_{ea}^2}\right)\left(\frac{-q}{\gamma_{ea}^2}\right) \quad \text{Electric force}$$

$$F'' = -\frac{Neq}{2\pi\varepsilon_0 r\gamma_{ea}^2}\left(\frac{1}{\gamma''^{\,2}_{ep}} - 1\right)$$

$$F'' = -\frac{Neq}{2\pi\varepsilon_0 r\gamma_{ea}^2}\left(1+\frac{(v_{ep}\gamma_{ea})^2}{c^2} - 1\right) = -\frac{Neqv_{ep}^{\,2}}{2\pi\varepsilon_0 rc^2}$$

and so

$|F''| = |F'| = |F|$ Force magnitude are equal in all frames hypothesize that the effect of the magnetic force in this frame is zero. Equation set 8.4 shows the equations for calculating the magnitude of the electric force.

The effects of force reduction and jiggle apply to all moving charges, but because the positive ions are moving slower than the electrons through wisp space, their gamma effects are smaller.

All charges reduce by γ_{ea} squared because of the effects of force reduction and jiggle. But because the positive ions move slower we must compensate their reduction effects. By dividing their charge by the inverse gamma (γ''_{ep} squared) we increase their effective charge strength.

We multiply the whole equation by γ_{ea} squared (*rules for time dilation compensation*).

After time dilation compensation is taken into account, we find that the magnitude of the force of attraction between the moving negatively charged particle and the wire is the same as that found earlier in frames S' and S.

8.3 Ether re-established

We have proven that all observers measure electromagnetic forces as having the same magnitude in all inertial frames, and so wisp theory proves that the Lorentz force law is valid in an ether medium – wisp space. And so it is not necessary to use Einstein's concepts of space–time to explain this.

There can be no doubt that the ether is responsible for the effects of the electromagnetic force.

9

Wisp and Special Relativity: Doppler Effect

9.1 The Doppler effect of light

The Doppler effect of light occurs when an observer moves relative to a light source, causing an increase or decrease – Doppler shift – in the frequency observed.

Special relativity appears to predict the correct Doppler effect in all cases, and this is one of its most common applications.

Scientist believe that the presence of an ether medium would cause Doppler effects that would be different to those predicted by special relativity. For example, the Doppler equations for sound and water waves – which both propagate in mediums – are completely different to those of light. So one could assume that light does not propagate in a medium, as is the case with special relativity.

However, wisp theory attributes the Doppler effect of light to motion through an absolute ether medium – wisp space, and so differs dramatically from special relativity.

The frequency predictions of wisp theory and special relativity agree almost exactly in every detail except one – a predicted increase in frequency as opposed to a decrease for a moving observer's transverse Doppler shift.

We will examine Doppler effect case by case and make comparisons with special relativity's predictions. And we use the results obtained to develop a single general Doppler equation for wisp theory.

We will find that if we limit an observer's motion through absolute wisp space to zero then the equation reduces to that of special relativity's.

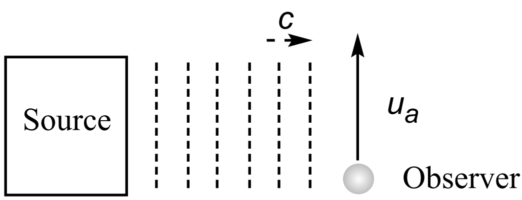


Figure 9.1 Transverse Doppler effect

Equation set 9.1

Transverse Doppler effect –

moving observer and stationary source

$u_a =$ Observer's absolute transverse speed (m/s)

$c =$ Absolute speed of light (m/s)

$\lambda_0 =$ Wavelength of light from stationary source (m)

$$[\gamma_{obs}] = \frac{1}{\sqrt{1 - \frac{u_a^2}{c^2}}}$$ Observer's gamma factor

$$f_s = \frac{c}{\lambda_0}$$ Frequency of stationary source (Hz)

$$c' = [\gamma_{obs}]c$$ Observer's relative light speed (m/s′)

$$f'_{obs} = \frac{c'}{\lambda_0} = [\gamma_{obs}]f_s$$ Observer's relative frequency (Hz′)

For special relativity the same measurement is

$$f' = \frac{f_s}{\gamma}$$

9.1.1 Light source device

A stationary electronic device emits light, which travels at speed c through one-state space. It has wavelength λ_o, and frequency f_o. The period ΔT of the electrical oscillations within the device determines the frequency of the light emitted.

When the device moves through wisp space, time dilation affects its period of oscillation, increasing it by γ, which in turn reduces the frequency of the light emitted.

9.2 Doppler effect

9.2.1 Doppler effect: transverse observer motion

We apply wisp's postulates to determine the Doppler effect for an observer moving at right angles to a wide stationary light source (Figure 9.1).

The wavelength of light emitted from the source has the same length in all reference frames – length invariance. And an observer measures the frequency of light by dividing its relative speed by its wavelength.

The observer is moving at right angles to light's motion, and so no relative displacement takes place in the direction of light, and light's relative speed (measured in absolute time) remains at c. But the moving observer experiences time dilation, and so we apply the *rules for time dilation compensation (Section 7.15.4)*. This increases the observer's relative speed of light by γ, which results in an observed increase in frequency.

The value predicted for the observed relative frequency is greater than that of the source (Equation set 9.1).

Wisp theory and special relativity agree on the size of the frequency change, but disagree on its sign. Wisp theory predicts a

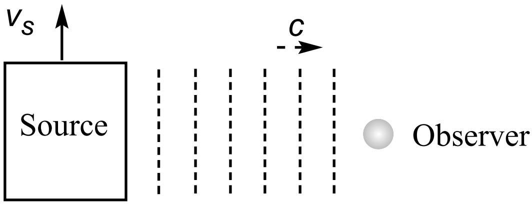


Figure 9.2 Transverse Doppler effect – moving source

Equation set 9.2

Transverse Doppler effect –

moving source and stationary observer

$v_s =$ Source's absolute transverse speed (m/s)

$c =$ Absolute speed of light (m/s)

$\lambda_0 =$ Wavelength of light from stationary source (m)

$\lambda_s' = \lambda_0 \gamma_s$ Wavelength of moving source (m)

$$\gamma_s = \frac{1}{\sqrt{1 - \frac{v_s^2}{c^2}}}$$ Source's gamma factor

$$f_{obs} = \frac{c}{\lambda_s'} = \frac{c}{\lambda_0 \gamma_s} = \frac{f_s}{\gamma_s}$$ Frequency measured by observer

For special relativity the same measurement is

$$f' = \frac{f_s}{\gamma_s}$$

positive value, whereas special relativity predicts a negative value.

9.2.2 Doppler effect: transverse source motion

A wide light source moves at right angles to a stationary observer (Figure 9.2).

In this case wisp theory predicts a decrease in frequency, which is the same as that predicted by special relativity (Equation set 9.2).

9.2.3 Transverse Doppler effect experiments

Experiments to measure the frequency radiated from high-speed atoms have been carried out to test for Doppler effect. The results show a decrease in observed frequency in the transverse direction, in agreement with both wisp theory and special relativity's predictions.

In 1963 Walter Kundig carried out an experiment on transverse Doppler shift. He used a rotating turntable with a radiation source placed at its centre and an absorber placed on its rim. The relative motion of the source and absorber are transverse at all times, and so the change in frequency detected will be due solely to time dilation.

Although the results of the experiment agree with special relativity to within 1 percent, we can only say with certainty that a frequency change took place due to the effect of time dilation. We cannot say whether the change was positive or negative.

Wisp theory predicts a positive change in frequency, whereas special relativity predicts a negative change. Both predicted changes have the same magnitude and will therefore have the same effect on the absorber. The results of the experiment are therefore inconclusive.

