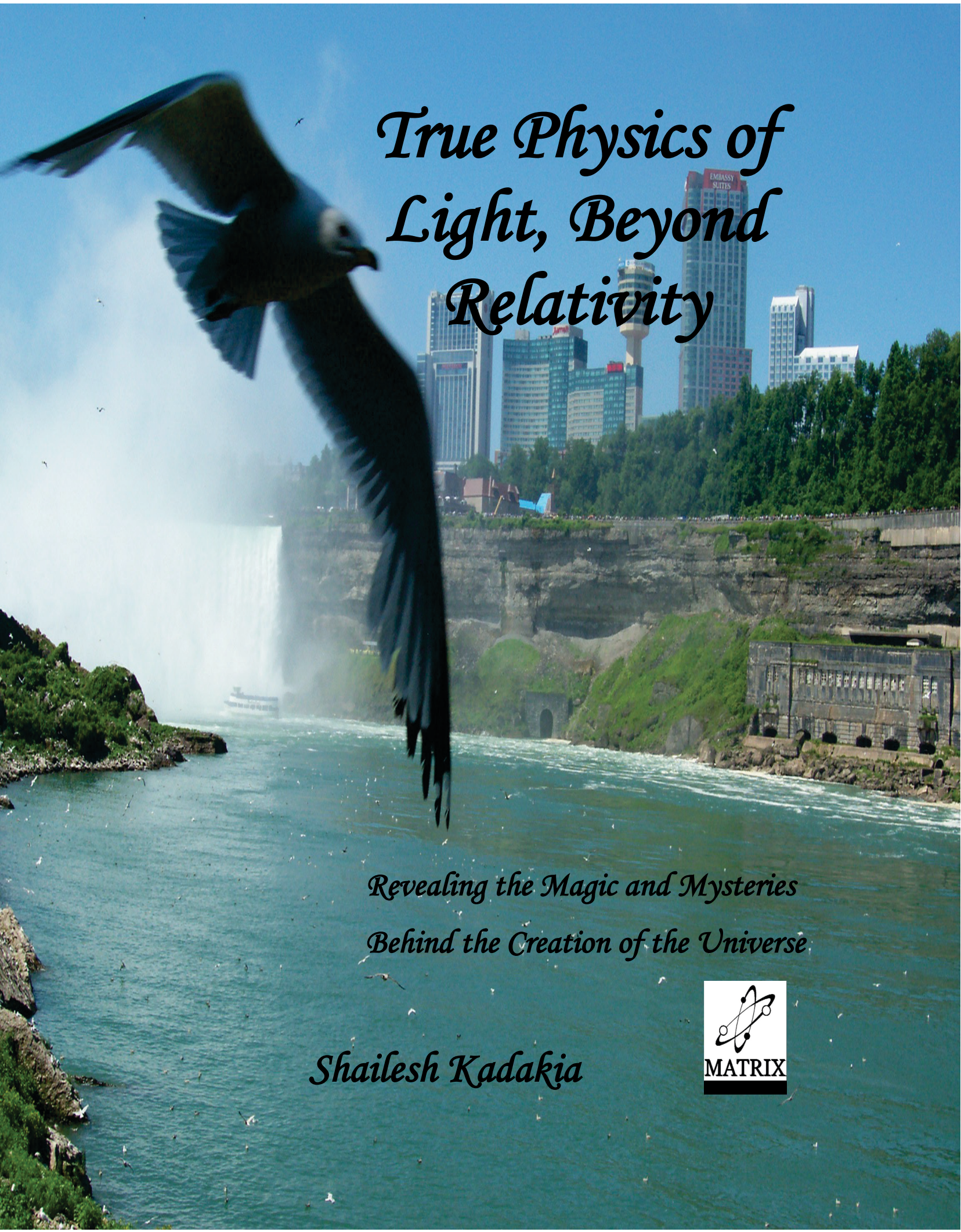

True Physics of Light, Beyond Relativity

Revealing the Magic and Mysteries Behind the Creation of the Universe

Shailesh Kadakia

MATRIX

True Physics of Light,

Beyond Relativity

Shailesh (Sky) Kadakia

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With 40 illustrations of which 29 in Color

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Dedication

To my parents,

Lilavanti R. Kadakia & Rasiklal S. Kadakia

Thank you for your constant encouragement and support.

– Shailesh Kadakia

Preface

An energy source, such as light, can be seen by humans yet cannot be otherwise sensed. It is known to have no material mass yet has revealed visible and physical effects of mass through several physical phenomena, such as photoelectron emissions and others. This strange nature and behavior of light energy waves has made it the most poorly understood energy source of nature. Often in the past, many scientists have erroneously modeled the dual behavior of light, sometimes as a particle and sometimes as a wave. After reading this book, you will be convinced that light energy waves strictly behave as waves, and that all of the phenomena and results of experiments over the past two centuries, to prove that light occasionally behaves as particles, were incorrect. Another source of energy is the force of gravity whose cause is not known to date. In this book, we have attempted to analyze the root causes of the force of gravity, among different celestial objects in the universe. Another puzzling question is, at what speed the force of gravity propagates? Albert Einstein had suggested that in vacuum, the propagation speed of gravity is the same as the speed of light waves. According to the postulates of the special theory of relativity, the speed of light in a vacuum is constant **c**. The speed of light varies according to the frame of reference, which is in-concert with the varying speed of light (VSL) theory proposed by the Portuguese physicist, João Magueijo, a research fellow in theoretical physics at Cambridge University. Therefore, it is imperative to answer the question, at what speed the force of gravity among different objects propagates. The speed of light is no longer constant in accordance with the **Skylativity**® theory.

The main intention of this book is to correct the basic understanding of the fundamental ideas regarding the nature of light, the special theory of relativity, and the general theory of relativity. The book is primarily written for first-year college students who are considering physics major. It assumes competence in high school algebra, geometry, and calculus. Since our emphasis is on improving the conceptual understanding of physics, and not to understand mathematical rigors, we have discussed analytical expressions with simplicity. Another purpose of this book is to determine an ideal theory of everything that will tie the creation of the universe, which contains huge celestial objects, such as galaxies, super nova, and nebulae, to the tiniest fundamental particles, such as quarks and fermions. Also, we shall utilize the concepts of the **Skylativity**® theory to marry classical mechanics with quantum mechanics and create a universal unified field theory (UUFT) of everything.

The content of this book is organized as follows:

In Chapter 1, we begin with a discussion on the nature of light and we are very critical about its behavior as a wave and not as a particle in some events, as quoted by Einstein and others. Then, we touch on some of the events that our predecessors thought were occurring as a result of the bending of light by the force of gravitation. A detailed examination of the

analysis of events will convey that it is impractical to predict that light waves are bending by the force of gravity. Next, we explain why the conclusion that light behaves as a particle, based on experiments performed in early 1900's, through modern times, may be incorrect. We demonstrate this by analyzing the sets of experiments of the photoelectric effect, short wavelength limit X-rays, the Compton Effect, and Michelson's interferometer. We substantiate the wave theory of light by explaining Doppler's shift effect and the rotation of a fan when its thin blades are coated with semiconductor paste and are exposed to light. Also, we point out that the concepts of time dilation, introduced by Einstein and Lorentz, are incorrect as a result of the wrong conclusions drawn from the analysis and results of Michelson's apparatus. In this chapter, we successfully indicate that some of the ideals proposed by Einstein, and subsequently promoted by Lorentz and others, may require further analysis.

