INSTANTANEOUS COMMUNICATION

Where we learn that current communication is inadequate for our forthcoming ambitions, and we do not at present have a suitable alternative for the future. We look at precisely what governs the speed of communication, and exactly how slow it is throughout the Universe. We take a glimpse at the evolution of communication. We also discover the attempts there have been to improve communication speeds, and ultimately discover a solution that nature has miraculously revealed to us.

Wave particle duality of light

- *Light contradicts logic by sometimes behaving like a wave on a pond and sometimes like a bullet from a gun.*
- *If light weighs nothing, then it seems strange that it is capable of travelling at all.*
- *The scary reality of the real world is that observing things is perhaps the only reason why they can exist – a major dichotomy.*

With light being one of the Universe's most intriguing, significant and readily-available phenomena, understanding the intricacies of light would seem a straightforward exercise for an intelligent race. However, it has caused a great deal of despair for scientists, especially once it was discovered that light can be observed both as a wave and as a particle.

Light can be emitted from its source and observed travelling in a straight line to its destination, just like a bullet from a gun. Quite remarkably, other apparatus can be set up showing that light travels in a wavelike fashion. It will act similar to waves on a pond, and even exhibit interference patterns just like pond waves, with peaks and troughs.

The experiment that displays this phenomenon best is the 'double-slit experiment'. Thomas Young, 1773 – 1829, developed his wave theory of light, which contravened Sir Isaac Newton's view that light is a particle. Young cleverly put forward reasons illustrating that light had wavelike properties, and developed demonstrations to support this.

He compared light's interference properties with ripples on the surface of water. By placing a piece of card in a beam of light with two slits cut out to let through light, it is possible to observe a resulting image upon a screen which clearly shows an interference pattern. The only explanation for this is that light is travelling as a wave.

The underlying building block of light is energy in the form of electromagnetic radiation; it is a photon or 'quanta' of light that travels at roughly a hundred and eighty-six thousand miles per second. It radiates out from its source and is thought to be without mass, otherwise it would contravene Einstein's theories.

So, effectively something which weighs nothing is travelling as a wave at a hundred and eighty-six thousand miles per second!

This is particularly difficult to fathom.

It is extremely difficult to comprehend that something weighing nothing can travel in the first instance. Then to realise that light can span the whole Universe uninterrupted, displaying this wavelike property, seems contrary to anything we would have originally expected.

What is so baffling is that when scientists reduce the discharge of light photons in Young's 'double-slit experiment' to such an extent that they are emitted individually, over the passage of time they still show an interference pattern when passing through the slits.

How can this be?

How can a photon of light be acting as if it were being interfered with by another photon of light, when it is in isolation?

The most widely understood reason for this very mysterious behaviour is that light can assume a state of superposition. The state of superposition allows light to simultaneously be in two or more places at once.

A sharp intake of breath is required!

This is what scientists have deduced.

Until light reveals itself at its ultimate destination, it has the potential to arrive in many places. Only when light reveals itself does it make its presence known to one of these many possible destinations. Until this ultimate position makes itself known, the light has the remarkable ability to interfere with itself. This phenomenon permits the interference pattern to appear, even when photons enter the double-slit apparatus one at a time.

Breathtakingly unbelievable, but true!

One further confounding aspect of this apparatus is that when the slits are observed closely to see exactly which one of the slits a photon of light goes through, the light no longer displays an interference pattern. Light suddenly begins to behave like a particle, and no longer can the light exhibit the state of superposition that it displayed previously. Again, this occurs both when many photons are streaming through the two slits, and when they are fired one at a time.

This is thought to happen because the light's wavelike properties collapse as it assumes a particle-like form upon observation. It is therefore thought that the act of observation, or detection, determines exactly what the photon of light is, and exactly where it is. Prior to this it can be considered as purely an undetermined wave of potential light.

This is an extremely weird phenomenon associated with such a familiar aspect of our world. It transpires that electrons, neutrons, protons, atoms and even molecules act in this very same way. This has had the effect of thoroughly confusing scientists who study superposition. It makes them question exactly what matter really is. Some people have taken the results to mean that the act of observing atoms makes them appear – if they were not observed they would remain in a state of potential existence.

Heavy duty!

Rapid technological evolutionary improvement

- *The Earth stabilised, and then, from its perfectly balanced environment, life evolved which developed intelligence.*

- *Thousands of years ago, very slow, gradual, evolutionary improvement was all that humans experienced.*
- *Anyone living during the present time that is not keen on rapid technological improvement is living in the wrong era.*

One of the principal reasons we have evolved here on planet Earth must be our extremely comfortable proximity to the Sun. The Sun originally staked its claim to take up its particular position within the Milky Way Galaxy, then the Earth and the other planets subsequently evolved around it. With the Earth containing the ideal combination of elements and being the perfect distance from the Sun, it began to harbour life.

Once the Earth's environment had become established and stabilised, out from the primordial soup arose intelligent human beings. From this moment we were destined to become prolific communicators.

Human verbal communication came about through the passage of time and gradual evolutionary improvement; from saying 'Ug' one day to the vocabulary of Shakespeare a short time later. Our communicative vocabulary has developed so dramatically that the English dictionary today contains at least three times more words than there were in William Shakespeare's day, 1564 – 1616.

It is very difficult to accurately count the number of words in the English language because some have several meanings. Dog could be counted as one word or two, 'a type of animal', and a verb meaning 'to follow persistently'. If we count it as two, then do we count inflections separately too? Such as, 'many dogs in the park', and 'he dogs me persistently'. Is 'hotdog' or even 'hot-dog' really a word, or two words?

Over half of English words are nouns, approximately a quarter of words are adjectives and about a seventh of words are verbs. The remainder are made up of interjections, conjunctions, prepositions, suffixes and a number of other less prevalent categories.

It is suggested that there are, at the very least, a quarter of a million distinct English words. This figure excludes inflections and words from technical and regional vocabulary not covered by the Oxford English Dictionary. It also excludes words not yet added to the published dictionary, of which perhaps twenty per cent are no longer in current use. If distinct meanings were counted, the total number of words would probably approach three quarters of a million.

Hundreds of thousands of years ago, human beings would have little or no concept of change. They could have experienced only very slow change from their own growth and the growth of plants and animals. The only other change that humans could have experienced would have been evolutionary change, but this would have been totally unnoticeable as this type of change spans many generations. This lack of noticeable change remained until technology arrived in the form of early rudimentary tools.

Human beings eventually developed more advanced technology which brought with it the concept of significant technological changes, rather than the slow evolutionary changes to which they were accustomed. Dexterous limbs evolved over time in tandem with human intellect providing us with the extraordinary capabilities we see today. But now let us compare the slow speed of this gradual physical and mental evolution with something that has evolved at a truly supersonic speed, such as our means of travel!

Some estimates suggest that human beings have frequented the Earth in our current guise for approximately seven million years, since diverging from the chimpanzee and gorilla lineage. But incredibly, over the passage of just one hundred years from 1869 to 1969, our means of travel undertook an unprecedented, major, technological change from earthbound steam driven engines to three thousand ton Saturn V space rockets. From chugging along at a few miles per hour with steam puffing in the air, to propelling Mankind to the Moon and back at twenty five thousand miles per hour took just one hundred years.

Truly incredible!

The history of powered flight has one of the most astonishing stories.

Amazingly, Sir Patrick Moore met with both Orville Wright and Neil Armstrong, two famous people from the extreme ends of powered-flight technology. Orville Wright was accredited, along with his brother Wilbur, for flying the first successful aeroplane on 17th December 1903, and Neil Armstrong was the first man to step foot on the Moon on 21st July 1969. With less than sixty-six years between the two events, it just shows how extraordinarily fast flight technology developed.

Considering that the Earth had been in existence for more than four billion years, this goes to show what a major change in technology took place during these astonishing sixty-six years.

Equally astonishing is that we rarely consider how enormously incredible the change was, during this extremely short period. In fact, our general view when we reflect back on this time appears to be the complete opposite. Ask anyone what means of transport existed a long, long time ago, and you will get answers such as steam engines, when they were actually very, very recent indeed!

The confusion possibly emanates from our experiences in more recent times, where we have automatically come to expect rapid and significant technological changes. Just consider advancements in industry sectors such as global travel, communication, Internet, handheld devices, nanotechnology, household appliances, genetics, aerospace and pharmaceuticals. Very little, or nothing, was known about these at the time of the Wright brothers' first flight.

I really pity anyone in this era who is averse to change!

Starting from smoke signals and beacons

- *The ability to communicate quickly over long distances has been on the human race's agenda for a considerable period of time.*
- *How to achieve fast, long-distance communication was not clear until the electromagnetic telegraph was first put to use.*
- *The development of fast, global communication via the telephone has been accredited to Alexander Graham Bell in 1876.*

One key industry that is perpetually witnessing significant technological changes is communication. Before we scrutinise how the next significant communication changes may come about, we will take a quick look at the history of communication, and how it has developed from its basic infancy over the last few hundred years.

Smoke signals and beacons had been successfully used for thousands of years until 1792, when Claude Chappe invented the semaphore network. It was based upon optical telegraph which utilised good weather, daylight and stations based every twenty miles. Networks were established throughout Europe, with many of the towers still left standing to this day. Napoleon benefited from this technology, which managed to convey roughly two words a minute. The last of Claude Chappe's commercial semaphore links was decommissioned in Sweden as late as 1880.

The electrochemical telegraph was invented by scientist Francisco Salvá i Campillo in 1804, and later perfected by Samuel Thomas von Sömmering in 1809. The design had thirty-five wires up to a few miles long, each immersed in a tube of acid which would electrolyse, releasing hydrogen bubbles that represented a Latin letter or numeral.

This was the first electrical means of communication, with the receiver visually interpreting the bubbles to construct the message.

I imagine it would have been rather frustrating trying to run your social networking site over along these lines!

