

# 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.

## Constituents of matter – Fermions

		Generations		
		First	Second	Third
Quarks	Up $\mu$ ○	Charm $c$ ○	Top $t$ ○	
	Down $d$ ○	Strange $s$ ○	Bottom $b$ ○	
Leptons	Electron $e^-$ ○	Muon $\mu^-$ ○	Tau $\tau^-$ ○	
	Electron-neutrino $\nu_e$ ○	Muon-neutrino $\nu_\mu$ ○	Tau-neutrino $\nu_\tau$ ○	

## Force carriers – Bosons

Photon $\gamma$ ○	Gluon $g$ ○	Bosons $W^+$ ○
		$W^-$ ○
		$Z^0$ ○

Figure 1.2 The Standard Model

### 1.2.1.6 *Supersymmetry theory*

A quarter of a century ago, Julius Wess and Bruno Zumino 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 lose 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 principles. 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 artefact 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 principles. 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 principle – 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 principles. Tests run 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.