In Chapter 2, we describe the basic differences between the physical properties of a wave like entities, and particles. Then, we explore the speed of the propagation of light and electromagnetic waves. We emphasize that the speed of light and electromagnetic waves is variable and it should vary differently in medium with different refraction coefficients. Also, it should alter if the frames of reference are moving at different speeds. Then, we introduce the concept of the true speed of light and formally define it, based on the distance between the speed measuring instrument and the source of light as invariant over the arbitrarily small time interval. We explain the importance that not all of the energy waves of the electromagnetic spectrum should be travelling at the same speed. Therefore, it may be imperative that the electromagnetic spectrum table should be split into three or more tables. We briefly discuss the strengths of the interactions of weak, strong, and residual forces on interacting particles and compare them over the range of the distances they encounter. Next, we analyze the expressions for the energy released during a nuclear radiation and explosion event and in general, the method for specifying the energy content of the light waves. In our analysis, we prove that the energy released during a nuclear explosion event, computed by Einstein's equation $\mathbf{E = M \times c^2}$, estimates the energy liberated in the excess amount rather than the actual value. Also, we explain that the major source of the energy released, is from the liberation of the binding energy of the nucleons at the core of the atoms of the radioactive matter and not the consumed mass of the matter, as explained by Einstein, in a nuclear explosion device, when detonated. We provide the correct analytical expression for the released binding energy. In this chapter, we also choose to discuss the topic of the temperature profile of the prime energy source, the sun in our solar system. We want to direct our attention to the fact that the temperature calculations predicted by the current techniques have provided large values for the surface and core temperature of the sun. These numbers are unrealistic and other methods are needed to confirm the results of the measurements to date. In particular, this is true for the 15M°K estimate for the core temperature of the sun. To predict the temperature profile for the sun's core, we have proposed a different solution.

In Chapter 3, we start explaining the theory of relativity, as postulated by Einstein, which has been widely accepted for a little over the past century. Here, we want you to be familiar with and refresh your memory about the basic concepts of the general and special theories of

relativity, first introduced by Einstein. We shall refer to his theory as the E-theory, from the name of its inventor, Einstein. Also, we shall use a similar name to abbreviate and refer to the postulates of special and general **Skylativity**® theories introduced by us, as K-theory. In the next section, we state postulates of the special and general **Skylativity**® theories. We highlight the differences between the postulates of E-theory and K-theory and explain the implications of the new theory to the applications of radio astronomy and cosmological measurements. Next, we point out, that on the basis of the new theory, Lorentz expressions for length, mass, and time computations for different inertial systems, are not required. Then, we discuss the modifications required in Maxwell's field equations, to reflect the variation of the speed of light among different frames of reference. Finally, we describe the changes required in the solution of Einstein's field equation that take into account the varying speed of light **c**.

In Chapter 4, we begin with a discussion of the limitations of Einstein's general and special theories of relativity, when applied to the measurement of length, time, and mass. We describe an example of a common incandescent light bulb to show that light energy can be generated when a finite amount of electrical energy is supplied. By showing this, we are stating that with a finite source of energy, light photons from a tungsten wire filament can be accelerated from zero speed to light speed. This contradicts the claims of the earlier theory that an infinite energy supply is needed to attain the speed of light. In Section 4.2, we indicate that, in the same example of the light bulb, when a filament emits light, it does not lose any mass. Therefore, for every event where the light energy is released, the popular energy to mass conversion relation, $\mathbf{E = M \times c^2}$, does not hold well. In Section 4.3 we explain that if we believe for an object, a different measured mass value for a different inertial system, we have to infer that the speed of light should be different in those frames of reference. This is true because the mass in both reference systems possesses the same rest mass energy. To resolve this conflict of mass variations for masses of moving objects, we introduce a concept that total mass consists of a real rest mass component and an energy mass component. The distribution of the rest mass component supposedly affects the center of gravity. The orthogonal imaginary component, the energy of mass, may affect the future position of the center of gravity after time $\boldsymbol{\delta t}$ is known as the dynamic mass. In Section 4.6, we propose that time dilation is a fictitious concept that was introduced by Einstein and others. His skewing of the time dimension does not make sense. Therefore, the time dimension is invariant and measured time will always be the same if clocks in the two inertial systems are truly identical. In the final section 4.7, we show that the stellar parallax distance measuring method would introduce a vast number of errors, if we assume that the light rays arriving from other stars, when passed by the sun, will be deflected by the force of gravity from the sun. Hence, it makes sense to state that light rays do not bend by the force of gravity.

We firmly believe that the Lorentz transformation equations for mass, length, and time measurement, for different inertial systems, are not needed. Therefore, in Chapter 5, to investigate a hypothetical situation, we explore the effect of the variable speed of light on the mass, length, and time measurement, using the current Lorentz transformation. We analyze

the values of mass, length, and time measurements for two different scenarios, approaching systems and receding systems. In the infinite universe, those two scenarios play a more important role in the space coordinate transformation than the linear movement in the X, Y and Z directions for two or more systems.

In Chapter 6, we highlight the benefits derived when the new postulates of the **Skylativity**® theory are applied to modern day astronomy and space science. In the first section, we describe the ways that create surplus funds and resources. We convince you that it may not be essential to invest funds in the construction of huge super colliders. At present, a significant amount of resources are spent to build proton accelerators to determine if the speed of light is achieved by a particle. The postulates of the **Skylativity**® theory state that the speed of light is achievable by particles, therefore, the financial and manpower resources may be saved by not applying them toward the construction of huge super colliders in the future. In Section 6.2, we stipulate that the measurement scales for mass, length, and time units are universal and constant among different frames of reference. This approach avoids the complex formulation of the Lorentz contraction of length and time dilation, while computing the coordinates in different inertial systems. In Section 6.3, we address the decay rate of very weak interacting neutrino particles from the sun. Scientists believe that the lifetime of these particles is very short, so, they will disintegrate before they reach the Earth's atmosphere. The particle survives because the decay rate is slowed by the time dilation factor computed according to the Lorentz formulation. We believe that time dilation is a virtual effect and should not affect the decay rate and disintegration of the neutrinos. In Section 6.4, we propose that the discovery of quarks allows us to develop future weapon systems with enormous power, similar to the fission of ^{238}**U** into ^{235}**U**. Alternatively, the controlled triggering mechanism that smashes protons and neutrons into quarks may be applied to design power plants. These power plants have the potential to generate a vast amount of energy source from the release of the binding energy of quarks. We shall call this proton and neutron power plants. In Sections 6.5, 6.6 and 6.7, we discuss the future of the space program and suggest ideas for the design of spacecrafts that travel at fractions of the speed of light.

In Chapter 7, we develop the universal unified field theory (UUFT) that integrates the effect of gravity from macroscopic objects, such as celestial stars, galaxies, and nebulae, with the strong forces of particles in the standard model which deals with microscopic particles. This has been a huge challenge in the past because gravity is found to be a very weak interacting force, as compared to the charge and spin momentum forces with strong interaction effects within nucleus of tiny atoms of particles. Next, we analyze the reasons for gravity. Every object in the universe projects a force of gravity on another object because both objects possess momentum and potential energy associated with each other. As per our explanation, the force of gravity exists among any two objects that have real mass and a static location for the center of gravity. Therefore, the force of gravity from large celestial objects does not have any effect on the trajectory of wave entities, such as light rays and electromagnetic radiation energy waves. In section 7.3, we briefly discuss time travel, which is a fictitious concept. Time travel only exists in your imagination because time dimension cannot be retraced. For instance, the conversion of hydrogen into helium atoms, through the

thermonuclear burning process on the sun, is an irreversible process. This implies that, at the end of the life of the sun, the death of our civilization is imminent. Also, no power on earth could ever change the rate or speed at which the sun orbits on ecliptic to the center of galaxy. In Section 7.4, we discuss the reasons why the weather forecasts are not accurate at all times.

