

# Is the “Holy Fire” Related to the Turin Shroud?



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Submission: June 6, 2019; Published: July 10, 2019

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## Summary

This paper presents the experimental results obtained on the “Holy Fire” (HF) in the Edicule of the Holy Sepulcher of Jerusalem. It is not the aim of the present paper to study how the HF is formed, but that to study its characteristics and effects and to detect if these features are in some way comparable with those typical of the Turin Shroud (TS).

The following experiments have been performed and discussed: HF temperature and spectrum; photos in visible light and infrared; effects of the HF and of a common fire (CF) on linen fabrics; possible air ionization in the environment of the Holy Sepulcher.

While some results appear not easy to explain from a scientific point of view, some experiments seem to show no appreciable difference between the HF and a CF.

In addition to these experiments, the author detected various series of strikes of lightening emitted at regular intervals at a frequency variable from 3 to 10 Hz, not easy to explain because not typical of flashes produced by photographers.

Various facts connected to the HF appear related to what it has been detected in reference to the TS that shows a double image of a man up to now not reproducible nor explainable and, in agreement with the Christian tradition, that shows some traces of the Resurrection of Jesus Christ.

## Introduction

The HF or “Holy Light” [1, 2, 3, 4, 18] is a phenomenon that repeats every year in the Edicule (Anastasis or Tomb of Christ) of the Holy Sepulcher (Church of the Resurrection) of Jerusalem and it was recorded annually at least for the past 1200 years. It happens in the afternoon (about 2 p. m.) of the Holy Saturday of

the Orthodox Easter and Orthodox Christians believe it is a potent symbol of the Resurrection.

The Greek Orthodox Patriarch (or another archbishop) of Jerusalem goes into the Edicule reciting prayers, the sepulcher where tradition refers that the body Jesus was posed after crucifixion.



Figure 1: Lightening (indicated by the arrow) out of the Edicule of the Holy Sepulcher verified in concomitance with HF ignition [6].

After a control to make sure that no oil lamps have been left burning inside, the Patriarch with other priests wait until lightening (detected by the author too), appear inside and outside the Edicule see Figure 1.

He then lights his candles from a so-called “miraculous flame” probably produced by one strike of lightening and goes out to spread the fire among the crowd by passing the flame from candle to candle so that the all the Basilica becomes illuminated by the HF. It is said that it is a gift from God that sanctifies people [5].

When he entered the interior chamber of the Edicule in 1999, Bishop Christodoulos [4, p. 242] affirmed that he noticed the tombstone perspiring liquid myrrh out of its interior and that at the same time a very intense blue light covered the entire tombstone.

Some videos [5, 6] confirm the strange phenomenon also detected by the author: outside the Edicule, various series of tens of strikes of lightening emitted at regular intervals at a frequency variable from 3 to 10 Hz just before the Patriarch goes out of the Edicule with the HF were observed.

These strikes of lightning are not easy to explain because they are characterized by lower frequencies than those typical of camera flashes produced by photographers and with a greater number per sequence. They can be related to a possible auto-ignition of a candle because a strike of lightening can produce a fire in the candle’s wick.

It is said that for the first several minutes the HF burns without consuming and that it is warm [7, 8]; pilgrims say that the HF will not burn hair, faces, etc., see Figure 2, in the first 33 minutes after it is ignited [9].



**Figure 2:** The HF produced by a bundle of 33 candles (Z-twisted as the TS thread are), taken by the author about after five minutes from the initial ignition, does not burn the beard.

Archpriest Gennady Zaridze of the Russian Association of Orthodox scientists, rector of the Church of the Intercession of the Holy Virgin in the Voronezh region used an infrared pyrometer in 2016 to measure the temperature of the HF [5, 6]. The temperature was measured on a silver plate (because silver is one of the most heat-conducting metals) five millimeters wide and one millimeter thick, put on the flame. 42 °C resulted after the first few minutes from the “HF” ignition, but 320 °C were reached after 15 minutes.

