



## Newton's Spectrum Theory, The Color Indigo and Its Mystical Practices

<sup>1</sup>Ernesto Carlos Pujazon Patron, <sup>2</sup>José Domingo Elías

<sup>1</sup>Faculty of Art and Design, University Technology MARA, Malaysia.

<sup>2</sup>Pontificia Universidad Católica del Perú. Perú

**Abstract:** Religion, science and faith dominated much of Newton's thoughts and his manuscripts are filled with biblical speculations and timeline, along with passages that excoriated the establish Law of the Anglican Church Fathers, positioning and rendering his private religious conviction as heretic, threatened not just his livelihood but his life. The intent of this two-part article is to provide a broader understanding and an integral view of the color called "Indigo" within the theory of color exposed by Isaac Newton and the visible spectrum. It is very common when science, religion, and arts met, to apply philosophies which are interwoven around historical and social events to presence science as a human, relevant and a lively endeavor. In this article historical aspects of the color are analyzed, described and correlated investigation are suggested. The first part in this article touches the social, economic, historical development and the pre-industrial aspect around the 17th century prior to Newton's birth; the second part focuses on exploring Newton's life, belief, and his main position in regard the light visible spectrum, his proposal on color theory, the cabalistic position of the number seven as well as the position of the color called "indigo" within the perceptible spectrum. Finally, this article concludes with the examination relate to where or not Newton's was affiliated to the freemason fraternal organization based on his free thinker practices in Masonic symbology and oriented on his alchemy practices.

**Index Terms - Hue/color, Indigo/Blue, Indigofera Tinctoria, Spectrum Theory**

### I. INTRODUCTION

The 17<sup>th</sup> century was a period of vigorous economic expansion which played a major role in the many other transformations social, political and cultural of the early modern age. It also brought the great plague of 1603, 1636 and the 1665-1666 that was the worst outbreak since the early black death occur during the middle age of 1348-49, each time spreading rapidly throughout the country killing one-third of the population in England. This century witnesses a huge political and social upheaval and years of civil war, terror and bloodshed that enveloped the kingdom. Charles I was executed and the republic was introduced [2]; afterward the event was overthrown with the restoration of Charles II, this was a short transition of powers that returned to autocratic royal influence. The social economic status during the 17<sup>th</sup> century of the merchants in England has improve exponentially. Besides mercantilism was a designed economic policy that increased the nations coffers and assets through their exports with this system the British colonies were money makers for the motherland the "United Kingdom of England". The trade industry was increasingly important to the country wealth. At the top of the society were the nobility aristocracy and squires, small but very powerful group followed by the gentry. The upper class of wealthy families enjoyed many luxuries than the average or poor families, they lived in suburbs or villages. Houses were beginning to display and boast the wealthy of the family that lived in them. These homes contained families with up to ten members and the woman were in charge of the servants running the house-state land, animals, and farm equipment's smoothly. The lower and the middle class was made up of gentlemen which were not rich but certainly well off, they did not do any manual labour, this included wealthy tradesmen and well-off manufactures. The craftsmen could read and write and below them came the mass of population of tenant farmers who leased their land from the rich and there were also the wage laborers, often illiterate and very poor [3]. During the 17<sup>th</sup> century the average life span was considered shorter than today's at birth it was only 35 years many people died while they were still children. If anyone may well survive the mid-teens, you would probably live to their 50s or early 60s [4]. It was within this scenario that new ideas across sciences set to develop.

Prior to the development in all fields of science from physics, chemistry to medical and life sciences, this scientific community were called "natural philosophers" men like Galileo Galilei, being the first person to observe the skies with a telescope in 1609; Johannes Kepler, let to search for the order in the universe, producing a series of studies works such as "*The Secret of the Universe*" (1597 first edition and 1621 second edition), "*New Astronomy*" (1609, this title proclaims that his new astronomy is causal, that it is a physics of the heavens based upon an examination of the motion of the planet Mars), "*Optics*" 1604, "*The Harmonices Mundi*" (1619, consisted of five books in which Kepler explored regular polyhedral further, gave the first systematic treatment of tessellations, provided a proof of the existence of only thirteen convex uniform polyhedral, and stated his third law of planetary motion), "*Conversation with Galileo's Sidereal Messenger*" 1610, and "*Somnium*" 1608 (*The Dream*), were the major ones, but among several relatively minor works, the edition of "*The Defence of Tycho against Ursus*" 1595, proves to be one of the significant analyses of Kepler's thoughts [13], and can be hardly summarized as a system of ideas a cartesian way which ascended in the second half of the 17<sup>th</sup> century with two main tendencies; first idea, linked to Platonism, a 17<sup>th</sup> Century attempt to reconcile Christianity with humanism and science, stressing especially that actual things are copies of transcendent ideas and that these ideas are the objects of