In Chapter 8, we focus on black holes and the origin of the universe. In Section 8.1, we explain that black holes do not have super gravity. Many scientists have claimed that black holes are massive with a super gravitational field in which light is trapped. We believe that light does not escape from black holes because it is absorbed. We provide a formal proof of our theory. Also, we believe that the universe is neither expanding nor contracting because the space of the universe is boundless. If we state that the universe is expanding, it implies that we know there is something outside the limit because it must expand into space that was either occupied previously or created by the expansion. There is no evidence which proves that such an expansion is observed inside of our galaxy. It is not obvious how the selective expansion of the universe could occur outside our galaxy. Our prognosis about the observed red-shift of celestial objects, such as other galaxies and supernova is correct because they are moving away (receding) to maintain the balance between gravitational effects and centrifugal force. Thus, it is essential to redefine Hubble's constant in his law for the three dimensional movement of celestial objects. Next, we suggest that the mapping of the sky should be partitioned into past, present, and future universes, according to the separation of celestial objects from our earth and the solar system. In Section 8.5, we discuss the ultimate fate of our solar system after all of the hydrogen is transformed into helium at the sun's core through the thermonuclear burning process. In Section 8.6, we explain why the planets Venus, Uranus, and Pluto, rotate from the east to the west on their axis instead of the west to the east motion of the Earth, Jupiter, Saturn, and other planets. In Section 8.7, we explain why the orbits of comets are asymmetric. In the final section of this chapter, we look at some of the advances in modern physics, such as the String theory and new dimensions.

In Chapter 9, we discuss the ways to bridge the gap between the classical Newtonian mechanics and quantum mechanics. In Section 9.1, we revisit the outcome of Young's double-slit experiment and the behavior of a quantum particle electron in a shell orbit, by applying the principles developed by Erwin Schrödinger. In Section 9.2, we analyze the discrete model for radiation from the surface of a black body invented by Max Plank. We show that the quantum of energy possessed by the light wave, Plank's constant **h**, is inherited from the parent particle. Therefore, **h** is property that is associated with the quantum particle electron and not the fictitious particle photon. In this chapter, we establish that the quantized model to characterize black body radiation, from Plank, should not prohibit us from proving the wave as the only model for light and radiation energy. In Section 9.3, we discuss an important contribution to quantum mechanics, from a somewhat less recognized physicist, Paul Dirac. His ideas were instrumental in the prediction of the existence of the complementary particle, pair proton, anti-proton, electrons, and positrons. Also, his equations validated many different concepts and theories, such as Pauli's theory and the hole theory of atoms. In Section 9.4, we address the main objective of this chapter, to connect classical mechanics and quantum mechanics. We achieve this objective by explaining the operation of

quantum devices, based on Schrödinger's equations. In Section 9.5, we discuss the practical application of quantum mechanics by looking at an example of the scanning tunneling microscope. In Section 9.6 we describe the applications of quantum mechanics as a solution of complex problems, such as finding material that exhibits super conductivity at and near room temperature.

Further information and details about the topics discussed in this book can be obtained at the web site **http://www.Matrixwriters.com.**

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Prologue

This book is about the true science of light. Many physicists from the beginning of time have failed to recognize the clear understanding of the exact nature of light as it relates to different events, either occurring naturally or created by human efforts. They have portrayed a sense that light behaves as waves in certain events and occasionally it behaves as particles. This ambiguous description of light pondered pioneer physicist Albert Einstein to formulate complex concepts of relativity theory and gravitational theory. Subsequently, renowned physicists, such as Richard Feynman, Roger Penrose, John Wheeler, Charles Misner, Stephen Hawking, and Kip Thorne, extended Einstein's principles to explain the mysteries surrounding distant celestial vast objects, black holes. In their discussion, they and physicist Stephen Hawking have inadvertently stated that black holes have super gravitational fields. From our point of view, light behavior is simple and straight forward in the sense that the rules of Newtonian classical mechanics may be applied without incorporating any special treatment for light. Therefore, black holes absorb light similar to a perfect black body. Further, the behavior of light can be very accurately characterized as a wave, regardless of the type of event. Very close examination of all the experiments performed to prove that light is a particle in those events, could very well be understood if it is modeled as wave.

One of the greatest strengths of this research is that the principles explained in this book provide a rather simplistic view point for several phenomena of complex nature, such as the bending of light caused by refraction as it passes to the medium and time dilation effect experienced by the very high speed moving objects. Our view point extends the ideas suggested by the Portuguese physicist, João Magueijo, a research fellow in theoretical physics at Cambridge University. We have taken one step further, proving his ideas of the Varying Speed of Light (VSL) to be correct. When our concepts are verified, you will gain a clear understanding and explanation of the events related to light, by applying the basic principles of atomic physics described in the book. Here, we have achieved success by taking advantage of the modern techniques and advances made by particle physicists. These physicists formulated the standard model, and the quark extension to the standard model, to describe all of the elements on the periodic table that are found in nature and artificially created. We have provided answers to many questions about the creation of the solar system and the universe that were not answered by previous creation theories, such as the big-bang.

Our theory of relativity, postulated by Mr. Kadakia, designated **Skylativity®**, comes from a simplification of many computations related to sky and the universe, and presents the results with higher accuracy than before. It leads to the formulation of the Universal Unified Field Theory (UUFT), and provides time and space invariant scales for length, time, and mass measures, for every frame of reference. You will discover that Einstein took a risk when he formulated his famous theory of relativity by making unrealistic assumptions. When he stated that time measured in different inertial systems by identical clocks would differ, he ignored the fact that the identical clocks ceased to remain identical in design, when they were stationed in each of the inertial systems. Further, he assumed that the speed of light is a

constant in James Maxwell's field equations. More recent advances in technology have verified that the speed of light has varied since the beginning of time and it varies according to frame of reference like an ordinary particle obeying the laws of Newton's mechanics. Our sense of accomplishment and quest will be complete when dedicated physicists and astronomers redirect their resources to promote the ideas of this book and to build a solid foundation for future space expeditions.

1.

Introduction

Do you have amusing questions on Light? We have convincing answers

Introduction

For more than a century, scientists and engineers have perceived the dual nature of light, a particle and a wave with great uncertainty. In this book, it is shown that light strictly **behaves as a wave**. Ever since Einstein devised his theory of relativity [1] to explain the phenomenon of light propagation in free space, very little work has been done to resolve the duality. His subsequent work to explain properties of matter at an atomic level and the energy released during a nuclear reaction popularly described by equation $\mathbf{E = mc^2}$, heavily relies on the facts that light behave as a particle and speed of light is constant c. Also, for the computation of important astronomical parameters such as distance and velocity of receding and approaching stars and, galaxies and, for the age determination for the universe, the Hubble time parameter is utilized by astronomers. The formulation to determine these numbers provides vastly different results depending on the behavior of light modeled as a wave or as a particle. Further in this book we have proved that every phenomenon associated with light propagation and its behavior during physical and bio-chemical reaction that are based on applying the particle theory of particle can be successfully explained by modeling it as a wave. The wave nature and wave model for light provides for the correct physical description of light.

