

Introduction

(Non-)Technical Specification

This book challenges a proposition that has dominated the scientific world for over a century. But it doesn't challenge *any* of the scientific evidence presented in support of that proposition.

That makes this book totally unique. All other challenges to The Theory of Relativity have sought to cast doubt on some aspect of the experimental data generally offered as evidence of the validity of that theory. On the contrary, this book not only accepts that evidence but uses it to show a totally new face of material reality, one that's been hidden for more than a hundred years.

It's all too easy to suggest that experimental data has been inaccurately measured or recorded, or even (dare we say it?) fudged. This is to do a great disservice to those highly intelligent, sincere and meticulous scientists who have, down the years, given us an ever more accurate picture of reality as it's been recorded by the best instruments available at the time ¹.

It also does a great disservice to those equally capable scientists who have come after them; rather than blindly accepting results that may in any way be open to question, those whose subsequent research depends on those earlier results will scrutinise them mercilessly for any possible irregularity. Nowhere will this be more true than in the case of a revolutionary new theory that turns conventional thinking on its head, as Relativity did in 1905.

So we start this book with a wealth of prior scientific evidence, repeatedly examined for signs of experimental error, replicated at ever-higher levels of accuracy – and not in any way found wanting. Einstein's theory is robustly self-consistent and totally in agreement with countless replicated tests of its various proposals regarding the nature of the observable universe.

“This is supposed to be a challenge?”, I hear you say. “It sounds more like a standing ovation.”

And so it is. There's every reason to applaud, long and loud, the thoroughness with which Einstein's theory has been thought out, tested against available data, checked and re-checked. [And, just for the record, in this author's opinion no-one explains it better than Einstein himself, at various levels, in his various monographs and other publications.]

Science is a cumulative study, a work in progress – always. Those who come before us leave us a legacy to be built on, *never* a finished product. Newton (as he himself observed) built on the work of others, Einstein built on the work of Newton – whilst at the same time giving it his own inimitable twist. Einstein expected no less of his own work, or of those who would come after him.

1. Most of those instruments were of course devised by those same scientists specifically in order to bring us the sharpest possible image of the universe we live in.

This book in its turn seeks to build on the work of Einstein. For thousands of years philosophers and scientists have contributed thoughts and observations that led ultimately to Einstein's Special Theory of Relativity. It would be remarkable indeed if the ultimate truth on this subject was presented in 1905, with no need or room for modification or clarification².

There's no need for modification or questioning of experimental results that stand complete and reliable in their own right. But there is room, indeed a need, for questioning of the conclusions drawn from those results. This is where the challenge presented by this book comes in; this is where a new perspective on those same results yields a significant advance in our understanding of the nature of material reality.

The concept of the *Observer Effect* is well understood in Quantum Mechanics: it's not possible to observe a situation without affecting that situation to some degree; the observer is part of the experiment. In a broader sense our perception of a given situation doesn't reflect simply the situation itself but our observation and measurement of it.

In that broader sense the phenomena documented under the heading 'Relativity' are all observer effects. This is the key message of this book. Rather than being simply *kinetic* effects – effects synchronised with one's state of motion – they are attributable to altered perception or experience *due to* one's state of motion. This applies equally to living organisms and measuring devices, *perception* in the latter equating to *measurement*.

This is a sweeping statement, one that requires substantial justification. That's why this is a fairly lengthy book. It rejects the notion of characteristics of reality that in some mysterious way auto-adapt to the observer's state of motion, instead presenting a clear causal mechanism that would make this seem to be so.

The rest of this 'Tech Spec' details the evidence presented in this book for such a mechanism and its various consequences.

Light-formed particles of matter

Scientists at Imperial College, London, declared in May 2014 that they would be creating particles of matter from light within the very near future. This has already previously been achieved by a multi-step process and prior to that was identified as a key step in matter-antimatter pair production.

This book provides very extensive evidence, both theoretical and practical, of this aspect of the nature of material particles. It details historical evidence of production of matter from light and vice versa. It considers evidence from a substantial number of eminent physicists relating to the wavelike behaviour of material particles, strengthening the concept of such particles being closed-loop constructs of waveform electromagnetic energy – 'spun light'.

2. This isn't the same as *extension*, which came 10 years later with General Relativity.

Findings of Special Relativity

[Note: the term *frame* is used here and elsewhere to mean *inertial reference frame*, *i.e.* a constant-velocity state of motion free of any gravitational effects. This is the main focus of Special Relativity, the primary subject of this book.]