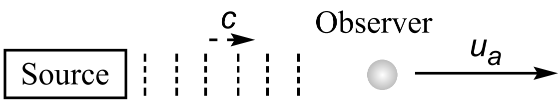


Figure 9.3 Receding Doppler effect

Equation set 9.3

Doppler effect –

observer receding for a stationary light source

$u_a =$ Observer's absolute receding speed (m/s)

$c =$ Absolute speed of light (m/s)

$\lambda_0 =$ Wavelength of stationary light source (m)

$[\gamma_{obs}] =$ Observer's gamma factor

$f_s = \dfrac{c}{\lambda_0}$ Frequency of source (Hz)

$c'_{obs} = [\gamma_{obs}](c - u_a)$ Observer's relative light speed (m/s′)

$f'_{obs} = \dfrac{c'_{obs}}{\lambda_0} = \dfrac{[\gamma_{obs}](c - u_a)}{\lambda_0}$ Observer's relative frequency

$f'_{obs} = \dfrac{(c - u_a)}{\lambda_0 \sqrt{1 - \dfrac{u_a^2}{c^2}}} = f_s \sqrt{\dfrac{1 - \dfrac{u_a}{c}}{1 + \dfrac{u_a}{c}}}$ Expressed as absolute

For special relativity with $u = u_a$,

the same measurement is

$$f' = f_s \sqrt{\dfrac{1 - \dfrac{u}{c}}{1 + \dfrac{u}{c}}}$$

9.2.4 Testing a moving observer's transverse Doppler effect

A receiver placed in a polar satellite could be used to detect a small positive increase in radio frequency due to the transverse Doppler effect.

It is important that the receiver moves faster through wisp space than the frequency source. The change in frequency measured will be a few parts per billion. The satellite's position and time measurements must be accurately recorded, as the frequency changes associated with approaching and receding Doppler effects could swamp the readings. Test instruments would need to be extremely accurate and sensitive.

Appendix A shows detailed results predicted by wisp theory, which differ slightly to those predicted by special relativity.

9.2.5 Doppler effect: observer receding from a stationary source

An observer moves away from a stationary light source at absolute speed u_a as shown in Figure 9.3. The observer's relative speed of light decreases and the *rules for time dilation compensation (Section 7.15.4)* are applied.

Equation set 9.3 gives the result for wisp theory. Although derived in a manner different from special relativity's, simple manipulation of the final equation shows that it is identical to Einstein's Doppler equation.

We have assumed that the light source is stationary in wisp space, and derived the result accordingly. However, we will find later that when the source moves through wisp space the result will be the same as for when it was stationary.

Also we will discover that if both source and observer were in motion through wisp space, the result again will be the same as if the source or observer were stationary.

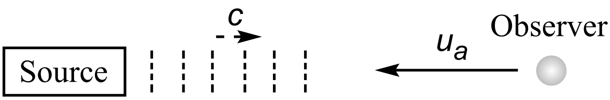


Figure 9.4 Approaching observer Doppler effect

Equation set 9.4

Doppler effect –

observer approaching a stationary light source

$u_a =$ Observer's absolute approach speed (m/s)

$c =$ Absolute speed of light (m/s)

$\lambda_0 =$ Wavelength of stationary light source (m)

$[\gamma_{obs}] =$ Dilation factor for moving observer

$f_s = \dfrac{c}{\lambda_0}$ Frequency of stationary source (Hz)

$c'_{obs} = [\gamma_{obs}](c + u_a)$ Observer's relative light speed (m/s′)

$f'_{obs} = \dfrac{c'_{obs}}{\lambda_0} = \dfrac{[\gamma_{obs}](c+u_a)}{\lambda_0}$ Observer's relative frequency

$$f'_{obs} = \frac{(c+u_a)}{\lambda_u\sqrt{1-\frac{u_a^2}{c^2}}} = f_s\sqrt{\frac{1+\frac{u_a}{c}}{1-\frac{u_a}{c}}}$$

For special relativity with $u = u_a$,

the same measurement is

$$f' = f_s\sqrt{\frac{1+\frac{u}{c}}{1-\frac{u}{c}}}$$

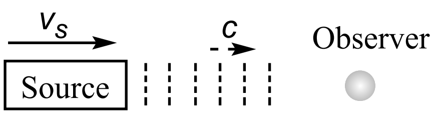


Figure 9.5 Approaching source Doppler effect

Equation set 9.5

Doppler effect –

source moving towards a stationary observer

$v_s =$ Absolute speed of source in wisp space (m/s)

$c =$ Absolute speed of light (m/s)

$\lambda_0 =$ Absolute measure of source wavelength (m)

$\gamma_s =$ Dilation factor for moving source

$\lambda'_s = \lambda_0 \gamma_s$ Relative wavelength of moving source (m)

$\Delta T' = \gamma_s \Delta T$ Relative period of moving source (s′)

$f_{obs} = \dfrac{c}{\lambda_{obs}}$ Frequency measured by observer (Hz)

$\lambda_{obs} = (\lambda'_s - \Delta T' v_s)$ Including source's time dilation (m)

$$f_{obs} = \frac{c}{\gamma_s(\lambda_0 - \Delta T v_s)}$$

$$f_{obs} = f_s \sqrt{\frac{1 + \frac{v_s}{c}}{1 - \frac{v_s}{c}}}$$

For special relativity with $u = v_s$, the measurement is

$$f' = f_s \sqrt{\frac{1 + \frac{u}{c}}{1 - \frac{u}{c}}}$$

9.2.6 Doppler effect: observer approaching a stationary source

An observer moves towards a stationary light source at absolute speed u_a (Figure 9.4).

The moving observer is subject to the effect of time dilation, which causes the relative speed of light to increase – see the *rules for time dilation compensation (Section 7.15.4*).

Equation set 9.4 shows the frequency recorded by the observer. Once again simple manipulation of the final equation shows that it matches the prediction of special relativity.

9.2.7 Doppler effect: source moving and observer stationary

A source moves towards a stationary observer at speed v_s (Figure 9.5).

The observer measures no increase in lights speed – see section 7.2.2 (Wisp relativity's postulate 2 – absolute speeds are constant).

Time dilation affects the moving source, increasing its relative time period, which in turn increases the wavelength of its emitted light. Also during the time interval $\Delta T'$ the source moves towards the emitted wave crest, and releases the next wave closer to the previous one (Figure 9.6), thereby reducing the wavelength of light moving through wisp space.

The stationary observer is unaffected by time dilation and records the received frequency as the absolute speed of light divided by the wavelength (Equation set 9.5).

When the source passes the stationary observer – moving away, we change the speed v_s to $-v_s$, and use the same formula.

The Doppler effect results are identical to those predicted by special relativity.

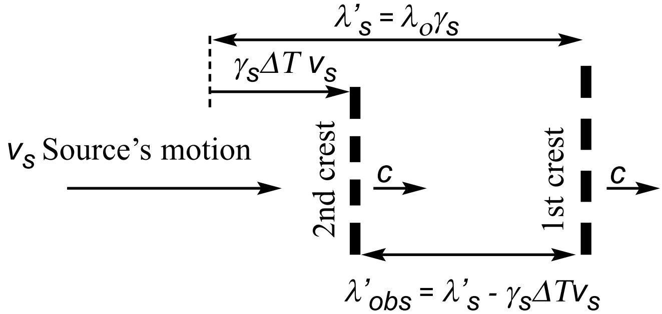


Figure 9.6 A source's motion affects light's wavelength

9.3 Doppler effect – general motion : observer and source moving

An observer and light source move through wisp space at absolute speeds u_a and v_s respectively (Figure 9.7).

The observer's relative speed of light increases or decreases, depending on the values of the variables selected.

The absolute speed values chosen for the source and observer can be positive or negative, but they must not exceed the absolute speed of light c.

If we consider the distance between source and observer to be large, then their motions will not affect the angles θ_s and θ_{obs} that they make with the line of sight joining their centres.

We simply input the angle and absolute speed values into Equation set 9.6 to calculate the Doppler effect.