In 1832, Baron Schilling designed the electromagnetic telegraph, which was first put to use in 1833. In 1839, the Great Western Railway in Britain deployed the first commercial electrical telegraph. It ran for thirteen miles from Paddington Station to West Drayton. The Scottish inventor Alexander Bain then took the telegraph one step further, and developed the recording telegraph in 1843, a device that could be considered the first facsimile machine. Morse code was patented by Samuel Morse in 1837, and was very successfully utilised for commercial and military purposes.

The telephone was patented by Alexander Graham Bell in 1876, which very quickly became a tremendous global success. Then, on 3rd April 1973, Martin Cooper momentously made the first mobile telephone call to Doctor Joel Engel. Text messaging was invented as a simple application upon the mobile phone; it was not intended to become particularly popular and when it did, took the telecommunications industry by surprise. The first text message, technically called Short Message Service, was sent by a Nokia engineering student called Riku Pihkonen, in 1993.

Email was first conceived as a concept by Multics – Multiplexed Information and Computing Service. This project, which culminated in the first Email system, commenced in 1964 and allowed communication on a closed network. It was not until 1989, when Tim Berners-Lee invented the World Wide Web, that email could be networked globally, and facilitate the storage of websites.

The World Wide Web was then further enhanced with one of the most ingenious inventions of our modern day, the Internet Search Engine. The first Internet Search Engine, ALIWEB, was invented by Martijn Koster in 1993, and I was absolutely delighted to work with him for one year during those very exciting times. ALIWEB stood for 'Archie Like Indexing for the WEB'. It allowed users to submit the locations of index files on their sites, which enabled the search engine to include web pages and add

user-written page descriptions and keywords. This empowered webmasters to define the terms that would lead users to their pages.

In 1991, I was involved in developing what was termed DROS, the ‘Data Related Operating System’, and spent many days traipsing around British banks trying to get the required funding to develop the idea into a commercially available product. The idea was that data could be communicated over the World Wide Web, be accepted into a browser and interpreted locally, hence being machine independent. The syntax of the code was relatively simple, and would allow the development of applications which could be interpreted by any computing platform located anywhere, so long as it was networked.

Unfortunately for us and the British banks, we were unsuccessful in securing the correct level of funding, and the venture was never realized. The piles of paperwork still collect dust to this day. The venture capitalists, unfortunately, had not got a clue about what we were talking about. What a crying shame for the British Computing Industry, as in 1995 James Gosling released JAVA as a core component of the Sun Microsystems JAVA Platform. JAVA proved to be a major success with its ‘write once run anywhere’ capability.

JAVA was supposed to have been a name chosen randomly from a list of words, but I did hear once that it was chosen as a good-humoured poke at the very acronym-riddled world of computing. I heard it stood for, ‘Just Another Verbose Acronym’.

However, I also heard that this could be just a myth.

So now we have data and voice communication whizzing around the world at the speed of light, what more could we want from communication?

Quite strangely, the speed of light is actually rather slow for anything other than local Earth-bound communication. For distances further than this, something faster is required. If we are to voyage further into space, then we must develop a high-speed communications method that circumvents the restrictions caused by the speed of light.

Perhaps we will have to turn to the quantum world to achieve faster-than-light communications. I have seriously thought for some time there must be some useful communications mechanism lurking within the depths of the quantum world!

In 1997 I began contemplating how some of the known quantum effects could be utilised to improve communication. I indentified some of the weird effects that showed clear signs of contributing towards faster communication, and scribbled a few diagrams and notes.

I went to a reputable patent attorney in London to ‘test the water’ regarding this communications method, and was met with positive bewilderment and jovial astonishment. I came to realise there is sufficient interest in such a communications mechanism, which is a relief after my inability to initiate DROS!

My experience at the patent attorney was extremely positive, and they recommended that I should persevere by creating a working model. This I feel may be rather difficult, as I do not have access to a suitable laboratory!

I thought perhaps the best thing to do was to just divulge the communications mechanism within this book, and leave it to the rest of the world to develop further. I feel I am relatively well-qualified to invent and divulge such a communications mechanism, as my credentials on the subject are fairly reasonable.

My first-hand experience of commercial communications has given me in-depth knowledge and understanding of this leading edge technology, its benefits and challenges. Each project I have worked upon has given me a greater insight into specific aspects, broadening my overall appreciation of communication.

I helped develop and maintain military standard X400, X500 secure messaging, which gave me an understanding of the importance of encryption methods. I headed a major UK airline's IT systems and communication infrastructure. This experience provided me with a clear understanding of the deployment and criticality of communication. I was instrumental in the development and programme management of Motorola's end-to-end solutions; namely the Internet to the mobile phone. This experience provided me with an understanding of the capabilities of communication. In Spain, I personally orchestrated the first ever GPRS handset to be connected to a live network. This experience provided me with an understanding of how new revolutionary technologies can be implemented. I managed the development of the Odin device – the first colour mobile-based device for Psion and Symbian. This experience provided me with a thorough understanding of handset technology. I was 3G Programme Manager for one of the UK's leading mobile phone operators. This experience provided me with an insight into the operations of a large communications network. I was a Director of one of the UK's leading mobile phone companies. This experience provided me with an in-depth understanding of how to orchestrate a communications infrastructure.

My association with computing and communications spans over thirty years. I graduated in computing and subsequently studied quantum physics with a specific interest in quantum computing, quantum communications and quantum weirdness.

Let us see what this has done to help pave a way forward!

The inhibitor to intergalactic communications

- *The speed of communication is governed by the speed of light – nothing can travel faster than this.*
- *Light can travel almost six trillion miles in one year – it takes just over four years for light to reach us from the nearest star.*
- *A much better and faster means of communication must be developed if humans are to explore deep space.*

Most people consider the speed of light as rather fast. Even though light travels at an incredible one hundred and eighty-six thousand miles per second, it is, in fact, the inhibitor that places an upper limit to the maximum speed at which communication can travel.

If we contemplate utilising a mechanism based upon the speed of light as a means of intergalactic communication, then we have problems!

Let us firstly contemplate the enormity of the Universe to see how big the problem actually is.

When attempting to absorb the enormity of the Universe, you have to disengage yourself from your normal, everyday, terrestrial, 'short-hop' distances such as trips to the shop, holidays, train journeys and plane fights. Distance yourself from these minute distances to engage your mind to become liberated within an almost unfathomable Universe, with its billions and billions of galaxies, each containing billions and billions of stars. With universal distances being measured in light years, our minds boggle when wrestling with the fact that one light year is almost six trillion miles, and the nearest star to our Sun, called Proxima Centauri, is just over four light years away.

Consequently, to attempt to colonise a planet orbiting around the closest star to our Sun, a distance of over twenty five trillion miles will have to be traversed through the void of space, before we can actually confirm there is a suitable planet on which to land and inhabit. Bearing in mind the Moon is just under a quarter of a million miles away, this puts the distance to Proxima Centauri into some kind of perspective. Proxima Centauri is a hundred million times further away from Earth than the Moon!

If we were to travel to Proxima Centauri at twenty five thousand miles per hour in a Saturn V space rocket, it would take us one billion years to get there. Plenty of time for things to go wrong!

Therefore, we can see that a significant change in communications technology is required before any type of intergalactic travel of this magnitude can be considered.

Our current communications infrastructure only operates at the speed of light and is not at all adequate. Speed of light communication proves to be extremely sluggish over these larger distances, and for this reason is totally inconvenient. When communicating instructions and messages to probes on Mars and other planets within our solar system, we have to contend with a number of minutes' delay. The time delay is made better or worse depending upon the planet's orbital distance from the Sun and relative position to the Earth – so the communication time delay to distant planets alters throughout the Earth's orbit.

It would be totally inappropriate to send a perilous pioneering expedition of intelligent astronauts hurtling off into outer space to colonise another prospective world within another solar system, with the only means of communication being a two-way radio featuring a four-year gap between conversations. It would take four years for us to get any message to them at the speed of light and then another four years for their response to return.

A technological challenge has therefore been set before us.

We must now develop an acceptable communications mechanism for such a voyage.

The various options available

- *Communication is now at the heart of everyday life - it is now an essential aspect of our daily routines.*
- *Time delays are a major problem with communication operating at the speed of light, as distances within the Universe are so vast.*

- *Speed of light communication is useless for intergalactic communication, as it will take years to transmit a single message.*

Prior to the invention of communication technology, such as the telegraph, telephone and email, the human race was able to communicate only by written correspondence, visual correspondence, messenger on horseback or smoke signals. Before a faster means of communication was invented, the speed at which people communicated was never construed as a problem. Everyone managed their communication in accordance with the communications means available to them. No one could contemplate anything superior.

Civilizations happily geared themselves up around this laid-back communications model, and the world worked flawlessly. No one was aware that communication was about to significantly advance, and become an intrinsic and absolutely essential part of everyday life.

It would have been impossible to imagine, all those years ago, how anyone could browse goods from around the world upon a screen in the comfort of their own home, and then at the click of a button have any item delivered to their door shortly after.

That is not possible with smoke signals!

Along came the telephone, which could miraculously relay real-time conversations over considerable distances. A freak, technological breakthrough, that suddenly allowed you to speak with someone when they were miles away. This was an extraordinarily strange experience at the time, as sight and sound had always gone hand-in-hand. Most surprisingly, many of the Victorian people of the day had great difficulty contemplating any practical use for this new device. The average person had difficulty seeing any practical reason why anyone would need to talk with someone who was not actually in the vicinity!

To them it was similar to being blind, and conversation was limited to “Hello … hello … isn’t this funny”.

A similar lack of vision was evident when Michael Faraday invented the electric motor in 1821. Having finally mastered electricity, Faraday was demonstrating it to Prime Minister William Gladstone. The Prime Minister turned to Michael Faraday and said, “What practical value has this electricity?”

