# BIOPHOTONIC HYPOTHESIS OF THE TURIN SHROUD

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**Abstract**: A biophotonics hypothesis is suggested for the scientific origin of the Turin Shroud. Presuming its historical authenticity the Shroud's image may have arisen via the Resurrection of Jesus Christ. Two separate but synergistic biophotonic reactions involving ultraviolet (UV) radiation are considered to interact: (a) UV emission by Christ's body and (b) UV absorption by the flax Shroud may explain the photo-negative image of the tortured and crucified Christ on the Shroud. A source of UV biophotons transmitted mainly from within the epidermis of Christ's body struck the Shroud where melanin within its fibres created a colourization on the surface of the Shroud in the form of the photo-negative image of Christ's wholebody. The dynamics of cell replication may be scientifically related to resurrection. UV photons emitted by chromosomes during the cell cycle evolve from a trickle into a cascade at metaphase as the chromosomes suddenly cleave into daughter chromatids followed by the dividing of the parent cells into pairs of daughter cells. In general cellular dynamics is involved in a balance of replication (creation) and apoptosis (annihilation) at every instant during life. UV emitted by the chromosome is due to a form of Stark effect involving colonies of cells and fertilized cells within them. Christ's resurrection may have been via a similar but much more energetic mechanism where a more rapid, more ubiquitous build-up of biophotons within ***all*** cells of Christ's body proceeded until resurrection was complete. High powered UV excimer lasers are known to induce colourization on Shroud-like flax linen. The Shroud image may have been produced via a stochastic high-energy process where the image was built up by photons being absorbed by the flax. Melanin is known to exist in many species including plants. Melanin may absorb UV to protect chromosomes within the epidermis of the fibres from UV damage. Characteristics of this hypothesis match listings of Shroud traits by the Shroud Scientific Group including the recent 'double superficiality'. There is an anomalous luminance on the sole of the right foot and X-ray like images of teeth and bones seen in the wholebody image that may have occurred via biogenic UV.

## 1.0 Introduction

The scientific history of the Turin Shroud began in May 1898 when Secondo Pia photographed the Shroud. This first photo led to other more recent photos that reveal the amazing photo-positive image of a Christ-like figure and head showing what appeared to be bloodstains due to having been tortured and crucified. In the hair there appeared to be bloodstains like a crown of thorns with injuries through the ankles and hands compatible with nails having been used to crucify the man. Pia used an early form of flashlight in the photograph. The image of the face and later also the wholebody on the Shroud was photo-negative and thus was obscure to direct human sight (Figure 1a). When Pia photographed the photo-negative the first photo-positive of the Shroud was revealed (Figure 1b) amazing Pia who reeled back due to his shock. The modern scientific age had been introduced to the physical reality of the Shroud; it appears to be nothing less than an ancient photographic negative of Jesus. Certainly the four Gospels, the other writings of early Christianity, and Christ's iconography support the Shroud's authenticity.

(a)  (b) 

Figure 1 Shroud of Turin (a) as a photo-negative (b) as a photo-positive

However science was not to accept the Shroud as an authentic relic, reminiscent of Christ's own life on Earth. In 1988 strips were physically cut from the precious relic and sent to carbon-dating laboratories in Oxford, Tucson and Zurich. The protocol used in these tests was flawed; all samples were collocated and not randomly dispersed across the garment as is the more accepted method of carbon dating. Nevertheless the carbon date was determined as 1290-1360 A.D.

In 1998 by the time Wilson wrote *The Blood and the Shroud: New Evidence That the World's Most Sacred Relic is Real*, to defend the Shroud's authenticity, there was a plethora of suggestions as to how medieval forgers might have replicated the Shroud. But none could scientifically replicate the details uniquely found on the Shroud and its image. Among the most difficult trait to replicate using medieval methods is the superficiality of the image; neither painting, nor drawing, nor scorching can reproduce this superficiality. The Shroud Scientific Group (SSG) an international multi-disciplinary[a] scientific cooperation established in 2002 has set about to detail these unique traits. A recent version of the list can be found in Fanti et al [2011]. One other trait to note is the 'double-superficiality' of the Shroud [Fanti 2010]; no forger would have or could have arranged for this strange feature of the image.