The maximum absolute speed between a source and an observer is twice the speed of light.

If an observer approaches a stationary source at near light speed, the observer will see the source 'approach' at a speed greater than that of light. This is an illusion effect caused by time dilation.

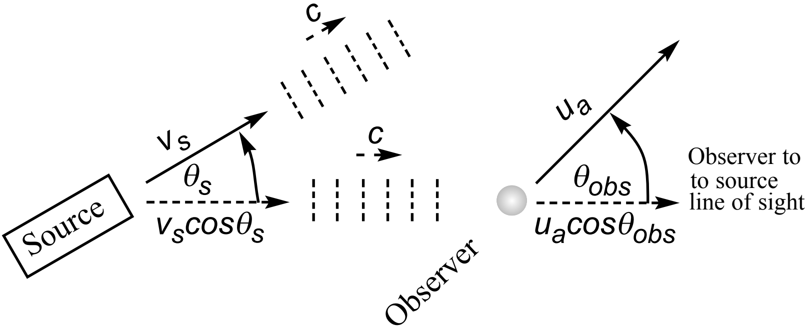


Figure 9.7 Absolute motions of source and observer

Equation set 9.7 shows wisp's general Doppler equation. Although derived using concepts different to special relativity's, simple manipulation using a limit process shows that it is identical to special relativity's Doppler equation.

Wisp's general Doppler equation calculates the Doppler effect for all observer–source motions through wisp space.

It agrees with special relativity's predictions in all cases except one – see sections 9.2.1 (Doppler effect: transverse observer motion); 9.2.4 (Testing a moving observer's transverse Doppler effect); and Appendix A.

The main difference between the two equations is that wisp theory allows for both observer and source to be in separate motions with respect to an absolute reference frame. So its equation has two absolute speed terms and two angles. Whereas special relativity is a limiting case where the observer is at rest in wisp space, and so uses one speed term and one angle.

If we assume that the Earth moves through wisp space at 30,000 m/s, then the relativistic effects on its surface are almost zero, practically undetectable. This explains why special relativity has remained so successful.

Equation set 9.6

Wisp's general Doppler equation

$v_s =$ Absolute speed of source in wisp space (m/s)

$u_a =$ Absolute speed of observer in wisp space (m/s)

$c =$ Absolute speed of light (m/s)

$c'_{obs} =$ Observer's relative light speed (m/s′)

$\lambda_0 =$ Absolute wavelength of stationary light source (m)

$\gamma_s =$ Gamma factor for moving source

$[\gamma_{obs}] =$ Gamma factor for moving observer

$\lambda'_s = \lambda_0 \gamma_s$ Relative wavelength of moving source (m)

$\Delta T' = \gamma_s \Delta T$ Relative time interval for source's period

$f'_{obs} = \dfrac{c'_{obs}}{\lambda'_{obs}}$ Frequency measured by observer (Hz)

$\lambda'_{obs} = (\lambda'_s - \Delta T' v_s \cos\theta_s)$ Includes source's time dilation

$c'_{obs} = [\gamma_{obs}](c - u_a \cos\theta_{obs})$ Includes t/d compensation

$f'_{obs} = \dfrac{[\gamma_{obs}](c - u_a \cos\theta_{obs})}{\gamma_s(\lambda_0 - \Delta T v_s \cos\theta_s)}$, substituting $\Delta T = \dfrac{\lambda_0}{c}$ gives

Wisp's general Doppler equation

$$f'_{obs} = f_s \frac{[\gamma_{obs}](c - u_a \cos\theta_{obs})}{\gamma_s(c - v_s \cos\theta_s)}$$

For special relativity's longitudinal Doppler effect,

let $\theta_s = \theta_{obs} = 0$,

and $u = \dfrac{u_a - v_s}{1 - \dfrac{u_a v_s}{c^2}}$ gives $f' = f_s \sqrt{\dfrac{1 - \dfrac{u}{c}}{1 + \dfrac{u}{c}}}$

Equation set 9.7

General Doppler equations – wisp and special relativity

$$f'_{obs} = f_s \frac{[\gamma_{obs}](c - u_a \cos\theta_{obs})}{\gamma_s (c - v_s \cos\theta_s)}$$ Wisp's general Doppler eqn.

For comparison with special relativity we use a limit process, letting $u_a = 0$, gives $[\gamma_{obs}] = 1$.

Substituting values into wisp's general Doppler equation reduces it to

$$f' = f_s \frac{\sqrt{1 - \frac{v_s^2}{c^2}}}{1 - (\frac{v_s}{c})\cos(\theta_s)},$$

which is the same equation used in special relativity.

However, technology is now available that will allow detection of the Earth's relativistic effects caused by its motion through wisp space. If results are positive, which I believe they will be, then wisp theory will become a credible alternative to special relativity.

10

Wisp and Special Relativity: Relativistic Mechanics

10.1 Conservation of momentum

We use wisp's velocity transformations to calculate the momentum before and after an elastic collision between two identical particles of masses m_a and m_b.

Particle A is stationary in absolute rest frame S, and particle B is stationary with respect to moving frame S'. Frame S' moves through wisp space at speed V along the negative x-axis.

Both particles receive a push along their y-axes, which move them towards each other at equal speeds, and they collide at a point that is the origin of both of their reference frames.

Figure 10.1 shows how each observer sees the event prior to

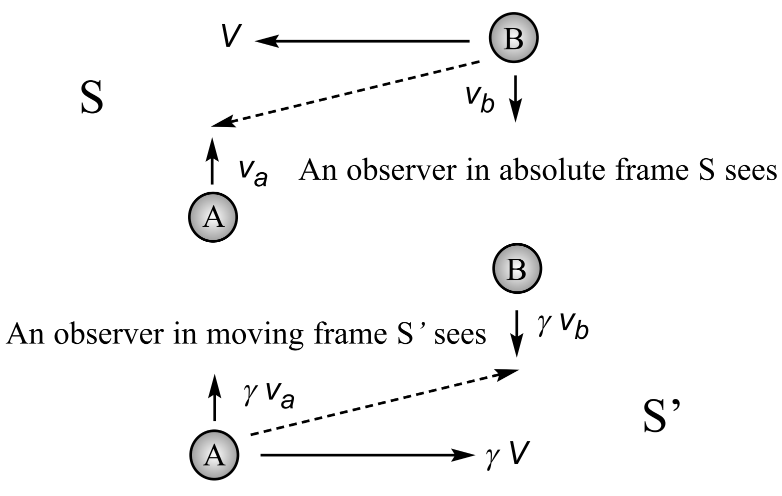


Figure 10.1 Before elastic collision

the collision. Both observers agree that the particles approach each other at equal speeds in their y-axes.

Figure 10.2 show the particles strike each other with a glancing blow, leaving their speeds in their x-axes unchanged.

We ignore the force reduction and jiggle that affect the electrostatic forces within the particles, as they have no affect on the outcome of the collision.

The observer in frame S sees both particles bounce off each other without losing speed.

After applying the *rules for time dilation compensation (Section 7.15.4)*, the moving observer in frame S*'* sees a similar collision process, except that all observed speeds are increased by γ.

Equation set 10.1 shows the equations for proving the conservation of momentum in both frames.