According to the Russian scientist Andrey Volkov Associate Professor in Mechanics of Materials at the National Research Nuclear University of Russia [4, p. 132-137] at Easter 2008 “*the appearance of the Holy Fire is accompanied by the appearance of plasma*” that is a highly ionized gas, very rare to form in nature. He also stated that before the appearance of the HF there was an electrical discharge, leading to think to a strict connection with the flame ignition. The instrument used to measure the phase

of electromagnetic radiation at specific frequencies was an oscilloscope “*Picoscope*” connected to a pc with proper software located about fifteen meters from the Edicule.

The Turin Shroud (TS) or Holy Shroud [10-14], is the archaeological object, as well as religious, more studied in the world. It is important because it shows a double image of a man up to now not reproducible nor explainable; it is also religiously important because, in agreement with the Christian tradition, it shows some traces of the Resurrection of Jesus Christ.

It is a 2000 years old linen cloth, 4.4 m long and 1.1 m wide, which wrapped the corpse of a tortured man, scourged, crowned with thorns, crucified and pierced by a spear in the chest. Many are convinced that the TS is the sepulchral cloth of Jesus Christ resurrected there after about forty hours from the wrapping. On the TS, various signs are visible, more or less important and not easily comprehensible at first glance: the double mirror image of

a man, frontal and dorsal, the bloodstains corresponding to the wounds of the Man there wrapped, and other minor signs.

The double body image visible on the TS is not scientifically explainable but several hypotheses have been proposed and several experiments have been performed. None of them has been successful in reproducing all the peculiar characteristics of the image. A critical compendium of hypotheses and experiments performed can be found in [15] showing that the best hypothesis, even if not yet complete, is based on Corona Discharge [16] that is a an electrical discharge brought on by the ionization of a fluid such as air surrounding a conductor electrically charged in high-voltage environments. Frequently it is visible as a bluish glow emitting light.

The author, having identified Jesus Christ with the TS Man, tries to answer to the question of the title "Is the "Holy Fire" related to the Turin Shroud?" by comparing some features of the HF and of the TS after having studied in person the HF during the Easter 2019. The following sections describe this analysis.

### Test Plan

As the peculiarities of the HF last for few tens of minutes, a restrict number of experiments was defined to try to characterize the phenomenon. Basing on information from Refs. [7, 9], the test plan has been formulated on an hypothetical duration of about 20 minutes.

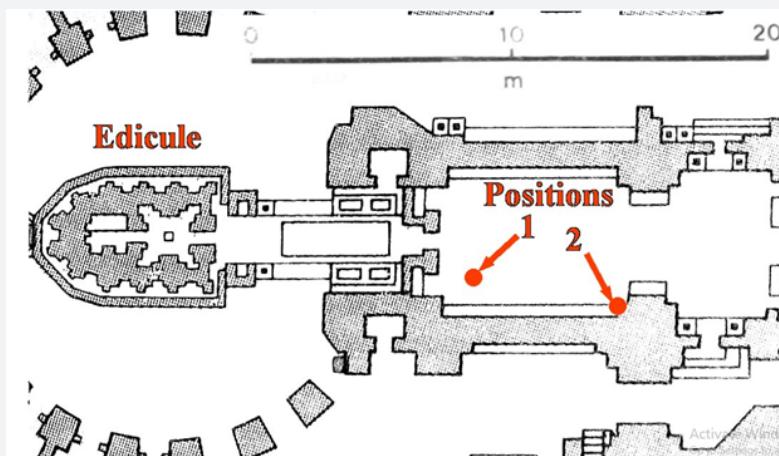
Supposing a delay of few minutes from the initial ignition of the HF to the beginning of the experiments, their duration should

have been less than about 20 minutes. In this time range, the following experiments have been designed to be performed in the listed order.