true knowledge apprehended by reminiscence [16], given priority to the role of geometry in the structured world; and the second idea, connected with the Aristotelian tradition accentuating the role of experience and causality [11]; Kepler always emphasizes his philosophical ideas even theologian to the question he deal with: “*God manifests himself not only in the words of the Scriptures but also in the wonderful arrangement of the universe and in its conformity with the human intellect*” [11]; another figure of similar importance was Lord Francis Bacon, known as Lord Verulam, philosopher and statesman who served as Attorney General and as Lord Chancellor of England, he was a leading figure and has been called the father of Empiricism philosophy, arguing for the possibility of scientific knowledge based only on “inductive reasoning” and the careful observation of event in nature. He wrote a treatise “*Novum Organum, sive indicia Vera de Interpretatione Naturae*” 1620 and his doctrine of the idols that he put forward in the early writings [12], functioning as an important theoretical element within the rise of the modern empiricism. According to Bacon, the human mind is not a “*tabula rasa*”, instead it is of an ideal plane for receiving an image of the world, which is a crooked mirror, an implicit distortion, forming an image in our mind right from the beginning which does not render and objective pictures of the true object. His reverences for Aristotle conflicted with his rejection for Aristotelian philosophy, which seemed to him barren disputatious and wrong in its objective; he reformulates and functionally transforms Aristotle's conception of science as knowledge of necessary causes, rejecting Aristotle's logic, which was based on his metaphysical theory, whereby the false doctrine implied that the experience which comes to us by means of our senses (things as they *appear*) automatically presents to our understanding as they “*are*” [12]; subsequently, he introduces a new conception of “philosophy prima” which is the study of the origin of words and their changes in structure and significance, as a meta-level for all scientific disciplines. He died of pneumonia in 1626, outside London. Another prominent character of these great scientist was Blaise Pascal; who did not publish any philosophical works during his brief lifetime; he was a child prodigy educated by his father a tax collector in Rouen, who was an accomplished mathematician provided the only formal education that his son enjoyed; Pascal, philosophical contribution can be gleaned from his commitment to scientific and theological debates in France in the mid-seventeenth century [14]. In an extraordinary unprecedented conjunction, Pascal and Descartes met in Paris 1647 to discuss, if they could conduct experiment with mercury barometers initially and later published as “*Experiences nouvelle touchant la Vide 1647*”. Pascal theological interpretation of the human condition was borrowed from San Augustine, said: “Adam's fall from grace resulted in a human nature that is essentially corrupt, and there is not possibility of recovery by natural means or human effort” [14]. Thus, religious faith merely compensated for a lack of evidence in support of a particular position, and made possible for a Christians to accept it as true [17].

Likewise, within this plethora of brilliant intellectuals, we find a Pascal, Bacon, Descartes and Newton causing a profound change in the culture outlook and lives of human beings. Their moto was that everything in our surroundings, any life form and its equivalents is like a clockwork, the universe is a machine as is the human body. Pascal died of a malignant stomach tumour in 1662, Paris France at the age of thirty-nine years. Another important position in medicine was set by William Harvey, whom determine that the human heart has four valves that permitted the flow of blood in one direction only, from the right ventricle to the lungs, then back to the left ventricle and then to the aorta. Harvey saw the human body as being moved by vital forces assigning primary importance to the formed organs and the primacy of the blood as nutrient and repository of the heat and spirits [5]. Today's Harvey's theory is recognised as the foundation for modern medicine, however at that time of his discovery, it was met with scepticism because it ran counter to the existing dogmas of the time [5]. He died of a stroke on the 3<sup>rd</sup> of June 1657, Roehampton, London. Philippus Paracelsus was a swiss doctor, free thinker an iconoclast, theosophist and alchemist known as spiritual science, he is also considered the father of modern toxicology [40], he correctly described a number of serious illnesses such a tuberculosis; he thought that diseases came from outside the body and could be cured by supplying the right chemical as opposed to herbal medicines, restoring the internal balance of the patience. In this period scientist came to be regarded as those who know the reality causing to be split between the human experience and the scientific facts. Along these developments, technology often preceded science so things were often created or invented, for example mathematics and geometry help artist and architects in their pursue, the double-entry bookkeeping system also was invented. Note here that with the invention of the printing press the availability to obtain and read book expanded the dissemination of scientific knowledge, breaking the chain imposed by the monopoly of the Catholic church. Paracelsus died on the 24<sup>th</sup> September 1541.

Rene Descartes, was a creative mathematician and a natural scientist, called “Natural philosopher” a metaphysician [6]. He formulated the first principle of his philosophy as “*je pense, donc je sui*” which was translated by Etienne de Courcelles as “*Ego cogito, ergo sum, sive existo*” in the “*Discourse on Method*” 1637 [10]. He was known among the learned of his day as the developer of a new and comprehensive theory of nature and the proposer of a new metaphysics. He laid the foundation for the 17<sup>th</sup> century continental rationalism a new direction in thoughts and as the forerunner of a cold rationalistic and calculative conception of human being advocated later by Baruch Spinoza and Gottfried Leibniz and opposite by the empirical school of thought of Hobbes, Locke, Berkeley and Hume. This century was regarded as the start of the modern philosophy with increased attention given to epistemology [8], shaking off the medieval occultist approach, especially the scholasticism, succeeding the Renaissance and preceding the Age of Enlightenment. Descartes epistemology project was set in the “*Meditations of First Philosophy*” 1641, that he used to circulate among his peers for written objections, feedback and comments [9]. Under this period many Philosophers advocate the changes in the system of government from the monarch to the system where the citizens held the control in society.

Descartes postulated that the mind is impalpable and the matter occupied space; the mind interacts with the body through the Pineal Gland, which he deemed “*The Seat of the Soul*” [15]. Yet while, he also stated that the physical world was made of invisible particles in motion. In the metaphysics, he provided arguments for the existence of God as perfect and infinite; therefore, the finite imperfect mind of man could not have dreamed or created Him up out of thin air [7]. God create man and endowed him with both matter and mind which are the distinct constituents of reality; showing that the essence of matter is extension, and that the essence of mind is “thoughts” [6]. He understood that science and numbers are not the only truth, senses are needed as well as revelation, intuition, impulse, where wisdom lies is in knowing the place and limits of all these. In 1650, he died of pneumonia in Sweden. Most of the philosopher and theologians lived during the age of the scientific revolution commonly believed that God reveals himself through the “Book of Nature” and the “Book of Scripture”, coy with their secrets and can be coaxed out by the truly wise man. Every philosopher has their own secrets which were written in their own way. What many understood as the conflict between religions and science during this period is later seeing as the invention of the Enlightenment [22]. The main argument among philosophers and scientists during the 16th and 17th century was more on who have the authority to reconcile religious scripture with nature and natural science, a task which was a delicate issue to execute. Most of the scientist and philosopher were very religious men of the own time.