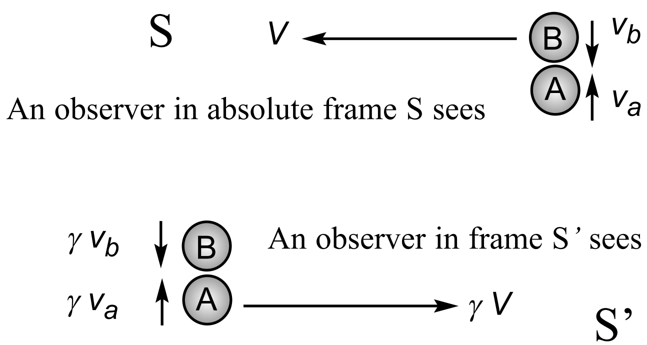


Figure 10.2 Elastic collision viewed in different frames

Equation set 10.1

Conservation of momentum – elastic collision

$\gamma = \dfrac{1}{\sqrt{1-\dfrac{V^2}{c^2}}}$ Moving observer's gamma factor

$v_a =$ Absolute speed of particle A (y-axis)

$v_b =$ Absolute speed of particle B (y-axis)

$V =$ Absolute speed of reference frame S'

$v_a = v_b$ Particles have equal speeds (y-axis)

$m_a = m'_a$ Masses are equal – mass invariance

$m_b = m'_b$ Mass invariance

$v'_a = \gamma v_a$ Relative speed of particle A (y-axis)

$v'_b = \gamma v_b$ Relative speed of particle B (y-axis)

$V' = \gamma V$ Relative speed of reference frame S

The momentum in frame S is

$\rho_{y-before} = v_a m_a + v_b m_b = 0$ (y-axis)

$\rho_{y-after} = -v_a m_a - v_b m_b = 0$ (y-axis)

$\rho_{x-before} = \rho_{x-after} = -V m_b$ (x-axis)

and the momentum in frame S' is

$\rho'_{y-before} = v'_a m'_a + v'_b m'_b = \gamma v_a m_a + \gamma v_b m_b = 0$

$\rho'_{y-after} = -\gamma v_a m_a - \gamma v_b m_b = 0$

$\rho'_{x-before} = \rho'_{x-after} = V' m_b = \gamma V m_b$

Momentum is conserved in both frames

The value of momentum in frame S is absolute, and the value in the moving frame S*'* is relative – not real in an absolute sense. But as far as the moving observer is concerned, all physical processes that take place appear real enough, and the *law of conservation of momentum* is upheld.

We have ignored the small additional relativistic effects caused by the particles' motions in the y-axis, as they are too small to be significant.

Each observer records a different time interval for the collision. Let T be the time interval from the moment particle A is pushed to the moment it returns to its start point on its y-axis, and T' be particle B's time interval when measured in frame S*'*.

The moving observer (frame S*'*) sees the whole collision process speeded up (*rules for time dilation compensation*) and so the observer's time interval T' will be correspondingly shorter by a factor of γ. (Only when observers carry out identical experiments in their local frames will they agree on results.)

The observers witness a collision process that is different from that predicted by special relativity, because mass is invariant in wisp theory.

Special relativity predicts that each observer sees the faster moving particle's mass increase as a consequence of relative motion. And the time interval from push to collision and return for the faster moving particle (Particle B in frame S, and particle A in frame S*'*) is longer by a factor γ. The faster moving particle travels slower in its respective y-axis and so, in order to comply with the conservation of momentum, the faster moving particles' mass must increase by a factor of γ.

In wisp theory, each observer records the particles' y-axes speeds to be the same and the masses of the particles do not change.

10.2 $E = mc^2$

The discovery by Einstein that mass and energy are equivalent, $E = mc^2$, is a remarkable prediction on the part of special relativity. Energy creates particles and particles change into energy.

We will look at this in detail and try to understand exactly what the implications are from wisp theory's perspective, bearing in mind that wisp theory states that mass is invariant – it does not increase with a body's speed. But what is the connection?

First we need to derive a mathematical relationship between energy and mass, which we do by calculating the energy required to move a force over a distance – in absolute wisp space (Equation set 10.2).

The value for kinetic energy is the same as that discovered by Einstein, but there is a subtle difference in wisp theory's interpretation. When a body is stationary in wisp space, its kinetic energy is zero, but it has a fixed amount of rest energy. This is the energy that was stored when the body formed, pulling one-state space apart to create zero-state spheres. A zero-state sphere's surface area is proportional to its surrounding fractal's mass, and the energy used to create it is stored in wisp space as potential energy (rest energy) within the structure of its matter-fractal. This is the mc^2 component and it stays at a constant absolute value as the body moves through wisp space.

The γmc^2 component is the total energy acquired by the body as it moves through wisp space. The γ term results from the effect of force reduction on the body, which creates a quasi-mass increase – see section 7.14.1 (Relativistic mass increase: quasi-mass).

The force used to create matter-fractals is the same as that which cause them to move – increasing their kinetic energy, so

Equation set 10.2

Mass and energy

$$KE = \int_0^s F ds \qquad \text{Kinetic energy}$$

$$F = \frac{d}{dt}(mv\gamma) \quad \text{Force}$$

Substituting gives

$$KE = \int_0^s \frac{d}{dt}(mv\gamma) ds = \int_0^{mv\gamma} v d(mv\gamma)$$

$$KE = m\int_0^v v d(v \frac{1}{\sqrt{1-\frac{v^2}{c^2}}})$$

Integrating by parts gives

$$KE = \frac{mv^2}{\sqrt{1-\frac{v^2}{c^2}}} - m\int_0^v \frac{vdv}{\sqrt{1-\frac{v^2}{c^2}}}$$

$$KE = \frac{mv^2}{\sqrt{1-\frac{v^2}{c^2}}} + \left[mc^2\sqrt{1-\frac{v^2}{c^2}} \right]_0^v$$

$$KE = \frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}} - mc^2$$

or

$$KE = \gamma mc^2 - mc^2 = mc^2(\gamma - 1)$$

Relativistic kinetic energy $=$ total energy $-$ rest energy we would expect there to be a direct relationship between the two energy types responsible for the force – potential and kinetic, which is why mass and energy are equivalent.

The relativistic kinetic energy is the total energy minus the rest energy. We find that for small speeds through wisp space this reduces to the classical expression for kinetic energy (Equation set 10.3).

Equation set 10.3
Classical expression for kinetic energy

For small x we can expand the gamma factor using the binomial expansion $(1+x)^n \cong 1+nx$
and so

$$\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$$

approximates to

$$\gamma \cong 1+\frac{v^2}{2c^2}+\ldots$$

so we can write

$$KE \cong mc^2(1+\frac{v^2}{2c^2})-mc^2$$

which reduces to

$$KE \cong \frac{mv^2}{2}$$ Non-relativistic kinetic energy expression

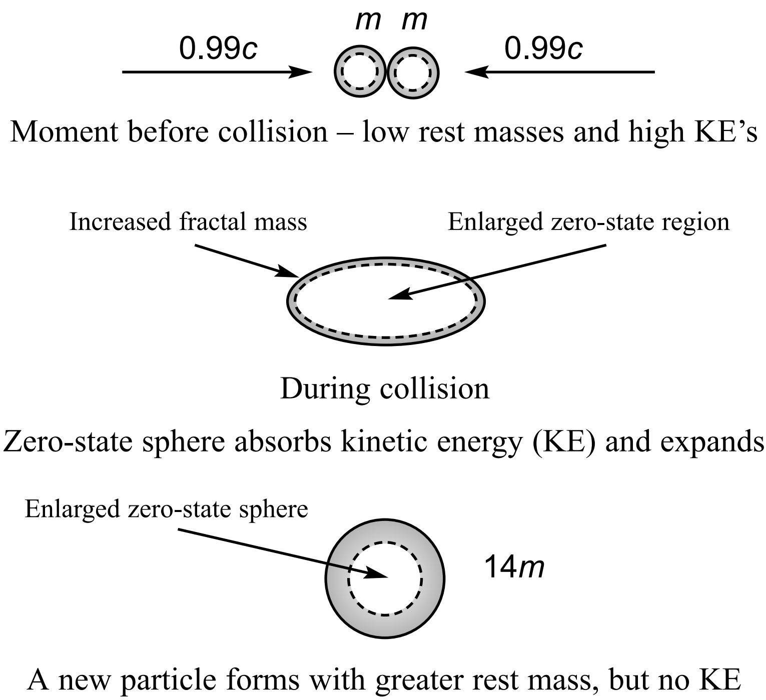


Figure 10.3 Mass–energy interaction – inelastic collision

10.2.1 Energy into mass

Small particles travelling at near light speed in particle accelerators can create more massive particles during collisions. But how does kinetic energy cause a particle with a heavier mass to form, if the small particles' masses do not increase as they speed up?