To which Michael Faraday answered, “One day, sir, you may tax it.”

Electricity made its mark on planet earth quite rapidly, changing the way we do most things, and was duly taxed!

Eventually the telephone found its way onto the Victorian stage as a form of magic trick, alongside the great performers of the time such as escapologists, strongmen and fart artistes. In 1876, the year that Alexander Graham Bell patented his invention, there seemed as much fun having a fart artiste make you laugh as there was in seeing a telephone work for the first time.

The take-up of the telephone could not have been helped when Alexander Graham Bell refused to have one in his study, as he found it rather intrusive!

How incredible!

Alexander Graham Bell certainly had vision, as I do not know anyone who has not found telephones rather intrusive in their lives at one time or other!

It is a very good job that the telephone caught on as a means of communication rather than the fart artiste. Otherwise we would be living within a very peculiar and decidedly different type of world today!

Phew!

The speed of light dictates the speed at which current communication can operate. Thankfully, the distances over which telephone calls needs to operate is relatively small compared to the distance light can travel in a second, so we do not notice any delay here on Earth.

Light can travel around the World eight times a second, but when utilising 'speed of light' technology to communicate interstellar distances, we begin to experience extremely inconvenient time delays.

To put this into some kind of perspective, imagine we live upon the surface of one of the largest know stars, called VY Canis Majoris. Its circumference measures roughly twelve billion miles. Utilising current technology there would be at least a ten-hour time delay between conversations.

This delay is incredible, especially as the two people communicating are both upon the same celestial body. Such is the size of this enormous universal structure, and this highlights the comparatively slow speed of our current communications technology.

If we were to live on Jupiter, we would similarly experience a noticeable time delay, but not to such a remarkable degree. Jupiter's circumference is roughly two hundred and eighty thousand miles compared with the Earth's much smaller circumference of twenty four thousand nine hundred miles. Light can travel around the Earth just over seven times a second, but in the same time it would not make one complete revolution of Jupiter. As a result, our telephone conversations on opposite sides of the planet Jupiter would be interspersed with annoying moments of silence.

Our current, conventional, 'speed of light' technology is totally impractical for intergalactic communication, due to the inherent time delay. For such relatively large distances, there is undoubtedly a genuine requirement for a totally different communications mechanism.

For anything to travel faster than the speed of light is considered to be nigh on impossible, due to the natural rules highlighted within Einstein's Special Theory of Relativity. However, this has not prevented people from challenging this convention in an attempt to derive a revolutionary solution, and become the first to discover a long awaited 'faster-than-light' phenomenon.

Gallant attempts to improve communications

- *Some extremely ingenious methods have been conjured up to attempt to communicate faster than light.*
- *Some scientists live in hope that there are undiscovered physical properties within the Universe which will permit faster-than-light communication.*
- *The science behind the future of communication could be mistaken for science fiction - the warp drive was devised by Miguel Alcubierre.*

Scientists have long dreamt of achieving faster-than-light communication. The sheer thought of it is intriguing, and the rewards attached with such an innovation would be

tremendous. Gallant attempts over the years to discover ‘faster-than-light’ communication have resulted in terminology such as tachyons, Alcubierre drives, rigid bodies, rotational effects, and traversable wormholes. Some of these attempts have been ingenious, others purely science fiction, and others a little more serious. To date, none of the attempts have been successful. However, we will take a brief look at each as they are all perfect examples of ‘thinking outside the box’ and thinking differently.

Tachyons were first described by the German theoretical physicist Arnold Sommerfeld, 1868 - 1951. They are hypothetical, subatomic particles that travel faster than the speed of light, but as they have never been detected are only realistic within the context of a science fiction film.

The Alcubierre drive, or Warp Drive, was a concept devised by Mexican physicist Miguel Alcubierre in 1994. It is a speculative mathematical model that theorises the expansion and contraction of space-time, causing the fabric of space to the front of a spacecraft to contract and the space behind it to expand, thus thrusting the spacecraft faster than light relative to everything around it. However, there is no way of creating a bubble within which the spacecraft may reside within, and hence we have to leave this as a theoretical concept for the time being.

Rigid bodies are interesting and something that I believe would be a great deal of fun trying to prove. If you have a long stick reaching from the Earth to the Moon and you push one end slightly, surely you would feel the prod movement immediately on the Moon. Normally it takes just over one second for conventional communication to arrive at the Moon from Earth at light speed. Are we on to something here?

Alas, the elasticity of the materials always turns out to be much slower than the speed of light. You could, however, imagine a new material whose elasticity renders it totally and utterly solid. In this way, you could say that theoretically there could be faster-than-light communication. Unfortunately, this may never be the case in our Universe.

The ‘rotational effect’ consists of standing outside on a clear night with the Moon on the horizon, then spinning yourself round and round about once a second. Now if we work out how fast the Moon is spinning around your head relative to yourself, it turns out to be roughly eight times the speed of light!

Bearing in mind that general relativity states that all coordinate systems are equally valid including revolving ones, does this mean the Moon is going faster than the speed of light as far as you are concerned?

Unfortunately not, as velocities in various places cannot be directly compared in general relativity, so this idea falls flat. However, this is an extremely ingenious attempt, utilising original thought, showing that a person can observe a faster-than-light experience, albeit a pseudo experience.

A traversable wormhole is unfortunately something that has so far been restricted to films. It is theoretically possible, according to Albert Einstein. Supposedly space can warp and stretch space-time, creating a shortcut from one location in space to another. The creation of a wormhole would be nigh on impossible, as it would involve travelling through a rip in the fabric of space to appear somewhere else within the Universe. From the sounds of it, I doubt very much anything would survive the journey through the rip in space anyway!

My favourite faster-than-light mechanism has not yet been given a name, I have heard only of the concept. The set-up consists of two planets and a dual light beam-generating unit. Imagine the two planets are separated by a distance of one million miles. The dual light beam-generating unit is specifically designed to emit blue light in one direction and red in the other.

It would normally take about six seconds for light to traverse the one million mile distance between the two planets. If we now position the light beam-generating unit centrally between the two planets, it will take roughly three seconds for light to travel from the light beam-generator to each of the planets.

If one of the planets receives a flash of red light three seconds after the unit is given the instruction to emit light, then the inhabitants of this planet instantly know that the other planet has received a flash of blue light!

This mechanism has managed to relay knowledge at twice the speed of light. The planet receiving blue light knows that the other planet has received red light and vice versa; this all happens at twice the speed of light.

Although this is true, it also relies upon the dependability of the beam-generating equipment. Original real-time communication cannot be relayed, only previously defined knowledge. This renders the mechanism's use extremely limited and unworkable for effective real-time communications. Irrespective of its limited capability, it is extremely interesting all the same.

These gallant attempts are all very commendable, but alas there are shortfalls within each. There is, however, hope for a breakthrough, as you will discover by reading on!

Our new communications mechanism for a new era

- *Who would have thought that matter was made up in the way that Mankind ultimately discovered - some very special people helped pave the way.*
- *The behaviour of particles completely baffled scientists as they battled to discover the secrets of matter.*
- *Quantum weirdness, or non-locality, displays astonishingly peculiar results that baffle the scientific world.*

I would like to propose a new 'faster-than-light' mechanism, but we need to firstly familiarise ourselves with a few little known facts at the subatomic level. Nothing too severe, I promise!

An atom is absolutely tiny and, unlike anything we could imagine, holds a charm of its own on a scale that we can scarcely believe. It was the behaviour of atoms which finally revealed the secrets relating to their size and make-up. It was first thought that matter was made up of something similar to plum pudding, before it was settled upon that they are actually made up of almost nothing whatsoever!

Our current understanding of the components of an atom has been bequeathed to us only since James Chadwick discovered the neutron in 1932. Earlier work undertaken by Ernest Rutherford, J. J. Thomson, Fredrick Soddy, Margaret Todd, Neils Bohr, Gilbert Lewis and others helped pave the way, but it was not until 1964 when quarks were first proposed, that we had any type of inkling that they were the smaller building blocks of neutrons and protons. This discovery is scarily recent, and we have hardly had time to

act on this information and extrapolate the full potential of exactly what this realm of the very, very small has to offer.

Now that we are beginning to understand the subatomic level, and have finalised our model of the atom, we have confidently printed it within text books. At this point, you would have thought everything would be plain sailing. However, how wrong you would be; there are so many unknowns, it is incredible. The behaviour and nature of particles at the subatomic level has thrown scientists some true googlies. Entanglement, superposition, quantum weirdness, wave particle duality and the quantum leap are names of just a few examples of this very peculiar realm of subatomic behaviour. These phenomena at the quantum level have perpetually bamboozled physicists attempting to reveal the mysteries of the very, very small.

Thanks to some extremely clever scientists, we can now go a step further into this very strange subatomic world of particles and atoms that make up everything in the Universe. At this point I need to explain some very exciting but peculiar phenomena relating to something that has been termed ‘quantum weirdness’.

Quantum weirdness, or non-locality, exhibits some extraordinarily interesting characteristics, and displays what is called the nonlocal property of particles. In a nutshell, this is where substance goes completely doolally, and particles disappear and reappear elsewhere without traversing the intervening space. Scientists have tried very hard to explain exactly what is happening, and a few think they have managed to come up with a fairly meaningful explanation, but what is interesting is that, irrespective of the reasoning behind this mind-blowing behaviour, it is consistent, and may be utilised to our advantage.

Spooky action at a distance

- *When looking at ‘spooky action at a distance’, one could be forgiven for thinking it is a paranormal phenomenon.*
- *A particle is capable of traversing the Universe, totally unaware of what its properties are.*
- *It would also appear that a subatomic particle does not know what it is until it has reason to reveal its identity.*

If you get excited about thinking that the Loch Ness Monster may exist, or have dreams about discovering a missing link within the evolution of man, or even if you are just an advocate of the paranormal, then you are in store for a pleasant surprise from this section of the book. The explanation of ‘spooky action at a distance’ is significantly more exciting than discovering the existence of the Loch Ness Monster. I sincerely believe that the phenomenon fits plumb into the category of the extreme paranormal. No disrespect to the Loch Ness Monster or Piltdown man!