## II. DISCUSSION AND RESULTS

Introducing a brilliant mind like Isaac Newton's [20], won't be easy, he was born accordingly the Julian calendar, (Used in England at the point of time and it was created by father Joseph Scaliger), on the Christmas day 25<sup>th</sup> 1642, which is in fact was the January 4<sup>th</sup>, 1643 (modern Gregorian calendar adopted by England in 1752 use until today) at Woolsthorpe-by-Colsterworth in the county of Lincolnshire with no worldly father; his natural father Robert, a farmer owned the property and animals make him quite wealthy uneducated man, he has died some three month before Isaac's birth. His family was of mixed social status, on his father side, he was part of an up-and-coming yeoman family (landed peasants, the forerunners of the middle classes), on his mother Hannah Ayscough, was of sort of impoverished minor nobles, who remarried Barnabas Smith the minister of the church at North Witham a nearby village, when Isaac was two years old; although Isaac father has dies, the house servant ran the family farm, Newton was clearly expected to take it over himself someday but soon showed that he had no interest in managing the estate. He did not have a happy childhood, left to be taken care by his grandmother Margery Ayscough, basically, he was treated as an orphan. No knowing much about his early years prior to enter the Trinity College, he lived with the Stokes Headmaster of the Free Grantham School, in 1660 completed his education [18]. As mentioned above, the family interest for the young Newton to manage the inheritance land was expressed by Newton's mother Hannah Ayscough, who wanted him to be a farmer to administrate the property left by his father previously; however, he intensively was devoted to the study of Mathematics and physics during his time at Trinity College a constituent college of the University of Cambridge, England, founded by King Henry VIII in 1546. Newton's life and history within the British society has been complex, he studies the classical curriculum at Cambridge and the modern philosopher of his time such a Rene Descartes from the early age, he also was deeply interested in all form of natural science and material science, which ultimately lead to some of his better-known contribution in science. At the age of 26 he was appointed the Lucasian professor of mathematics at Cambridge, sparsely his lecture was attended by reduce number of students and frequently happens that no one would show up.

### 2.1 Newton's Works and Influence

He was the greatest scientific of the age, someone whom expend much of this time and intellectual energy on scriptures as he did on nature; he kept his work closely secret. Rob Iliffe, presented Newton religious thoughts on a very comprehensive book: "*Priest of Nature: The Religious Worlds of Isaac Newton*" [22]. There are three main characteristics that stand in the way of giving an account of Newton's work and influence. Firstly, is the unsurprising contrast between the public Newton works, which mostly consisted of publications during his lifetime and in the decade or two following after his death; secondly, the private Newton works, consisting of his unpublished work in math and physics, his efforts in chemistry which is the 17th century blend of alchemy and chemistry; thirdly, Newton writings in radical theology, material that has become public mostly since World War II [20]. He composed some of the most controversial works of any early modern period. Little wonder that his inheritors family suppresser his investigations and for centuries was largely inaccessible. However, the Royal Society and the Cambridge University Digital Library have made possible to have access to all available scientific paper written my Newtons.

### 2.2 Light Spectrum Theory

During the outbreak of the great bubonic plague in 1665- 1666 that ravage Europe and England many things changed, London alone lost around 100,000 souls, all universities closed down and the twenty-three-year-old Newton, was one of the thousand students sent home to prevent further outbreaks. He was force to expend eighteen months at the family farm in Lincolnshire (Finlay, 2002: 339), and it was during this year and half that he was making sense of the world at time when it probably made less sense than usual. Newton wanted to understand the world in term of absolute physical rules. Most of Newton's writing were addressed to all European scholars, few people outside the England understood English at that point of time, most of who did likely were business traders. It is known that he could understand and write in Latin since many of the main books were written in Latin, (Lingua-Franca: Latin language is highly-structured in its nature which made it better fit for scientific and philosophical discourse), partially because it was endorse by the church and it was learned by the educated man of the time, also because people who wrote their works in Latin would ensure and guarantee their perpetuity (Latin as language did not change in the subsequent thousand years which means that the so called modern Latin speakers could easily be able to read the classical Latin); as for another languages such as Greek and Hebrew, these would have been part of any formal curriculum of a biblical scholar knowing him been a ferocious interest in finding the uncorrupted meanings on the Bible as well as other religious books. On another noted, all materials in science and philosophy sent for publication and reviewing to the Royal Society (Originated on November 28, 1660 after a group of philosophers and scientist met after a public lecture at Gresham College), London were written in Latin as scholarly language. In some manuscripts occasionally Newton, has some scribbles or references in English. Another reason to write in Latin was to encourage the church's approval, since English being a Celtic language, it was not favored by the clergy. Newton went on to formulate four important contributions to science and mathematics, in a controversial dispute that lasted until Gottfried Wilhelm Leibniz death in 1716, Newton has been attributed with the invention of the branch of new mathematics called "*Calculus*", discovering many of the laws of "*Optics*", the "*Laws of motion and the planets*" and crystallizing the universal "*Law of gravitation*" [28].

As everyone know colour dominates today's world as in no other times. Although the natural world is hardly bland and capturing its hues remains any artists challenge, blunt contrasts and iridescent brilliance are rarely found among its more modulated and patterned colours [1]. Historical references tell us that in the seventeenth century Newton's began a series of experiments with the natural sunlight and a glass prism demonstrating that splitting the visible natural white light was composed of seven visible hues [21]; at this point in time no one argued that the old theory of color set by Aristotle believing that it was send by God from the heaven through celestial rays of lights related to the four elements of nature was inadequate, and a debate was set to defend Newton's claims against the objections set by Robert Hook and Christiaan Huygens; as we know, color is the property of the light, and Newton color spectrum is suggested that derived from paint mixture first and not from the light mixture; later on during his studies Newton up-date the color list from five (Aristotle description of color) to seven colors to map the rainbow colors which appeared in the sky adding on the "orange and indigo". Many people that have investigated Newton has come on with few fundamental questions: why or what let Newton to decide and conclude that "indigo" was a necessary color to complete his visible spectrum of seven hues? why are there two different types of "blue hue" as commonly are known "blue" and "indigo"? or why he associated the rainbow of seven color to his theory of the light spectrum?; for this and a few other questions, there are some important connotations to take into consideration to clarify as well. Begins let's explain Newtons' theory; by cutting a tiny whole in the window shades, let the sunlight through showed up on the wall and around illuminated areas, this single bean of natural light travel through a glass prism and is refracted by turning