Consider two small particles, each approaching the other at an absolute speed of $0.99c$ (Figure 10.3). Their combined mass before the collision is $2m$.

During collision the particles stick together, forming one large expanded region of zero-state space. This happens because the particles had large kinetic energies and during the collision their zero-state spheres merged and stretched, absorbing the particles' kinetic energy and forming a larger region of zero-state space. This enlarged region quickly reshapes forming a particle of larger mass, $14m$. (A huge amount of energy is stored in wisp space as potential energy – rest energy – in the matter-fractal's structure that surrounds its zero-state sphere).

Typically this larger particle would be unstable and short-lived. It could resonate, break apart, and even release the same small particles that created it.

The recently discovered top quark is about 40,000 times more massive than the more common up-quark. Wisp theory states that their masses are proportional to the square of their zero-state spheres' radii, which makes the top quark about 200 times bigger than the up-quark, explaining why it is very unstable.

In general the size of matter-fractal's zero-state sphere is minute, almost point-like, in comparison to the size of an atom's nucleus.

10.3 Conservation of charge

The magnitude of the total electric charge of a system of particles before and after a high-speed collision is conserved.

Charge arises from asymmetry or twists in the structure of matter-fractals. And it follows from Newton's third law of motion that equal and opposite amounts of twist must be created or destroyed in wisp space when charged particles are created or destroyed.

By way of an analogy, think of stretching an elastic band by applying equal and opposite force to its ends. Pulling one end only does not stretch it. A similar process applies with newly created charged particles; they can only be made if wisp space twists in equal and opposite ways.

This explains why quarks (asymmetric matter-fractals) can only appear in pairs with opposite charge following collisions.

11

Big Bang

Cosmologists have collected evidence that clearly shows the universe came into existence in a big bang event, about 14 billion years ago.

It originated from an infinitely dense point – singularity – and prior to that explosive event space–time did not exist.

This model supports the cosmological principle, which asserts that on a large scale the distribution of matter and radiation in the universe is uniform. The reasoning follows on from the argument that the universe expanded from a small point. So how galaxies formed in this smoothly expanding universe remains a mystery.

Wisp theory proposes that the collapse of a spinning ultra-supermassive black hole created a big bang event that formed the current universe. And prior to that, the black hole had been steadily growing, feeding on an expired universe.

11.1 Black holes

11.1.1 General relativity

Einstein's general theory of relativity predicts the existence of black holes whose masses are concentrated into infinitely dense points – singularities.

Wisp theory suggests that at the centre of a black hole is zero-state space – 'nothingness'. The mass that makes the black hole so formidable lies outside its zero-state sphere's surface, basically a black hole is an enormous matter-fractal.

Both theories support the notion that curved space causes gravitation. However, whereas general relativity describes this as a distortion in the four dimensions of space and time, wisp theory attributes it to three dimensions of space only.

Figure 11.1 shows a quasar – quasi-stellar source, which is powered by a spinning supermassive black hole. (Quasars are tiny, but they are the most luminous objects in the universe – giving off as much energy as a thousand billion suns.)

The black hole is completely invisible, a tiny speck located at the centre of the glowing accretion disc, and it emits powerful gamma ray bursts – jets that travel at near light speed – from its poles.

In its dormant state (non-feeding) the black hole is practically undetectable.

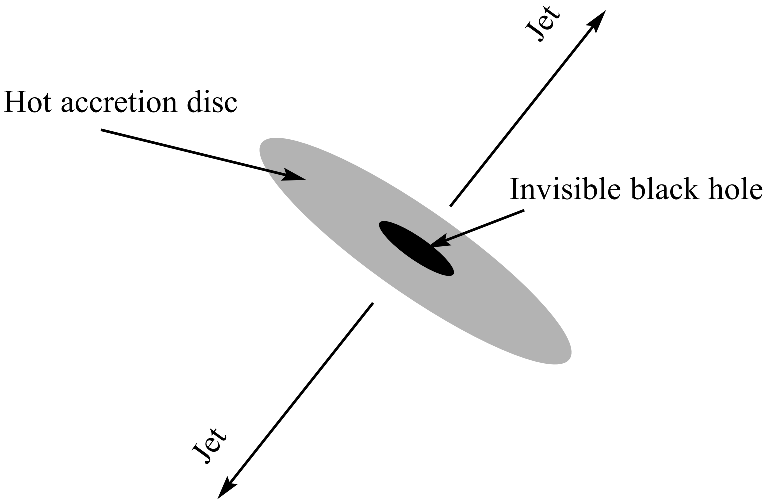


Figure 11.1
A quasar’s spinning black hole emitting powerful jets

Whereas large black holes grow in size, smaller ones do not, they slowly expire through emission of ‘Hawking radiation’ (after Stephen Hawking who first suggested this).

11.1.2 Points of singularity

In wisp theory the smallest point is that of the wisp, and so no points of singularity exist.

At the centre of a black hole lies zero-state space – ‘emptiness’ – and its mass lies in the wisp space surrounding its zero-state sphere’s surface, not at its centre.

11.1.3 Supermassive black holes

Astronomers have collected evidence that suggest all galaxies have supermassive black holes at their centres. Their masses are about 0.5 per cent (typically several million to a billion solar masses) of that of their host galaxies.

How they came to exist is a mystery, but wisp theory suggests that they are fragments of zero-state space blasted out during the big bang.

11.1.4 Ultra-supermassive black hole

An ultra-supermassive black hole contains all the energy and zero-state space needed to create a new universe. Its central zero-state sphere possibly spans several light years across.

Once its size reaches criticality its structure rapidly collapses, tearing its central zero-state space apart and blasting fragments out into wisp space.

A spinning ultra-supermassive black hole produces asymmetry in wisp space when it collapses, which is responsible for the creation of more matter than antimatter.

11.2 COBE (launched 1989)

In 1992 NASA's Cosmic Background Explorer Satellite (COBE) discovered small variations of 1 part in 100,000 in the temperature of the cosmic microwave background radiation.

These tiny variations are believed to be the cause of galaxy formation, although the process by which this happens is not known.

Wisp theory suggests that at the very beginning of the big bang, the explosion threw out spinning fragments of the ultra-supermassive black hole. So disturbances in wisp space were already present before the background radiation formed.

The radiation came from the universe when it was 300,000 years old and its temperature is estimated to have been around 30,00 K. Now, 14 billion years later, it has cooled down to just 3 K above absolute zero, barely detectable but nevertheless clear evidence of an explosive start to the universe.

11.3 Wisp big bang theory

The big bang event started from the collapse of a spinning ultra-supermassive black hole. Once it had reached the point of criticality, its structure collapsed, unleashing enormous gravitational potential energy stored in wisp space.

Matter-fractals formed immediately around its collapsing zero-state sphere, causing wisp space to expand, which in turn pushed the broken surface of the sphere inwards at a speed thousands of times that of light. Opposite surfaces of the sphere would have smashed together, creating powerful longitudinal shock waves that travelled at faster than light speed through wisp space, triggering the formation of matter-fractals along the way.

The continued creation of large numbers of matter-fractals would cause wisp space to expand rapidly.

The collapsed massive zero-state sphere would have blasted spinning fragments of zero-state space out into wisp space.

11.3.1 Inflation

In 1979 Alan Guth proposed the idea of inflation to explain unsolved riddles in the big bang theory.

Immediately following the big bang, the universe underwent a short period of extremely rapid expansion at a speed thousands of times that of light.

Wisp theory suggests that this resulted from the rapid formation of matter-fractals – their shapes expand the surrounding wisp space and generate positive pressure. The huge number of matter-fractals created during the big bang event would have created enormous positive pressure, causing inflation.