Imagine Einstein's surprise when he realises there is a truly weird phenomenon, so weird that he coins it 'spooky action at a distance'. Upon witnessing it, Einstein even questions whether God is playing dice with the Universe by saying, "God does not play dice with the Universe".

Einstein is in disbelief regarding what he observes, and remarks, "Quantum mechanics is certainly imposing. But an inner voice tells me that it is not yet the real thing. The theory says a lot, but does not really bring us any closer to the secret of the old one. I, at any rate, am convinced that he does not throw dice."

No one could believe what they were witnessing at the subatomic level. It would appear that electrons and other subatomic particles can behave very peculiarly indeed. In certain circumstances, particles will miraculously disappear and reappear somewhere else, some particles can be everywhere all at once, and at other times they can become entangled together as twin particles.

All very true and very weird!

This crazy behaviour of particles is extremely counterintuitive in contrast to the behaviour of items to which we are normally accustomed.

A simple one hundred watt light bulb emits roughly one million, million light particles, called photons, every second. They burst throughout the vicinity of the bulb to illuminate everything around. These photons may entangle themselves with other photons to become twin particles which subsequently travel off in different directions.

Particles naturally decay and convert to become other particles. In doing so they conform to conservation laws that result in pairs of particles being generated that find themselves assuming conjoined states. This effect is called quantum entanglement, and is a naturally occurring phenomenon.

Imagine a pair of particles that have two states, 'spin up' and 'spin down'. These particles can now be viewed as one entangled status of two particles, and may not be described individually without making reference to the other. The case we just described is referred to as an anti-correlated entangled state as the properties of the particles oppose each other. If the spins were to be the same, they would be referred to as being in a correlated entangled state.

Within the quantum world, a particle's properties cannot be determined until it is observed; it is said that a property of a particle is indeterminate until an observation or measurement is made. When measuring the spin of many similar, 'normal' particles, the result will yield an unpredictable series of random fifty-fifty probabilities of spin up or down. However, when measuring the spin of entangled particles, their spin is correlated. Detecting the spin of one of the entangled pairs tells you exactly what the spin of the other is!

Unfortunately, there are other known behaviours of particles that cause a difficulty with this situation. There is something called 'The Copenhagen Interpretation', which demonstrates that a particle will only know its true identity, or properties, the moment it is observed or measured. It may sound rather strange that a particle can traverse the Universe not knowing what it is, but this is one of the underlying principles of 'The Copenhagen Interpretation'.

So with this in mind, when the first particle of an entangled pair is measured, the state of the second is known at the same instant. This is regardless of the distance between the two particles. The knowledge about the state of the second particle is the

problem scientists have with quantum entanglement. As the distance between the two entangled particles is irrelevant, and could be millions or billions of miles, this means that the information about the status of each must be travelling faster than the speed of light. However, this does not conform to Einstein's principle of general relativity.

Scientists find this area of quantum physics very messy, and have developed all manner of reasons to try to explain the faster-than-light transfer of information. A number of theories such as the hidden variables theory, Bell's inequality, Bell's theorem and the Bohm interpretation, have been proposed to try to explain this result.

It is all very mystifying, and causes sleepless nights for many quantum physicists!

The mere observation of subatomic particles, such as light, affects their characteristics as they actually act as a potential particle until observed, or questioned, about what they actually are. It is almost as if particles travel from source to destination in a different form, within a wavelike structure, as opposed to what we would naturally expect them to be; like bullets being fired from a gun.

Only when the wave structure is observed does it give up all its secrets, and the wavelike structure is abandoned to reveal itself as a particle with particular characteristics and properties. The wavelike structure that it assumes as it travels means that it can be interfered with by other similar waves, just like the waves of an ocean. However, what is especially confusing to everyone studying this phenomenon is that, even if there is only one particle travelling within this wavelike structure, it can be seen to remarkably interfere with itself, demonstrating unequivocally that it is in more than one place at once. In fact, it could in reality be actually in an infinite number of potential positions.

Spooky and weird!

Within an instant, the particle becomes observable at its destination, randomly deciding truly where it is, and assembling itself out of the wavelike composition into a particle-like composition. It is at this instant that the wave-function of the potential particle collapses, and the particle appears to randomly present itself in a location that conforms to just one of its possible locations.

This phenomenon could be looked upon as particles existing in a state of potentiality, with just a probability of existence in a particular place. What is so truly miraculous and so counterintuitive is that even in the absence of any other waves of potential particles, these individual waves have been witnessed interfering with themselves. This ability for a particle to be in many places at one time is referred to as being in a state of superposition, exactly the same as being everywhere all at once.

It would also appear that a subatomic particle does not know what it is until it is observed by something; as a consequence it has the ability to defy interrogation during its journey as it traverses as a wavelike structure between its origin and its destination. It is as if a particle travelling as a wavelike structure does not know what its identity is upon its outset. This can be deduced by placing interrogation devices along its journey, and studying the logic associated with the ultimate outcome at a final detector; the final detector can produce results that totally defy all conventional logic.

Instantaneously aware of interrogation

- *At times, at the level of the very small quantum world, it is as if there is no intervening space between particles.*
- *There are recently-discovered weird phenomena at the quantum level that have yet to be put to practical use in this world.*
- *Particles have a series of properties such as spin direction, charge and colour – these can be detected by apparatus.*

Most miraculously, when an entangled pair particle is determined at its destination, it seems to be instantaneously aware of any interrogation devices to which its other particle pair has been subject. If one of the particle pairs has revealed its identity, then this will be instantly known to the other pair. This happens even if the pairs of particles are massive distances apart; it is as if the space between them does not exist. This faster-than-light acknowledgement occurs between entangled particles even if the distance between the two were millions of miles!

Einstein's 'spooky action at a distance' blatantly exhibits the bizarre nonlocal behaviour of particles.

The entangled particles will unashamedly lie about their characteristics, and pass through interrogation devices, prior to arriving and revealing their ultimate identity at their destination. This reveals that a particle has the ability to display particular characteristics to an interrogation device earlier on in its journey, to only appear to change its characteristics when determining truly what identity it is. This implies that whilst in its wave form it just does not know what it is, and the fact that it defies logic as it passes through interrogation devices, shows that the particle did not have a clue as to what it was from the outset.

When one of an entangled particle pair is suddenly forced to reveal its identity, it may then render the interrogation device results for its partner erroneous, even when the interrogation devices have already been navigated and determined. This is quantum weirdness!

If you did not understand all of this, then, do not worry - not many people do!

How on earth can the particles of matter that we know and love so much in our normal world behave in this way?

It certainly does not justify a trip to your psychiatrist if your mind feels muddled, but if you do understand why this happens then it is certainly worth a trip to the Institute of Physics to explain it to them.

You may be worth a fortune!

What people have not done to any degree of detail is to speculate what practical use this may have in our world, irrespective of why particles behave like this.

I can now sense you thinking about the possibility of this wave particle duality of light, with its associated idiosyncrasies, becoming the basis of a new communications mechanism. Surprisingly, how right you would be!

So what can we accomplish with this spooky action at a distance?

Well, let us examine it closely to see whether there are the constituent components for a communication mechanism hidden within there somewhere.

So we can be familiar with the precise events occurring at this quantum level, and relate more closely to the exact behaviour of these tiny particles, I will illustrate all that is

happening as if it were to be witnessed at our more understandable level of the world of comprehensible ‘larger’ things.

What follows is an account of the associated activities occurring at the quantum level as if it were to be happening to something familiar, such as cars, at our level of the large.

This spooky behaviour of the subatomic particles we have just recounted happens with light and equally well with electrons. Light is made up of photons which are small packets of energy. We will now imagine them to be cars.

What we will to do for the purpose of this analogy, and to convey a clear message, is to imagine that a photon of light is a motor car. A photon has attributes associated with it such as spin direction, charge and colour, but if we look upon them as cars instead it will be easier to envisage the strange happenings, and relate to how bizarre particles, such as light, act.

To perform quantum weirdness experiments in a laboratory, physicists require a reliable light source or a laser to produce a constant source of photons. However, we will imagine an enormous car park full of cars - the car park will emit cars just like a light source emits photons. In our experiment, the cars will travel in straight lines along roads, just like light travels directly from a light source to its destination. At points where light could be interrogated for certain properties and diffracted, our cars will be observing road signs and taking the appropriate turnings.

Certain characteristics of our cars will make our experiment interesting – we will imagine that the cars are randomly coloured back or white and they are being randomly driven by men or women.

The cars and the particles

- *We set up apparatus that sends particles along a route - just like we may direct certain traffic along particular roads.*
- *There are other parts of the apparatus where particles may choose randomly to go north or south, just like cars joining a motorway.*
- *Amazingly, to everyone’s total disbelief, we find particles at one of the destinations that we were sure the apparatus had directed elsewhere.*

To imagine how weirdly particles behave at the subatomic level, imagine we have a car park full of black and white cars belonging to both men and women. Road signs will direct the cars along a system of roads, which will result in some people arriving at a bar to enjoy a drink.

As the cars drive out of the car park and travel along the road, after a short distance there is a turning they may take. There is a road sign by the turning which instructs all female drivers to take the turn, leaving all the male drivers to continue along the road unaffected.