it in a linear band strap composed of seven hues: red, orange, yellow, green, blue, indigo and violet (ROYGBIV), similarly to what we see in a natural rainbow. There is a resemble he noticed between the red-violet on one end of the band and the blue-violet at the opposite end; so, connecting these two ends of the linear band colors, a circle was formed that allowed him to illustrate the relationship amongst the hues [21]. So, while color circles have existed previously, the new circular dimension of hue begins with Newton [23]. Newton circle was incomplete due the fact that certain hue does not generated individual wavelengths such as purple, which is one of the non-spectral colors as this hue does not generated any wavelength [30]. Many artists reluctant called purple instead of violet and vice versa. Purple color or hue does not exist in the real world.

This hue circle created by Newton of seven hues (ROYGBIV) does not correspond to the traditional pigment color circle of six hues: red, orange, yellow, green, blue, and violet (ROYGBV) [27], used in fine arts, where color correspond to the mixture of two existing ones and there is one type of blue hue only. In general, visible light widely vary under different condition as they render the color of the body object; this object will change because of the differences in the spectral reflectance of each source [32]. So, he studies the electromagnetic radiation, which is the form through which energy is transmitted, this natural light or sunlight is energy composed of electromagnetic vibrations of different wavelength travelling in all direction in undulating motion. The human eye is sensitive to light in the middle range of the visible spectrum and identify these hues such as green-yellow more easily (Holtzscue, 2006: 13). This is a narrow portion within the electromagnetic spectrum that can be seen by the human eye; other forms of radiations and wave of energy cannot be see included X-Rays, radio waves, gamma-rays, infrared rays, and microwaves. The eye is composed of cells which are sensitive to visible light spectrum, translate or mane as color/hue. Human perception is very limited to the small range of visible light wavelength called visible spectrum, identify by Newton’s [21]. Since then, color theory and color notation have been developed and modified by the after followers of Newton time, at the foremost are scientists, artists, philosophers, physicist and chemists.



Figure 1 Sir Isaac Newton Experiment with A Prism. Engraving After A Picture By J.A. Houston, Ca. 1870. Courtesy of the Granger Collection New York

Before him, Aristotle held for over 2000 years the universal believe that color was sent by God from heaven through celestial rays of light in white and black (lightness and darkness) and associated to the natural nature of four elements: water, air, earth and fire, and objects were made of a mixture of elements with color reproducing the said mixture (appearance). He also devised a linear scale based on the idea that colors might be formed by the mixing in various proportions of white and black. In his “*Peri Aristheseos Kai Aistheton*” (*On sense and what is sensed, c. 330 BC*), Aristotle arranged five chromatic colors on a line between white and black, with yellow closes to white and blue closes to black [23]. Newton, refuted the color theory inherited from Aristotle, in which stated that the light and dark were the two antagonistic primitives that mysteriously derive all other colors, this idea was widely accepted until 18<sup>th</sup> century. The new color theory exposed by Newton was vehemently opposed by the German poet and philosopher Johann Wolfgang Goethe, believing that science and mathematics has no role to play in the theory of color [30].

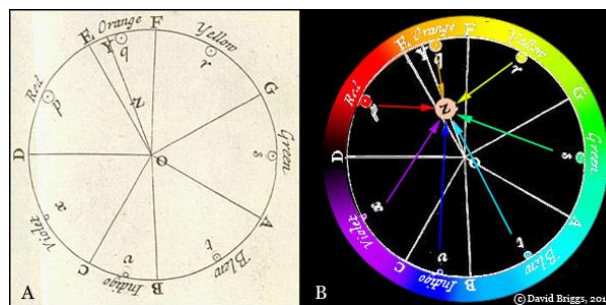


Figure 2 Newton Hue circle, from the Opticks 1704, [23]

Newtons, added two hues to the spectrum of colors, “orange and indigo” believing that the harmony of colors in the rainbow must be similar to the diatonic notes in a major musical scale, another reason probable was that it was a pleasant cosmological number; the word “harmony” derive from the Greek ‘*harmonia*’ meaning fitting together [30]. We remember Newton as an accomplish scientist, a man who opened up the way for modern science and thinking but we must see him as a sorcerer, an alchemist, a most unusual Christian by todays believe, whose understanding of the world embraced its totality mystery as well as its all-encompassing rules (Finlay, 2002: 339). For Newton the figure six (6) was insignificant number and the figure seven (7) was better because it has better symbolic totality, displaying seven as the governor of vibration that maintain all things in being bestowed life and motion and its influence extended to heavenly beings. Another concept was; having the world been created in six days God rested on the seven days [19], or as the sum up of the number four (symbolizing: Earth with its four cardinal points) and number three (symbolizing Heaven),

seven also comprises the fullness of moral life with the three theological virtues of faith, hope and charity which are added on to the four cardinal virtues of Prudence, temperance, justice and fortitude. This number is frequently used in the Old Testament. [19].

Different color circles may at first appears too conflicting, but they are all variations of the same color-order idea. All recognized the same sequence of colors. Hue may be added or omitted, but the white light spectrum moves directly from red-to green, or from orange to blue. Many arguments were made based on the number of colors included in each color notations, however, the names given are mostly intellectual exercises [32], as for the conveniences of many artists and painters, most of which work-out a palette of color consisting of three primary and the three secondaries which is combination of the two existing primaries hues. The conflict argument in Newton discovery of the hue circle, is that this notation from yellow to blue can be constructed in two different ways: passing by red or green. This laid the path for others to experiment with colors in a scientific manner. It is important to note here also that colors always affect one to another, or whether each has its own intrinsic and immutable qualities [33]. The study of these intrinsic and immutable qualities brings us to look into the contrast which affect each-others colors, no as a mean between light and dark in relation to tone, but in relation to their "hue brightness" whether it is saturated or desaturated, reaching the maximum of its intensity [33].