- 1. To detect either if the HF burns the beard of a man or if it produces insufferable heating on a human face, see Figure 2.
- 2. To compare the CF and HF flames by means of a hand-spectroscope (Krus) connected to a video camera.
- 3. To compare the CF and HF flames by means of an infrared camera able to acquire up to 350 °C (NEC AVIO mod. ThermoShot F30W, in the range of -20°C/350°C).
- 4. To compare temperatures of the CF and HF flames by means of a dual thermometer (RS 1314) connected with a K-thermocouple (Ni Cr + / Ni Al -).
- 5. To compare effects of the CF and HF distant about 3 cm from different linen fabrics.
- 6. To visibly compare the CF and HF flames.
- 7. To measure the air ionization before and after the ignition of the HF by means of an air ion counter (Alpha Lab Inc. USA) set on negative polarity.

### Results

While the author received the HF in the Position 1 of Figure 3, about 10 meters from the Edicule, the experiments have been performed in Position 2 about 15 meters from the Edicule.



**Figure 3:** Plant of the Holy Sepulcher in correspondence of the Edicule (V. Corbo) showing where the author received the HF (Position 1) and where the experiments have been performed (Position 2).

A video [6] shows that the time interval starting from the HF ignition, the moment in which the Patriarch brings the HF out of the Edicule and the HF arrives to the author lasted 2 minutes. The following results refer to the points described in the Test Plan Section.

-1. The HF did not burn the beard of the author and it produced no pain on his face, see Figure 2 in agreement with

the supposed low temperature of the HF. *Experiment duration 2 minutes, ending 4 minutes from HFI.*

-2. The hand-spectroscope showed the result of Figure 4 in which the HF spectrum (1) is compared with that of a CF independently lit by a lighter (2).

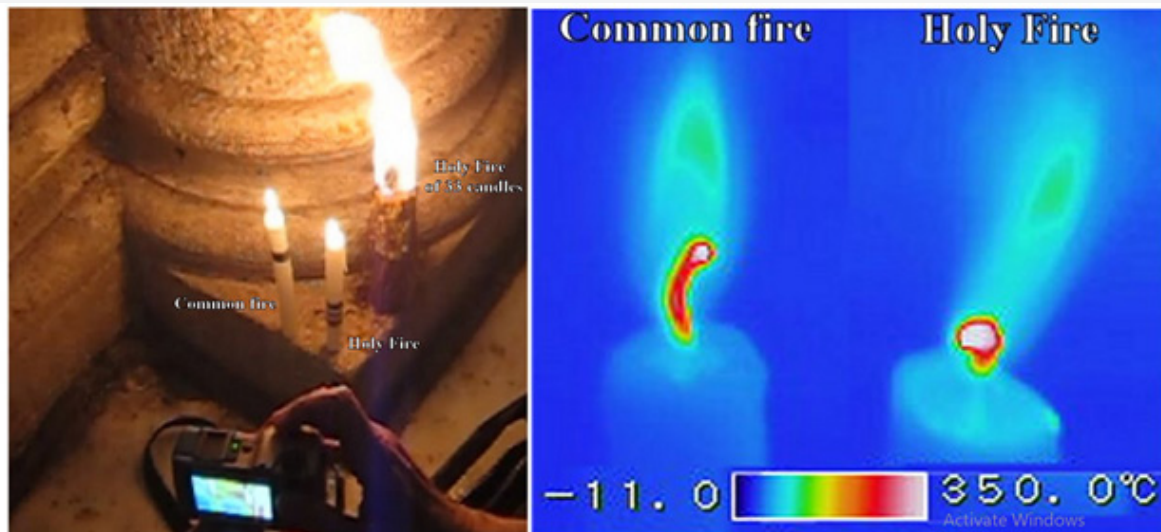


**Figure 4:** Spectra of the HF (1) compared with that of a CF (2): no appreciable differences appear.

Almost no blue light is observed in the two spectra because in a CF the flame temperature varies from 1400 °C at its base to 500 °C in the periphery, so that the blue light is very weak in agreement with the curve of the Black Body. For the rest the two spectra are typical of a low-temperature black body. Spectrum (1) of the HF is practically equal to that of the CF (2), with the difference that the temperature seems a bit lower for the HF (1), because the yellow band seems less intense. The slight shift of the HF spectrum (1)

to the right is simply the result of optical and not physical effect. Therefore, the two lights do not seem to be different. *Experiment duration 1 minute, ending 5 minutes from the HF ignition.*