The male drivers then arrive at a fork in the road giving them a choice of direction - they may either take the road which heads northwards or take the road which heads southwards. The male drivers randomly choose to go northwards or southwards. A little further along each of the roads, irrespective of whether they chose northwards or

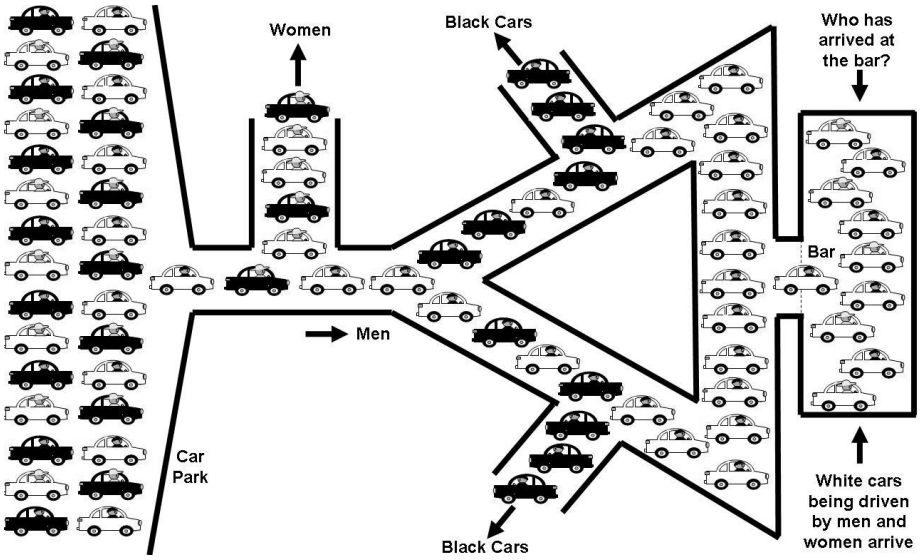
southwards, they encounter another road sign which instructs all black cars to turn off – leaving all the white cars to continue along the road unaffected.

If all drivers have paid attention to the road signs correctly, which we shall presume they have, along the two main roads there will be just white cars being driven by men – some heading northwards and some heading southwards. Both the northerly and southerly roads then make a sharp turn which heads all traffic towards the bar, where all that arrive can get out and enjoy a drink.

Amazingly, to everyone's total disbelief, we find that the people that pull up at the bar are not as we would expect. All cars that arrive at the bar are white, but for some weird reason they are being driven by both men and women. How did the women arrive there, when clearly, if they had followed the directions properly, they would be miles away at this point!

The road sign had clearly instructed all women drivers to take a turn shortly after the car park, near the start of the journey.

This defies all logic, but this is exactly what happens with photons if we treat them in a similar way using their specific properties.



Amazingly – despite appropriate turnings being taken, all white cars being driven by both men and women arrive at the bar!

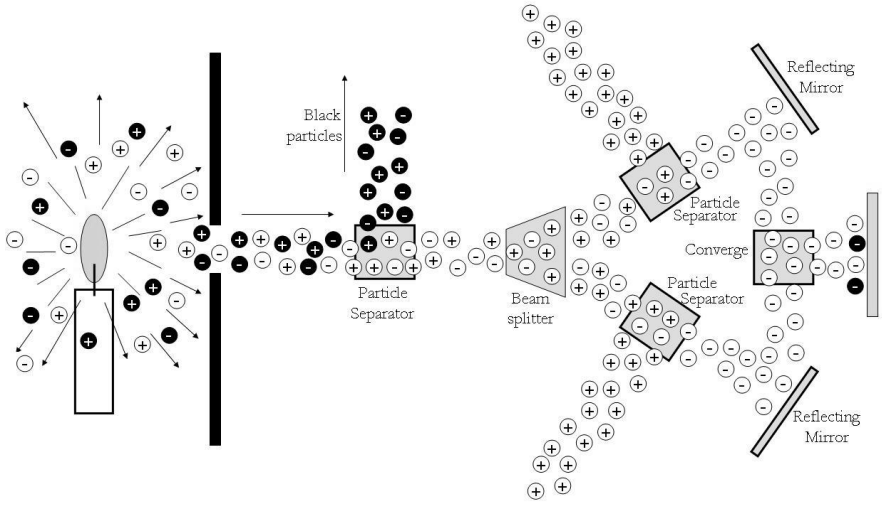
The diagram explains a very strange phenomenon that occurs at the subatomic level, but has been enlarged to something to which we can relate.

Let us just recap this bizarre setup. There are black and white cars being driven along a road by both men and women from a car park. All female drivers are told to turn left very soon after the exit from the car park. Then there is a fork in the road which those travelling along can randomly choose to take. The black cars along both forks are now told to turn off. The two roads containing only white cars being driven by men are then merged back together again arriving at a bar. Amazingly, at the bar we find both men and women in their white cars.

At the subatomic level, this is what is referred to as Quantum Weirdness, and has become one of the most amazing mysteries.

Some believe that the nature of the subatomic world does not allow you to know two properties about a particle. So having already directed particles along a path due to an earlier interrogation device, when they are analysed in the second device, the result of the first no longer holds true, even though we know the first filtering process works perfectly well in isolation.

We shall now move on from the car analogy to take a close look at what happens in the real world. The properties of light are many and varied – but for pictorial reasons we shall imagine light particles may be black or white and positive or negative.



Beams of particles are emitted by the candle. Each particle has properties: they are black or white, also they may be either positive or negative. Even though the apparatus separates out the black particles early on, they miraculously reappear at the detector to the right of the apparatus. Truly bizarre!

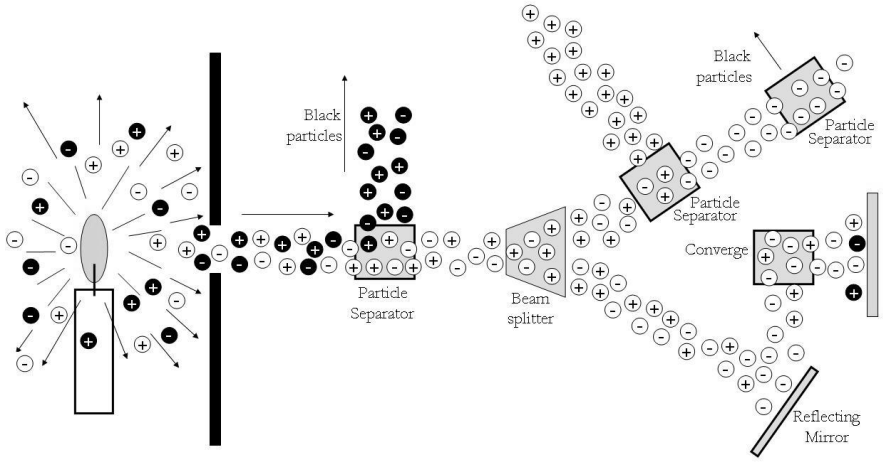
Once familiar with the events that occur in the previous diagram, there is another interesting twist to fathom. With a mechanism placed to detect the property of the particles on the northerly path, irrespective of whether there is a mechanism to detect the property of the particles placed on the southern route, the detector still reports as if it were there – this can only have been influenced by there being one on the northerly route. This happens even though knowledge of this would have taken faster than the speed of light to inform the particle at the detector, not even if the particles have passed the beam splitter before someone decided to insert the detecting mechanism on the northerly route.

This defies all logic, but who cares?

Our greatest scientists have had sleepless night thinking about why this happens.

We should not worry about it.

Let us utilise the effect to our benefit!



Amazingly, if we insert the particle separators on just the upper route then we get similar results as before. This is without any experimentation taking place on the lower route – this means that the knowledge of the particle separator being in position on the northerly route is relayed to the detector faster than the speed of light.

So we know the result when we 'do not' detect at a distance along the upper path, and we know the result when we 'do' detect at a distance along the upper path. Different states result, like on and off. So if we insert the detector, this has the effect of toggling the result. If we place the detector in and out like a piston, then surely we have a means of sending messages in binary ones and zeroes over limitless distances instantaneously.

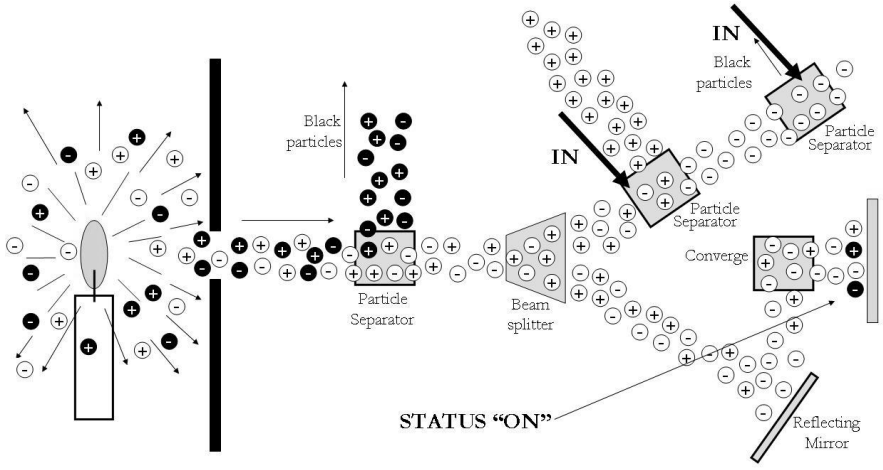
So we can now draw the apparatus that does this and take a closer look at exactly what is going on.

The particles are fired from source through an initial detection mechanism, and the particles that continue through then race towards a beam splitter. The beam splitter acts purely as a means of dividing the stream of particles into two, without any detection mechanism.

We now have a lower and upper beam of similar particles which are entangled together. If we now interrogate the upper beam for a particular property, the lower beam instantly recognises this fact; and because of this, we have invoked and thus contravened the principal that you can only know one thing about a particle, namely Heisenberg's Uncertainty Principle. This has the effect of strangely invalidating the initial detection mechanism, and particles which were at first glance no longer within the upper or lower beams, miraculously reappear at the detector. If we now take the detector out of the upper beam, instantly we get a different result at the detector at the end of the lower beam.