All of the experimentally validated findings of Special Relativity are shown to be direct consequences of the spun-light structure of matter: perceived frame invariance of the speed of light; motion-related time dilation; speed-dependent increase in apparent mass; light-speed limit on physical motion; mass-energy equivalence, $E = mc^2$; the Lorentz Transformation for mathematical transition between different reference frames. Most are shown to result from object motion.

The Lorentz Transformation is shown to be fully reciprocal in its representation of distances, times and their derivatives as perceived in different frames. However the unproven assumption of *actual* frame symmetry is not supported; in particular the assumption that time dilation is symmetric across any two frames is shown to be invalid.

Most notably it's shown that all inertial reference frames are *not* equivalent, as proposed in Special Relativity; there exists one unique absolutely static frame³, all other frames are in a state of absolute motion.

Perhaps surprisingly, this doesn't invalidate Einstein's Principle of Relativity as expressed in his first postulate of Special Relativity: "If a system of coordinates K is chosen so that, in relation to it, physical laws hold good in their simplest form, the *same* laws hold good in relation to any other system of coordinates K' moving in uniform translation relatively to K".

It does, however, invalidate the universal interpretation of that Principle (including Einstein's own meaning), in which those physical laws are defined as referring to actualities rather than appearances. *E.g.* 'The speed of light *is* invariant across all reference frames', rather than 'the speed of light *appears* invariant across all reference frames'.

In short: Einstein's first postulate holds good *only* for laws defined at a level that's sufficiently fundamental for relativity-based effects to be recognised as subjective rather than objective environmental realities. Those laws must thus be defined at a quantum (or sub-quantum) level dealing with the structure of elementary particles – notably those in the observer or measuring device.

This, again, is the message of this book: it's not enough to simply say "these are the effects of Relativity; this is just how they are". There are reasons *why* that's how they are (or how they appear to be); we need to identify those reasons and incorporate them into our laws of Physics.

3. Subject to Hubble expansion of space, which might be considered to be a state of motion only in the same sense that the surface of a balloon is in motion as that balloon is being inflated. This is quite different from that surface rotating, which is analogous to a moving frame.

‘Proofs’ of Special Relativity

A number of experiments conducted over the past 160 years are considered to provide compelling proof of Einstein’s theory. Each of the experiments listed below is considered in detail in the text and shown to be fully consistent with the light-flow structure of elementary particles. They are thus shown to be at least as supportive of this new perspective as they are of conventional Relativity.

Fizeau’s experiment. This experiment is considered to provide strong support for Einstein’s addition-of-velocities formula; Einstein himself saw it as a major verification of Relativity. Present-day understanding of light flow through translucent materials provides a full explanation of Fizeau’s results, and higher-accuracy versions of his experiment, without resorting to objective Relativity.

Maxwell’s equations. James Clerk Maxwell combined empirically-based rules for electricity and magnetism into a set of equations defining interactions of electric and magnetic field effects. These equations showed that such field effects would interact to form electromagnetic waves; Maxwell had discovered the nature of light.

As a teenager Einstein figured that these waves needed to be moving in order to continue to exist. In the classical view they wouldn’t be moving relative to one travelling with them at light speed – so they wouldn’t exist. That didn’t make sense – so Einstein reasoned that the classical view was wrong.

Also Maxwell’s equations aren’t defined specifically in relation to any particular frame of reference – so the speed that they give for light could be relative to *any* frame. This appears to make the speed of light frame-independent.

The fallacies in both of these lines of reasoning are detailed in Chapter 6.

Michelson-Morley experiment. Michelson & Morley tried to detect the *aether drift* – motion in the hypothetical substance that was believed to act as a transport medium for light. Their results led to the widespread belief that the speed of light was independent of the frame in which it was being measured.

In the years prior to Einstein’s theory at least three researchers had come to the conclusion, independently of each other, that matter is contracted by moving at speed. Einstein himself incorporated this view into Special Relativity. This concept, based on Maxwell’s equations, fits well with the electromagnetic structure of matter.

This concept of *Lorentz-FitzGerald Contraction* is shown to fully account for Michelson & Morley’s results without any reference to Relativity.

Relativistic time dilation. This finding is a cornerstone of Special Relativity, having been verified in a number of ways. It’s been shown beyond reasonable doubt that time slows down for objects moving at speed, in accordance with a clearly-defined formula. This formula appears to support the notion that relative motion is equivalent to a (symmetric) rotation of the space-time axes of one object relative to another.