Wilson's earlier book on the history of the Shroud, *The Turin Shroud* written in 1978 describes how the Shroud has survived many threats to its existence such as fires, wars, and political intrigues, some of these of recent times. It recently came to light Hitler had designs on the Shroud ca. 1938. Sensing the danger of theft or worse the Vatican secretly moved the Shroud to Abbey Montevergine over two hundred kilometers south of Rome where it remained unsullied until after VE day in 1945. In all this it appears providence has played a major role in the Shroud's survival up to the present scientific age. Perhaps no other flimsy piece of cloth has survived the ravages of time in better shape. It may be the destiny of our age to use the scientific methods developed by scientists over the last millennium to answer the scientific question: how the Shroud came into existence as an amazing ancient photo-negative of the crucified Christ perhaps at the very instant of Resurrection.

In the following a synergistic hypothesis based on biophotonics is presented for the origins of the Shroud's image. Photons in the UV range were emitted by chromosomes (DNA) inside cells of Christ's body. These UV photons were able to exit the body and impact the Shroud due to their penetration depth. Melanin within the Shroud then absorbed the UV causing a reaction that led to a colourization on the Shroud surface.

## 2.0 Hypothesis of the Turin Shroud

But if the Shroud is truly an ancient photograph how did it come

[a] The SSG is composed of theologians, historians, journalists, artists, biologists, chemists, physicists, physicians, forensic scientists, mathematical physicists, and others.

about? And why is it unique in scientific history? We must face the fact that we do not yet understand in full how it occurred scientifically. Is there at least a plausible physical method by which the image came about based on our current scientific knowledge? Can we hypothesize how it came about? Implicit in any hypothesis is the fact that science evolves from age to age. As Newton commented: **"***If I have seen further it is by standing on the shoulders of Giants.***"** The leaders of academia of each age may like to think of themselves as world's best experts in all matters relating to science, knowing all scientific questions thrown to them. But the empirical fact is that science up to the present age has evolved over the generations; we have not yet reached a stage of complete knowledge. Sometimes this process of an ever improving match to physical reality has been revolutionary, e.g. Einstein's *annus mirabilis* in 1905, but overall the process of gaining scientific knowledge is evolutionary. Hence we must be unpretentious, perhaps humble even in the light of our present incomplete understanding of science [Fleming 2012]. That said, we are an age where science has provided humanity with technological benefits to the extent that perhaps more than a billion people in the developing world have been lifted from abject poverty. We live in an age of powerful but incomplete science and technology. Do we know enough to uncover a scientifically plausible physics of the Shroud? Perhaps we do not yet understand the full process but it does seem we are on the verge of learning many areas of knowledge hitherto unexplored.

One of the areas currently reshaping our view of biology, medical practice, and biological evolution is biophotonics [Fleming 2014]. This involves new insights as to how cells act cooperatively as a colony to achieve replication of fertilized cells within the colony. This involves electrostatic and magnetostatic fields that evolve during the cell cycle across the colony. This new area of science is based on fields that sit below biochemistry as currently understood. These biofields form the binding energies between electrons and protons within the biomolecular structures including cellular proteins and strands of deoxyribonucleic acid (DNA). The biophotons in these molecules form another level of structural organization that sits beneath the atomic chemistry we have quantitatively understood from quantum theory over the 20$^{th}$ century.

**UV Biophotons and cellular dynamics**

As the cell-cycle proceeds there is a build-up of electric and magnetic fields across the colony of cells. Initially we detect a very small trickle of

UV biophotons down the axis of the chromosomes of any fertilized cells within the colony. This small trickle builds up to a cascade at metaphase at which point in time each chromosome cleaves into two identical chromatids and each chromatid moves towards the opposite ends of the fertilized cell. As replication proceeds each chromatid is duplicated so two complete daughter chromatids are now created at both ends of the fertilized cells. Further along the cycle within each fertilized cell the cell membrane cleaves in two at the equator creating two completely new cells. In the body's many immune systems there are innumerable such biophotonic reactions occurring every moment during life. These processes of growth and development occur from the time the human cell is initially fertilized within the womb of the mother until complete apoptosis of all cells occurs at the point of death.

Figure 2 Colony of cells align and polarize to create a biogenic electrostatic E-field through north-south axis of a central replicating cell whose spindle poles have moved apart to the north and south poles after cell nucleus melts to initialize E-field in cytoplasm of central cell which begins to emit UV photons along axis of chromosomes.