Another question that has puzzled many physicists is whether any particle or object can travel at or above the speed of light, Einstein provided an answer by applying postulates of special relativity. The theory states that it is impossible to attain the speed of light for any object because its relativistic mass (the sum of rest mass and mass gained because of kinetic energy) rapidly increases towards infinity as the speed of the object approaches the speed of light. The author of this book has presented a different view. It is not accurate to state that relativistic mass increases rapidly towards infinity as the speed of an object approaches to the speed of light. The rest mass of object is a measure of the quantity of matter contained in object. This rest mass should not change with frame of reference. Mass gained caused by an increase in kinetic energy is not a true increase in mass. Usually gain in kinetic energy of an

object results in change in potential energy content of the object. Therefore, within practical limits, it should be possible to accelerate particles to speed of light or even above speed of light. The upper bound on speed of light is applicable to energy waves such as visible light, infrared rays, X-rays, Gamma rays and Electro-magnetic radiation only and not to the objects.

Therefore the principles of special relativity, limit on speed of light c should not be imposed to objects and particles with non-zero rest mass. For example, very tiny particles such as electrons are accelerated to the speed of light in a super collider when accelerated under the influence of an electromagnetic field produced by electric current carrying coils. However, it is possible that when the accelerating electron attains the speed of light, the particle may start to radiate light and the kinetic energy of the particle will diminish. Specifically this is true when molecules of matter are accelerated to speed of light because molecules are comprised of atoms which consist of many protons, neutrons and orbiting electrons. Thus further increase in speed of any object is inhibited when atoms and molecules of the object starts radiating energy waves. In reality, the speed of molecules or particles is decreased to conserve the energy.

The author's assertion that the speed of a particle is decreased below speed of light because of emission of radiation is consistent with Erwin Schrödinger's findings in 1925. He derived wave equations to model behavior of light particle as a wave propagating in one, two and three dimensions. An elementary analysis of energy radiation by excited atoms may be found in pages 605-622 [3]. The analysis though not rigorous, provides quantitative expressions for irradiative life times and rate of energy radiation. Further, when electron orbit transition event occurs, selection rules for initial and final quantum state that govern the possibility of electric dipole transition are derived.

It is well known that waves are generated when any particle, string, wire or rod of metal vibrates upon application of stress. The wave produced is characterized by the frequency of normal oscillation modes of the system. Schrödinger stated that for every wave there is a particle motion responsible for its creation. He described that as a wave-particle duality. Clearly, wave-particle duality is different from the dual nature of light behavior, wave and particle. Waves at any frequency (Sound, electromagnetic, X-RAYS, LASER, MASER and visible light waves) are carriers of energy. No one has described that sound waves consist of particles of matter. Why should light wave be treated any differently? The only difference between visible light waves and sound waves is they differ in frequency. Therefore particles causing radiation of visible light does not constitute a different entity and should not be treated separately. In fact, light waves in the visible spectrum are released by a process similar to the production of LASER and MASER. In Figure 1.1, an example of a radiation event caused by light or thermal energy is shown. Typically, wave energy is released in a radiation event when an electron in outer shell makes a transition to a lower shell orbit by excitation. This transition can occur when thermal energy is applied to matter or high field strength is induced by applying electrical potential as in the case of solid state LASER.

The content of this chapter is organized as follows. First, it is explained why it is important to model the behavior of light very accurately. Then, it is clarified that only the wave model of light is correct. The discussion follows to explain why the absolute speed of light can be attained by particle with non zero rest mass. In section 1.2, the example of light trajectory in an accelerating elevator is explained on wave basis.

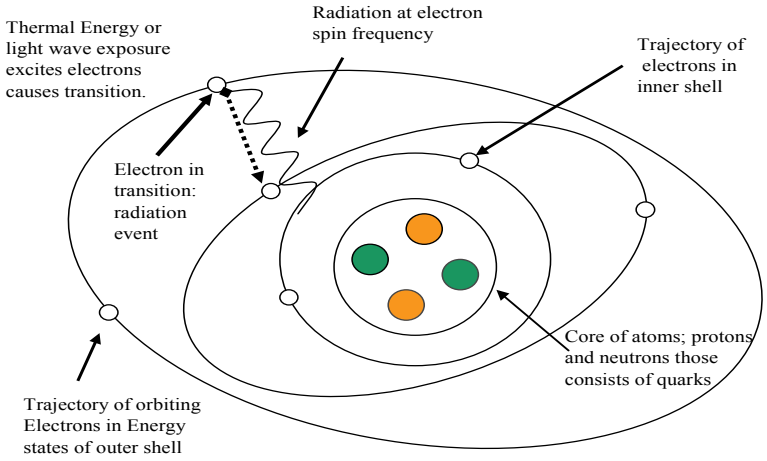

Figure 1.1 Radiation events: Orbiting electron in excited state. When orbiting electrons are exposed to light wave energy, they are excited, trigger an orbital transition event. The excited electrons radiate energy waves at frequency that corresponds to energy difference .between initial and final quantum states of electron in orbit.

In section 1.3 we will discuss why bending of light arriving from distant stars when passing by the sun are not deflected by the sun's gravity. In section 1.4, operation of Michelson interferometer apparatus is described. Also, it is explained why his experiment does not prove that classic Lorentz length contraction occurs in his experiment. In section 1.4.1 we discussed what were the assumption made that lead to the wrong conclusion that emphasize need for special relativity postulates proposed by Albert Einstein. In section 1.4.2 an improved design for Michelson's Interferometer is suggested. The newly designed apparatus Sky's Interferometer allows to precisely measure orbital speed of earth surrounding the sun. In section I.5 we will demonstrate that the results of experiments of proponents of particle theory do not provide conclusive evidence for particle model of light. The results from three experiments: photoelectric effect, Short Wavelength-Limit X Rays and the Compton Effect are investigated in sections 1.5.1, 1.5.2 and 1.5.3 respectively. Our investigation proves that light is a wave and not a particle as claimed by their performers. In section 1.6, we have discussed details of a single most important effect Doppler's shift to prove that light is a wave. Also, in this section we have analyzed the results of a rotation of blades fan experiment to prove that light is definitely a wave. Further, zero shifts between absorption and emission line spectra of various elements strictly prove that Electro-magnetic radiation is wave. We have included several events associated with light propagation to prove that the light indeed behaves as a wave.

1.1 Light: Wave or Particle?

According to Einstein's special theory of relativity, light exhibits its behavior as a particle and he named them photons. Also in his general relativity theory, he stated that a beam of light will bend and slow down under the influence of a force field such as gravity. In the following two sections we will show that light does not bend or its trajectory is not affected by gravity or any other accelerating force. Further, in section 1.3 we shall explain why bending of light by force of gravity would provide for catastrophic results when one projects the positions of huge celestial objects nebulae and billions of stars inside neighboring galaxies. In the following section, we shall discuss details of trajectory of light from a flash light in a moving elevator.

Read more…….

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1.3 Do light waves bend as they pass by the Sun and other stars?

According to general relativity theory, in the presence of gravitational fields, the velocity of material bodies or of light can assume any numerical value. In an arbitrary Gaussian coordinate system, not only does velocity of light become different, but light rays no longer remain straight [7]. We agree that the speeds of light vary. We disagree that light rays will bend. Einstein tried to explain the bending of light rays from distant stars because of the gravity of the sun. His prediction of deflection of a ray of light coming from a star by 1.75 seconds was attempted to be verified by German mathematician Soldner in 1801 and British astronomer Eddington as late as on May 29, 1919. Two British Expeditions were sent out to observe total eclipse of sun-one to the west coast of Africa, other to the north Brazil. They returned with a number of photographs of the stars surrounding the sun. The results obtained from the photographs were announced on November 6, 1919. The displacement from the pictures was 1.75 seconds of arc which was in close agreement with Einstein's prediction. Many scientist applied results of this test to conclude Principles of Einstein's relativity correct. In Figure 1.4a the situation in which a ray of light arriving from a fixed star passes close by the sun and observed on earth is displayed. The ray will be attracted towards the sun by the force of gravity from the sun and will describe somewhat concave trajectory as indicated in figure 1.4 (a).