### 2.3 The Theory of Indigo Color and Its Impact on Science and Industry

The early Modern English word INDIGO, referred to a blue vat dye obtained from plants (Merriam-Webster. (n.d.), not to the visible spectrum hue introduced by Newton. Indigo is not traditionally part of the basic or light color-naming system of red, green and blue (RGB).

Indigo was actually a plant that got its name because came from the Indus Valley, discovered some 5,000 years ago, where it was called *nila*, meaning dark blue. And by the 7<sup>th</sup> Century BC, people starting using the plant as a dye—the Mesopotamians were even carving out recipes for making indigo dye onto clay tablets for record-keeping. By 1289, knowledge of the dye made its way to Europe—when the Venetian merchant traveller, Marco Polo reported that many caravans travelling from areas of the Middle East and India contained cloths dyed with peculiars and precious "Indigo". This plant is used to create dyes for many different purposes, such as cloth dye, ink dye, and paint dye. It has the value of gold at one point of time in Europe. Early usage of indigo dye across continents are: Indigo tinctoria cultivated in Egypt Fifth dynasty [ca. 4400 BP), East Asia, and in Peru another type is known as "indigotin" a specie derived from the Indigofera native to South America [29]. In North America, Indigo plant was cultivated by Eliza Lucas Pinckney, a daughter of a British military officer, who received a package of seeds to attempt to grow it, after a couple of attends in 1744 was the first successful harvest of indigo in the South Carolina's [25]. She might not have known that other types of indigo species were very familiar to the native Central and South American, that have withstood the weather and insects better than the imported "indigo" [25].



Figure 3 Indigofera Tictoria cake. Natural dye

This plant was highly profitable compared to other plantation such as rise plantations; this is due to its properties to repel mosquitoes carrying malaria and yellow fever that cause the dead of slaves. Indigo dye is a greenish dark blue obtained from the tropical indigo plant (Indigofera) and in India is called woad plant (Isatis Tinctoria), in China this color is named as Chinese Indigo (Persicaria Tinctoria), in Japan, the called is name as Japanese Indigo or "Aizome". Indigo Tinctoria and Indigo Suifruticosa are most common type of plants. This color indigo is slightly different from the either visible spectrum indigo or pigment, which is similar to the midnight blue. A substitute for this dye was synthetic dyes from coal tar originated in England and France. It was Willian H. Perkin at the London Royal College of Chemistry who in 1856 accidentally discovered the first synthetic dye that could be used to give textiles a purple color [26]. When new synthetic dyes were created and mass manufactures, Indian work and platers suffered due to a lack of need for natural indigo dyes plans; so many Indian peasants who were tenants on the land of the indigo planters were forced to pay higher rents each month turning many of them into poverty.

### 2.4 What Was Indigo To Newton Naked Eyes?

Many has suggested that Newton settled on seven visible spectral hues because of a preconceive attachments to his conspicuous theological conception and symbolism of the number seven, as an analogy to his comparison of the seven-musical scale, the Book of Revelation (Seven churches, seven angels, the apocalypse seven symbolic seals, seven trumpets, seven starts or planets), it meaning derives from being tied to God's creation of all things (which may be plausible), however equally speculative alternative of seeing the figure six (6) symmetrical hues in the color wheel used by artists which is based on the three historically primaries of red, yellow and blue (RYB) and the mix of them. It could also be associated to the mystical hexagon a symbol of harmony and balance, but the figure seven (7), has better symbolic connotation; it is the number of completeness and perfection (Physical and spiritual), it is tied to the Unity of God's creation and the Universe; as well as wisdom, mysticism, intuition and inner strength.

## 2.5 Newton Undisclosed Relation To The Freemason and His Alchemy Practices

Historians lay the beginning of the Age of Enlightenment between 1650 and early 1700s. This is also the period when many Operative Lodges in England, Scotland and Ireland were accepting “speculative” masons into its rolls. As Speculative Lodges grew, Freemasonry provided a powerful force on behalf of liberalism in Europe from about 1700 until the 20th Century and it expanded rapidly during the Enlightenment among powerful aristocrats, politicians, intellectuals, artists, and political activists reaching practically every country in Europe. Those political, cultural, and philosophical ideas spread through the American colonies. During this period freemasons comprised an international networking of men promoting the philosophies and ideals of the enlightenment and encouraging its members to pursue lives filled with integrity, honesty and love for all humankind. It was within this scenario that Newton set his contributions. There is so much speculation on Newton practical knowledge of alchemy and mysticism as these topics were some of the most intriguing subjects that he always examined. As we know his interest was broadly into other fields of science such as astronomy, mathematics, physics, mysticism and theology. In the Middle age alchemy was a practice which involve great esoteric quest of searching for the internal philosopher stone and the ability to transmute base consciousness into spiritual goal or allegedly could transmute ordinary metals like lead and iron into gold. The early practitioner of alchemy realized that compounds could be broken into their constituent parts and then recombined. Newton did apply this concept to his visible light spectrum theory where a beam of light passed through a glass prism and then a second prism of the same type is placed in the path of the spectrum to reconstitute the light beam. So, men of science in those days were partly associated with the paranormal (outside our normal perception), and mystical practices in their investigation; we know neither many people could write and read in their own language nor speak any other language. Science was often persecuted and outlawed by the church. In 1404, King Henry IV signed into Law the Act Against Multiplication, this “Act” lasted for almost 300 years until 1698, when Newton and Robert Boyle were preoccupied with their alchemy experimentation.