So are the cellular dynamics of replication associated with death and resurrection? Certainly we know that cells 'die' when the cell membranes lose their structural integrity and dissolve. Perhaps our current knowledge about the science of resuscitation further into death is insufficient to give a definitive answer as to how a dead person[b] can be brought back to life once 48-60 hours have elapsed (the time estimated to have elapsed after death before Christ's resurrection) when the blood is likely to have fallen under the forces of gravity to the feet and lower legs where it may have remained after death. If life was restored via an

[b] One of the clinically difficult questions to answer at this time is how we define death.

impulse of energy within Christ's body it would have necessitated this blood being able to resume pumping through Christ's body. Any blood that was not spilt as a result of traumatic injuries and wounds during crucifixion would have to reverse its position within the feet and lower legs to resume pumping through the entire body, a substantial amount of energy. So where did the energy for this 'whole-body defibrillation' and blood-pumping process come from? Perhaps the logical place it may have come from is within each and every cell of Christ's body.

How the energy got there is a question science does not know at this point in time. However recent insights via biophotonics do give strong indication that biophotons may be involved in life, consciousness and death. Like heart defibrillation cells need to be reenergized somehow if life is to be recovered from the state of death.

**Reaction of melanin within plants to UV radiation**

According to Solano [2014] melanin is perhaps the most ubiquitous and ancient pigments found in nature. Melanin appeared very early in most living species on the Earth. Melanin has been recently found in very old fossils from dinosaurs, early birds, nonavian theropod species, and primitive cephalopods. These recent findings will probably make melanin a new biomarker in life evolution. The name "melanin" comes from the ancient Greek *melanos*, meaning "dark". One of its main uses in nature is as a prophylactic against UV damage to chromosomes which in the hotter climate of the early Earth was likely a widespread part of biological immune systems. Life needed to protect itself from the solar source of UV that was more intense on the early Earth than today[c].

Knowledge of how melanin works as a prophylactic within skin comes from how melanin operates within human skin since melanoma a most dangerous skin cancer forms a much studied line of medical and pharmaceutical research. This link between plant and human melanin means pharmaceutical melanin for use as sun protection in humans can come from production of melanin extracted from plants. Plants have been found to have higher concentrations of melanin perhaps due to the harsh weather vertebrates can find shelter from. Health benefits are identified with high concentrations of melanin in popular beverages, moderate amounts of coffee, wine and green tea [Dun-Xian Tan, et al, 2012]. In the

[c] The age of the solar system is about 1/3 the estimated age of the expanding universe. Hence the size of the solar system was somewhat smaller than today.

present context our interest is in the variation of colour with different UV exposure levels via photonic mechanisms in the epidermis of plants; in this hypothesis the UV photons originate from within Christ's body.

Figure 3: How UV affects skin colour via melanin in humans

The Shroud is a linen cloth made of flax. Linen is made from the cellulose fibers growing inside the stalks of the flax plant, one of the oldest cultivated plants in all human history. Textile manufacturing including linen production forms one of the earliest technological processes known of human civilization. The process of harvesting **f**lax is to pull it out of the ground a month after the initial flowers bloom and the lower part begins to turn yellow. Turning flax into linen includes various processes such as rippling, retting, drying, breaking, scutching and hackling, before being spun into yarns. Depending on the processing used, melanin can end up within the linen fibers. See Figures 4(a)-(b). The colourization of Shroud-like linen [Di Lazzaro et al., 2010] when exposed to UV indicates the possible presence of melanin in the Shroud.

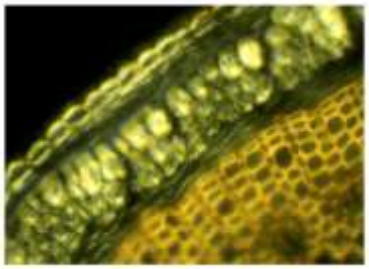
(a)  (b) 

Figure 4(a). Flax plant showing the fibers and the seeds; (b) Cross-section of flax stem observed by polarized light microscopy showing the outermost cuticle/epidermal layer, birefringent fibers, and innermost core tissues

## 4.0 Discussion

In the preceding Section a synergistic hypothesis based on biophotonics has been presented. Photons in the UV range are emitted by the DNA inside all cells of Christ's body. Many of the photons from the cells of Christ's epidermis, and from other locations, e.g. some bones on