So by placing in, and removing out, the detector on the upper beam, we can make the detector on the lower path yield different results instantaneously, irrespective of the distances involved. This includes the distance from the beam splitter and the piston motion of the detector on the upper beam. So here we have a communications

mechanism that can traverse limitless distances instantaneously, passing information effortlessly.



By placing in, and removing, the detector on the upper beam, we can make the detector on the lower path yield different results instantaneously, irrespective of the distances involved – the above diagram depicts status 'on'.

We can use line of sight, or cable, or both, to send messages of this nature. The communication path is from the point where the detectors are positioned on the upper beam across to the detector.

How is all this possible?

Heisenberg's Uncertainty Principle explains the more you know about one property of a particle, the less you can know about any other. It is a very counter-intuitive concept and it is difficult to understand the reason why, but we can see this operating with a very simple experiment.

If a laser beam of light is passed through a small pea-sized hole, we can witness the resulting light emerge from the hole by displaying it on a screen. Now if we make the hole narrower and narrower, something very strange happens when the hole gets to about a hundredth of an inch wide; the dot on the screen suddenly spreads out.

It is no longer a speck!

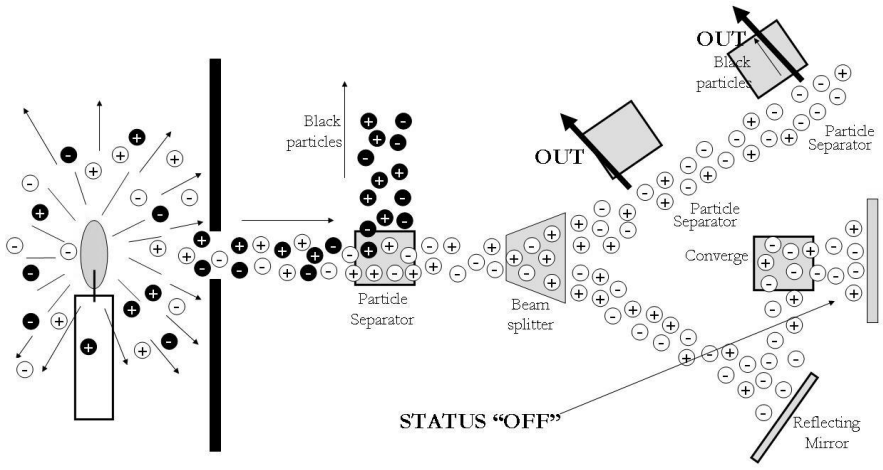
How can this be so?

What is causing this to happen?

It happens quite miraculously because our Universe very strangely will not allow an observer to know more than two things about a particle. Because we know so precisely where the laser light is on the horizontal plain of the tiny opening, when it subsequently emerges from the hole, the direction of the light can no longer be determined. It would appear that the particle's sense of direction is made random once we know where the particle is. So what we see is the light spreading out on the horizontal plain; very non-intuitive, but it is the way the Universe works!

It is worth considering whether we are seeing Heisenberg's Uncertainty Principal at work within our setup, perhaps coupled with superposition!

No one has ever been able to explain the strange phenomenon observed with this apparatus setup; perhaps a number of quantum effects are acting together.



By placing in, and removing, the detector on the upper beam, we can make the detector on the lower path yield different results instantaneously, irrespective of the distances involved – the above diagram depicts status 'off'.

Interestingly, the apparatus still works the same when we fire just one particle into the system. What this fact implies is that the particle traverses along both the upper and lower paths in the superposition state, and is capable of interfering with itself.

Knowing that the particles are fully conscious and aware during their superposition state as they travel through the system, then if there is some way of changing the outcome quickly and repeatedly, whereby the final detector can acknowledge these changes, we have created a communications mechanism.

So, having drawn the apparatus required to establish this communications mechanism, I suddenly realised that the set-up is identical to the inner chambers of the Great Pyramid at Giza.

Was this a coincidence, or ingenious design?

Well, I know which one I would put my money on!

Does this mean that, at one time, we were part of a large network of interlinked planets, happily communicating, sharing ideas and satisfying ourselves in the knowledge that other beings are caring for, and sharing, our Universe?

We can only speculate at the types of conversations that could have been traversing the Universe before, unfortunately, something went wrong, and it became inoperable.

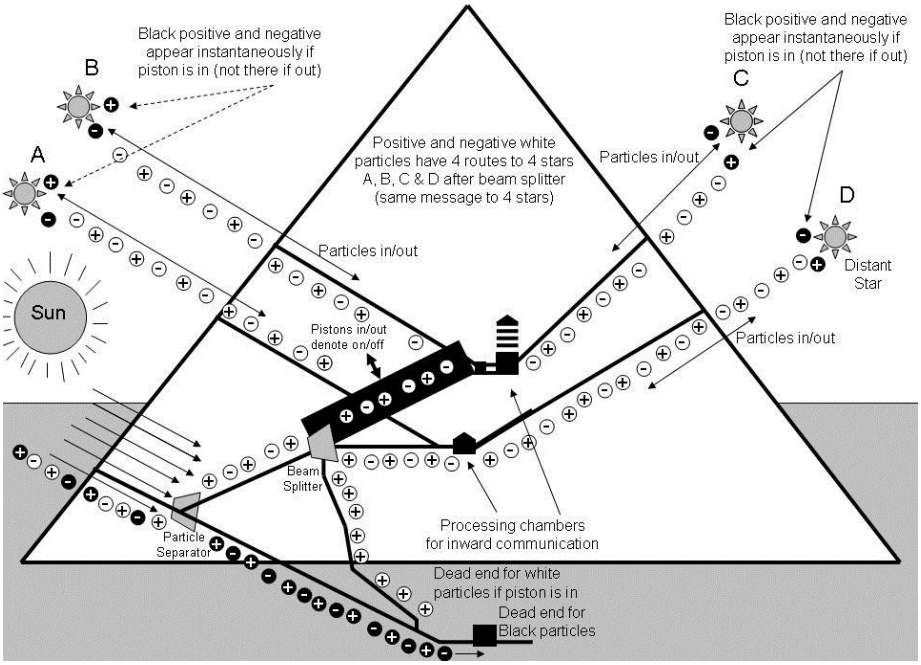
We now float amid the constellations as a failed planet, unable to keep abreast of the latest universal gossip. Unaware of our past, uncertain about our future, and so ignorant that we did not even know what the Great Pyramid at Giza was when it was staring us in the face all these years.

Four shafts lead out of the Great Pyramid at specific angles, pointing directly at Orion's Belt, Sirius, Alpha Draco and Kochab. Who on Earth would have built this

massive thirteen-acre construction from over twenty two million stones, each weighing five to seventy tons, if it were not for some truly remarkable reason?

We know that the Egyptians were an intelligent race of people, but their hieroglyphics only go so far as to explain what they did, what they ate and what they believed in - everything about their lives apart from how and why they built the pyramids. This could quite possibly be because they did not build them. How likely is it that a super-race of beings came to Earth with a view of linking it up into a universal network?

Once having travelled the expanse of space with super knowledge, they simply developed the transmitter/receiver for instantaneous communication across limitless distances, based on designs they brought with them. An amazing feat it was, and surely something that beings would only embark upon if there was something incredible to be gained.

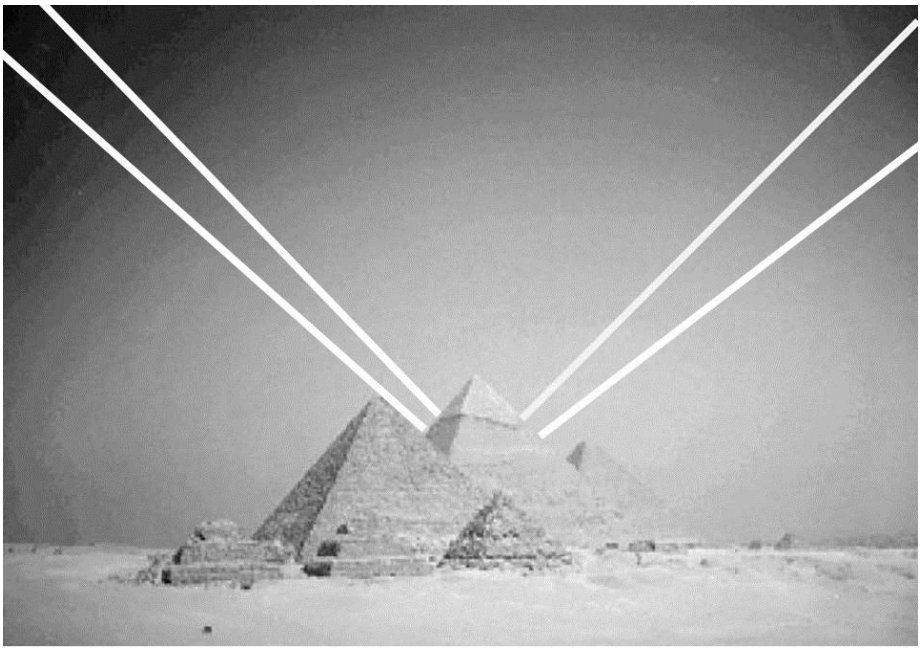


By placing in, and removing, the detector on the light beam from the sun, the detectors billions of miles away register different results instantaneously – well worth the effort.

To picture that it was built for a tomb or a place of worship is far too ridiculous a reason for building it. Imagine the reaction a race of intelligent humans would get when their leader chirps up and announces that they are to build this almighty structure simply because he wanted it.

After a few bricks, people would have been questioning the guy's scruples. The regime of building would have undergone mass mutiny and construction would have stopped. So the motive must have been greater, and the end result must have been worth all the precision that went into it.

No one has ever been able to explain the intricate pattern of passages that have been built with such amazing accuracy.