The practice of alchemy and the join of cult were for instances a normal practice by small group of intellectual men because for many scientists these practices were at odd with the church due the fact of their methods of investigations and its experiments these scientific community had far less data to drawn from to reach conclusions. Scientists who were raised by the church were influenced by their religions upbringing until they found evidence to refute it. During this time, lines were not so sharply drawn between the rational science and meditation upon the otherworldly, Isaac pursued his investigation in solitude for few good reasons; the practice of alchemy was outlawed by the British government, which feared that the ability to create gold might undermine its use as currency; by 1699, Newton became the Master of the Royal Mint overseeing the new coinage in line with the Queen Anne accession in 1702. The practices of alchemy did brought some technical progress and benefits in areas of metallurgy, the preparation of pigments and medicine however this approach swiftly lost credibility in the 18<sup>th</sup> century due the new and modern culture of open enquiries and scientific debates which has starting to grow during Newton lifetime believing that “transmutation” have been sustained by a complex combination of secrecy, confusion and fraud. Was Newton part of the so-called community of freemason a fraternal organization of the Enlightenment? Yes, he was but the idea that good science could come out of bad occultism clearly has confronted many thinkers. This conclusive idea from major thinkers in the scientific pantheon were influenced by mysticism, occultism and specially by the practices and theorist of alchemy. Newton beliefs that everything in the universe encompasses the creation of the Grand Master, an architect, where dimension and proportions were like a cosmic Rubix Cube, with one solution, pertaining the origin and fate of the Universe [31].

## 2.6 The Initiate in Freemasonry

It is important to mention that Freemasons fraternal organization recognizes itself as a “discrete society”, even though its constitutive acts of “Anderson's Constitutions in 1723” mention that it is “a secret society”. Said concept of “secret” in the seventeenth century and following centuries, did not involve suspicion or promote a position of concealment of the truth that overshadows the common good, recurrently inferred in the conspiracy theories that today afflict our society. On the contrary, secrecy in Western court society was associated with prudence and good looks in the manners of the nobility, even though the rumor of improper anecdotes from high-ranking members of the noble high society was far from being desired [37]. The fraternal organization of Freemasons as we know it, was installed in 1717 with a consortium of four lodges gathered in the tavern of the “Goose and the Grill”, made up of free men who join the name of the Grand Lodge of London [38]; Later, more lodges were integrated into the original lodges, all of them being designated in concord with the name of the United Grand Lodge of England in 1813. Freemasonry is made up of members who make up a group of initiates, understanding that membership in its ranks is mediated by some initiation or rite of entry or passage, which must be passed by the candidate to be accepted into said fraternity. In fact, this procedure was used by the unions of liberal trades that recognized their equals as such [35]. Thus, the guilds of stonemasons, carpenters, butchers, blacksmiths, etc., all of them liberal trades were grouped by the same knowledge of each of the services that they provided to the incipient bourgeoisie and the caste nobility [36]. Examples of that fraternal union in which the guilds congregated were the builders of churches and cathedrals who performed the office of stonemasons through a symbolic and allegorical perspective of the representation of the temple of God. For this, in the process of incorporation into the trade of carving the stone and tracing the temple, they climbed various stages in the knowledge and expertise of carving the rough stone to not only erect a material temple, but the immaterial and spiritual temple that integrates the human feeling of the existence of the supreme being, embodied in the Great Architect of the Universe. To this noble operational mission of representing the wonders of the universe through the cosmic order manifested in the splendid structural geometric configuration of the cathedrals of the West in those times, which express the nature of everything created by divinity, they join these guilds of builders, the intellectuals and figures of the nobility who express fervent ideals in the new paradigms that seek to respond to the true essence of human nature and a growing faith in divine wisdom materialized in everything created. It is in this process that they acquire the name of speculative masonry, since they incorporate and integrate philosophical ideals typical of the natural and exact sciences [35]. In the middle of the seventeenth century, the deep belief in a true God was strengthened in the scientific knowledge of explaining the transcendence of the human being in the search for the bright light of wisdom, thus expressing the omniscience of divinity as a superhuman essence. Isaac Newton was not oblivious to the sensitive changes that manifested in the intellect of British society, since the restless spirit that animated his being tuned in with the great changes that permeated his time, questioning dogmatic positions overcome by the philosophical speculation that harbored the scientific knowledge of evidentiary methods and exact natural models of tangible reality. Newton's entry into the Royal Society in 1672 and then later he was elected president in 1703, being consecutively reelected until his death in 1727, he did establish an important milestone in his performance in the said scientific society since its members were people from other British Masonic lodges. Therefore, it is not surprising that

Newton embraced Masonic thought to interpret the worldview of human nature in the prolegomena of a transcendent entity that questioned the knowledge that until then was immutable and dogmatic due to its clerical preexistence. Within the Masonic lodges the study of natural and exact sciences, sacred and secret geometry, astronomy and cosmogony, alchemy and metaphysics, numerology and kabbalah, architectural orders and beauty, oratory and other knowledge inherited by humanity since ancient times, were studied, investigated and exposed in the light of reason assisted in the transcendent principles of the human soul [34]. This transcendence explores the limits of human finitude that is linked to the immanence of the great universal geometries: the Grand Master or Great Architect of the Universe.

For this reason, Isaac Newton, imbued with that spirit of the free thinker of his time, seeks to unravel the temporal, finite and human realm to transcend the timeless, infinite and supra-human where the universal wisdom that integrates and contains everything is found. [39]. In uniqueness, Newton addresses the study of alchemy as a hidden science that seeks to materialize the philosopher's stone, whose manifest process consists of converting impure and rustic metals into a precious metal that is desirable for its beauty and splendor: gold. In this process the base metals are transformed consecutively.