Billions of years on, the positive pressure has weakened to almost zero, as wisp space continues expanding.

11.3.2 Redshift

In the 1920s Edwin Hubble detected redshifts (shift towards longer wavelengths) in the spectral lines originating in distant galaxies. He concluded that they were the Doppler shifts due to the distant galaxies receding at great speed.

Hubble found a relationship between the speed of recession of galaxies and their distance from us (Hubble constant), and this provided the first proof that the universe was expanding.

Wisp theory supports the view that the expansion of wisp space causes matter-fractals (including supermassive black holes) to move with it.

11.3.3 Galaxy formation

The collapse of the ultra-supermassive black hole caused its central zero-state sphere to disintegrate rapidly, blasting spinning fragments out into wisp space. These fragments are the supermassive black holes that formed the seeds of the galaxies.

Larger fragments would form large galaxies, which in turn would have attracted smaller fragments, forming the globular clusters that exist in their halos.

Large spinning fragments would form large spiral galaxies; non-spinning fragments would form elliptical or irregular galaxies; and smaller isolated fragments would form dwarf galaxies.

11.3.4 Star speeds in rotating galaxies

Supermassive black holes with masses typically several million solar masses lie at the centres of galaxies.

In theory there should not be a link between the speeds at which outer stars move in a galaxy and the mass of its black hole, but astronomers have found that the two are linked. There is a strong possibility that the presence of the black hole affects the surrounding wisp space, which has the effect of increasing the gravitational pull on stars in the galaxy.

It is likely that the spin of the black hole causes the surrounding wisp space to rotate, which in turn causes it to stretch and reduce its density. In this rotating wisp space matter-fractals' shapes would distort, becoming pear-shaped instead of spherical. Their shapes would attempt to restore to circular symmetry, and in doing so would produce a net additional force directed towards the black hole. The effect is similar to that which causes the Pioneer spacecraft to experience an additional retarding force – see chapter 5, section 5.6 (Pioneers' orbital discrepancies).

The expansion of wisp space in a rotating galaxy causes an effect that is similar to a galactic mass increase. This explains the mystery of the illusive 'dark matter', which is believed to cause the stars to orbit faster.

11.3.5 The big crunch

It is highly probable that the universe will eventually collapse in on itself in a big crunch event.

Even though there is evidence that the universe is still expanding, due to positive pressure in wisp space, it is most likely that remnants of the ultra-supermassive black hole still remain and these will in time grow sufficiently powerful to begin to exert a rotational influence on the universe. This will cause an increase in the gravitational pull on matter that has travelled to the extremities of the universe.

This cycle could possibly take 1000 billion years or more! But may be shortened if the universe captures material from other universes.

Wisp versus Special Relativity Test

A.1 Transverse Doppler effect experiment

Wisp theory predicts that a receiving device travelling through wisp space at a greater speed than a frequency source will record an increase in transverse Doppler frequency. Special relativity predicts the opposite – a decrease in frequency.

By subtracting the two results from each other, a small difference should be detectable when the receiver is moving directly above the source.

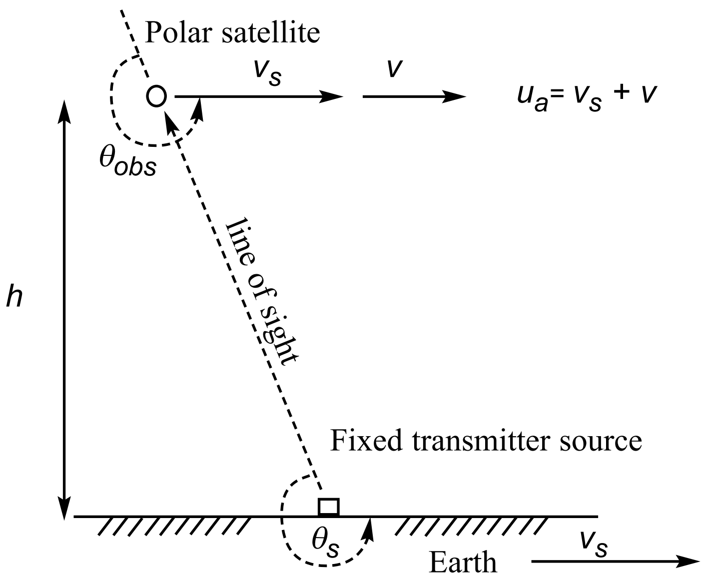


Figure A.1 Transverse Doppler experiment setup

For maximum effect the source is placed at the North Pole (Figure A.1), and a polar satellite carrying a receiver passes overhead.

A.2 Initial data

We will assume that the speed of the Earth v_s around the sun (30,000 m/s) is its absolute speed through wisp space.

The relative speed v – measured in absolute terms – of the satellite to the Earth's surface is 7,700 m/s, and the total speed of the satellite through wisp space is u_a. It has a maximum value when the direction of the satellite is the same as the direction of the Earth's orbit. Let the satellite's altitude h = 380,000 m.

The satellite's position must be tracked to an accuracy of +/- 5 m, an error greater than this could cause the experiment to produce a null result.

Both receiver and transmitter devices should be tuned to the frequency of radiation emitted from a caesium-133 atom – (f_o = 9,192,631,770 Hz +/- 1 Hz). The receiver must have a measurement accuracy of about +/- 1 Hz.

The presence of the Earth's atmosphere and the jiggle effect will slow the speed of light down. However, we can ignore these effects, as they are negligible.

A.3 Special relativity's formula

We do not derive any of special relativity's formulas in this book, but we do use them for comparison purposes.

Equation set A.1 shows special relativity's formula for calculating the frequency received by the satellite.

A computer is used to calculate the frequencies for time inter-

(Equation set A.1)

Wisp versus special relativity test

Equations for special relativity

$h =$ Satellite's altitude (m)

$v =$ Satellite's speed with respect to the Earth (m/s)

$c =$ Absolute speed of light (m/s)

$\theta_{obs} =$ Angle $-$ satellite to transmitter source (radians)

$t =$ Time from zenith point (negative for approaching and positive for receding)

$$\cos\theta_{\text{obs}} = \frac{vt}{\sqrt{(vt)^2 + h^2}}$$

$f_0 =$ Earth based transmitter frequency

The satellite receives a predicted frequency of

$$f'_{sr} = f_0 \frac{\sqrt{1 - \frac{v^2}{c^2}}}{1 - \frac{v}{c}(-\cos(\theta_{obs}))}$$

vals ranging from 100 seconds before to 100 seconds after (t = -100 to t = + 100 seconds) the point of zenith, $t = 0$. The results are stored in readiness for comparison with wisp theory's predictions.

At the zenith point, special relativity predicts a frequency decrease of 3 Hz from the source frequency f_o.

(Equation set A.2)

Wisp versus special relativity test

Equations for wisp theory

$h =$ Satellite's altitude (m)

$v =$ Satellite's speed wrt earth (m/s)

$v_s =$ Earth's speed through wisp space (m/s)

$u_a = v_s + v$ Absolute speed of satellite (m/s)

$c =$ Absolute speed of light (m/s)

$$\gamma_s = \frac{1}{\sqrt{1 - \frac{v_s^2}{c^2}}}$$ Earth's gamma factor (Source)

$$\gamma_{obs} = \frac{1}{\sqrt{1 - \frac{u_a^2}{c^2}}}$$ Satellite's gamma factor (Receiver)

$\theta_s = \theta_{obs}$ Receiver and source have equal angles

$$\cos\theta_{\text{obs}} = \frac{vt}{\sqrt{(vt)^2 + h^2}}$$

Wisp theory predicts a received frequency of

$$f'_{wt} = f_0 \frac{[\gamma_{obs}](c - u_a \cos(\theta_{obs}))}{\gamma_s (c - v_s \cos(\theta_s))}$$

(Equation set A.3)
Wisp versus special relativity test
f_{diff} = Difference in predicted frequencies (Hz)

$$f'_{sr} = f_0 \frac{\sqrt{1-\frac{v^2}{c^2}}}{1-\frac{v}{c}(-\cos(\theta_{obs}))}$$ Special relativity's prediction

$$f'_{wt} = f_0 \frac{[\gamma_{obs}](c-u_a\cos(\theta_{obs}))}{\gamma_s(c-v_s\cos(\theta_s))}$$ Wisp theory's prediction

$$f_{diff} = f'_{wt} - f'_{sr}$$

A.4 Wisp theory's formula

Equation set A.2 shows wisp theory's formula (it is wisp's general Doppler equation, which we derived earlier – see Equation set 9.6).