Communication utilising quantum weirdness would have been achievable with the appropriate apparatus configured within the Great Pyramid – perhaps this is what it was built for!

The millimetre-perfect passages have puzzled many a philosopher, construction engineer and scientist for eons.

Perhaps it is now time we rewrote our history books, placing something plausible within them rather than ignorant, unjustifiable twaddle.

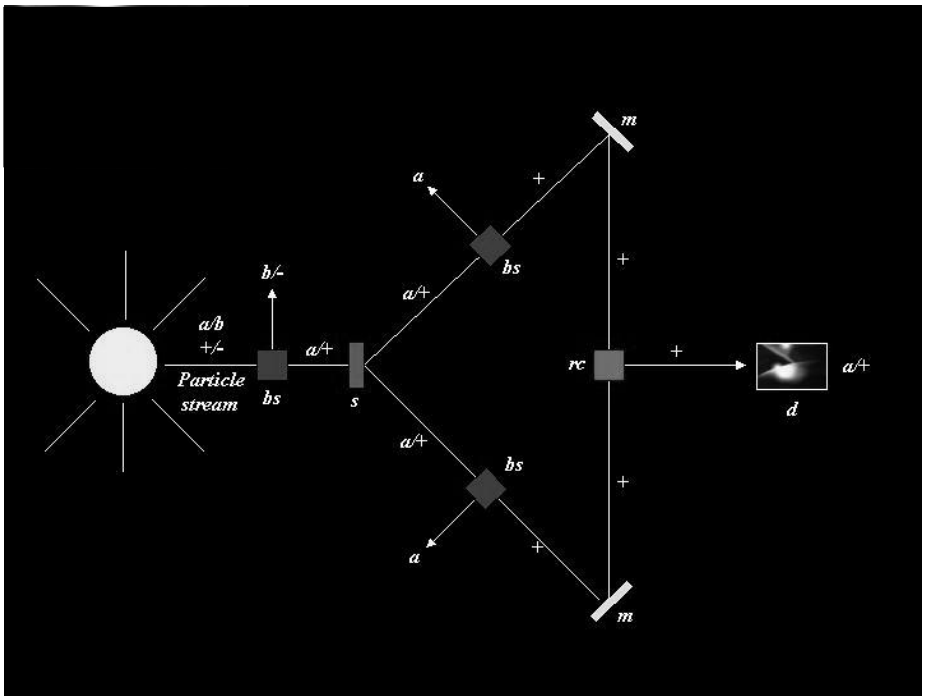
So is it possible to mend this apparatus, restoring it to its original operational glory?

I believe it is quite possible; it just requires a number of scientists to study the internal passageways with the communications mechanism in mind, and we will surely get sight of precisely what should go where. My attempt at this is as follows, but do remember it has to be bi-directional so as to act as a transmitter and receiver.

A conventional acoustic, analogue or optical transmitter encodes speech and data in order to transmit it over cables or lines of sight, before being decoded at the receiving end. This communications mechanism operates in a similar way to interfering with the particles whose brother particles have already arrived at their destination, but have not yet been detected. Upon detection, it will be in one state or another, depicting the digits of a binary number.

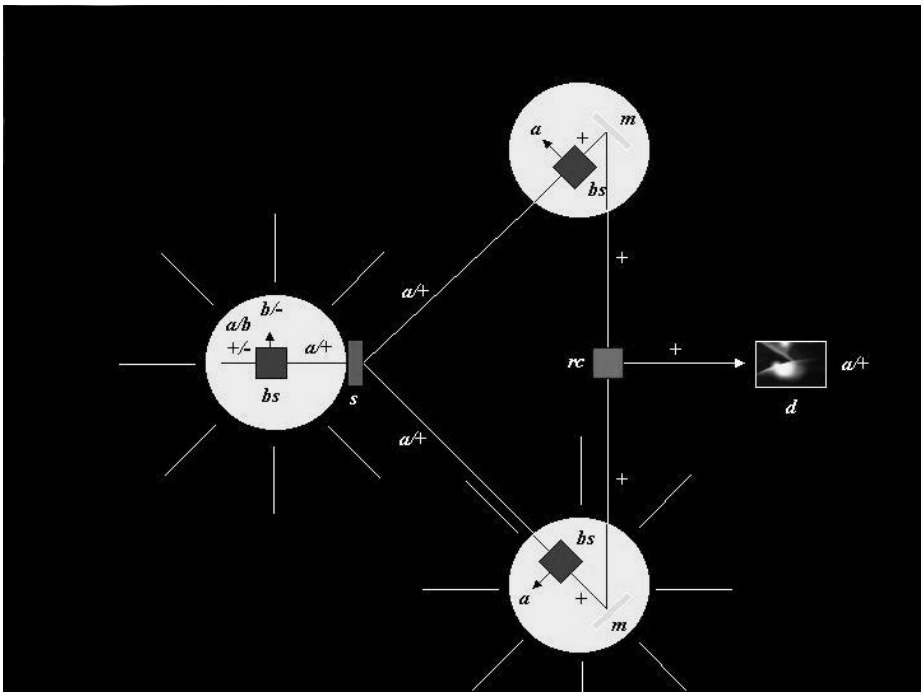
If you consider the Sun to be a living entity, you will see that it will also need a means of communicating with other stars to discuss various interstellar topics, such as quasars, comets, where to blow up next, dead planets, habitable planets and humans. I am sure the Sun and other stars would not be happy to have many years' delay between conversations, so my intuition brought me to think that they must communicate in this way too.

The following diagram shows how a light source sends photons through from source, such as a star, to a destination, taking with it discarded particles, supposedly discarded from the first check!

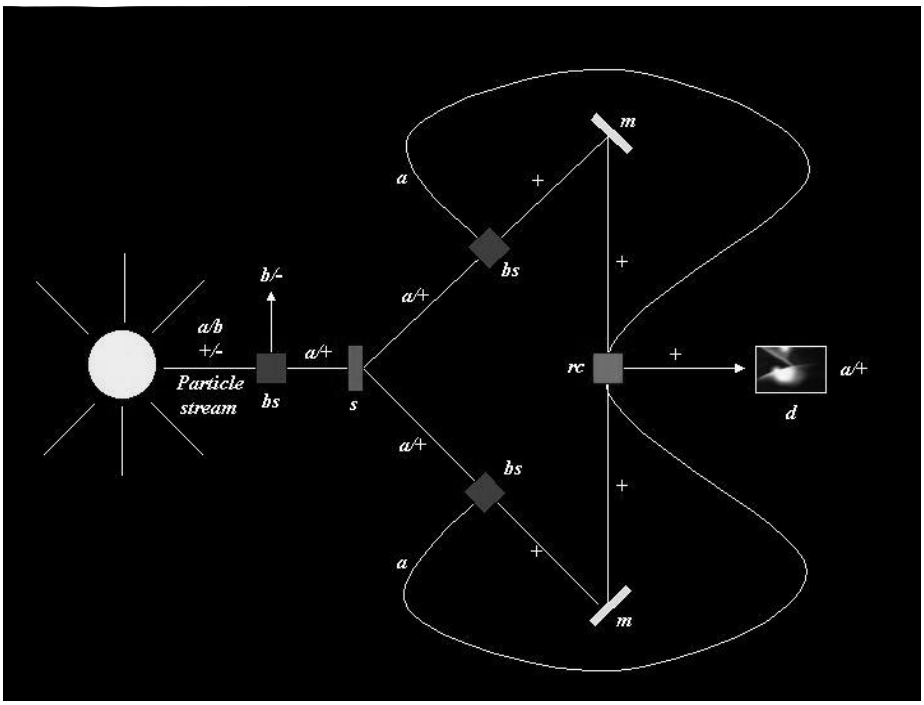


The 'answer' yielded at detector 'd' is truly miraculous. The first beam splitter that dispels the 'b/-' particles leaving the 'a/+' particles to continue. The particles continuing have their properties split, in this case 'a/+'. After this they are introduced again via a mirror, giving an amazing result. The answer at the detector 'd' reports that '+' appears, but so does 'a'. How is this?

We are now looking at one of those particularly deep phenomena within quantum physics that does not make too much sense at first glance. However, it has inordinate potential for communications. This very bizarre happening does not currently have any explanation. We wait with baited breath!



Is this the method that stars use to communicate with each other instantaneously also?



How can the answer be 'a/+', when 'a' is nowhere within the vicinity? Perhaps it finds an alternate route through space. Perhaps it is due to entanglement. Perhaps it is due to the superposition state of light.
Not to worry – it works – we should use it for communication.

The go splat world of light

- *Leave fruit for a while and it will begin to decay – but why does a ray of light from a distant galaxy not decay on its journey here?*
- *Time does not tick at the speed of light - so light that reaches us from distant galaxies thinks it has done so instantaneously.*
- *Light will traverse from its source to its destination at the same time coming into existence and vanishing.*

There seems to be something curious with the concept that a ray of light can traverse the whole Universe, taking millions and millions of years to wind its way through to its destination, and arrive as fresh as the day it was created all those years ago. Unlike an apple, light does not appear to decay over time. Is it really possible to throw a particle into outer space, and expect it to remain constant without mutating in any way for all that time?

There are two answers to this: firstly, this must be the case; secondly, this is not the case, and as light knows where it is to land at the moment of creation, it appears there instantly with the illusion of time attached.

When considering some of Einstein's theories about relativity, laws of motion and space-time, it is understood from one of Einstein's equations that anything travelling at the speed of light experiences no time whatsoever. Also, the very fact it is travelling at the speed of light implies that it has no mass at all.

This means that every ray of light travelling the distance from its source, such as a star, to its destination, such as the Earth, does so, as far as it is concerned, instantaneously, irrespective of the distance involved.

Certain experiments have been conducted with light which show very weird results. It is as if you are in fairyland – a make-believe world.