From this book's point of view, the light waves follow a curved path for a different reason. . The light rays arriving from the distant stars are deflected as they pass by the sun because they are refracted by the hydrogen gas atmosphere of the sun. Also, the light rays from the stars are further refracted by the earth's atmosphere. The deflection of light by gravity effects could produce disastrous results when they suffer bending due to multiple stars. One such incident is depicted in Figure 1.4 (b). It is clear that gravitational bending of

light by multiple stars will not permit mapping of sky with Billions of stars in Universe with any acceptable level of accuracy. Now let us compare the bending of light ray arriving from a distant star because of change in refractive index of atmosphere from vacuum (free space) and bending due to the sun's gravity. In the following, we shall apply Newton's laws to compute bending of light by gravitational field. Also, we shall apply Snell's law to compute deflection of light as a result of passage of light through earth's atmosphere.

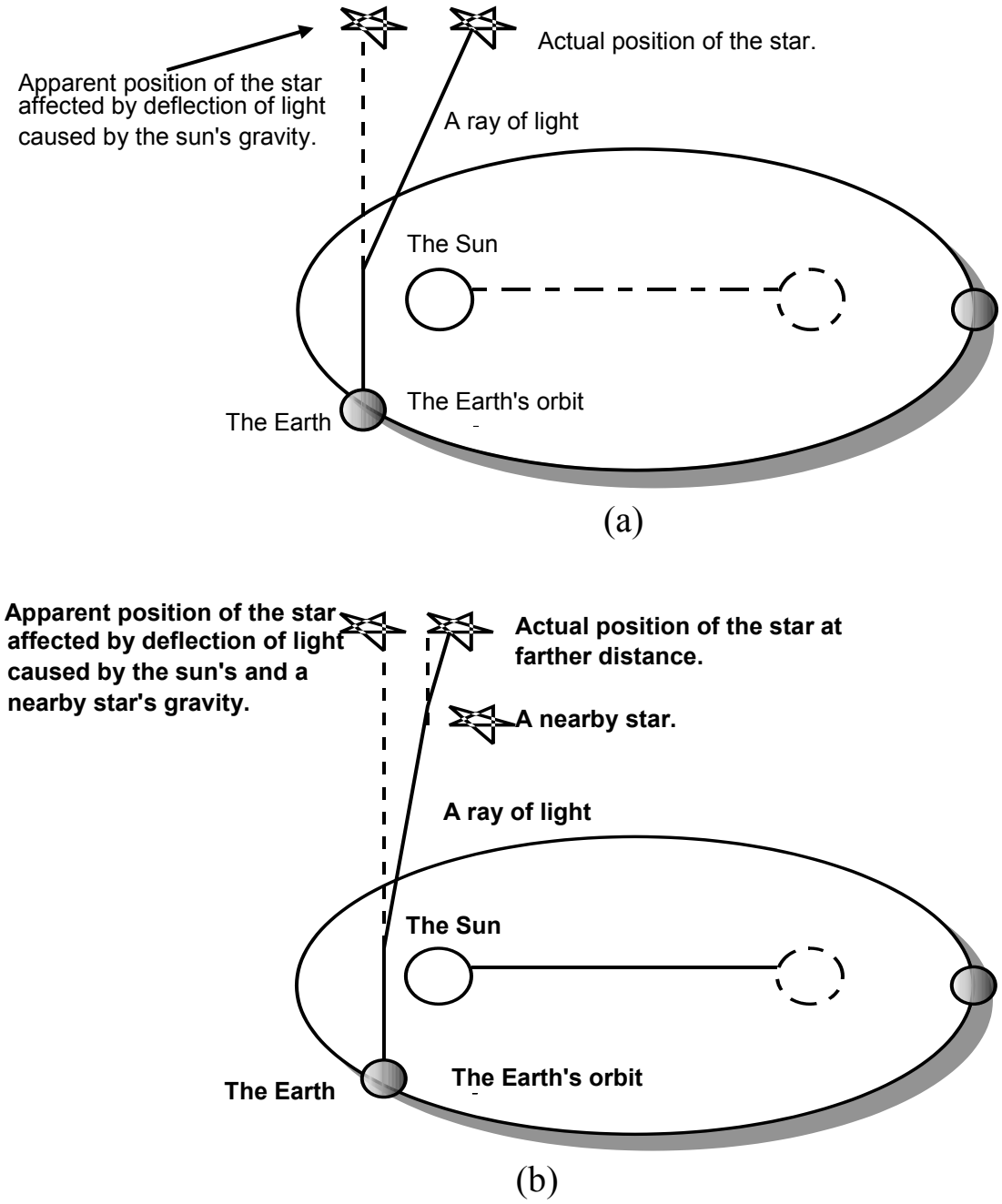

Figure 1.4 Position of star is affected by bending of light. (a) Deflection of ray of light from a star by the sun. (b) Trouble in computations: bending of light is caused by multiple stars.

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Light a particle does not make sense.
New perspective, correct interpretation of facts pertains to the Photoelectric Effect, the Compton Effect and the X-ray emission spectra experiments.

1.5 Advocates of Particle Theory and Experiments

The proponents of theory that light consists of photon particles among others including Einstein used results from several experiments to validate the concept. We shall discuss three experiments. Their evidence indicate that energy possessed by individual photon of frequency ν is expressed by relation

$$\mathbf{E_{photon} = h \times \nu} \qquad \textbf{(1.7)}$$

here **h** is known as Planck's constant**.**

In particular, we shall investigate the details of following experiments in great depth to correctly understand the behavior of light waves.

1. Photoelectric effect
2. Short – Wavelength – Limit X Rays, and
3. The Compton Effect.

We discovered that evidence from those experiments does not necessarily prove that light consists of photon particles. Our observation is based on the fact that the outcome of the experiment would not be different even for wave model for light. Let us look at the details of each experiment and explain why their results do not conclude that light is particle and instead is a wave.

1.5.1 The Photoelectric Effect

In this section we shall discuss details of experiment for photoelectric effect. It is well known that free electrons are ejected from a clean metal surface when exposed to light energy. The electrons are called photo electrons and ejection by light is known as photoelectric effect. It is discovered that for a given value of frequency ν or wavelength λ for incident light there is a spread of photoelectrons energies down to zero. However the maximum kinetic energy K_{max} of photoelectrons is fairly sharp defined and varies linearly with ν. The energy K_{max} does not depend on intensity of light but only on its frequency. Experimentally it is verified that high intensity of incident light results in more number of photoelectrons ejection but not more energy per electron. Further, below a minimum threshold frequency ν_0 for the incident light no photoelectrons are ejected regardless of intensity of incident light. The threshold frequency ν_0 is the characteristic of the metal being used as photo emitter.

In Figure 1.9, the photoelectron ejection by impinging of incident light is displayed. A closer look at ejection of photoelectrons due to incident light indicates a conclusion that is contrary to Milikan's observation. In Table 1.1 data maximum kinetic energy of photo electrons and frequency of incident light rays are summarized and plotted in Figure 1.10. We provide the following explanation for our conclusion in favor of wave nature for the energy that is incident to eject electrons from the orbits. The data was reproduced from courtesy of R. A. Milikan, phys. Rev. 7, 355 (1916).