The predicted frequency values are calculated and compared with special relativity's values.

A.5 Comparison

The frequency difference is found simply by subtracting the two sets of values from one another (Equation set A.3).

The graph in Figure A.2 shows a maximum difference in frequency of 29.7 Hz occurs at the zenith point.

The difference between the actual position of the satellite and

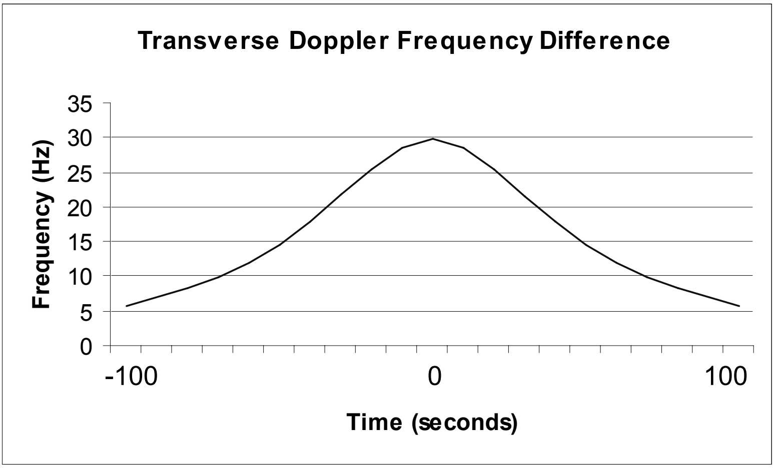


Figure A.2 Frequency difference (maximum)

special relativity's predicted position will be reduced to near zero, if an error in tracking the satellite places it 51 m behind its actual position (Figure A.3).

For the difference value to be detected the satellite's position must be known to within +/- 5 m.

A.6 Analysing data

In order to achieve a maximum result the absolute speed of the satellite through wisp space must be greater than that of the Earth's.

When the satellite passes the South Pole, its absolute speed will be less than Earth's, and so it will produce a smaller negative difference of -17.5 Hz.

If the Earth's speed through wisp space is greater than that

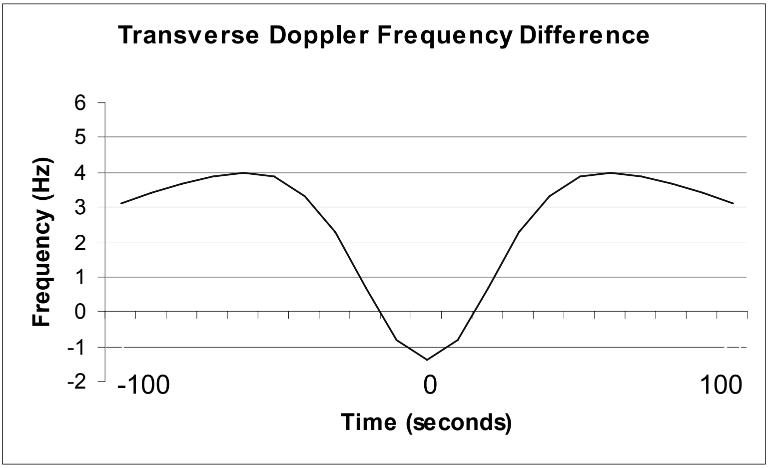


Figure A.3 Frequency difference (position error of 51 m)

assumed, then the difference result will be greater than that predicted and easier to detect.

If at the time of measurement the speed of the Earth through wisp space is near zero, then the difference will be 6 Hz, and a tracking error of 10 m could reduce the difference result to zero. An error of 5 m could reduce it to 3 Hz, making detection impossible.

Fizeau's Experiment

In 1851 Armand Fizeau performed an experiment to measure the speed of light in moving water. Its purpose was to measure the value of the ether drag coefficient.

He discovered that changes in the speed of light are proportional to the water's flow rate, and he calculated the drag coefficient to be 0.48, a result consistent with Fresnel's earlier prediction of 0.43.

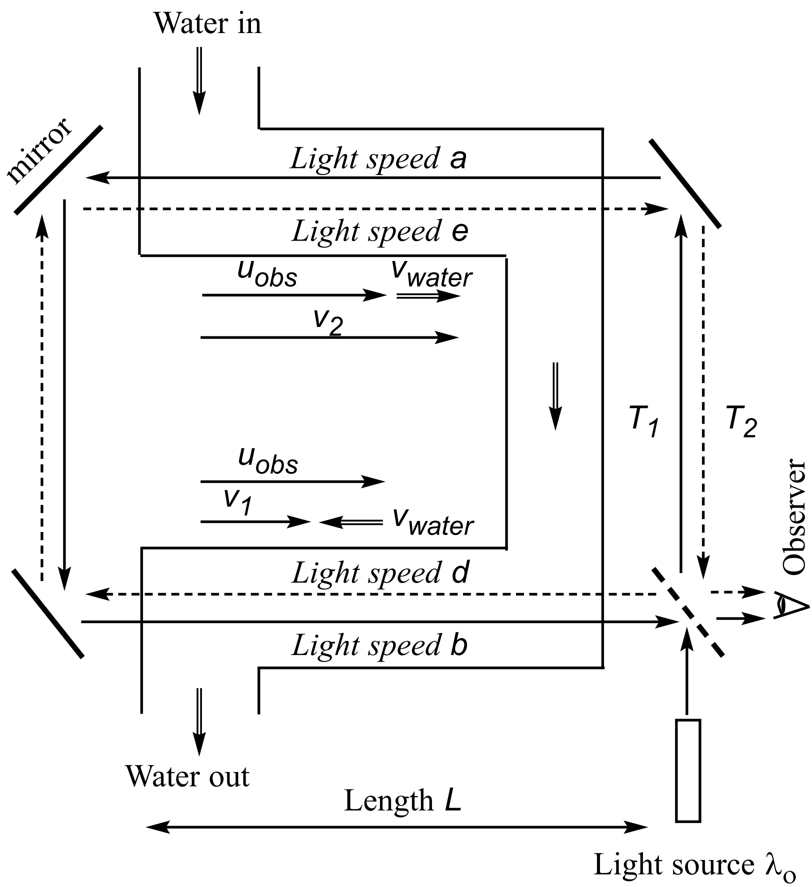
However, it turned out that the drag coefficient predicted by Fresnel gave a result that appears correct, but its derivation is not wholly correct.

We know that moving water does not drag wisp space along with it, but there is some merit in Fresnel's thought process. Both Einstein and Fresnel have produced equations that appear to give correct predictions for the speed of light moving through water, and we shall apply wisp's velocity transformations to both sets of established equations.

Wisp theory will show that there is a small difference in predicted values caused by the Earth's motion through wisp space.

B.1 Apparatus

Light of fixed wavelength emits from a source and strikes a half-silvered mirror that splits it into two rays, which travels along different paths – with and against the flow of water (Figure B.1). We draw the rays separated for clarity to allow their individual speeds to be seen, but in reality they would form a single ray with components travelling in opposite directions.