Interfering with one part of a quantum system alters the results observed in another part. This is what physicists call quantum weirdness.

This also means that the ray of light is created, traverses the Universe to reach its destination, investigates all avenues and dies in the same instant. As far as the ray of light is concerned, there has been absolutely zero elapsed time whilst it travelled the distance, even if the distance was billions and billions of miles.

Put another way, time does not tick or even exist for anything travelling at the speed of light. The ray of light in this split instance will stretch from its source to its destination at the same time as being created and dying.

This means light is at its destination and destroyed the moment it is created. This is what is called the 'go splat' world of light.

This actually means that light is dying whilst being created, which also implies that its destination has as much to do with its existence as its creation source. This can then be

viewed as a bidirectional, instantaneous event, but we humans know it is not, as we clearly see the source i.e. a candle flame. However, perhaps as far as the crazy laws of quantum physics are concerned, light's destination is just as important for its existence as its creation. It needs something to land on and die, the instant it is created. This could be similar to how an electron's quantum leap works within an atom as it orbits.

On close inspection, a totally uneducated person who knew nothing of time or the concept of forwards and backwards, could interpret light as being something that shoots out from a leaf and arrives at the Sun to help it brighten it up to the magnitude we see. This is how some people were thought to have viewed light in the Victorian times. But our minds do not work like this, as we are told at school that the Sun shines, giving out light.

How would we view the world if were taught that the Sun attracts light from leaves, grass, our skin and everything around us, to brighten itself up; this is as likely a view that a totally-uneducated person could arrive at as the one we have built into our cultures!

You may think that placing something like a piece of paper in the way of a candle light casts a shadow on a wall, hence proving that light is generated at the candle light source, and is propagated outwards and blocked by the paper, preventing the light from hitting the wall. Well, no, it may just be that the light the candle needs is now coming from the paper presented before it.

The very act of sucking particles from something may warm it up also. I do not know about you, but when I put my wet hand in front of a flame it seems to suck all the moisture from my hand, rather than provide it with something. Also, the luminosity of my hand could be the effect of light leaving my hand and rushing to the candle.

Somehow it is clear that the source of light is the candle and it spreads out from there. Does this mean that if a star is shining on the edge of the Universe, half of it would not be able to shine, as the light needs something to land on to be created?

If this were the case then the star would either stop shining, as light cannot shine towards nothing, or it would continue to shine as there is no edge to the Universe as the shape of space makes it bend back on itself.

There is something strange about light that may get you thinking deeply. Relatively stationary observers such as ourselves will see light travelling at a specific speed through space, and will be unaware that the ray of light believes itself to be instantaneous.

This gets rather interesting when you get to understand the following: as light has no mass it cannot be influenced by gravity, and light has no time to exist within which to be influenced by gravity. Although light appears to be influenced by gravity around a planet, it is actually being influenced by the warp in space-time created by the planet within the fabric of space.

Effectively, as light passes a planet it will bend, due to the fact that the planet has bent space, not that it is being influenced by the planet's gravity. It is a good job that light is not influenced by gravity, otherwise we would not be able to see anything throughout space, and also the world would be ultra bright as it sucked in all the stray light floating out in the Universe.

Gravity is caused by the accumulation of the masses of objects combined together. No one is quite sure, but the speculation here is that gravitons perform the force of gravity. However, they have never been detected.

The faster something goes, the more it will ignore gravity; this is best looked upon as its trajectory. And, blow me, the faster an object's trajectory, the slower time gets and, hey presto, when we reach light speed there is no time for an object's trajectory to be influenced by a planet or a star's gravity.

Directionally, light can only be influenced by the shape of space within which it moves; the space within which light moves can only be distorted by mass, not time. Where light sees its straight-line journey through the Universe bent by the shape of space caused by mass within space, we would experience gravity, because we have the concept of time and mass as we do not travel at light speed.

This means that time alone cannot visually shape the Universe, due to light's ignorance of it. Therefore, to us on Earth as light-seeing human beings, time will lie to us due to a ray of light's ignorance of time. That is why we see illusions, such as an oar bending in water. This is because light travels instantaneously, as far as it is concerned, and humans see time influencing light's speed within a different medium. It is a straight line as far as light is concerned, especially as time does not exist.

This is a great example of how mass distorts our space time. The light gets to our eyes from all parts of the oar instantaneously, as far as the light from the oar is concerned. The oar emits light that instantly travels to our eyes; however we, as stationary human beings, see things differently - we see the light coming towards us at a particular speed because we have the notion of time.

All we have been able to do before is calculate the angle of refraction of light entering water, and calculate the speed of light in water. Now we can go a step further to understand the Universe's communications mechanism, replicate it and connect ourselves back with where we once were.

So on one hand we can ignore time, as light does not comprehend it, and on the other remember that human beings are susceptible to it, as we are fairly stationary.

Let us recap: light is at its destination and destroyed the moment it is created. This actually means that light is dying whilst being created, which implies that its destination has as much to do with its existence as its creation source. This can then be viewed as a bidirectional instantaneous event.

A different angle on life - sceptical of all knowledge

- *A 99%-accurate detector sounds fairly precise; however, it will produce extremely flawed results when tested upon large numbers of samples.*
- *Newspaper editors get a snippet about the truth of a story and twist it to be sensational - quite often, totally unlike the event that really occurred.*
- *Some factual sentences can appear very convincing, when they are actually based upon a previous sentence that was only a tentative belief.*

At the age of nine, I was innocently staging a long wheelie on my bicycle right outside my house when the police pulled me up. When they asked where I lived and I pointed

directly to my house, their response was, “Don’t be so stupid, you don’t think we were born yesterday. Where do you really live?”

I was really taken aback that they did not believe me.

I dropped my bicycle and ran to my house just as my Mum came out to see what was going on. I ran straight into her arms.

When you are innocent and do not know what a lie is, it makes for a mystifying world.

As I wrote in my first book ‘A True British Eccentric’, I have been extremely sceptical of reports, statistics, beliefs and assorted knowledge from a very young age. I became rather sceptical of the world when I discovered that a 99%-accurate disease detector, which sounds quite accurate, will produce extraordinarily erroneous results. This was proved by studying a rare disease from which a hundred people within a population of a million are suffering. If the disease detector is ninety-nine per cent accurate, then ninety-nine people would be correctly diagnosed as having the disease. However, amazingly ten thousand people would be incorrectly diagnosed as having the disease when in fact they have not.

My confusion within this world all started when I was not believed at the age of seven by my teacher, Miss Beeby, when I wrote, “I have a seaside in my back garden,” in my school news book. As my parents really had built a replica seaside in the back garden, I thought this normal, and here was a grown adult telling me to write ‘real’ news in my news book.

This subsequently led me to challenge a great deal of facts and figures passed to us from our ancestors, whether they be factual within books, or even inherent within us. Mistakes could easily have been made!

You only have to be involved with any news item to realise that newspaper editors have a field day with the truth, twisting it to become almost another story entirely. Even worse are the 1937 encyclopaedias, still sitting on my parents’ bookshelves, which tell you that scientists believe certain markings of Mars are areas of cabbage-like vegetation, which spring into life when water from the melting polar caps reaches them.

It frightens me that I was born only twenty-five years after these encyclopaedias were published. Goodness only knows the extent of the inaccuracy of the historical and ancestral facts we have brought forward in time within our cultures.

Another of the claims about Mars was, “The dark spots at the junction of the canals on Mars are believed to be centres of habitation, their dark appearance being caused by the growth of vegetation watered by the canals”.

It amazes me that the second part of this sentence is so convincingly based on a belief suggested within the first part of the sentence.

To check the accuracy of text written about other known woolly topics, I decided to read the 1937 encyclopaedia entry regarding the Egyptian pyramids. I made a note of the ambiguous aspects of knowledge similar to the inaccurate planet Mars description.

Well, about the Sphinx it says, “No one can estimate the age of this gigantic figure carved in rock and partly buried in the sand”. That is not too bad, at least they are honest.

About the Great Pyramid at Cheops it says, “Cheops was an Egyptian king and the pyramid forms his tomb.”

Clearly, if there was any ambiguity before 1937 it has now been ironed out, and everyone is to believe that the two point two million stones making up the pyramid, each

stone weighing from five tons upwards to seventy tons, were just for a chap who popped his clogs.

How about considering that the pyramid was there already and they buried this guy within it because they were “not so clever?” Also, it was built for some totally different reason, as we now know. However, no one grasped it because no one gave it a thought, after being spoon-fed information from a reprint of a 1937 encyclopaedia. Knowing what I know now, as far as I am concerned, if the Great Pyramid is alleged to have been built to contain the body of a person, then that is absolutely unbelievable.

We learnt how the act of observation or detection of light photons determines precisely what it is and where it is – prior to this it can be considered as purely an undetermined wave of potential light. We learnt how we have automatically come to expect rapid and significant technological changes on an ongoing basis. We learnt how communication has improved over the centuries, and how the speed of light limits the speed of communication. We learnt how people find it difficult to relate to new technology, such as when Prime Minister William Gladstone could not see the benefits of electricity. We learnt about some failed ‘faster-than-light’ communications technologies such as tachyons, Alcubierre drives, rigid bodies, rotational effects, and traversable wormholes. We leant about how quantum weirdness displays a new ‘faster-than-light’ mechanism for future generations to exploit. We learnt about the crazy behaviour of particles, and how counterintuitive they are in contrast to the behaviour of items to which we are normally accustomed. We learnt how, as soon as one of a pair of entangled particles has revealed its identity, then this will instantly be known to the other partner, however far away this is. We learnt how the Great Pyramid in Egypt could have been used for intergalactic communication – replicating how other celestial bodies could naturally communicate. We learnt how light is at its destination and destroyed the moment it is created – based upon the fact that anything that travels at the speed of light experiences no time.

Next we look at what the future has in store for us – we certainly have very exciting times ahead.