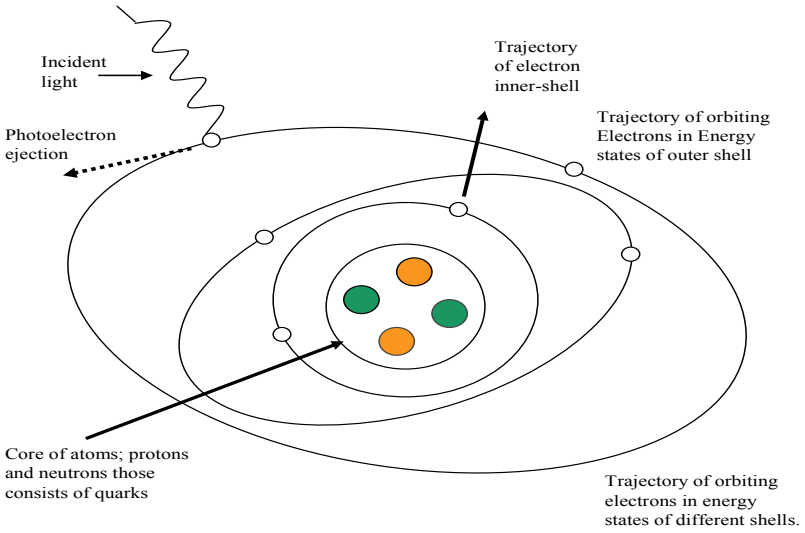


Figure 1.9 Photoelectron emissions by incident light on a clean metal surface. When bound electrons in metal are exposed to light they absorb quantum of energy and escape for conduction of current.

The energy K_{max} depends on frequency and not the intensity of incident light because the ejected electron from a specific orbit absorbs light energy in a quantized maximum amount at the frequency of incident light. The quantity of energy absorbed by an

orbiting electron is a function of de Broglie wave length representing the electron in orbit. At frequencies of light incident corresponding to at or above de Broglie wave length the electron may absorb more energy required to alter the quantum state of electron. It is probable that higher frequency light waves penetrates in to deeper inner shells and knocks of electrons from interior orbits after those electrons absorb the light energy than lower frequency of light can penetrate. The kinetic energy of electrons from inner orbits is higher than the electrons in outer orbits because orbital speed of electrons in interior orbits is higher than electrons in exterior orbits. The fact that incident light having frequency below threshold ν_0 does not result in any ejection regardless of intensity proves that below that frequency the light energy is not absorbed by electrons in any orbit.

Table 1.1 Frequency of light waves vs. Maximum KE of photoelectrons

Frequency 10 X THz	Kinetic Energy Electron volts
48.5	-2.33
55	-2.03
69	-1.5
74	-1.3
82	-0.94
96	-0.38
118	0.5

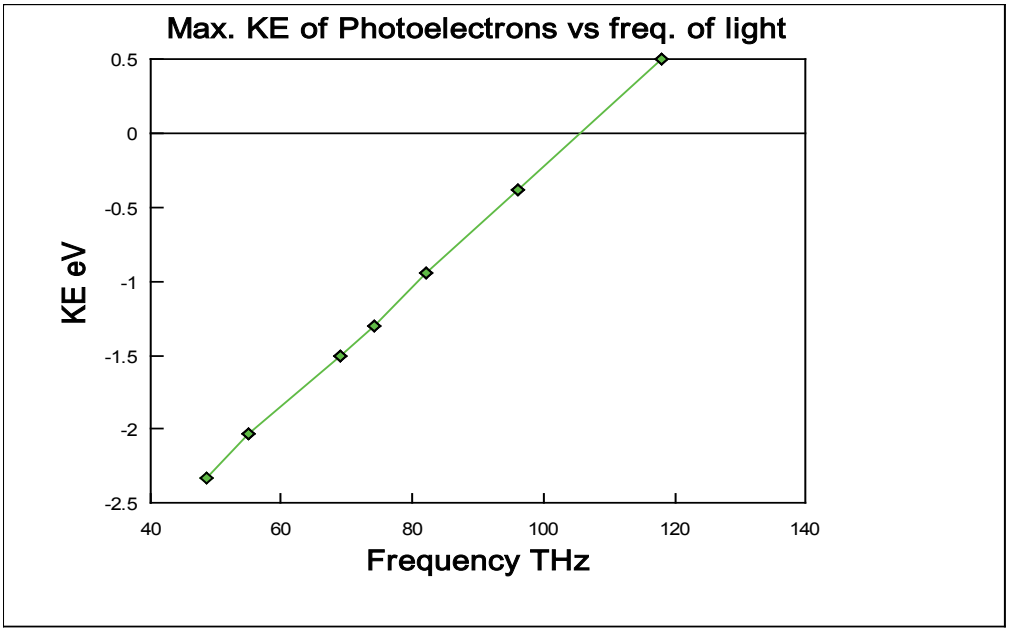
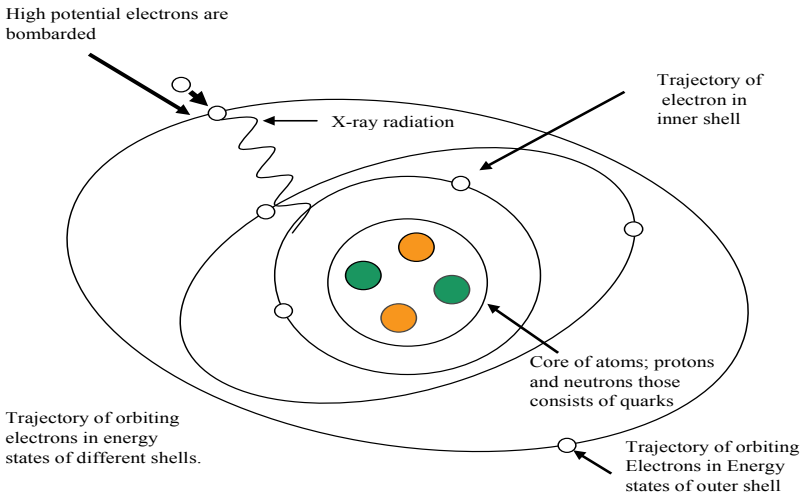


Figure 1.10 Maximum KE of photoelectrons vs. frequency of incident light. The maximum kinetic energy is proportional to frequency and not related to intensity of light incident because high frequency light waves affect electrons of the inner shell orbits. [Figures from R. A. Milikan, Phys. Rev. 7,355 (1916) reproduced with permission of the University of Chicago Press.]

Further, it was argued that time-delay between initial light illumination and onset of photoelectron ejection current is so short 3 X 10^{-9} sec (< 10^{-8} sec) that it can not happen with wave model of light. The onset time delay is still very high compared to period of light incident wave which is few femto seconds (1.25-2.5 femto sec. Table 2.1 for visible light range). It is highly probable that photo electrons may be ejected after it absorbs wave energy over several cycles of light waves. However, Einstein and proponents of particle theory of light claims that photo electrons are ejected by energy absorption from exactly one quantum of photon. Even if that is correct observation, it is not right to specify that photon is particle. Our argument is that a particle should have rest mass and center of gravity.