Supporting evidence for relativistic time dilation includes:

- (a) a variant of the Michelson-Morley experiment (Kennedy & Thorndike);
- (b) decay rate of muons reaching earth in cosmic radiation;
- (c) Transverse Doppler Shift (Ives & Stilwell, Hasselkamp *et al.*).

It's shown in Chapter 4 that the spun-light structure of material particles leads to motion-related time dilation as a direct consequence. Effects attributed to time dilation are thus fully explained without reference to Relativity.

[It's further shown in Chapter 6 that a 'non-relative' reality, as proposed, will mimic a wholly relative scenario to a high degree of accuracy in a Hasselkamp-type experiment configured to distinguish between these two possibilities.]

Mass and Inertia

The subject of 'what causes mass?' has been a hot topic in science for over half a century. Very recently the scientific community has come down in favour of the Higgs field/boson theory, prompted by discovery of a particle with certain quantum characteristics that fit that theory (though no proof that it does actually cause inertial mass and no clear link at all with gravitational mass).

Chapter 4 proves very simply (junior school maths) that $E = mc^2$. It also explains in detail how inertial mass is a natural consequence of the light-flow structure of matter – with no need for any additional field or particle. This includes a clear explanation of why apparent mass increases with speed.

Chapter 8 shows clearly how gravitational mass is likewise a direct consequence of that energy structure, and so also directly proportional to inertial mass. No force-carrying bosons (*gravitons*) are required in order to explain gravity.

The concept of the Higgs boson is shown to be irrelevant to all effects of mass.

Sequencing of events

If two vehicles (*e.g.* spacecraft) are moving at significantly different speeds then their occupants may see events in a different order, due to the time it takes the light from those events to reach them. According to Relativity those event are not just *seen* in a different order, they actually *happen* in a different order for those two observers; both views are equally valid, equally true.

In other words a single pair of events could actually happen in a different order for Jean, say, than they do for Jim – same two events, different way round. This shouldn't actually make any difference in the grand scheme of things – unless Jim or Jean can travel faster than light (or get between two points faster than light can by some other means, which comes to the same thing).

According to Relativity, if Jim or Jean can get from A to B faster than light can (wherever A and B may be), different ordering of events means they can travel backwards in time. This could create some pretty massive cosmic paradoxes.

Chapter 7 explains in detail why this can't in fact happen, even if some way is found to cross space faster than the speed of light.

General Relativity

Chapter 8 extends the principles of spun-light material particles to provide a full explanation for the effect referred to as *Gravity*:

- (a) What it is about matter that gives rise to the gravitational field;
- (b) What that gravitational field consists of, out there in ‘empty’ space;
- (c) How that field causes attraction towards massive bodies;
- (d) What is meant in physical terms by *curvature of spacetime* – what it is;
- (e) What are *negative energy* and *escape velocity* in relation to such a field?
- (f) Why does *The Equivalence Principle* hold? What is it about gravity that causes light to bend, time to slow down, black holes to trap light completely?
- (g) Why is gravity: always attractive; effective for *all* objects; proportional to an object’s mass; tiny in comparison with other forces; unblockable?

Effects attributed to *electric charge* are also explained in this chapter.

Relativity Revoked: A Proof of Frame Asymmetry

Chapter 9 may well be the most significant chapter in this book, as it presents in very explicit terms a clear demonstration that the currently-held view of physical reality is invalid in one very significant aspect. This chapter gives an informally presented formal proof of the asymmetry of inertial reference frames.

This proof is founded wholly and solely on experimental evidence that has in every case led to award of a Nobel prize. It doesn’t rely on any other proposal or conjecture; specifically it does not depend on any of the concepts newly raised in this book resulting from the photon structure of material particles.

This proof, based on one significant practical asymmetry, is followed by an explanation of how that asymmetry is hidden by a balancing misconception.

Resolving the de Broglie Clock Paradox

Count Louis de Broglie, in his Nobel prizewinning doctoral thesis, proposed that the structure of an electron includes a waveform that effectively acts as a clock for that particle, since it has a well-defined periodicity.

[Now that science has confirmed that electrons are formed from photons of light-type energy, it’s clear that this waveform is simply the photon wave.]

This immediately raises an apparent contradiction: for an electron moving at speed, time will slow down, *reducing* the frequency of that clock; but motion increases the energy content of such a particle – *increasing* the frequency of the wave, since energy is proportional to frequency.