### III. CONCLUSION

Isaac Newton died in 1727, leaving behind no will, he left an enormous number of correspondences, notes, and manuscripts containing all sort of mathematic and scientific studies. Newton Alchemy has revealed the other side of him, something that he wanted to keep hidden from the public. He wrote a forensic analysis of the Bible in an effort to decode the Divine prophecies. He held unorthodox religious view of the church rejecting the doctrine of the Holy trinity of the Father and the Son being a single entity, he was highly speculative of everything that did not make sense in religious, scientific, mathematic, and alchemy terms. At the time of his dead, he had 139 books of alchemy and 31 of chemistry in his personal library (Schettino, 2017: 71), it believes to have lot more during his move from Cambridge to London years and possibly others were lost during a fire that occurred in his laboratory; there is no evidence that possessing these amounts of books under this specific topic mean any affiliation to any groups or order, although he may have shared some of fundamental beliefs and sentiments.

Newton has been the founder of modern science and advocate of the scientific rigour; he was very meticulous in his research and rarely completely satisfied with the obtained results (Schettino, 2017: 71). He stated that in experimental philosophy, propositions gathered from phenomena by induction should be taken to be either exactly or very nearly true notwithstanding any contrary hypotheses, until yet other phenomena make such propositions either more exact or liable to exceptions. What is key to understand, and what have been tried to present here, is that this existing way of thoughts remained strong in England through the first half of the eighteenth century, and that one of its chief proponents was firmly placed within the Newtonian circle, succeeded and developed upon ideas clearly held by Newton himself; and in his visible spectrum theory. Why did he choose Indigo? A question which still remains... apart from being a hue taken to complete his visible spectrum of colours, "indigo" as a simple "dye" was controversial. A couple generation before Newton's time shows that the main blue in Lincolnshire have been "woad" as it was known by the locals farmers a dyed-tinted rather than an actual colour; if Newton wanted seven shades to make up his mystical harmony of colours, similar to the light rainbow in the sky, he could have picked the turquoise colour (Blue turquoise) that separates the actual green from the blue (Blue as a colour similar to the sky-blue or light blue as it is known), or he could have use it to separated pale violet from deep purple (purple is a man-made colour that does not appeared in the spectrum), as the spectrum disappeared into darkness. A most logical and practical explanation could have been to choose "Indigo" to separate the blue (Sky blue or light blue) from violet, as this "indigo" colour was known to local farmers of the region. During the 18<sup>th</sup> century in England, many dyes were registered as indigo in many shades which range from the light shades to dark shades this included: milk blue, pearl blue, pale blue, flat blue, middling blue, sky blue, queen's blue, watched blue, gather blue, mazareen blue, deep blue, and navy blue. Who knows, what shade of "indigo" as a colour Newtons has in mind to complete his visible spectrum linear colour band! [25]. Well, we are yet to find this answer. It should be taken into account that Newton grew up in a favorable environment for the development of speculative philosophical thought in which he was based, the demonstration of nature as an object of study of a reality that manifested two simultaneous aspects: a model of scientific thought probative and a transcendental intrinsic normative spirit of the eternal. For the acquisition of those timeless knowledge, the use of symbols and allegories that throughout history were constant in their proposed paradigms was required. In Newton it is observed that, not only does he try to explain events of materiality making use by laboratory test of organic components of the everyday in exact rationalism, but he infers the primordial mystery in the symbolic light of wisdom, generating the ontological link of finitude of the human being towards the transcendent and that transcendence is manifested in the glow of heat in the crucible. The constant of a meaningful symbology in Newton is exemplified by transforming the light beam into various qualities of chromatic frequencies that penetrate not only the nature of things but also include revealing proposals that underpin the Age of Enlightenment.