1.5.2 Short-Wavelength-Limit X Rays

The focus of this section is to describe details of Short Wavelength-Limit X-Rays experiment. In this experiment, metal target is bombarded with high energy accelerated electrons in range of 5-50 KV a spectrum of wide range of wave length X-rays are emitted. The radiation is caused by absorption of energy from bombarded electrons. The energy is absorbed by electrons in outer orbits and re-emitted in the form X-rays. It is also possible that the X-rays are emitted because of the collision between free electrons and bombarded electrons. That is one reason that the sharp cut-off frequency only depends on accelerating potential and does not depend on type of metal target. The work function does not appear because it is almost negligible in comparison to the electrons and photon energies involved (order of 0.1 percent). In Figure 1.11 the radiation event is displayed. In Figure 1.12 relative intensity of X-ray emission vs. wave length for varying electron potentials are plotted. The corresponding numerical data is included in Table 1.2. In Figure 1.13 maximum frequencies vs. accelerating voltage is displayed and the corresponding numerical data is summarized in Table 1.3.



Radiation event caused by collision of high energy electrons. Here it is demonstrated that electron with high accelerating potential may trigger an orbital transition event and release X-rays.

The X-ray spectrum indicates sharp-cut off at a minimum wavelength (or maximum frequency), that is same for all metals and varies linearly with accelerating potential [3]. The phenomenon resembles the photoelectric effect in reverse. It is argued that maximum possible frequency of X-ray corresponds to the kinetic energy of an incident electron which is converted into the energy of a single photon. There is an error here. Highest potential electron produces the highest frequency X-rays because the electron digs to deeper shells of electron orbits. The electrons bombarded in orbits closer to nucleus have higher speed and spin momentum than the electrons in outer shell orbits. As indicated in Figure 1.11 the excited electron absorbs energy from bombarded electrons and re-emits the excess energy in form of X-rays. The maximum frequency of X-ray is function of excess energy and the quantum state (spin momentum and speed) of electron from which the energy is released. The fact that this maximum frequency is linearly increasing with accelerating potential of electron does not prove that energy released X-ray is photon a particle. The energy content of a wave can be quantized number just as well as that of a particle precisely. . Further spectra of various wavelengths are emitted in this event. Therefore conclusion that X-ray photon is a particle in this event is not accurate.

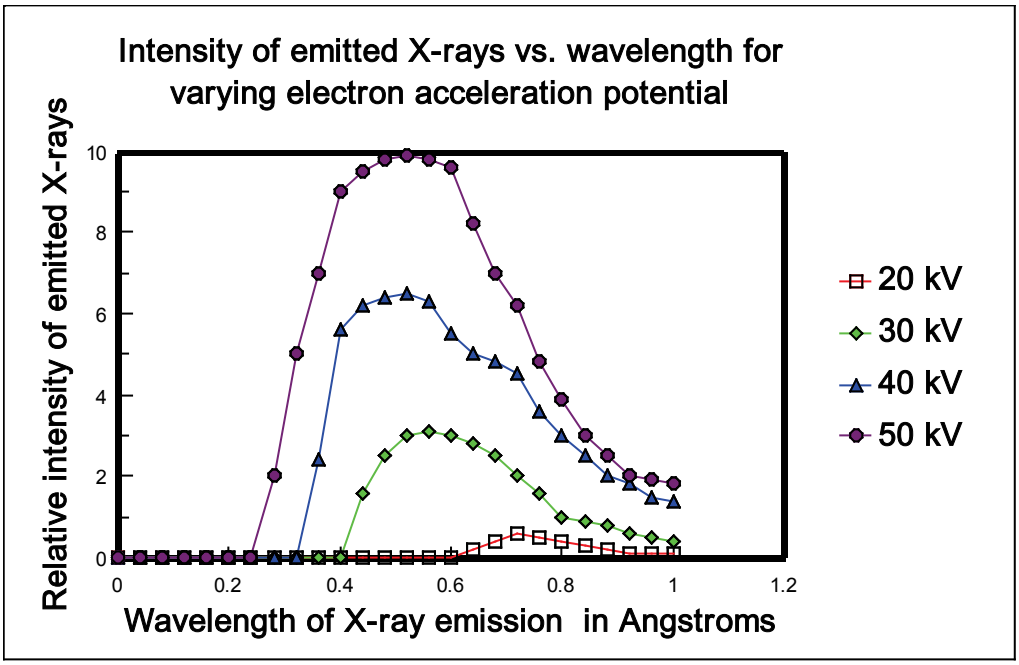


Figure 1.12 Bremsstrahlung spectra: electrons of various energies striking a metal target. X-rays are emitted when electrons with high acceleration potential are bombarded to a target metal. [Data of C. T. Ulrey, Phys. Rev. 11, 401 (1918),].

Table 1.2 X-ray emissions versus cutoff frequencies for various eV acceleration.

Wavelength X-ray Ang.	Relative Intensity at 20 kV Acc.	Relative Intensity at 30 kV Acc.	Relative Intensity at 40 kV Acc. .	Relative Intensity at 50 kV Acc.
0.0 – 0.24	0	0	0	0
0.28	0	0	0	2
0.32	0	0	0	5
0.36	0	0	2.4	7
0.4	0	0	5.6	9
0.44	0	1.6	6.2	9.5
0.48	0	2.5	6.4	9.8
0.52	0	3	6.5	9.9
0.56	0	3.1	6.3	9.8
0.6	0	3	5.5	9.6
0.64	0.2	2.8	5	8.2
0.68	0.4	2.5	4.8	7
0.72	0.6	2	4.5	6.2
0.76	0.5	1.6	3.6	4.8
0.8	0.4	1	3	3.9
0.84	0.3	0.9	2.5	3
0.88	0.2	0.8	2	2.5
0.92	0.1	0.6	1.8	2
0.96	0.1	0.5	1.5	1.9

Next we shall describe details of an experiment the Compton Effect discovered and named to his inventor. Though proponents of duel particle and wave nature of light impressively utilized the Compton's effect to justify their conclusions and belief, our position is firm. We will convince the readers, that light is indeed a wave in all the phenomena and experiments to prove it otherwise. We admire the effort of Compton to come up with a brilliant argument as this. In a nutshell his experiment is based on absorption of energy from light wave (photon) by an X-ray photon to decrease the frequency of X-ray from one regime to a different value in a quantized quantity.

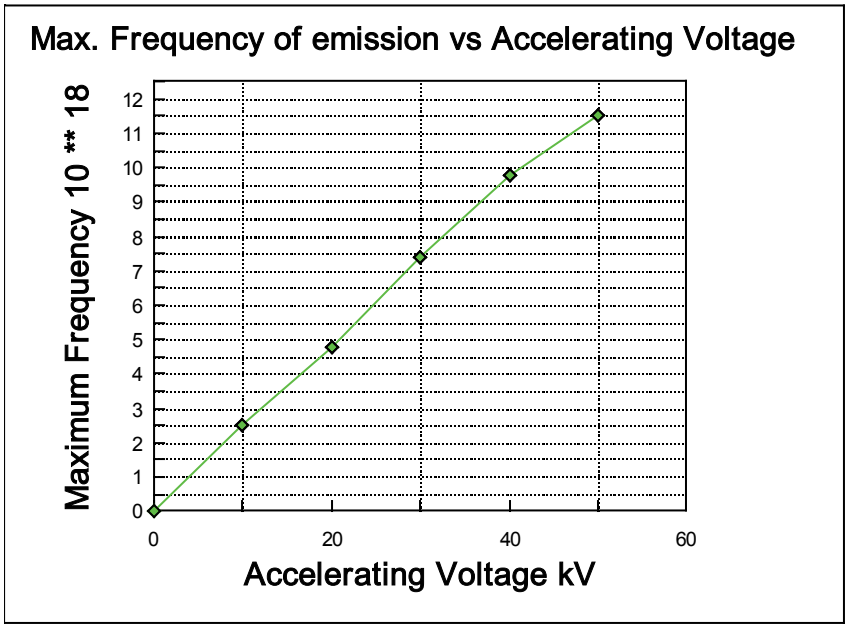


Figure 1.13 Maximum frequency of emission vs. accelerating voltage.
[Data of C. T. Ulrey. Phus. Rev. 11, 401 (1918).]