-3. The infrared photos of the HF flame and that of a CF independently lit by a lighter have been acquired and compared, see Figure 5. *Experiment duration 3 minutes, ending 8 minutes from the HF ignition.*



**Figure 5:** On the left, set-up of the experiment; on the right, infrared photo of the two flames: no evident difference appears.

-4. Both the temperatures of the HF and that of a CF independently lit by a lighter have been measured by means of a K-Thermocouple and compared, see Figure 6 where two values of 892.2 °C and 846.2 °C are indicated. The temperature reading varied from about 800 °C to about 950

°C on both candles, depending on the millimetric distance between thermocouple and wick. Therefore, no appreciable temperature difference resulted for the two flames under analysis. *Experiment duration 2 minutes, ending 10 minutes from the HF ignition.*

-5. These experiments are addressed to compare the effects of the HF flame and that of a CF independently lit by a lighter, distant about 3 cm from different linen fabrics. The study therefore consists in the analysis of the browning/charring

produced on linen fabrics exposed to the two flames for a period ranging from about 4 s (third experiment) to about 30 s (first experiment).



**Figure 6:** Temperature measurement by means of a K-thermocouple: the two values of 892.2 °C and 846.2 °C refer to measurements performed in proximity of the wick of both the HF (on the right) and the CF (on the left).

In the first and second experiment, a bleached TS-like linen fabric was used while for the sixth and seventh experiment a raw

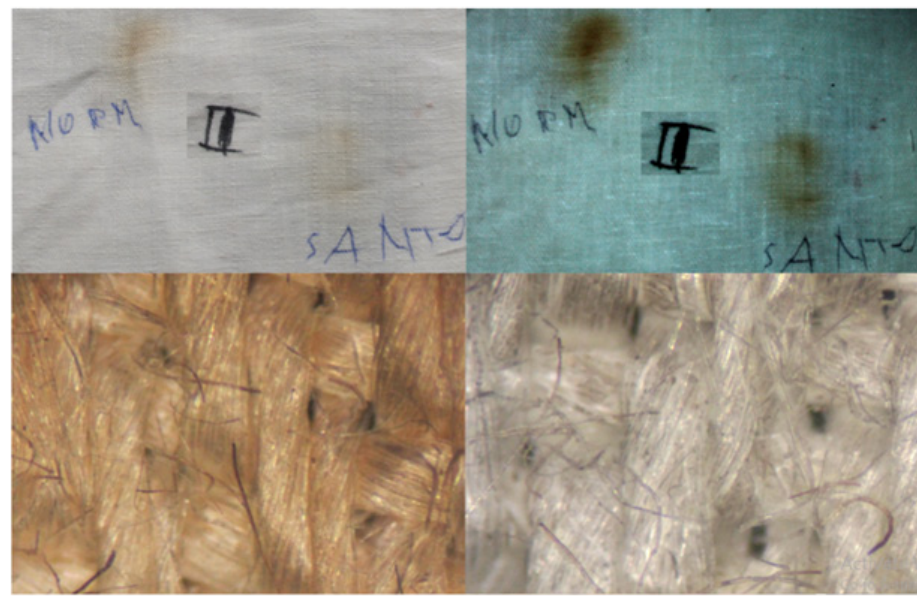
linen fabric was used. (The third, fourth and fifth experiment are not reported here because of minor importance.)



**Figure 7:** First experiment of bleached TS-like linen fabric exposed to fires for about 30 s. “The CF (on the left) burns the linen, while the HF (on the right) only sines it.”

The first experiment lasted about 30 s and was performed about 10 minutes from the HF ignition. It clearly shows a different effect of the two fires on the TS-like fabric: while the CF burned the fabric, the HF produced only a browning of the linen fibers (singeing), see Figure 7.