Each of these effects predicted by Relativity has individually been extensively confirmed by experiment, but taken together they seem to clearly contradict one another: how can a wave’s frequency both increase and decrease simultaneously?

Appendix F tidily resolves this paradox.

Antimatter Matters

The discovery of antimatter played a key part in conclusively identifying particles of matter as constructs of electromagnetic radiation – light. The ongoing study of antimatter has continued to shed more light on the detail of those constructs.

In return, consideration of the spun-light structure of material particles has much to tell us on the reasons for the dramatic imbalance between antimatter and normal matter in the observable universe – a subject of much puzzlement among scientists for over eighty years.

Chapter 10 explores various matters to do with antimatter and explains why antimatter matters so much in respect of our understanding of both normal matter and the universe around us. It also offers the first ever clear logical causal explanation for that matter-antimatter imbalance. See also Appendix D.

The Cosmic Microwave Background (CMB)

The CMB was formed by the creation of the universe itself; this gives it a unique place in the structure of the cosmos. It also provides a unique rest-frame used by cosmologists and astrophysicists as a benchmark for motion of cosmic phenomena such as clusters of galaxies.

Appendix E gives some background on the Background, including historical details of the second ‘accidental’ Nobel prize referred to in this book.

Scientific Authority vs. Scientific Authenticity

Just a couple of hundred years or so ago the last word on any scientific discovery was claimed by religious authorities who had the power to obstruct reasonable progress in our understanding of the physical world. Thankfully common sense now prevails and the opinions of those in positions of authority aren’t allowed to override or replace the due process of scientific investigation.

Usually.

The example of Sir Arthur *Eddington* and *Chandrasekhar*, almost exactly a century ago, is a salutary warning that the age of dogmatic assertions is not quite dead and buried. Now, though, it’s apparently scientists in positions of authority or public standing who can direct public opinion with ‘authoritative’ assertions for which there may in some cases be little or no actual authentic scientific evidence. A recent paper in a leading journal voices exactly this concern.

As a society we’d do well to consider whether we want a new priesthood based on scientific status, or whether we expect and require scientific authenticity, backed by firm empirical evidence, for new theories of reality – no matter how exciting and compelling they may sound, or how well qualified their proponents.

Nowhere is this more so than in respect of our own being. Consciousness is said to be an *emergent property* of matter. This means that any ability that we may have to control our own destiny is down to factors totally outside our control (!)

Anyone who doesn't see an inherent contradiction in this must either believe that we are automatons, totally incapable of any form of independent action, or have faith that science can explain the unexplainable - a blind faith reminiscent of the most devout religious devotee.

If any living creature is to have even the tiniest shred of self-determination (aka *freewill*) then this implies something more than just a set of externally-imposed rules and maybe (also externally imposed) random fluctuations. The possible nature of that 'something' is explored under the heading of *consciousness*, with an exercise for the reader suggested by way of further investigation.

Consciousness Science

Following that practical exercise, the scientific study of Consciousness and its role in the outworkings of reality is considered. Principles are set out whereby experimental investigation may be conducted into our own possible role in the universal process, also implications of findings that may arise.

An associated topic, the proposal of *indeterministic randomness* (no, that's not a tautology), integral to the *Copenhagen Interpretation* of Quantum Mechanics, is assessed as a valid scientific concept and a well-founded alternative proposed.

Finishing on Time

Scientists have discovered that, below a certain level (*Planck Time*), time itself just disappears from their equations, as if it no longer exists. This apparent nonexistence of time as an objective reality is echoed by in-depth consideration of the spun-light view on material reality.

Following the various appendices, two articles by the author, published five and six years ago respectively, explore the ephemeral nature of time as revealed by this new perspective on the physical realm. Conclusions are presented that could help to advance our understanding of physical reality.

Various mathematical and other appendices as listed in the Index.

References/Bibliography

A comprehensive list of references is provided at the end of this book (before the Glossary). So as not to interrupt the flow of the main text with numbers for those references, they are instead listed by subject; an index is provided for the bibliography giving subjects and topics covered within each subject.

Glossary

An extensive glossary completes this book, listing many words or phrases used in the text whose meaning may not be completely clear to some. This includes terms whose meaning is explained in the text on first usage but which later also appear elsewhere. It also includes many names mentioned in the text.

[Terms or names with a meaning or relevance specific to the scientific context of the text are printed in *italics*; many of these can be found in the glossary, any that are not should be readily found by a simple internet search.]

Atoms of Light