Table 1.3 Maximum frequency of X-ray vs. accelerating potential of electrons.

Accelerating Voltage V (kV)	Max. Frequency 10 ** 18 Hz
0	0
10	2.5
20	4.8
30	7.4
40	9.8
50	11.5

1.5.3. The Compton Effect

In this section we shall illustrate the details of experiment that narrates Compton Effect. Compton Effect demonstrates that photon carries radiant energy and a linear momentum. Collision event between photons and free electrons can be analyzed using the energy and momentum conservation laws of relativistic particle dynamics. Compton showed that when X-ray photon collides with free electrons; the X-ray photon suffers a loss of energy. The loss is manifested as an increase in wavelength of the X-ray by precisely the amount corresponds to an elastic collision between two particles. Here Compton faces a

dilemma. He speaks that X-ray is a particle. Then he says that an elastic collision between X-ray and electron particle results in increase of wavelength of X-ray. He is implying that particle X-ray is analogous to wave X-ray with difference in wavelength caused by conservation of momentum. This is interesting but it does not prove that X-ray is a photon particle. It is hypothetical to describe that X-ray photon collides with an electron. It is more appropriate and accurate to specify that X-ray radiation encountered a free electron. The electron absorbed X-ray energy and re-emitted the energy at a lower wavelength. It is possible that the free electron which absorbed the X-ray energy may have changed state from being free to be bound by one of the atoms in the orbits.

Our explanation on results of above experiments clarifies that results do not necessarily prove that light energy consists of photon particles. The fact of the matter is that entire spectra of signals and radiation consists uniformly of waves with different wavelengths and completely characterized by wave properties of light. In the following section we shall focus on the experiment and results to show that light is indeed a form of wave energy.

Read more…….

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1.6.2. Why blades of a fan rotate when exposed to light?

The supporters of particle theory proposed yet another experiment. They prepared a fan with very thin (light) blades. Then the blades were coated with a thin layer of photo-sensitive material. The fan was exposed to light rays. They discovered that the blades started rotating in a direction that will indicate that photon particles from the light transferred linear momentum into a torque. A construction of this fan and the apparatus is displayed in Figure 1.14. The result does not prove that light consists of particles. The reason is simple. The size of photons with zero rest mass is very small compared to the mass and the momentum change associated with the blades. Further the fan blades would not rotate if not coated with photo-sensitive paste. The designers of the experiments erroneously concluded that photons were impinging the blades and transferred their momentum. Therefore a closer examination is needed to analyze the rotation.

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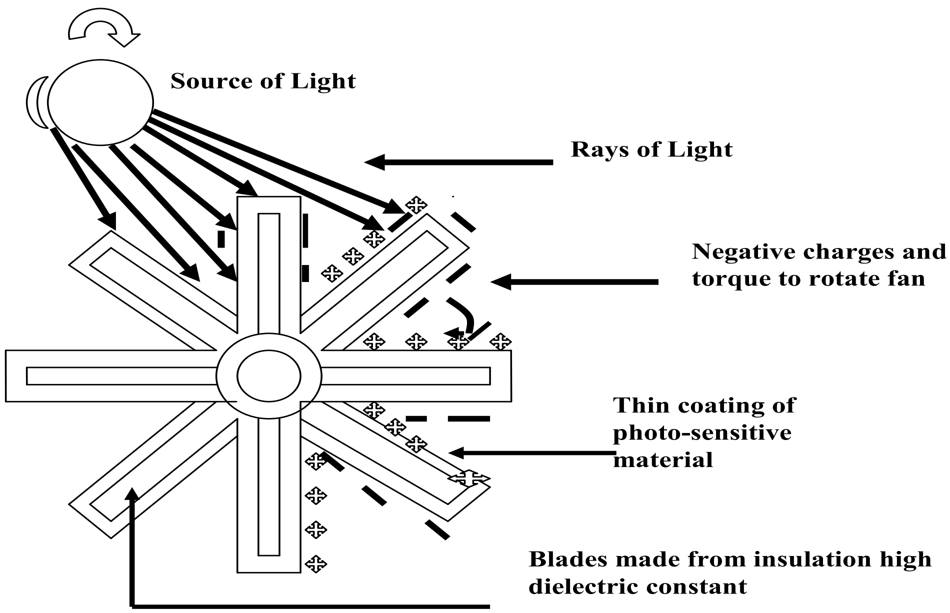

Figure 1.14 Rotation of fan blades coated with photo-sensitive material. When blades of fan are exposed to light, charges on the surface of fan blades are asymmetrically accumulated because of Skin effect and absorption of wave energy. The fan sees a torque and rotates.

In Figure 1.15 a detailed view of a pair of blades is shown. The blades are made out of a very thin film of ceramic which has very high dielectric constant compared to air. Also, thin film decreases the weight of film and whole fan to less than an ounce. These blades are coated with photo-sensitive material. When the blades are exposed to an intense light beam, many electrons in outer shell of photo sensitive material atoms absorb light wave energy. They jump to conduction band and become free electrons and leave behind holes in bound state. The free electrons are accumulated on the surface of blade because of skin effect.

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About the Author

Shailesh Kadakia originally from Mumbai, India earned his graduate degree MSEE in Electrical Engineering with emphasis on computer technology from the University of Texas at Austin in May of 1981. He was awarded the National Science Foundation funding for research and thesis completion. From 1981 to 2001, Shailesh was employed as an Information Technology Engineer in several blue chip manufacturing corporations. During his 20-year IT career, he was issued five patents in computer technology (circuits and systems), and had published over 25 reports and papers in journals. He contributed toward the successful completion of VLSI projects at IC vendors National Semiconductor, Fairchild, Texas Instruments, Cirrus Logic, Motorola Semiconductor, Hewlett Packard, LSI Logic, Silicon Graphics, Entropic Communication and NxtWave Communication.

From 2003 to 2007, he directed his attention from the IT industry to the investment industry. During his three year career at MetLife Insurance and Primerica as an investment executive, he educated himself on financial and corporate management practices and laws. Simultaneously, he did extensive research and studies on relativity theory that lead to the creation of this book. Then, he founded start-up corporations Krypton Security Systems, Inc. on his own and MicroLink Inc. in partnership with an MIT graduate from Mainland Sam Tang. For proposing the idea of Smart Card for nation security, Shailesh was awarded Business Man of the year 2005 award from NRCC. From June 2008 to June 2009, he accepted employment at Harris Corporation's RFCD Division, Rochester, New York, as a Software Engineer Level 3. At Harris, he was routinely testing the Flacon III family of Soft Defined Radios designed for the U.S. defense department.

Shailesh is listed as an honored life member in the Cambridge Who's Who directory and is on the professional network of LinkedIn (http://www.linkedin.com/in/shaileshkadakia). His outside interests include swimming, sight-seeing, singing and spending time with friends. His favorite sports are tennis, volley ball and bowling. In the indoors, he likes to watch football, ice hockey and basketball, play chess and play billiards. Also, to relax, he likes to cook, visit Ellison Park, Rochester. He likes the people and community of Rochester where he is currently residing.

Finally, he enhanced the theory of relativity proposed by famous physicist Albert Einstein and complemented his work by postulating the new **Skylativity®** theory. He invites you to provide your feedback and comments on the subject matter of this book on his web site www.Matrixwriters.com. He will incorporate your suggestions when the next edition of the book is released.

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