The second experiment, lasted about 8 s and performed about 11 minutes from the HF ignition, still shows a different effect of the two fires on the TS-like fabric, evidenced in the photo made by using ultraviolet (UV) rays. The CF produced a more intense singeing, see Figure 8.



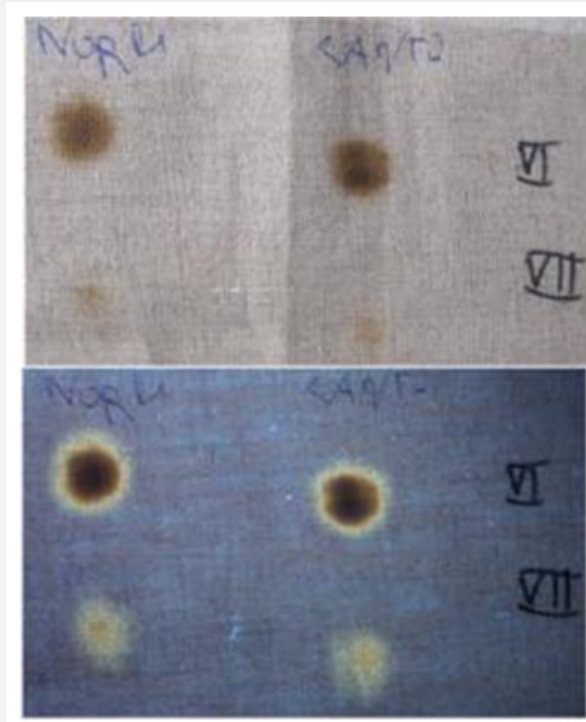
**Figure 8:** Second experiment of bleached TS-like linen fabric exposed to fires for about 8 s. The CF produces a more evident singeing than the HF, better visible in UV (on the top right). On the bottom, photomicrographs of the linen fabric exposed to CF (on the left) and to HF (on the right): the fabric exposed to CF shows a more intense color.

The third experiment, lasted about 4 s, was performed about 11 minutes from the HF ignition. No appreciable differences appear, if compared with the second experiment, see Figure 9. The sixth and the seventh experiment, lasted respectively about

20 s and 4 s and were performed about 17 minutes from the HF ignition. Not well evident differences appear between the result of the CF and of the HF even if the darkness of the spots produced by the CF still seem a bit more evident, see Figure 10.



**Figure 9:** Third experiment of bleached TS-like linen fabric exposed to fires for about 4s. The CF produces a more evident singeing than the HF, better visible in UV on the bottom. On the Left, set-up of this experiment.



**Figure 10:** Sixth and seventh experiment of raw linen fabrics exposed to fires respectively for about 20 s and 4 s. The spots, more visible in UV on the bottom, show similar color intensity even if those relative to the CF (on the left) seem to show a bit more intense color.

The results of this experiment seem interesting and in agreement with those obtained by G. Zaridze [5, 6] who detected a variation in the temperature after 15 minutes from the HFI and in contrast with what pilgrims affirm pilgrims [9]. Therefore, it seems that the HF gradually transforms itself from a special fire to a common one in not more than 20 minutes. *Experiment duration 8 minutes, ending 18 minutes from the HF ignition.*

-6. The flames of two similar candles lighted one with the HF and the other with a CF produced by a lighter have been visually compared, see Figure 11. No appreciable differences appear from the following points of view: color variation from the inner part of the flame to the external one; bluish color on the bottom of the flame; shape and sizes. *Experiment performed 18 minutes from the HF ignition.*



**Figure 11:** Visual appearance of the flames produced by CF (on the left) and HF (on the right). No appreciable difference appear.



**Figure 12:** The air ion counter measured 140 negative ions/cm<sup>2</sup> before the HF ignition, while during the HF the reading raised up to 6040 negative ions/cm<sup>2</sup>.