$\Delta T' = T_1' - T_2'$ Relative time difference between light paths

$$\Delta T' = \left(\frac{-L}{Speed\ a} + \frac{L}{Speed\ b} \right) - \left(\frac{-L}{Speed\ d} + \frac{L}{Speed\ e} \right)$$

Figure B.1 Fizeau's experiment

(Equation set B.1) Fizeau's Experiment
– applying wisp theory to special relativity's velocity addition formula (all speeds are in m/s)

$L =$ Horizontal length of water tube's arm (m)

$n =$ Water's index of refraction

$v_{water} =$ Absolute relative speed of water to observer

$u_{obs} =$ Absolute speed of observer in wisp space (m/s)

$v_1 = u_{obs} + v_{water}$ Absolute right moving speed of water

$v_2 = u_{obs} - v_{water}$ Absolute left moving speed of water

$c =$ Absolute speed of light in one-state space

$[\gamma_{obs}] =$ Gamma factor for moving observer

$$T_1' = \frac{-L}{\left[\left[\dfrac{\dfrac{-c}{n} + v_1}{1 + \dfrac{\dfrac{-c}{n} v_1}{c^2}}\right] + u_{obs}\right][\gamma_{obs}]} + \frac{L}{\left[\left[\dfrac{\dfrac{c}{n} + v_2}{1 + \dfrac{\dfrac{c}{n} v_2}{c^2}}\right] - u_{obs}\right][\gamma_{obs}]}$$

$$T_2' = \frac{-L}{\left[\left[\dfrac{\dfrac{-c}{n} + v_2}{1 + \dfrac{\dfrac{-c}{n} v_2}{c^2}}\right] + u_{obs}\right][\gamma_{obs}]} + \frac{L}{\left[\left[\dfrac{\dfrac{c}{n} + v_1}{1 + \dfrac{\dfrac{c}{n} v_1}{c^2}}\right] - u_{obs}\right][\gamma_{obs}]}$$

$\Delta T' = T_1' - T_2'$ Relative time difference between light paths

B.2 Theory

The relative speed of the water affects the speed of light ray passing through it. As the light rays travel in opposite directions with and against the water flow, they move at different speeds, and when recombined they are seen to be out of step with one another – even though their wavelengths are the same.

Altering the water's flow speed causes the light's interference fringe pattern to shift.

The refractive index of water, $n = 4/3$, determines the speed at which light travels through it, c/n. If water then travels at speed through wisp space, it changes the speed at which light travels.

Water molecules create shapes in wisp space that cause light to slow down, and when water moves its shapes displace wisps at right angles to its motion, which affect light's speed. Moving against the direction of light reduces its speed further, while moving with it reduces the slowing effect and light travels faster.

The process is complex, but it appears that both Einstein's and Fresnel's equations do correctly predict the interaction of light with moving water.

Fizeau's experiment demonstrates that the motion of water speeds up or slows down light. Since the frequency of light leaving the source is the same as that seen by the observer the shift in the observed fringe pattern can only be due to light travelling at different speeds through moving water.

(Equation set B.2)

Fizeau's Experiment

– limit process – applying wisp theory to special relativity's velocity addition formula.

Letting the observer speed $u_{obs} = 0$

reduces the wisp equation to

$$\Delta T = \frac{4Lv_{water}(n^2 - 1)}{c^2 - n^2 v_{water}^2}$$

The equation for special relativity is

$$\Delta T = \frac{2L}{\dfrac{\frac{c}{n} - v_{water}}{1 - \frac{v_{water}}{nc}}} - \frac{2L}{\dfrac{\frac{c}{n} + v_{water}}{1 + \frac{v_{water}}{nc}}}$$

which also reduces to

$$\Delta T = \frac{4Lv_{water}(n^2 - 1)}{c^2 - n^2 v_{water}^2}$$

B.3 Applying wisp theory to special relativity's formula

By applying wisp's velocity transformations to Einstein's velocity addition formula we can predict what affect the Earth's motion through wisp space has on the outcome of the experiment.

Equation set B.1 shows Einstein's velocity addition formula

(Equation set B.3)

Fizeau's Experiment –

adapting Fresnel's equation for $v_1 << c$ for wisp theory to include absolute references and gamma effects

$L =$ Horizontal length of water tube's arm (m)

$n =$ Water's index of refraction

$u_{obs} =$ Absolute speed of observer in wisp space (m/s)

$v_1 = u_{obs} + v_{water}$ Absolute right moving water speed (m/s)

$v_2 = u_{obs} - v_{water}$ Absolute left moving water speed (m/s)

$c =$ Absolute speed of light in one-state space (m/s)

$\left[\gamma_{obs}\right] =$ Gamma factor for moving observer

Let $k = 1 - \dfrac{1}{n^2}$

$$T_1' = \frac{-L}{\left[\dfrac{-c}{n} + kv_1 + u_{obs}\right]\left[\gamma_{obs}\right]} + \frac{L}{\left[\dfrac{c}{n} + kv_2 - u_{obs}\right]\left[\gamma_{obs}\right]}$$

$$T_2' = \frac{-L}{\left[\dfrac{-c}{n} + kv_2 + u_{obs}\right]\left[\gamma_{obs}\right]} + \frac{L}{\left[\dfrac{c}{n} + kv_1 - u_{obs}\right]\left[\gamma_{obs}\right]}$$

$\Delta T' = T_1' - T_2'$ Relative time difference between light paths

(Equation set B.4)
Special relativity and Fresnel's result for a small value $\frac{v_{water}}{c}$
gives

$$\Delta T \cong \frac{4Lv_{water}(n^2-1)}{c^2}$$

Wisp theory modifies this equation by taking into account the Earth's motion through wisp space (30000 m/s)

This gives

$$\Delta T' \cong \left[\frac{4Lv_{water}(n^2-1)}{c^2}\right]1.000265$$

expressed in terms of wisp's velocity transformations.

By letting the observer's speed u_{obs} equal zero (a limit process), the wisp equation reduces exactly to special relativity's equation, as would be expected (Equation set B.2).

However, when we take into account the Earth's orbital velocity (its assumed motion through wisp space), it results in a small increase in the time difference interval.

The ratio of wisp time to special relativity time is 1.000265, and it stays constant for varying water speeds (assuming absolute water speeds are small compared to the speed of light).

B.4 Applying wisp theory to Fresnel's formula

We adapt Fresnel's formula (Equation set B.4 – upper) to wisp theory by referencing the speed of water to absolute wisp space and adding the effects of time dilation.

Again, when we take into account the Earth's motion through wisp space, it results in a small increase in the time difference interval (Equation sets B.3 and B.4 lower).

B.5 Conclusion

By applying wisp theory to established equations that appear to give a correct prediction of the speed of light through moving water, we discover that the Earth's motion causes the time difference term to increase by a small constant multiplying factor of 1.000265.

Equation set B.4 (lower) shows the corrected formula for measurements carried out on Earth (the water's speed measurement v_{water} is relative to the Earth's surface).

By rotating the apparatus such that both arms are perpendicular to the Earth's motion through wisp space the small offset effect will be cancelled.

It might be possible to detect this offset using sensitive fringe shift detection equipment, and using materials with a higher refractive index – such as glass (refractive index 1.5) – to achieve better accuracy. Glass could be rotated in cylinder form to ensure that its speed is uniformly controlled while the light rays pass through its sides.

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A simple but powerful new theory

Wisp unification theory has been developed from a simple idea:

- Fractals form in 'full' space, creating particles that have empty space at their centres.

Wisp theory explains clearly the cause of gravity, which it links to a new 'ether' theory of relativity that treats space and time as being separate.

It agrees that the universe started with a Big Bang. But its origin was not a small point (singularity), but a large region of 'zero-state space' at the centre of an ultra-supermassive black hole.

Einstein's relativity theories are fundamental to modern physics and remain unchallenged. But wisp theory challenges them, predicting similar results but in fundamentally different ways, and it exposes the weaknesses of Einstein's special theory of relativity.

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