the back of the hands leave the body before completely dissipating within the body. Many of the photons that exit from within Christ's body, biophotons, then impact the Shroud. These UV photons are absorbed by melanin inside the epidermis of the fibres of the Shroud. Melanocytes that detect any UV push dendrites with their melanosomes towards the surface of the epidermis of the fibres. Depending on the phase and frequency of these photons this causes a variable degree of colourization of the fibres. But all the photons leaving the body are coherent, so all are in phase making the image possible. The UV field varies in intensity with the distance from the body to the Shroud; this is a near field so intensity is inversely proportional to distance, hence the colourization varies with the inverse distance relationship. There is a synergy between the UV being emitted from the chromosomes of the cells of the epidermis inside Christ's body; and then interacting with the melanin in the Shroud's fibres giving a sepia colour to the Shroud (yellow according to Di Lazzaro et al [2010]), similar to different pigmentation observed as 'black', 'yellow' and 'white' across the human race, white, black, Asiatic, indigenous, etc. See Figure 3. This hypothesis gives agreement with previous findings; e.g. of the Shroud Scientific Group [Fanti et al. 2010] Fanti 2012]. This is also the case for the 'double superficiality' phenomenon; the dendrites, like 'little baseball gloves' can be pushed (stochastically) around the periphery of the fibre at points to form a second much weaker image on the rear side of the fibres.

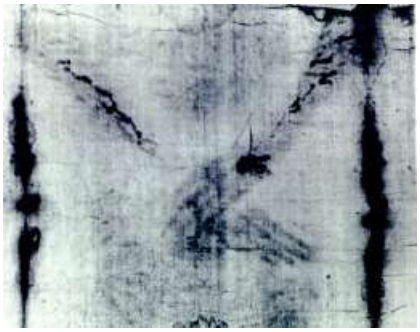
(a)  (b) 

Figure 5(a) Unusual high luminance on complete sole of right foot (compare with luminance of calves) (b). X-ray like image of metacarpals (Accetta et al. 2000)

There are some complicated physical processes concerning the blood, what possibly happened after crucifixion, death, during and after resurrection. First, there is actual blood on the Shroud as is known from

analysis of the blood-type. In terms of the biophotonics hypothesis it needs to be understood how photography reacts with this actual blood. What we find is that this actual blood can be photographed and it becomes a photo-negative amongst the photo-positive of the rest of the Shroud; so it appears 'whiter' (higher luminance) than the rest of the image. For example the 'crown of thorns' appears whiter than the skin of the forehead. It appears also there is a tell-tale trickle of blood wherever there is actual blood, e.g. where a nail has pierced the left foot there's another large trickle falling under gravity, probably dripping onto the right foot positioned underneath it so the two can be nailed together onto the crucifix. But when we come to the underside of the right foot we see something quite different; no tell-tale trickle, just a whiter region covering the complete sole of this right foot; this region is not quite as white as the trickles of blood, but considerably whiter than the skin say of the back of the calves (See Figure 5(a)). We concentrate on the underside of the right foot because the sole of the left foot is obscured by the right foot. The white region neatly covers the complete sole of the right foot and is totally unlike the trickles e.g. the front of the left foot.

It is this 'blood' that is one of several lines of inquiry forming evidence for a biophotonic effect. This 'blood' may have been formed by falling under gravity following the death of Christ. The blood internal to Christ would likely have fallen to the bottoms of the legs; maybe some of it sought small capillaries to seek a pathway through to the soles of the feet. Perhaps what is seen is blood still INSIDE the body that has aggregated in the feet and the bottom of the legs forming a tissue that is engorged with blood unlike living tissue within the feet and the bottom of the legs. This engorgement will affect the luminance of the tissue at the sole of the foot making a higher luminance than ordinary un-engorged living tissue.

There might also be a corollary to the blood falling down to the ankles and feet due to gravity. If that is so, then there will be a ***lack*** of blood elsewhere in the body including the hands and face, especially if Christ died on the Cross and the blood fell down while his hands were raised above his head at the time. This raises the very real possibility that "X-ray" like images observed by some are composed of photons coming from the cells within hand and facial bones, and teeth in addition to skin in which the blood has been drained. According to dielectric theory, it is the high-water content blood that is conductive and dissipates the electromagnetic waves [Fleming 2014]. As there is very little blood in

the hands (See Figure 5(b)) and cheeks after death, the tissues just below the skin are no longer deeper than the skin depth because there is not the usual amount of blood (high-water content tissue)..

In general the characteristics of this biophotonic hypothesis match the listing of characteristics of the Shroud detailed by the SSG [Fanti et al. 2011] including the recent finding of 'double superficiality'; this double superficiality comes about because the melanin pushes dendrites (small cellular protrusions) around the periphery of the flax fibres of the Shroud. These dendrites have embedded melanosomes within them.

## Acknowledgement

The author would like to thank the members of SSG who helped with some of the details of this paper. He also thanks Barrie Schwortz for the use of photos from his most comprehensive web site (www.shroud.com)

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