-7. As possible electric phenomena could produce air ionization, in the surrounding environment, this ionization has been measured before and after the ignition of the HF, see Figure 12. The air ion counter measured an increasing of negative ions in the environment of the Holy Sepulcher from 140 to 6040 negative ions/cm<sup>2</sup>. Without additional specific measurements, it is nevertheless not simple to separate the ionization effect of hundreds lighted candles from that of a possible ionization related to the particular HF ignition. *Experiment duration 80 minutes, starting from 60 minutes before the HF ignition.*

In agreement with the results of G. Zaridze [5, 6] and differently from pilgrims' affirmations [9] it seems that the HF gradually transforms itself from a special fire to a common one in not more than 20 minutes (see Point 5).

### Relations between HF and TS

Various facts detected just before and during the phenomenon of the HF have been related to what it has been detected in reference to the TS [13, 15] in Table 1.

**Table 1:** Some relations between the HF and the TS.

	Facts Detected for the Hf [1-9]	Facts Detected for the TS [10-16]
1	Andrey Volkov [4] reports: <i>"the appearance of the Holy Fire is accompanied by the appearance of plasma that is a highly ionized gas very rare to form in nature."</i>	One of the best hypotheses able to explain, at least partially, the TS body image formation is based on the Corona Discharge that is strictly connected with the formation of plasma [15,16].
2	Andrey Volkov [4] detected an electrical discharge, before the appearance of the HF. Refs. [5, 6] show various series of tens of lightning's strikes outside the Edicule emitted at regular intervals at a frequency variable from 3 to 10 Hz.	The hypothesis of lightning, that is an electric discharge [15], has been formulated by various scholars to try to explain the body image formation of the TS.
3	During the HF formation Bishop Christodoulos [4] noticed a very intense blue light.	The Corona Discharge produces blue light (and non- visible ultraviolet radiations) [16].
4	During the HF formation Bishop Christodoulos [4] noticed the tombstone perspiring liquid myrrh out of its interior.	According to many authors [10,11] and with the John's Gospel, the body of Jesus was wrapped in the TS sprinkled with spices like aloe and myrrh.
5	From the experiment described in this paper, during the first minutes the HF does not produce burnings on linen fabrics like those produced by a CF but only a singeing.	The TS body image does not present burnings but only singeing [13,15].
6	From the experiment described in this paper, a flame of the HF produces browning on a TS-like linen fabric distant few centimeters from it.	A phenomenon acting at a certain distance from the corpse produced the TS body image [13,15].
7	From the experiment described in this paper, a flame of the HF produces browning on a TS-like linen fabric; the yellow- brownish color is produced by a source of heat of not more than few hundreds °C; it results as an oxidation and dehydration of the linen fibers.	The color of the TS body image [12,13,15] is yellow- brownish; to obtain such a singeing on a TS-like linen fabric, it must be subjected to a temperature not greater than 250 °C for few minutes. The TS body image consists on an oxidation and dehydration of the linen fibers.



These relations evidence a strict connection between the HF and the TS, in particular with its body image formation that Christian tradition relates to Christ's Resurrection.

### Concluding Remarks

Every year in the Edicule of the Holy Sepulcher of Jerusalem, the HF is formed without a clear explanation and the Orthodox Church refers it as a miracle.

It is not the aim of the present paper to study how the HF is formed, but that to study its characteristics and effects and to detect if these features are in some way comparable with some typical of the TS.

In agreement with the results of G. Zaridze [5, 6] and differently from pilgrims' affirmations [9] it seems that the HF gradually transforms itself from a special fire to a common one in not more than 20 minutes (see Point 5). The planned experiments in this limited range of time, produced the following results.

-1. The HF is colder than the CF because it did not burn the beard of the author and it produced no pain on his face, see Figure 2.

-2. The two spectra relative to the HF and the CF are similar and typical of a low-temperature black body.

-3. The infrared photos of the HF flame and that of a CF independently lit by a lighter have been acquired and compared, see Figure 5.