## REFERENCES

- [1] McDuffie Jr., T. E. (1995). The search for indigo. *Science Activities*, 32 (3), 8. Source from, <https://doi-org.ezproxybib.pucp.edu.pe/10.1080/00368121.1995.10113188>
- [2] Matthew White. (2018). The Turbulent 17th Century: Civil War regicide, the Restoration and the Glorious Revolution. *Politics and Religion*, British Library. Source from, <https://www.bl.uk/restoration-18th-century-literature/articles/the-turbulent-17th-century-civil-war-regicide-the-restoration-and-the-glorious-revolution#>
- [3] Tim Lambert. (2021). A brief History of English Society. Source from, <http://www.localhistories.org/society.html#:~:text=English%20Society%20in%20the%2017th,of%20society%20were%20the%20nobility>
- [4] Trisha Hughes. (2018). Society in 17th Century England. English Historical Fiction Authors. Source from, <https://englishhistoryauthors.blogspot.com/2018/04/society-in-17th-century-england.html>
- [5] Aird W. C. (2011). Discovery of the cardiovascular system: from Galen to William Harvey. *Journal of Thrombosis and Haemostasis : JTH*, 9 Suppl 1, 118–129.
- [6] Hatfield, Gary. (2018) "René Descartes", The Stanford Encyclopedia of Philosophy (Summer 2018 Edition), Edward N. Zalta (ed.), URL = <<https://plato.stanford.edu/archives/sum2018/entries/descartes/>>
- [7] James A. Watkins. (2019.) Science in the 17th Century; the word "Scientist" coined. Owlcation. Source from, <https://owlcation.com/humanities/Science-in-the-17th-Century>
- [8] Bertrand Russell. (2004). *History of Western Philosophy*. Psychology Press. Pp. 511.
- [9] Newman, Lex. (2019). "Descartes' Epistemology", The Stanford Encyclopedia of Philosophy (Spring 2019 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/spr2019/entries/descartes-epistemology/>
- [10] Fumitaka Suzuki. (2012). The Cogito Proposition of Descartes and Characteristics of His Ego Theory. *Bulletin of Aichi University of Education*, 61 (*Humanities and Social Science*). Pp. 73-80.
- [11] Di Liscia, Daniel A. (2019). "Johannes Kepler", The Stanford Encyclopedia of Philosophy (Fall 2019 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/fall2019/entries/kepler/>
- [12] Klein, Jürgen & Guido Giglioni. (2020). "Francis Bacon", The Stanford Encyclopedia of Philosophy (Fall 2020 Edition), Edward N. Zalta(ed.), URL = <https://plato.stanford.edu/archives/fall2020/entries/francis-bacon/>
- [13] Owen Gingerich. ( 2002). Kepler Then and Now. Harvard-Smithsonian Center for Astrophysics. *Perspective on Science*, Vol. 10, no. 2. Pp. 228.
- [14] Clarke, Desmond. (2015). "Blaise Pascal", The Stanford Encyclopedia of Philosophy (Fall 2015 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/fall2015/entries/pascal/>
- [15] Lisa Shapiro. ( 2011). Descartes's Pineal Gland Reconsidered. *Mid-West Studies in Philosophy XXXV*. Wiley Periodical, Inc. Pp 260. Source from, <https://lisacshapiro.files.wordpress.com/2012/04/shapiro-pinealgland.pdf>
- [16] Merriam-Webster. (n.d.). Platonism. In Merriam-Webster.com dictionary. Retrieved May 10, 2021, from <https://www.merriam-webster.com/dictionary/Platonism>
- [17] Clarke, Desmond M. (2011). "The Epistemology of Religious Belief," in D. M. Clarke and C. Wilson (eds.), *The Oxford Handbook of Philosophy in Early Modern Europe*, Oxford: Oxford University Press, pp. 548–70.
- [18] J.J. O'Connor, E.F. Robertson. (2000). Sir Isaac Newton. MT Mac Tutor. Source from, <https://mathshistory.st-andrews.ac.uk/Biographies/Newton/>
- [19] Jean Chevalier, Alain Gheerbrant. (1996). *Penguin Dictionary of Symbols*, Penguin Books. Pp. 860.
- [20] Smith, George, "Isaac Newton", The Stanford Encyclopedia of Philosophy (Fall 2008 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/fall2008/entries/newton/>
- [21] Charles Wallschlaeger & Cynthia Busic-Snider. (1992). *Basic Visual Concepts and Principles, for Artists, Architects and Designers*. WCB. Brown Publishers. Pp. 245.
- [22] Matt Goldish. (2018). *Maimonides, Stonehenge, and Newton's Obsessions*. *Jewish Review of Books*. Source from, <https://jewishreviewofbooks.com/articles/3215/maimonides-stonehenge-and-newtons-obsessions/>
- [23] David Briggs. (2013). *The Dimension of Colour, Hue before the Hue circle*. Source from, <http://www.huevaluechroma.com/071.php>
- [24] Merriam-Webster. (n.d.). Indigo. In Merriam-Webster.com dictionary. Retrieved May 11, 2021, from <https://www.merriam-webster.com/dictionary/indigo>
- [25] Victoria Finlay. (2004). *Color a Natural History of the palette*. Random House Trade Paperbacks. Pp. 318-351.
- [26] Jochen Streb, Jacek Wallusch, & Shuxi Yin. (2006). Knowledge spill-over from the new to old industries: The Case of German synthetic dyes and Textiles (1878-1913). *Exploration in Economic History*. *ScienceDirect*. Vol 44. Issue 2. Pp 203-223. Source from, <https://doi.org/10.1016/j.eeh.2005.11.002>
- [27] Brittany Anas. (2020). *Understanding color theory: the color wheel and finding complementary colors*. In *Inside Design*. Craft. Source from, <https://www.invisionapp.com/inside-design/understanding-color-theory-the-color-wheel-and-finding-complementary-colors/>
- [28] Robert M. Hazen. (2021). *Sir Isaac Newton: Early Life, Education and work*. *From the Lecture Series: the joy of science: The Great Coursed Daily*. Source from, <https://www.thegreatcoursesdaily.com/sir-isaac-newton-early-life-education-and-work/>
- [29] Jeffrey C. Splitstoser, Tom D. Dillehay, Jan Wouters, & Ana Claro. (2016). Early pre-Hispanic use of Indigo blue in Peru. *Science Advances* 2. (9), e1501623. Source from, <https://advances.sciencemag.org/content/2/9/e1501623>
- [30] Stephen Westland, Kevin Laycock, Vien Cheung, Phil Henry, & Forough Mahyar. (2007). *Colour Harmony*. *Colour: Design & Creativity*. 1(1):1, 1-15. Source from, [https://www.researchgate.net/publication/263334546\\_Complementary\\_colour\\_harmony\\_in\\_different\\_colour\\_spaces](https://www.researchgate.net/publication/263334546_Complementary_colour_harmony_in_different_colour_spaces)
- [31] Ashley Cowie. (2016). *Isaac Newton and the Temple of Doom (1/3)* part. Source from, <https://ashleycowie.com/blog/isaac-newton-and-the-temple-of-doom>
- [32] Linda Holtzschue. (2006). *Understanding Color and Introduction for Designer*. VNR. Van Nostrand Reinhold. Pp. 25.
- [33] Mary Acton. (2009). *Learning to look at Painting*. Routledge, Taylors & Francis Group. Pp 118-119.
- [34] Agüero, Javier. (1988). *Cámara de reflexiones. Manual iniciático de filosofía masónica*. Lima: Ediciones Gran Logia del Perú.
- [35] Assmann, Jan. (2017). *Relio duplex. Misterios egipcios e ilustración europea*. Madrid: Ediciones Akal.



[36] Butler, Amy. (2010). *Un rojo perfecto*. Imperio, espionaje y búsqueda del color del deseo. Universidad de Valencia

[37] Gruzinski, Serge. (2013). La guerra de las imágenes. De Cristóbal Colon a “Blade Runner” (1492 – 2019). México: Fondo de Cultura económica.

[38] Jacq, Christian. (2004). *La masonería. Historia e iniciación*. Madrid: Ediciones Martines Roca.

[39] Kleber, Paul. (2013). *Salomon’s Secrets Arts: The Occult in the Age of Enlightenment*. Yale University Press.

[40] Joseph F. Borzelleca. (2000). Paracelsus: Herald of Modern Toxicology, *Toxicological Sciences*, 53, 2-4.