-4. The temperature of the HF and of the CF measured by means of a K-Thermocouple show very similar values (of 892.2 °C and 846.2 °C).

-5. The effects the HF and of the CF on linen fabrics are different in the first minutes but they tend to become very similar after about 20 minutes from the HFI. This fact seems interesting because new and in agreement with many features of the TS. The gradual transformation of the HF from a special fire to a common one in not more than 20 minutes is therefore confirmed.

-6. The visual aspect of the HF and of the CF do not show appreciable differences.

-7. The air ionization in the environment of the Holy Sepulcher increased in negative ions from 140 to 6040 negative ions/cm<sup>2</sup>.

While some results, like the different burnings produced by HF and CF (see Points 1 and 5) appear not easy to explain from a scientific point of view, some experiments like those of Points 2, 3, 4, 6 seem to show no appreciable difference between the HF and a CF.

The HF, in the view of a possible miraculous fact connected to it, confirms the possibility that a physical phenomenon shows normal physical values while producing not physically explainable effects like those of Points 1 and 5.

In addition to these experiments, basing on the observation of with Andrey Volkov [4, p. 132-137], the author analyzed the lightening verified outside the Edicule before the appearance of the HF on the basis of the videos reported in Refs. [5, 6]. He detected various series of strikes of lightning emitted at regular intervals at a frequency variable from 3 to 10 Hz, not easy to explain because not typical of flashes produced by photographers.

It must instead be observed that the declaration: "*The light does not produce shadows!*" of Ref. [4 p.29] could not be imputed to an additional miraculous effect because it is well explainable from a scientific point of view if the source of the lightening emitting the flash has sizes of various meters.

Various facts detected just before and during the phenomenon related to the HF seem related to what it has been detected in reference to the TS [13, 15]. The TS [10-14] is important because it shows a double image of a man up to now not reproducible nor explainable; it is also religiously important because, according to the Christian tradition, it shows some traces of the Resurrection of Jesus Christ and the author has identified Jesus Christ with the TS Man.

Therefore if the Edicule is the place where Jesus Christ was buried and if the TS is sepulchral cloth of Jesus Christ resurrected there after about forty hours from the wrapping, probably there can be some connections between HF and TS. Table 1 shows some of these relations between the HF and the body image formation that Christian tradition relates to Christ's Resurrection.

Future analyses, better if performed in proximity of the Edicule of the Holy Sepulcher will confirm these data never published before.

At this point a fact described in the Exodus (3,1-3) comes to mind: "*Now Moses ...looked, and the bush burned with fire, but the bush was not consumed.*" and the following questions arise: is there perhaps a correlation between the fire of the bush just reported and the HF? And are the fire of the bush, the HF and the burst of energy supposed for the TS a sign of God?

In the end, a desire inspired by Pope St. John Paul II, considering the HF a miracle controlled by the Orthodox Church and the TS a miracle controlled by the Catholic Church [17]: "*... the Church must breathe with her two lungs! In the first millennium of the history of Christianity, this expression refers primarily to the relationship between Byzantium and Rome. ... we understand clearly that the vision of the full communion to be sought is that of unity in legitimate diversity.*"

### Acknowledgements

The author thanks prof. Roberto Basso of Padua University for filming the experiments and for his help furnished during the measurement of the air ionization; he thanks prof. Giuseppe Zagotto for the spectroscope lens; dr. Giuseppe Baldacchini of ENEA of Frascati for his interpretation of the spectra; dr. Ihsan

Salama of Nazareth for his help in the accession of the Holy Sepulcher and for the time registration during the experiments.

Thanks to Dr. Susan Lara, Managing Editor at Juniper Publishers and her collaborators for the help and kindness during the publication the present paper in addition to those listed below:

- Fanti G. "Why is the Turin Shroud Authentic?". *Glob J Arch & Anthropol.* 2018; 7(2): 555707, <https://juniperpublishers.com/gjaa/pdf/GJAA.MS.ID.555707.pdf>

- Fanti G. "Why is the Turin Shroud Not Fake?", *Glob J Arch & Anthropol.* 2018; 7(3), <https://juniperpublishers.com/gjaa/pdf/GJAA.MS.ID.555715.pdf>

- Fanti G. "Science and Christian Faith: The Example of the Turin Shroud", *Glob J Arch & Anthropol.* 2018; 7(3), <https://juniperpublishers.com/gjaa/pdf/GJAA.MS.ID.555726.pdf>

## References

1. Holy Fire (description) Holy fire will appear this year on April 26.
2. Holy Fire (description) <https://www.custodia.org/en/news/feast-holy-fire-jerusalem>.
3. Holy Fire (description) <https://www.premierchristianity.com/Past-Issues/2018/April-2018/Holy-Fire-The-biggest-miracle-you-ve-probably-never-heard-of>.
4. Haris Skarlakidis (2015) Holy Fire – The Miracle of the Light of the Resurrection at the tomb of Jesus. Elea Publishing, Athens, Greece.
5. Holy Fire (Italian description and lightning), <https://www.youtube.com/watch?v=W8qoyuyQg3k> Accessed 4 June, 2019.
6. Holy Fire 2019 (very clear lightning) <https://www.youtube.com/watch?v=7D3UJvQsSPl> Accessed 4 June, 2019.
7. Temperature of Holy Fire (around 40°C in first few minutes) <http://orthochristian.com/96672.html> Accessed 4 June, 2019.

8. Эксперт: температура Благодатного огня в первые минуты - около 40 градусов <https://ria.ru/20160901/1475794050.html> Accessed 4 June, 2019.
9. Holy Fire lasting 33 minutes, [https://orthodoxwiki.org/Holy\\_Fire](https://orthodoxwiki.org/Holy_Fire) Accessed 4 June, 2019.
10. Antonacci M., *Test The Shroud: At the Atomic and Molecular Levels*, Forefront Publishing Company; 1st edition. USA. 2016.
11. Fanti G., P. Malfi, "The Shroud of Turin – First century After Christ!", Pan Stanford Publishing Pte. Ltd., Singapore, 2015.
12. Schwalbe LA, Rogers RN (1982) Physics and chemistry of the Shroud of Turin, a summary of the 1978 investigation. *Analytica Chimica Acta* 135: 3-49. Link: <https://goo.gl/KL8fmH>
13. Jackson JP, "The Shroud of Turin: A Critical Summary of Observations, Data and Hypotheses" ver. 4.0, (2017), <http://www.shroudofturin.com/Resources/CRTSUM.pdf>
14. Fanti G. "Why is the Turin Shroud Authentic?". *Glob J Arch & Anthropol.* 2018; 7(2): 555707,
15. Fanti, G., Hypotheses regarding the formation of the body image on the Turin Shroud. A critical compendium, *J. of Imaging Sci. Technol.*, 2011, 60507-1,14, <https://doi.org/10.2352/J.ImagingSci.Technol.2011.55.6.060507>
16. Fanti G. Can Corona Discharge explain the body image formation of the Turin Shroud? *J Imaging Sci Technol* Vol. 54 No. 2, 020508 2010. <https://goo.gl/zpOKck>
17. Pope S.t John Paul II, "Ut Unum Sint" (On commitment to Ecumenism), Encyclical of May, 25, 1995, #54, [http://w2.vatican.va/content/john-paul-ii/en/encyclicals/documents/hf\\_jp-ii\\_enc\\_25051995\\_ut-unum-sint.html](http://w2.vatican.va/content/john-paul-ii/en/encyclicals/documents/hf_jp-ii_enc_25051995_ut-unum-sint.html) Accessed 4 June, 2019.
18. Hvidt N. C. "Orthodoxy Today", <https://www.orthodoxytoday.org/articles/HvidtHolyFire.php?articles/HvidtHolyFire.htm> Accessed 4 June, 2019; book in publication.



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DOI: [10.19080/GJAA.2019.10.555782](https://doi.org/10.19080/GJAA.2019.10.555782)

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